CONVERSATIONS

ON

ANATOMY, PHYSIOLOGY,

AND

SURGERY.

BY

A. ROBERTSON, M.D.
LECTURER ON THE PRACTICE OF PHYSIC.

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ON

ANATOMY, PHYSIOLOGY, AND PATHOLOGY.

ANATOMY OF THE THORAX.

Q. How are the parts of the thorax commonly divided?

A. Into external and internal parts.

OF THE MAMMÆ.

Q. We have discussed the bones and muscles of the thorax; describe now the situation and structure of the mammæ?

A. The mammæ are situated on the anterior and lateral parts of the thorax, adhering by cellular substance to the pectoralis major on each side. Their structure is whitish and glandular, being of the conglomerate kind; a great number of smaller glandular masses, separated by adipose substance, compose the mamma; and each of them has its lactiferous ducts, which unite with others, and form larger tubes that open in the papilla.

Q. What is the *nature of the Papilla or Nipple?*

A. It is composed of tough cellular substance, enveloping the terminations of the lactiferous tubes opening upon its apex; it is red-coloured, and of a conical shape; its base is surrounded by the Areŏla, of a colour different from the rest of the skin.

Q. What is the *use* of the mammæ?

A. They ornament the breast of females, and secrete milk for their offspring.

Q. Do the mammæ differ in size at different periods of life?

A. Yes; in girls they are small; after puberty they become prominent; during utero-gestation they increase in size; after the cessation of the menses they become smaller, soft, flaccid, and pendulous. After fecundation there are peculiar feelings in the breast, and these organs begin to swell; on the approach of gestation, a serous fluid escapes, sometimes in great quantities, called the colostrum.

Q. Does *Titillation* alter the size of the Nipples, or influence the secretion of the mammæ?

A. Yes; titillation of the nipple increases its size and distension; affections of the mind do the same. By titillating, handling, or applying a child frequently to the nipples, *milk* has been brought into the breasts both of young and old women; nay, even into those of men.

Q. What are the properties of milk?

A. It is composed of cream and of milk; the last contains water 28.75 parts; cheese with a trace of sugar, 28.00; sugar of milk, 35.00; muriate of potash, 1.70; phosphate, 0.25; lactic acid, acetate of potash, and lactate of iron, 6.00; phosphate of lime 0.30. Cream contains, butter 4.5; cheese, 3.5; whey, 92.0, in which 4.4 parts of sugar of milk and some salt.

Q. Does the nature of the aliment change that of the milk?

A. It is more abundant, thicker, less acid, when the diet is animal; vegetables produce a contrary effect in all these respects: purges taken by the mother render the milk cathartic; alcohol renders it stimulating, &c. The milk continues good during the course of the second year.

Q. What *organic derangements* take place in the *Mammæ?*

A. Their structure is frequently destroyed by inflammation and induration, or followed by suppuration; by schirrous tumours; by cancer, &c.

ANATOMY OF THE INTERNAL PARTS OF THE THORAX.

Q. What are the internal parts of the thorax?

A. The pleura, mediastīnum, lungs, pericardium, heart, vessels, nerves, and thymus gland.

Q. Describe the PLEURA?

A. The pleura is a thin pretty strong membrane, whose external surface is cellular, adhering to the parts surrounding it; its internal surface is smooth and polished, moistened by a serous fluid emitted from its exhalant arteries. The pleura forms the mediastīnum, which divides the thorax into two distinct cavities. The pleura adheres to the internal surface of the ribs, intercostal and sterno-costal muscles, sternum, dorsal vertebrae, and upper surface of the diaphragm, and is called *Pleura costalis;* it also covers the pericardium and lungs, and is there called *pleura pulmonalis.*

Q. Do the contiguous surfaces of the pleura costalis and pleura pulmonalis not adhere?

A. Not in their natural and sound state; the exhaled fluid prevents adhesion: in cases of inflammation, however, they frequently adhere. The potential space between them forms the cavity of the thorax.

Q. Describe the MEDIASTINUM?

A. It is double, being formed by the reflection of the pleura, whose two layers are united by cellular substance; the anterior mediastinum is connected with the sternum before, and with the pericardium and large vessels of the heart behind.

Q. What is contained in the *Anterior Mediastīnum?*

A. The two layers of it separate at the upper part of the thorax near the sternum, and include the *Thymus Gland.*

Q. What does the *Posterior Mediastīnum* contain?

A. It extends from the root of the lungs and back part of the heart to the dorsal vertebrae: between its layers a triangular space is formed, containing the under end of the Trachēa, the Œsophagus, the Aorta Descendens, the Vena Azygos, the Thoracic Duct, and the two trunks of the eighth pair of Nerves.

Q. What is the *use of the Mediastīnum?*

A 2

A. It divides the thorax into two cavities which do not communicate with each other; it supports their contents, and prevents the weight of the one side from pressing the other; or any fluid effused in the one lung from passing into the other.

Q. What *organic derangements* is the *Pleura* subject to?

A. It is very subject to inflammation, during which it pours out a great quantity of a serous fluid into the cavity of the thorax, and it is often mixed with pus: its texture is thickened and pulpy, and its surface is often covered with a layer of coagulable lymph, which forms adhesions to the contiguous parts. Some portions of the pleura have been found ossified. When pus is collected in the cavity of the thorax, it is called *Empyema.* When a serous or watery fluid is poured out by the Pleura into the cavities of the thorax, it produces *Hydrothorax.*

ANATOMY OF THE LUNGS.

Q. How many lungs are there?

A. *Two;* a *right,* which is divided into three lobes, and a *left,* which is divided into two, the heart occupying the middle space.

Q. Do the *Lungs* in their natural condition fill the cavities of the thorax?

A. Yes; they are in contact with the surrounding parts, and completely fill the thorax.

Q. What are the *connections of the Lungs?*

A. They are connected with the trachēa by the bronchia, with the spine by the two layers of the Mediastinum, and with the heart by the pulmonary vessels.

Q. Is each lobe of the lungs again subdivided?

A. Yes; each is again divided into a great many lobules of different forms and sizes; and these diminish, and ultimately degenerate into Cells or Vesicles.

Q. How many *Coats* have the Lungs?

A. *Two;* their *external coat* is a reflection of the pleura; their *internal* or *proper* coat adheres firmly to the former, insinuates itself between the Lobules, and is intimately connected with their cellular substance.

Q. Of *what Vessels* are the Lungs composed?

A. Of bronchial vessels, blood vessels, absorbents, and nerves.

Q. Describe the *structure* of the *Bronchial Tubes?*

A. Their structure in the larger tubes is nearly the same as that of the trachēa; the cartilaginous rings are divided into pieces, which however can keep the tubes open; they become thinner, and after they have descended a considerable way into the substance of the lungs, the cartilaginous fabric disappears; the muscular coat goes down from the trachēa into the substance of the lungs upon the bronchial tubes, farther than the cartilaginous rings are observable: and after the bronchial tubes become small, having dropt their cartilaginous and muscular texture, the elastic ligamentous coat, and the innermost irritable membrane of the trachēa, are continued to their terminations in the numerous cells of the lungs.

Q. Do the *Bronchial Tubes* form many ramifications?

A. Yes, a great many; for there branch out from the larger tubes innumerable smaller ones, which being still much more minutely divided, are disposed in such a manner as to occupy the whole of the neighbouring space; their ramifications resemble the branches of a tree, and their terminations in the cells a cluster of grapes: and this disposition is continued throughout the whole of the lungs, which are thus made, when the bronchial tubes and cells are filled with air, to occupy the whole space of the thorax, not taken up by other viscera.

Q. Is the *Membrane* which lines the bronchia a *mucous one?*

A. Yes; it is strictly speaking a mucous membrane; and this in a very thin attenuated state forms the innumerable Cells at the termination of the bronchial tubes.

Q. What *Blood-Vessels* are dispersed throughout the lungs?

A. The Pulmonary and the Bronchial Vessels.

Q. Describe the *Pulmonary Artery?*

A. This artery, arising from the Right Ventricle of the heart, ascends behind the sternum within the pericardium, as high as the concave part of the arch of the aorta, where it divides into two branches; the right being the longest and largest, passes behind the curvature of the aorta, and the superior vena cava; these branches divide into ramifications, which accompany the bronchial tubes through the substance of the lungs.

Q. Describe also the *Pulmonary Veins?*

A. The extremities of these veins receive the blood from the Pulmonary Arteries; then they unite and form larger and larger trunks, which accompany the course of the bronchial tubes and branches of the pulmonary artery; at last the pulmonary veins in each lung form two trunks, which, with the two of the other lung, making in all four venous trunks, terminate in the left auricle of the heart.

Q. Describe the *Bronchial Arteries?*

A. They arise from the anterior part of the descending Aorta; two are commonly sent to each lung, they divide and follow the distribution of the bronchia through the lungs.

Q. Describe the course of the *Bronchial Veins?*

A. These veins receive the blood from their arteries, unite into larger and larger trunks, accompany the branches of the bronchia, and terminate in the Vena Azygos and left Superior Intercostal Vein.

Q. What course do the *deep-seated Lymphatics* observe in the Lungs?

A. They follow the course of the bronchial tubes in the same manner as the pulmonary veins do; and lastly, pass through the bronchial glands.

Q. What course do the *Nerves* take which are dispersed through the deep-seated parts of the lungs?

A. They arise from the anterior and posterior pulmonary plexuses near the division of the trachēa into the bronchia, accompanying the branches of the bronchia and blood-vessels in the substance of the lungs, and are ultimately dispersed upon the internal membrane of the Air Cells.

Q. What connects the lobes, lobules, cells, bronchial tubes, blood-vessels, absorbents, and nerves of the lungs together?

A. *Cellular Substance*, completely destitute of fat, is interposed, unites the different vessels and parts firmly together, and supports them in their relative situations.

Q. Have the *Cells* of the bronchial tubes any communication with those of the cellular substance of the lungs?

A. No; the bronchial cells communicate with each other through the medium of their tubes; but they have no communication with the common cellular texture of the lungs?

Q. Do the *Cells* in the cellular substance of the lungs communicate with each other?

A. Yes; most freely, as they do in other parts of the system; hence when they are filled with an effused fluid, they constitute the disease called Hydrops Pulmōnum.

PHYSIOLOGY OF THE LUNGS.

Q. What causes produce the motion of the blood in the pulmonary veins?

A. The contraction of the right ventricle, and the approach of the sides of the pulmonary artery: the capillaries which are supposed to drive on the blood would be as likely to send it backwards as forwards, as it is supposed, that when the blood gets to the capillaries, it ceases to obey the influence of the heart. The agency of these vessels is beyond the cognizance of the senses, and therefore not a matter of science, but of supposition. In reptiles, the passage of the blood from the artery to the vein can be seen by glasses, and there is no pause in the capillaries. The action of the right ventricle is the true cause. There can be no doubt that the compression of the sides of the small and large vessels of the lungs by their collapse, has some effect in retarding the course of the blood : this, however, is a mere mechanical obstruction. In it, the capillaries are passive.

Q. Are there any other causes which influence the motion of the blood through the lungs?

A. The eighth pair modifies most probably the state of the vessels of the lungs. and thus facilitates or retards its passage. When it is divided the circulation is retarded, by the infiltration of the cells with serosity: it is probable that its division facilitates this infiltration by rendering the membranes of the lungs more porous.

Q. Do the pulmonary veins absorb ?

A. They do, as is evident from the inhalation of turpentine, which soon appears in the urine. It is in this manner that deleterious gases, medicines, and miasmata in the air often produce their effects upon the system.

OF THE RESPIRED AIR.

Q. What is the air or atmosphere ?

A. It is a fluid surrounding the earth to the height of 45 miles, composed of oxygen and azote, and a small portion of fixed air, the former of which supports life. It is elastic and compressible ; the higher strata are more rare than those below, which bear the whole weight of the atmosphere, which is sufficient to support a column of mercury equal in height to 28 inches, forming the instrument called the barometer.

Q. Does this pressure vary ?

A. It is less of course as we ascend the upper regions of the air, as upon the summits of mountains than at their bases ; greater when the air is charged with humidity, than when it is dry, changes exhibited by the barometer.

Q. What are its other properties ?

A. It dilates by heat; it is heavy, thus a balloon weighed when filled with air, is heavier than when it is empty; air is 770 times lighter than water: it is always more or less charged with humidity, in proportion as its temperature is raised. The degree of moisture is shewn by the hygrometer: when the temperature is depressed, the moisture is precipitated, and forms clouds and rain. Though transparent, its colour is light blue; as is proved from the colour of distant objects.

Q. How and by what means does the air gain admittance into the lungs ?

A. When the thorax is dilated, the lungs being extensible, and each lobule communicating with a branch of the wind pipe, the air is pressed in through the nose and mouth into their cavity, the one or other being opened by the raising or depression of the velum of the palate: when we breathe through the nose, this partition falls upon the tongue; therefore when we wish to examine the posterior parts of the fauces, it is necessary to make the patient breathe through the mouth. If the mouth is full of food we breathe through the nose; when the nose is obstructed by mucus, through the mouth.

Q. What is the number of respirations in a minute?

A. It differs in different individuals (from 14 to 27) varying according to distension of the stomach, exercise, fever, the capacity of the lungs, &c.

Q. Does the volume of air diminish in the lungs ?

A. By the latest experiments there appears to be no difference in the air after breathing and before.

Q. Do any changes take place on the air inspired into the lungs ?

A. Yes; the air expired is loaded with vapour, and is charged with Carbonic Acid Gas, which is demonstrated by passing it through Lime Water, which is rendered turbid by the formation of Carbonate of Lime.

Q. From what source comes the *Carbonic Acid Gas?*

A. From part of the Oxygen of the inspired Air uniting chemically with the Carbon emitted from the blood.

Q. How is it proved that a portion of the Oxygen of the inspired air is thus disposed of?

A. It has been found by repeated and accurate experiments, that a portion of the oxygen in the air inspired disappears, when it is expired; and that the quantity of oxygen necessary to constitute the carbonic acid expired is exactly equal to that which had disappeared.

Q. Whence comes the *Vapour* in the air expired?

A. The exhalant vessels of the lungs throw out a fluid, which by acquiring caloric is converted into vapour, and emitted with the expired air.

Q. How is this proved?

A. Water injected into the pulmonary artery passes in innumerable drops through the air cells. If water be injected into the arteries of a dog, its vessels will be extremely distended, so that it will have great difficulty to move: in a short time the movements of the thorax will be increased in number, and the water will be discharged by pulmonary transpiration. Weak alcohol, a solution of camphor, of ether, introduced into the cavity of the peritoneum, or in other parts, are also discharged by the lungs. Phosphoric acid is discharged by the nostrils, after injecting a solution of oil and phosphorus into the crural vein.

Q. From what source comes the CALORIC *generated in the Lungs?*

A. From the differences of capacity of the Oxygen, and of the Carbonic Acid, for retaining Caloric; for the Oxygen, when it forms a part of the atmospheric air, has a greater capacity for combining with and retaining Caloric, than it has when in combination with Carbon in the Carbonic Acid; hence a part of the latent Caloric is set at liberty, and becomes sensible, when the Oxygen changes its state, and enters into the formation of the Carbonic Acid. This evolution of Caloric is the source of heat communicated to the animal body.

Q. Does this evolution of free Caloric then increase the temperature of the lungs above that of other parts of the body?

A. No; but it would increase the temperature of the lungs very much indeed, were no provision made in the animal economy for its reception.

Q. By what provision of Nature is the *free Caloric absorbed* or disposed of in the lungs?

A. The venous blood is charged with *Carbon*, which, when the blood circulates through the lungs, is brought into near contact with the Oxygen in the bronchial cells, separates from the blood, enters into combination with part of the Oxygen of the atmospheric air, and forms *Carbonic Acid:* while the Blood, having thus lost its superfluous Carbon, has its capacity for receiving and entering into combination with Caloric much increased. The *Caloric*, therefore, as soon as it is evolved by the Oxygen changing its state, is immediately absorbed by the Blood, enters into combination with it, and becomes latent.

Q. Is the *colour of the Blood* affected by the *Carbon?*

A. Yes; the blood much charged with Carbon is of a purple colour; but when it has parted with the Carbon, it becomes much redder, and what is commonly called *arterial blood.*

Q. How does *Carbon* affect the *capacity* of the blood for retaining *Caloric?*

A. The matter necessary for the formation and deposition of particles, requisite for the renovation of wasted parts of the system, is prepared by the extreme arteries, whether in glands, or otherwise; and during that preparation Carbon is disengaged, and enters into the blood, which is received into the veins. In proportion as the carbon thus accumulates, the capacity of the blood for retaining Caloric is diminished; the latent Caloric therefore is disengaged from its combinations, becomes sensible, and produces animal heat: and as the extremities of arteries are general every where in the system, so is the evolution of free Caloric, and the generation of animal heat.

Q. Does the oxygenation of the blood alter its qualities in any other respect?

A. Its taste and smell become more decided. Its coagulability also increases; its specific gravity is lessened; the serum is also less in arterial blood.

Q. Does oxygenation take place after death?

A. Yes; it is on this principle that resuscitation of drowned persons is effected; the venous or black blood becoming suddenly arterial on blowing air into the lungs; this change also takes place through a bladder, when filled with venous blood, and plunged into oxygen gas; or on exposing the surface of venous blood to the air.

Q. How is the colour of the blood accounted for?

A. Some attribute it to iron, but this is doubtful. Its cause is unknown.

Q. What is the effect of the respiration of other gases?

A. They are all mortal; even oxygen, and the components of atmospheric air, in other than the natural proportions.

Q. Are the different gasses all equally pernicious?

A. Azote, hydrogen, &c. destroy life by being non-respirable; others are directly deleterious, as sulphuretted hydrogen, ammoniacal gas, arseniated hydrogen, nitrous gas, oxymuriatic acid gas. The nitrous oxide is for a short time respirable, produces great intoxication, and if the respiration be continued, death.

Q. What is the influence of the eighth pair in respiration?

A. Its division destroys the animal sooner or later, at most in three or four days: It produces its effects upon the glottis, which it closes by the suspension of the powers of the recurrent, which supplies the muscles which open the glottis, and thus the animal cannot inspire and dies of suffocation. This is the cause when death takes place immediately: when life continues for three or four days, the animal breathes with difficulty, is easily fatigued, lies perfectly still; the difficulty of breathing increases; the arterial blood loses its scarlet colour, the animal becomes colder and at last dies. The lungs are found filled with froth, with some serum effused into the parenchyma of the lungs. The functions of the lungs are in this case gradually destroyed, the blood not being arterialized. If only one nerve is cut, life is continued by the lungs alone, for many months.

Q. How is respiration kept up by artificial means?

A. By blowing with a bellows into the nose or mouth; by applying the mouth of a person to the mouth of the person whose respiration is suspended. Life can be preserved for several hours in this way, even after the spinal marrow has been divided: after some time, from the effusion of air into the cellular membrane about the air-cells, the lobules do not dilate, and the distension of the lungs is thus prevented.

Q. What *Organic Derangements* are the lungs subject to?

A. The lungs are subject to the following diseases.

PATHOLOGY OF THE CHEST.

Affections of the Air-Tubes.

ANGINA LARYNGEA.

Q. What are its symptoms?

A. They are pain in the region of the larynx, increased by pressure, by the action of deglutition, coughing or speaking; the stethoscope indicates the presence of the "râle muqueux;" and as this depends on the fluid in the trachea, it is evident in proportion as that fluid is more abundant and less tenacious, the air bubbles being evolved with greater or less facility according to its degree of consistence. The voice is sensibly altered, becomes hoarse, frequent cough, increased by speaking, which also becomes hoarse, painful, suffocating, and is accompanied by an expectoration, the product of which is variable, sometimes consisting of mucus, sometimes of pus, or of a mixture of both.

Q. What are its anatomical characters ?

A. The mucous membrane lining the larynx, and particularly the glottis and epiglottis, is red and injected; which appearance is either in spots, or diffused to a greater or less extent. It is also somewhat swollen, and on its surface is effused a viscid or puriform fluid. When the disease has continued for any length of time, the redness disappears, and the membrane acquires an increase of thickness; small ulcerations are occasionally in this case observable upon it, particularly at the sides of the glottis.

TRACHITIS.

Q. What are its symptoms ?

A. They are pain in the inferior part of the neck below the layrnx, extending downwards behind the sternum ; this is increased by pressure and by inspiration, and is accompanied by a mucous rattle, such as occurs in laryngitis, which is perceptible in the trachea but not in the lungs, or even at the root of the bronchi ; the voice is but little altered except at intervals, when the mucus secreted in the trachea becomes accumulated in the larynx, but this hoarseness of the voice ceases after expectoration.

Q. What are its anatomical characters ?

A. Redness of the mucous membrane, which is covered with a viscid or purulent fluid, and if the affection has passed into the chronic form, the membrane usually presents several small spots of ulceration, always less numerous than in the larynx. In some cases the ulceration extends so as to perforate the walls of the trachea.

CROUP.

Q. What are its symptoms?

A. In this disease there is a combination of the symptoms of the two preceding affections, together with spasm of the glottis, accompanied by a peculiar alteration of the voice, and a cough which comes on in fits, the intervals between which diminish as the disease advances; the dyspnœa is extreme, the respiration sibilant. This disease, which usually attacks children, and occasionally adults, sometimes begins with a slight cough, attended with pain, though not very acute, of the larynx or trachea; to this sometimes is added a tracheal mucous "rattle;" at other times, however, it sets in suddenly without any perceptible premonitory symptoms; the patient in many instances is awakened during the night by a severe fit of coughing, which is at first dry, but is soon followed by the expectoration of a viscid fluid, sometimes puriform or combined with flocculi of an albuminous substance. The cough may be either acute and shrill, like the crowing of a young cock, or may be hoarse, low, and deep; the voice too becomes hoarse, particularly when the inflammation approaches the glottis; the inspiration is sibilant, in consequence of the spasm at the glottis, and is always heard at a considerable distance. The little patient experiences a severe constriction in the throat, frequently raises his hands towards his neck; the face becomes swollen, and presents the appearance of considerable congestion; the dyspnœa increases in intensity.

Still the symptoms may diminish, and a remission supervene, but the cough retains its peculiar character, and the voice its hoarseness; a second attack, more violent than the first, comes on, and induces fits of coughing attended by an expectoration, either of a mucous or purulent fluid, or of portions of false membrane, or even of membranous tubes of a form perfectly cylindrical, the removal of which, in general, gives some momentary relief.

When the expectoration consists of a viscid mucus, we can distinguish a "râle muqueux," with an easy disengagement of the air-bubbles; if the expectoration be puriform, the "râle sibilant" is perceived, giving a sensation which announces the presence, in the larynx and trachea, of a more thick and viscid fluid. When false membranes are being expectorated, there is no "râle," but we can distinguish a sound similar to that of the valve or clapper of a pump, which is audible only at intervals, when the false membrane is partially detached by the passage of the air through the larynx. If this sound is perceived during inspiration, it indicates that the membrane is detached at its superior extremity, but if during expiration, then the detachment must have occurred at the inferior one.

Finally, the hoarseness of the voice and the dyspnœa increase as the inflammation proceeds; sometimes complete aphonia takes place, but is removed momentarily, by expectoration; the fits become more and more violent, and occur at shorter intervals; the cough becomes more frequent as the consistence of the expectorated matter diminishes, and death, if the termination be fatal, soon closes the scene.

The diseases with which croup may be confounded are simple laryngitis, suffocating catarrh, and œdema of the glottis.

Q. What are its Anatomical Characters?

A. The mucous membrane lining the larynx, upper part of the trachea, and sometimes even the larger divisions of the bronchi, exhibits a greater or less degree of redness, which disappears rather suddenly; it is sometimes covered by a false membrane, of a pale yellow, or greyish colour, the thickness of which depends on the intensity and extent of the inflammation. This production lines the inner surface of the larynx and trachea and commencement of the bronchi ; it is either moulded into a tubular form, or appears in detached portions, blended with mucus, or flocculi of albuminous matter ; it is sometimes separated from the mucous membrane, by a viscid or puriform fluid ; at others it adheres more or less intimately, according to the degree of the inflammation, and also as its seat is nearer to the glottis. When the disease has been of short duration, the false membrane is usually confined to the trachea. The redness of the mucous membrane and tumefaction of its follicles, are considerable. In several cases, the under surface of the epiglottis becomes coated by the false membrane, and the rima glottidis is obstructed by it, or by the purulent matter which frequently occurs in place of it. Finally, cases have occurred in which the mucous membrane of the air-tubes was covered merely by a viscid fluid, or by pus, and still death took place as speedily, and with precisely the same symptoms, as mark the progress of the disease in those in whom the false membranes really existed. Those who die of croup generally exhibit a high degree of congestion of the lungs, and also of the vessels of the brain.

ŒDEMA OF THE GLOTTIS.

Q. What are its symptoms ?

A. They are pain, or a feeling of uneasiness at the upper part of the larynx, giving to the patient the sensation as if a foreign body were lodged there ; this impression is so decided, that he fancies the body is moved during deglutition, and changes its place, so as to occupy the aperture of the glottis, or one of its sides during expiration. From the commencement of the disease, respiration is performed with extreme difficulty, recurring by fits, which threaten instant suffocation ;* inspiration is sonorous or sibilant—ex-

* Cases have occurred in which tracheotomy has been resorted to, for the removal of foreign bodies supposed to be lodged in the larynx or trachea—but in some of them nothing of the kind

piration *free and easy.* The voice is hoarse and somewhat weakened, occasionally altogether suppressed. If the finger can be carried along the tongue, as far as the upper extremity of the larynx, a soft tumor may be felt, about the margin of the aperture of the glottis. The severity of the symptoms gradually increases, and the patient generally dies rather suddenly.

Q. What are the diseases with which it may be confounded?

A. They are croup or suffocating catarrh.

Q. What are its Anatomical Characters?

A. The margins of the glottis are thickened and swollen, forming a tumor of greater or less size, caused by a serous, or still more rarely, a sero-purulent infiltration of the sub-mucous cellular tissue, but without any constant redness of the mucous membrane. A similar turgescence is sometimes found on the inner surface of the larynx, which sometimes resembles phlyctenæ, caused by the application of a blister to the skin. The epiglottis occasionally presents the same appearance. We also in some cases find chronic alterations of different descriptions in the larynx.

CATARRH. (*Suffocating.*)

Q. What are its symptoms?

A. The attack comes on very suddenly, often during the night, attended by considerable difficulty of respiration, threatening of suffocation, a sensation of compression of the thorax, and cough more or less painful; to this state a remission generally succeeds, which is soon followed by a more violent attack, which is in general fatal.

could be discovered even after the most careful examination. It would appear that such a mistake may occur from the close resemblance that exists between the symptoms of œdema of the glottis, and those caused by the presence of a foreign body. Expiration is comparatively free and easy in œdema, but in cases of foreign bodies in the trachea both inspiration and expiration are sibilant and difficult.

Q. What are its Anatomical Characters ?

A. They are unknown.

Q. What are the diseases with which it may be confounded ?

A. They are, croup, asthma, and œdema of the glottis.

PULMONARY CATARRH.*

Q. What are its symptoms ?

A. Catarrh, considered as an inflammation of the pulmonary mucous membrane, is divisible into two stages, the acute and chronic. Its degrees of intensity vary from the slightest cough to such a derangement as makes it resemble phthisis in almost every particular. It begins with irritation in the throat, and dry cough ; but, after an interval, which varies according to the constitution of the individual, or the treatment resorted to, each fit of coughing is followed by the expectoration of a clear, transparent, glairy mucosity, somewhat similar to the white of an egg ; the greater the degree of inflammation in the mucous membrane, the greater is the viscidity and tenacity of its secretion. When the patient is seized with violent fits of coughing, accompanied by a sense of heat in the interior of the chest; by general anxiety and oppression; the expectorated matter acquires a degree of viscidity, somewhat approaching the glutinous sputa of acute pneumonia.

In the midst of this transparent matter we sometimes find several small particles of a dull white colour, which have been frequently mistaken for portions of pulmonary tubercle, and therefore indicative of phthisis.† They do not, however, come from

* This chapter is somewhat too brief in the original, it has been therefore written anew, or rather compiled from the first volume of Andral's work.

† If there be any doubt as to the nature and origin of these substances, it can readily be satisfied by placing some of them on a piece of paper, and exposing them to heat. If they are merely sebacious matter from the mucous cryptæ, in the fauces

the lungs, they seem to be secreted in the mucous cryptæ of the pharynx and fauces. Whilst the expectoration presents these appearances, the symptoms of bronchial irritation remain unabated; but according as this tends to resolution, the sputa progressively change their character. The mucosity of which they consist, by degrees loses its transparence, becomes mixed with opaque yellow, white, or greenish masses, which at first few in number, gradually increase, and ultimately constitute the whole of the expectorated matter. This change is generally accompanied by a perceptible remission of the symptoms of the acute affection, indicative of its resolution.

When the disease, instead of thus terminating, passes into the chronic form, the sputa retain the same appearance as in the latter period of the acute stage. They are opaque, white, yellow or greenish; they sometimes adhere to the bottom of the vessel, at others they float in a transparent mucosity, or are suspended in the midst of it. They are generally inodorous, and to the patient insipid; and in most cases expectorated without difficulty.

Thus the expectoration resembles what is very commonly observed in phthisis; the respiration too is short and frequent; there may be night sweats, and a considerable degree of marasmus. Under such circumstances, none of the ordinary modes of examination are sufficient to distinguish chronic catarrh from phthisis; the stethoscope alone can furnish signs really pathognomic; and these vary according as the catarrh is dry or humid. In the former, there is a feebleness, or even total absence of the respiratory murmur, in parts of greater or less extent, of the affected lung. This, however, is not constant, it changes almost incessantly, so that the respiration

and pharynx, they will leave on the paper a greasy stain, which effect will not be produced if they are tubercular matter from the lungs.

becomes distinct in the parts where it had but a moment before been inaudible, and ceases to be heard where before it had been distinct. These effects are produced by the altered bronchial secretion momentarily stopping up the air-tubes in some places ; and of course they cease when the impediment is removed. This state of the respiration is accompanied by the "râle sonore" and "râle sibilant ;"* the former is little liable to change its seat ; the latter, on the contrary, is very variable. It disappears for a while, probably after an effort of coughing, then suddenly returns with the same intensity as ever. Sometimes, however, both are constant, strongly marked, and occupy the greater part of the organ, which indicates that the affection is extensive and violent.

Acute catarrh may be confounded with emphysema of the lung, and with croup ; chronic catarrh presents several of the characters of phthisis.

Q. What are its anatomical characters ?

A. On opening the body of a patient, who has died of any infection, during the course of which he had been attacked by acute catarrh, the mucous membrane is found red to a greater or less extent. This most usually occurs towards the end of the trachea, and in the first division of the bronchi. In very severe cases it may be found even in the smallest ramifications. If it is confined to the bronchi of one lobe, it is rather remarkable that those of the superior lobe are most constantly affected. In some cases, the membrane seems as if finely injected ; in others there is no appearance of vessels, we see merely a number of small red points aggregated closely together. Finally, the redness

* The "rale sonore" is permanent in its duration, because it depends on a change of structure either in the bronchi or their lining membrane ; the "rale sibilant" is variable, because it depends on the presence of a viscid secretion plugging up the bronchial tubes, which is constantly liable to be displaced and expectorated.

may be confined to particular spots of various forms, constituting so many distinct inflammations, between which the membrane is white and healthy.

This bright redness disappears in chronic cases, and is replaced by a livid, violet, or brownish tinge, but this is not an invariable occurrence. Bayle and Andral report cases of inveterate chronic bronchitis, with puriform expectoration, in which the membrane scarcely presented any trace of redness, or was even in some instances perfectly pale in its entire extent. The small bronchial tubes, particularly those towards the summit of the lungs, are occasionally found dilated in some parts, so as to be considerably larger than in the rest of their trajet, which may increase to such an extent as to emit a real pectoriloquy.—See Andral, vol. ii. p. 29.

HOOPING-COUGH.

Q. What are its symptoms?

A. This affection which is peculiar to infancy, and sometimes epidemic, commences usually with symptoms of catarrh, either of the lungs or larynx, which last for about fifteen days; the cough then becomes convulsive, and recurs by fits at variable intervals. These are attended with violent efforts, and consist of one long sonorous inspiration, followed by several rapid, quick expirations; there is at the same time congestion of the face, and occasionally are accompanied by a sensation of suffocation and constriction, more or less intense, give rise to a vomiting of large quantities of mucous matter, and an expectoration which is thin, transparent, and viscid at the commencement, but afterwards becomes thick and opaque; after this there succeeds a complete remission, with every appearance of perfect health. The duration of this affection is variable.

It may for a short time be taken for croup, or suffocating catarrh, in children.

Q. What are its anatomical characters?

A. Pathology has not as yet thrown any light on the causes of this complaint; in fatal cases, it is usual to find an inflammation of the mucous membrane lining the larynx, trachea or bronchi, and sometimes even some ulcerations.

PLEURODYNIA.

Q. What are its symptoms?

A. Pain in one side of the chest, with immobility of the ribs during respiration, which also becomes more or less incomplete. The murmur of respiration is weak, or altogether inaudible in some parts of the thorax; percussion gives a dull sound; inspiration and pressure on the muscles cause pain. There is no trace of any of the phenomena peculiar to other diseases of the chest, such as œgophony, pectoriloquy, râle, &c. &c.

Q. What are its anatomical characters?

A. Its anatomical characters are unknown.

It may be confounded with pleuritis.

ŒDEMA OF THE LUNGS.

Q. What are its symptoms?

A. This affection, which is seldom idiopathic, usually supervenes either with other diseases—at the close of fevers of long duration—or of organic diseases, particularly those of the heart. The respiration is laborious and difficult; the respiratory murmur is scarcely perceptible, though the thorax is largely expanded; there is a slight "râle crepitant," particularly at the base and inferior part of the lungs. The sound on percussion is clear, and on both sides equally so; the cough is followed by an aqueous expectoration. In some cases the respiration becomes "puerile," in a small part of the summit of the lung. This affection is sometimes complicated with pneumonia, or with emphysema, in which case its diagnosis is very difficult. The nature of the "râle," and the general symptoms, alone can distinguish it from catarrh.

Q. What are the diseases with which it may be confounded?

A. They are pneumonia and catarrh.

Q. What are its anatomical characters?

A. The tissue of the lung, of a pale greyish colour, is more dense and heavy than in the natural state; it is crepitant, and collapses only when, by compression, it is freed from the liquid that is infiltrated into it; the lung seems to contain very little blood, but is gorged with a colourless, transparent, frothy serosity: the air-cells retain their natural texture.

PNEUMONIA*.

Q. What are its symptoms?

A. Laennec has established three periods or stages of this disease, each characterized by a distinct group of symptoms. In the first, the respiration is difficult, accelerated, laborious, becomes also unequal, and imperfect, and so bears no proportion to the dilatation of the walls of the thorax. When both sides are affected it becomes abdominal, the ribs over the affected part are unmoved; occasionally there is a dull pain in some part of the chest, but this is by no means a constant occurrence, except when the disease is complicated with pleuritis. On percussion the chest sometimes sounds as in health, but most commonly its resonance is rendered dull, or lost altogether in a greater or less extent, always, however, limited to that of the affected part of the lung.

When we examine the respiration in those parts in which the resonance is altered, we find it feeble, scarcely perceptible, or altogether masked by "*a râle crepitant*," which indicates both the nature and extent of the alteration. The respiration becomes "puerile," in the parts that remain unaffected, and sometimes also in the other lung. These phenomena soon change, either by the resolution of the disease,

* This chapter has been compiled from Andral and Collin, that in the original not being sufficiently full, considering the importance of the subject. The chapters on Emphysema and Phthisis have been for the same reason taken chiefly from Laennec.

or by its making further progress. In the former case, the "râle crepitant" diminishes in extent and intensity; the murmur of respiration approaches its natural state; the sound of the chest becomes less dull, and its movements more regular; and finally, a "râle muqueux" is audible, which indicates the change of the expectoration, and approach of convalescence. But if, on the contrary, the disease proceeds unabated; the alterations in the movements of the thorax still continue; the sound becomes altogether dull, the "râle crepitant" ceases, for the lung is no longer permeable to the air; there is a total absence of the murmur of respiration, except in some points corresponding to the large bronchi, in which the respiration becomes cavernous, and the voice resounds, so as frequently to produce a real bronchophony. The expectoration is more or less difficult; the sputa are white, slightly yellowish, or semi-transparent, and so viscid as to adhere firmly to the vessel even when inverted; they contain some bubbles of air, and present some striæ of pure blood, or are so intimately blended with it, as to exhibit a dusky *or perfectly red colour.*

If the disease occupy but a small part of the lung, it may still end in resolution. It will then be found to retrace its steps, as it were, and go back through the very same stages by which it had ascended. But if, on the contrary, it still advances, a purulent effusion takes place into the affected part of the lung; the movements of the chest become more restricted, weak, and difficult; symptoms of general debility supervene—a peculiar "râle muqueux," is heard, at first in some points, then in the whole of the affected part. This soon degenerates into a gurgling sound, indicating that the pus is collected into a mass, or cavity, from which it escapes by the neighbouring bronchi; and so, a real pectoriloquy is established by means of this communication between the cavity and the air-tubes.

As each stage of this complaint exhibits a distinct set of symptoms, we can seldom be in error as to its character or extent, if we have an opportunity of following it from its commencement to its termination. But if we are called in, after the second period is established, we experience much difficulty in deciding what the complaint really is. Thus, we find the sound dull, the respiration suppressed, and the ribs immoveable: but are not these common to empyema and hydro-thorax, as well as this stage of pneumonia? The previous history can alone establish the distinction.

Again, in the third stage, the respiration is cavernous, a gurgling sound is heard in the part, together with pectoriloquy, which constitute the leading characters of phthisis. How then are they distinguishable? The previous history and the nature of the expectoration must be our chief guides.

A. From pulmonary apoplexy, it is distinguished by percussion and the examination of the movements of the thorax, which furnish us in general with sufficient data for establishing the diagnosis. The respiration is always complete in apoplexy, but, in most cases, incomplete in pneumonia. In the first degree of the latter, while the "râle crepitant" exists, the sound is obscure or dull, but remains clear in the first degree of the apoplexy; the "râle," is rarely diffused in pneumonia; it is usually in the other affection.

What is the part of the lung chiefly affected in pneumonia? Is it the cellular tissue between the cells, or rather the air-cells themselves? As yet we cannot affirm any thing with positive certainty; we may state what appears probable.

Whilst there is but a simple congestion, we recognize it during life by the existence of the "rale crepitant." Now this "rale," seems to be but the diminutive, as it were, of the "rale muqueux," and if it is quite certain that the latter is seated in the bronchi, we can scarcely hesitate to admit that a mixture of air and fluid in the bronchi of the smallest size produces the "rale crepitant;" but the pulmonary cells are nothing but the ultimate terminations of the bronchi expanded into forms of a cul-de-sac. These cells then are the seat of the "rale crepitant," in the first stage of pneumonia. If this reasoning be correct, it follows that this disease consists essentially in an inflammation of the air-cells, whose inner surface secretes a fluid at first muco-sanguinolent, and afterwards purulent.

As the inflammation advances, the fluid becomes more thick and viscid, it can no longer be expelled from the vesicles in which it is formed; it accumulates, obstructs, and distends them, and so gives rise to those granulations, which give to the lung its hepatized appearance in the second degree of pneumonia. At a later period, it is not mucus or blood that is poured out; it is pus, which in its turn fills the air-cells, and so constitutes the grey granulations which characterize this last stage, or "hepatization grise." If a portion of a lung in this state be pressed, we see the pus escaping in the form of drops, each seeming to come from the vesicle in which it had been contained. If the distention of the cells be general and carried to a great degree, they burst their contents, become blended, and so the granular appearance is lost.

The walls of the vesicles become soft and friable, just as all tissues do when inflamed. Hence the remarkable softening of the substance of the lung in pneumonia.—See Andral, vol. ii. p. 313.

Q. What are its anatomical characters?

A In the first stage of pneumonia the substance of the lung presents an increase of weight and density; it is infiltrated with a frothy, sanguineous serosity in considerable quantity; it still crepitates on pressure, and its alveolar texture can be recognized; the external surface is a deep violet, the interior is more or less deeply red. In the second stage, or that of "heptization rouge," it no longer crepitates on pressure. It presents the heaviness, appearance and density of the liver, its tissue seems granular when torn; its external surface is not so much of a violet colour as the preceding degree: its internal is red, and presents some white spots, caused by the pulmonary cells and vessels; these are occasionally mixed with black spots, similar to those observed on the surface of granite. The sanguineous serosity with which it is infiltred is diminished in quantity, and does not trickle out when a section is made. In the third stage, or that of "hepatization grise," the interior of the lung becomes of a pale yellow tinge, its granular aspect becomes even still more manifest; a purulent fluid issues from it on incision, which may be collected by the scalpel; lastly, the pus infiltered into the substance of the lung may unite in some points, and then gradually increase so as to present the appearance of abscesses, the walls of which exhibit no trace of false membranes; on the contrary, they are softened and broken down, so that not a trace of their original structure remains.

PLEURITIS.

Q. What are its symptoms?

A. At the commencement of the disease, before any false membranes are formed or fluid effused, an acute pain occurs in some part of the chest, together with immobility of the ribs, particularly those corresponding to the seat of the affection; respiration is frequent, (especially if both sides are affected at the same time) painful, hurried, quick during inspiration, and slow in expiration; percussion is painful, in other respects it gives the same results as during health. The respiratory murmur is weakened, but not altered in character, except the disease be complicated.

When an effusion takes place to a moderate extent, the sound becomes dull in the lower part of the thorax, both laterally and posteriorly. This effect may also be produced in any other part of the cavity, in which the effusion shall have become circumscribed by bands of adhesion left by a former pleurisy.

When the stethoscope is applied along the posterior border of the scapula, or towards its inferior angle, in fact opposite to any point to which the effusion may have extended, we perceive, when the patient is desired to speak, the diminutive, as it were, of his voice, sharp, thin and tremulous, to which Laennec has applied the term œgophony.

When the effusion is very considerable from the commencement, or becomes so during the progress of the disease, the sound is altogether dull, the œgophony disappears, and the respiration is no longer heard, unless where old adhesions retain some part of the lung near the ribs, and prevent it from being forced back by the effusion. The intercostal spaces become enlarged, and elevated ; the affected side is more expanded than the sound one, but is no longer influenced by respiration, its immobility forming a striking contrast with the great mobility of the other, in which the respiratory murmur is increased in intensity, so much so as to assume the puerile character.

When the disease begins to decline, and the fluid becomes absorbed, so that its quantity is reduced to the proportion necessary for the production of the phenomena, the œgophony recurs for a while, but gradually diminishes as the effusion is lessened, and ultimately disappears altogether when its absorption is complete. Still the sound given by percussion remains dull for a considerable time, and the respiration weak or imperceptible ; which effects continue in greater or less degree, until the adhesions of the pleura are converted into cellular bands, or into a structure similar to fibro-cartilage. Then the intercostal spaces are contracted, the ribs are made to sink inwards, the thorax becomes narrowed, and the affected side never again resumes its former dimensions or mobility. The diseases with which it may be confounded are hydro-thorax, chronic pneumonia or phthisis.

While the œgophony exists, there is no possibility of mistaking pleuritis for any other disease, except hydro-thorax: as that phenomenon is altogether peculiar to these two affections, the other local and general symptoms of each must be taken into account in order to establish the diagnosis. But when the effusion is abundant, or the disease has passed into the chronic form, if we have not observed it from the beginning, we may mistake it for hydro-thorax, or chronic pneumonia; or, on the other hand, these affections for pleurisy. However, the previous history, together with the general symptoms, will enable us to distinguish them.—There seems no probability of its being confounded with phthisis.

Q. What are its anatomical characters?

A. The inflamed membrane presents a great number of red points, which, though situated under the pleura, are visible through its substance. The spaces between them retain their natural colour; sometimes the membrane is injected, but is scarcely ever thickened. The inflammation always determines the effusion of a serous, transparent, citron-coloured fluid, somewhat similar to unclarified whey; and which contains some detached portions of the false membranes, which are formed on the surface of the pleura. The extent of these is determined by that of the inflammation; if it be confined to the pleura costalis or pulmonalis, then the surface is covered with a layer of coagulable lymph, which is gradually converted into a false membrane; but if the pleura lining the wall of the thorax, and that covering the adjacent portion of the lûng, be at the same time inflamed, then both are covered with layers of membrane, and become connected by transverse bands passing from one to the other, through the fluid which is effused between them. When these new structures become red, and traversed by vessels, the portion of the pleura subjacent to them becomes red also, and the effused fluid partakes of the same colour. The surface of the lung beneath the inflamed pleura usually remains unaffected, but is somewhat more dense and less crepitant than natural. When the effusion is considerable, the lung is compressed and flattened, and if the pleurisy becomes chronic, it may be forced back towards the vertebral column, and be reduced to the form of a membranous lamellæ, so as to be with difficulty discovered, and so induce a belief that it had been altogether destroyed.

In this chronic state the pleura is more red, and the false membranes more friable than in the acute form ; the effusion also is more abundant, but less limpid, and is mixed with minute albuminous flocculi, which give it a puriform appearance.

If resolution and absorption of the fluid take place, the lung becomes distended with air ; the false membranes contract adhesions, which are usually of a cellular structure, or sometimes that of a fibro-cartilage; the membranes themselves present the same organization. It is during this process that the ribs approach each other, the chest becomes narrowed, and the affected side contracted. When the effusion is circumscribed, as happens when it is poured out amongst old adhesions closely united together, it may be mistaken for a cyst in the lung, particularly if it occurs in one of the interlobular fissures. In such a case the lung, being compressed against the vertebral column, renders the mistake still more likely to occur, as at first it may be supposed to have been altogether destroyed ; but the error is removed as soon as the false membrane is removed from the pleura.

Gangrene sometimes takes place in the pleura, presenting itself in the form of circumscribed spots of a dark brown or greenish colour, penetrating the substance of the membrane, and extending in some cases to the subjacent cellular tissue, or to the surface of the adjacent soft parts, which become infiltered by a serous fluid. If the gangrene be the result of an intense pleurisy, which is a very rare occurrence, the false membranes partake of the same state as the pleura, become softened, broken down, lose all consistence, and give out the peculiar odour of gangrene. If it be caused by the rupture of gangrenous abscess of the lung, which pours its contents into the pleura, pleurisy, with formation of false membranes, first takes place, and then the gangrene supervenes consecutively. The walls of the thorax may sometimes be engaged in the disorganization, and an abscess, caused by the infiltration of the effused fluid, may burst externally.

HYDRO-THORAX.

Q. What are its symptoms?

A. If the effusion be not very abundant, œgophony is perceived in the same places as in pleuritis, and presents the same modifications. The sound of the chest is dull on percussion, and the respiration inaudible, except along the vertebral column.

Q. With what diseases may it be confounded?

A. The only disease with which hydro-thorax can be confounded is chronic pleurisy; hence the previous history, together with the absence of the symptoms of the latter, can only determine the diagnosis.

Q. What are its Anatomical Characters?

A. The cavity of the pleura contains an effusion, in most cases consisting of a citron coloured serosity, transparent and without any albuminous flocculi. The lung void of air is compressed towards the mediastinum. But if instead of serosity, the pleura exhales blood, then the membrane is studded with numerous small red points, and covered with blood in a semi-coagulated state.

EMPHYSEMA OF THE LUNGS. (*Asthma.*)

Q. What are its Symptoms?

A. This is one of the many diseases long confounded under the common name, *Asthma*. It is characterized by habitual dyspnœa, recurring by fits, which are exceedingly irregular in their periods of return and duration, and are subject to be increased by any cause, however slight, that affects the respiration. The movements of the thorax are irregular, and habitually unequal; inspiration is short, high and rapid; but expiration is slow, incomplete, and as it were graduated; there is thus a manifest difference in the duration of the two movements. During the fits the respiration becomes conclusive. On percussion, the chest emits a sound more clear than in the healthy state, but this unnatural resonance is not given equally at all points, as the disease seldom extends to the whole lung. When the affection occurs at both sides, we experience much difficulty in estimating this increase of sound, as we have then no subject of comparison: and again, when only one side is affected there is another source of error; we may mistake the sound side, as being less sonorous, for the diseased one; but this is soon rectified by auscultation.

There is a constant cough, returning in fits, usually dry, or accompanied by a viscid, transparent expectoration. When the emphysema is of long standing and extensive, the intercostal spaces become expanded, and the thorax is rendered prominent and rounded on one or both sides, according as the affection is single or double.

In all the points occupied by the emphysema, the murmur of respiration is very weak or altogether suppressed. During full inspirations, and sometimes during expiration, we hear a "*rale sibilant*," resembling the sound of a small valve, or a "*rale sonore*," imitating the cooing of a dove. The contrast between this marked resonance of the thorax, with the feebleness or total absence of the respiratory murmur, constitutes the distinctive character of this disease.

Q. With what diseases may it be confounded?

A. The diseases with which emphysema may be confounded, are—pulmonary catarrh, and pneumothorax, unaccompanied by effusion of fluid.—From catarrh it may be distinguished by attention to the following circumstances: In catarrh the suspension of the respiration in any particular point is of short duration; and when it returns, it is strong and even "*puerile*," a constant râle, sonore or sibilant, also accompanies it. In emphysema the suspension of respiration in a particular part may be long continued, and even permanent, and when it is restored, the respiratory murmur always continues weak, particularly if the disease has lasted long. Further, in catarrh, the movements of the ribs remain free, the respiration does not present a constant inequality, and the chest retains its natural sound and capacity. But in emphysema, one side is more moveable than the other, inspiration is very short relatively to expiration, and the thorax becomes expanded, and acquires a tympanitic resonance.

Q. What are its Anatomical Characters?

A. The pulmonary vesicles on the surface of the lung are distended; their size varies from that of a millet seed, to a nut. The partitions separating them are ruptured, hence the contained air is readily extravasated; the small bronchial ramifications of the affected part are also dilated.—When the thorax is opened, the lung does not collapse; on the contrary, it seems to extend beyond it, as if too large for its cavity, and if it be thrown into water, it floats on the surface. The mucus which obstructs the bronchi is very viscid.

PHTHISIS.

Q. What are its symptoms?

A. Phthisis may be considered as divisible into three periods. From this it is not to be inferred, that a disease, in many cases so obscure in its progress, and variable in its duration, conforms strictly to any such systematic division. Still it is useful to adopt it, for the purpose chiefly of facilitating the description of the symptoms and diagnosis of the complaint. During the first period, namely that in which tubercles, in moderate number, begin to be developed in the substance of the lung, we cannot find either by the examination of the local phenomena, or general symptoms, evidence of any other affection than a catarrh more or less severe; in some instances its progress is, as it were, latent, and altogether escapes observation. However, there usually is some cough, which may be either hard and dry, or accompanied by an expectoration, similar to the saliva of the throat and fauces, which consists of a colourless, ropy, and somewhat frothy fluid, and in which we occasionally find suspended some black spots, and rounded flocculi.

In the second period, the tubercles increase in number, so as to compress and obstruct the substance of the lung to a certain extent; in which case they afford sufficient evidence to make us suspect their presence, but not to decide with positive assurance. Finally, in the third stage, the substance of the tubercle becomes softened, makes an opening for itself into some of the neighbouring bronchi, is evacuated, and so gives rise to the formation of a cavity, the existence of which is indicated by its characteristic symptom—pectoriloquy.

The movements of the chest are very variable during the progress of this complaint, so much so, that though they present almost every possible alternation, they can contribute little to its diagnosis.

In the second period, we usually find that the summit of the side of the chest gives, on percussion, a sound more or less dull and obscure; and if the cylinder be applied on this part, a weakness or total absence of the respiratory murmur is found to exist; and the voice thrills with increased force under the instrument. These symptoms, however, do not become signs of the disease unless they are constant, and exist at one side only; for it is on the comparison of the sound with that of the affected side that their value depends.

After some time the sound returns, occasionally with even increased intensity; or, on the contrary, diminishes; and from having been obscure, becomes altogether dull. The pectoriloquy, doubtful at first, soon becomes perfectly manifest, and so continues, except the disease should increase so much as that the excavation becomes of unusually great extent, when something of indistinctness is given to it. Whilst these changes are taking place, the catarrh increases from day to day, and extreme emaciation is produced.

If phthisis during its progress observed these regular periods in all cases, and exhibited this succession of phenomena, it would no longer be a disease difficult to be recognized. But how frequently does it not happen that patients die before the softening and evacuation of the tubercular matter, or even before the tubercles have increased in number sufficient to alter the sound of the chest, or affect the distinctness of respiration? but it decides its existence with certainty, only when it has passed beyond the reach of art. The complaint with which phthisis is most liable to be confounded is chronic catarrh, from which it is distinguishable by the pectoriloquy, and other symptoms given above, as indicative of the development of tubercles. But the diagnosis is still rendered uncertain, for in catarrh a pectoriloquy may be produced by the dilatation of the bronchi, in which case, time and the progress of the disease can alone clear up the difficulty. From acute or chronic pneumonia occupying the superior lobe of the lung, it will be distinguished by the previous history, the expectoration, and general symptoms.

Q. What are its Anatomical Characters?

A. Tubercles, in their first stage, present themselves in the form of small semi-transparent granules of a greyish colour, or sometimes almost colourless and transparent, their size being usually about that of a millet seed, whence the term *miliary* tubercle. As they increase, they become yellow and opaque; at first in the centre, then gradually in their whole extent; some of those that are near to each other unite, form masses of a pale yellow colour, and of the consistence of cheese, in which state they are named *crude* tubercles.

In this, the second stage of their progress, it frequently happens that the substance of the lung, round the tubercles, hitherto healthy, becomes indurated, semi-transparent or greyish, owing to a new production of tubercular matter, which becomes as it were infiltrated into the pulmonary tissue. However, it occasionally happens that masses of considerable size are formed by a similar process of infiltration, without the previous development of separate miliary tubercles. The part of the lung in which this deposition occurs is dense, humid, impermeable to the air, and when cut presents a smooth polished surface. In some parts of this induration, we generally observe several small yellow granules, which mark its change into the second stage, or that of *crude tubercle.*

As the hardening began in the centre of each mass, so also does the final process of softening, which progressively increases until the consistence of the whole is changed, when the matter by opening for itself a passage into some of the bronchial tubes, becomes evacuated, and so leaves a true tubercular cavity. The interior of these cavities is sometimes crossed by bands of pulmonary tissue, studded with tubercular matter still in the crude state, or in some rare cases by obliterated vessels, but never by any bronchial ramifications. As to the larger vessels, they are forced back and compressed by the progress of the tumour, but not altogether obliterated; the small vessels only suffer that change.

After the evacuation of their contents, the internal surface of these cavities becomes lined by a soft, friable, false membrane; or there is merely an exudation which exists in some parts only, and presents variable degrees of thickness. If the exudation and false membrane should exist at the same time, then the latter is placed beneath, and is found to be torn in some parts. Some cases have occurred in which these excavations are lined by semi-cartilaginous lamellæ, of a greyish white colour, semi-transparent, adherent to the substance of the lung, uniting by a progressive increase, and so becoming continuous with the lining membrane of the bronchi. In some cases also, the sides of these excavations have been found united by cellular adhesions, or by a structure similar to fibro-cartilage, which form a cicatrix, in which different structures may exist, such as chalky concretions, black bronchial matter, &c. Finally, the boundaries of the excavations may be formed by the substance of the lung having become red, hardened, or infiltrated with tubercular matter. Their form is more or less tortuous, their contents vary, sometimes consisting of a matter of the consistence of thick pus, at others of a friable substance, swimming in a serous limpid fluid.

In some cases pulmonary tubercles are contained in cysts, semi-cartilaginous in their texture, firmly adherent to the tissue of the lung by their external surface, but smooth and polished on their internal. This is most commonly found in the bronchial glands.

HÆMOPTYSIS.

(*By exhalation on the Mucous Membrane.*)

Q. What are its symptoms?

A. The attacks of this affection are always preceded by a titillation in the region of the trachea, larynx, or bronchi, according as the congestion exists in one or other of these points; there is also a sensation of heat and irritation in the chest, together with a cough, which is soon succeeded by an expectoration, consisting of frothy, red, vermillion-coloured blood, in greater or less quantity. The chest emits

its natural sound on percussion; respiration continues unimpeded, but is accompanied by an abundant "râle muqueux," with large bubbles.

Hæmoptysis may be periodical, or supervenes on the suppression of an habitual sanguineous discharge. It can scarcely be confounded with hæmatemesis or epistaxis.

Q. What are its Anatomical Characters?

A. The mucous membrane lining the air-tubes, is covered with blood, and presents on its surface a number of red points, but there is no trace of erosion or lesion of its texture.

PULMONARY APOPLEXY.

Q. What are its Symptoms?

A. This affection, which is generally very sudden in its invasion, is marked by intense dyspnœa, and sometimes even a threatening of suffocation. The movements of the thorax are hurried, unequal, intermittent; sometimes alternately full and contracted as if convulsive; in a word, they exhibit the greatest possible irregularity; the patient seems as if suffocating, and every movement indicates the greatest anxiety.

At the commencement the sound of the chest on percussion is found very little, if at all, altered, but the murmur of respiration is decidedly changed. In some points of the lung, circumscribed and more or less numerous, we perceive a "râle crepitant," and in the intervening spaces the respiration is perfect, or increased in intensity, so as to become what is termed "puerile." After some time, however, it ceases to be heard, is succeeded by a "râle muqueux" in great abundance, and consisting of large bubbles, indicative of an abundant exhalation of blood into the bronchi and air-vesicles; these phenomena are soon found to extend to the whole of the lung or lobe affected, and then the diagnosis which was founded upon them, is confirmed by the expectoration and its characters. In this, the second degree of the disease, the sound of the chest becomes in general obscure and dull.

Q. With what diseases may it be confounded?

A. Pulmonary apoplexy may be confounded, while in its first stage, with incipient pneumonia, in its second with catarrh, particularly if it assumes a chronic character, and if the expectoration of blood be not constant, which usually is the case.

Q. What are its Anatomical Characters?

A. Some portions of the lung, generally circumscribed to a few inches in extent, are found of a very deep dark-red colour, presenting a degree of density similar to that of hepatized lung: these appearances are not altered by ablution. When these portions are divided by an incision, we generally find in their centre some coagulated blood; the surface of the incision is granulated and homogeneous, its aspect being perfectly like that of a clot of venous blood, as it is impossible to discover any trace of vessels, bronchi, or cellular intersections. The parts of the lung which surround them are crepitant, sometimes pale, at others red and injected with blood; but they are always separated from the parts affected by the apoplexy, by an abrupt, well-marked line of demarcation.

GANGRENE OF THE LUNGS.

Q. What are its symptoms?

A. This disease, of rather rare occurrence, may attack the surface of the organ, and then produce pleuritis with or without pneumo-thorax; or it may occur in any central part. In the commencement it presents the signs of a slight pneumonia, together with a great degree of general prostration; and then there supervenes an expectoration of diffluent, greenish, fetid sputa, emitting the gangrenous odour: this is accompanied by frequent cough, and sometimes by an abundant hæmoptysis.

This disease can scarcely be said to have any symptom peculiar to it. In its first stage, its characters are those of pneumonia or intense catarrh ; and in the second, when an excavation is formed by the gangrene, we find pectoriloquy as in phthisis—and if a communication be established between the bronchi and pleura, then the stethoscope indicates its existence by the " tintement metallique,"—but the general adynamic symptoms, and peculiar odour of the sputa, sufficiently indicate the nature of the disease.

Q. What are its anatomical characters ?

A. When the gangrene is not circumscribed, its borders are blended insensibly with the adjacent parts, the transition being marked by traces of inflammation in the first or second degree, but the substance of the lung is more humid, and more easily torn than in the first stage of pneumonia. It is of a dirty pale colour, or of a green, bordering on brown or black, interspersed with portions of a livid red tinge, infiltered with blood in a very liquid state. In other parts, it is so much softened that it falls into deliquescence, and when divided by an incision a sanious fluid oozes out, of a greenish colour, and emitting a gangrenous fœtor. In some cases the gangrene is circumscribed, and presents the appearance of a dark, livid eschar, somewhat similar to that produced by the application of caustic potass to the skin. Sometimes this eschar is enclosed within an excavation, but more commonly is converted into a putrid, sanguineous pulp, which finds an exit into the bronchi or pleura, or into both together. When an ulcerated cavity is thus formed, after a previous inflammation, it is sometimes lined by a false membrane, which secretes a dark fetid sanies ; but when there is no membrane, then the walls of the excavation seem to secrete the sanious fluid. Their tissue is granular, sometimes fungoid, soft, and of a reddish brown colour. In some instances, the vessels, though denuded, cross these cavities uninjured; at other times, on the contrary, their coats ulcerate, slough, and discharge their contents.

PNEUMO-THORAX.

Q. What are its symptoms ?

A. This complaint is sudden in its invasion, and dangerous in its character; it consists essentially in the effusion into the pleura of an aeriform fluid, to which is added in many instances a liquid effusion also. Its signs vary according as there is, or is not, a communication between the pleura and the bronchi. The affected side gives a hollow tympanitic sound, even when the thickness of the walls of the thorax is considerable. If it should happen that the lung is connected to the walls of the thorax by bands of adhesion, the sound in these points is almost natural, which renders the change in all the others still more manifest. When the respiration is suppressed in all the space occupied by the gaseous effusion, it is scarcely heard even at the root of the lung. This depends on two circumstances. 1. The compression of the lung by the air contained in the pleura: 2, the pressure of that air, which is a bad conductor of such feeble sounds as those produced by the passage of the air into the bronchial tubes. At the sound side the respiratory murmur is distinct, often "puerile."

When the effusion is considerable, the affected side is dilated, but there is no "râle" of any description. When a gaseous and a liquid effusion are present at the same time, then on making percussion, we find the sound of the thorax clear at its superior parts, but altogether dull in the inferior; hence by varying the patient's position, and by consequence that of the contained fluids, we can vary the seat of the clear and the dull sound.

When this gaseous effusion is owing to a fistulous communication between the pleura and the bronchi, it is known by the existence of those peculiar phenomena described by Laennec,—"la respiration et la resonnance metalliques," or the metallic resonance and respiration.

Finally, if there be a gaseous and liquid effusion, and at the same time a fistulous communication, in addition to these signs another is added—" le tintement metallique,"—or metallic tingling.

The presence of the fluid can always be ascertained by the peculiar sound caused by succussion. This is sufficient to distinguish this affection from all others in which the respiration is suppressed for a considerable time, and to any great extent. It can then be confounded only with emphysema of the lung —but in this latter the sound of the chest is rarely increased to such a degree ; the respiration is never altogether suppressed, it is heard distinctly at the root of the lung, it is accompanied by some " râle," and returns occasionally in parts in which it had ceased to be perceptible.

Q. What are its anatomical characters?

A. We find effused into the cavity of the pleura, an elastic fluid, sometimes containing sulphuretted hydrogen gas. This seldom occurs without some perceptible lesion. It usually is accompanied by a sero-purulent effusion, and by a communication with the bronchi. In other instances, it results from the rupture of a tubercular cavity into the pleura, or even of a gangrenous eschar of the lung ; in this latter case, we also find traces of pleurisy. Finally—pneumo-thorax may arise from gangrene of the pleura, effusion of blood into its cavity, or from rupture of some pulmonary vesicles.

ACCIDENTAL PRODUCTIONS DEVELOPED IN THE LUNGS.

Q. What are their symptoms?

A. There is a degree of dyspnœa proportioned to the size of the tumor, accompanied by a dry cough, or by an expectoration, whose characters are exceedingly various: there is no fever, or general disturbance of the functions. After some time the sound of the chest and murmur of respiration diminish at the points which correspond to the seat of these productions, and finally cease altogether when they have acquired any considerable size. When "ramollissement" of these productions occurs, then that series of symptoms begins to be manifested which attends the same alteration in tubercle, and which has already been detailed in the chapter on Phthisis.

They may be mistaken for pleuritis, chronic pericarditis, or phthisis.

Q What are their anatomical characters?

A. These tumors vary very much both in their size and composition. They are, in some cases, merely cysts in the lung, invested by a membrane whose structure is sometimes similar to serous, at others to mucous membranes. At other times these productions consist of a cellular, fibrinous or cartilaginous structure, in the centre of which, we sometimes find calcareous or osseous concretions. These latter productions also exist without any cyst, in which case they adhere immediately to the substance of the lung; in some instances they are developed in a mass of cartilage or tubercle.

ACCIDENTAL PRODUCTIONS DEVELOPED IN THE PLEURA.

Q. What are their symptoms?

A. When small, or in the state of crudity, there are no means of ascertaining their presence. This can only be done when serous effusions take place, or when the tumours pass into the state of "ramollissement," and symptoms of hydrothorax set in, namely œgophony at the commencement, and then absence of respiration, and dull sound of the chest, to which, in some cases, symptoms of pleurisy are added.

Q. What are the diseases with which they may be confounded?

A. They may be confounded with pleurisy, pneumonia, or pericarditis.

Q. What are their anatomical characters?

A. These productions vary according to the nature of the tissues that compose them. In some cases they consist of encephaloid, in the form of small tumours, in no great number, occasionally combined with melanosis; the pleura to which they adhere is, in general, red towards the point of union. In other instances they are tubercular, appearing as small, transparent, grey granules, united together by a false membrane in which they seem to have been developed, rather than in the pleura itself. These at a later period became opaque and yellow, but seldom pass into the state of "ramolissement." On the surface of the pleura we sometimes find small, white, opaque granulations, analogous to fibrous structures. Other serous membranes present occasionally similar productions, which seem to be the result of inflammation. And lastly, we sometimes find on the surface of this membrane, depositions of cartilage—fibro-cartilage, and even osseous matter.

ANATOMY AND PHYSIOLOGY OF THE PERICARDIUM.

Q. To what parts is the Pericardium attached?

A. Its external coat fixes it firmly to the middle tendon of the diaphragm, and also to its muscular part opposite the fifth rib; and to the mediastinum anterius, while the large vessels themselves fix it to the spine.

Q. What is the structure of the *Pericardium?*

A. It is composed of two layers, the external of which is a continuation of the Pleura; the internal is strong and tendinous-like, smooth within, and composed of fibres running in different directions.

Q. Is the *Pericardium* larger than the heart?

A. Yes; it is much more capacious than merely to contain the heart, and of course so large as to admit of the motions of the heart most easily.

Q. Does the *Pericardium* also cover the origin of the large blood-vessels near the heart?

A. Yes; its upper and anterior part is reflected upon, and includes the Aorta, Pulmonary Artery, and veins.

Q. Does the Pericardium adhere to the heart?

A. No; from the exhalants of its internal surface a fluid is poured out, called *Liquor Pericardii*, which lubricates the surfaces, facilitates the motions of the heart, and prevents it from adhering to the Pericardium.

Q. What is the use of the Pericardium?

A. It keeps the heart in its situation, allows it to have free motion, defends it from injuries, and restrains its inordinate motions.

Q. What are the *Chemical Constituents* of the Liquor Pericardii?

A. It contains much water, some Albumen, Mucus, and Muriate of Soda.

ANATOMY AND PHYSIOLOGY OF THE HEART.

Q. What is the situation of the Heart?

A. It is situated between the right and left lungs, resting upon the superior tendinous part of the diaphragm, with its apex between the lobes of the left lung, and behind the cartilages of the fifth and sixth true ribs.

Q. What is the *division* of the heart?

A. It is divided into a *base* placed towards the spine; a *body*, consisting of a right or anterior, and a left or posterior side; and an *apex* turned forwards and obliquely to the left side.

Q. How many *Cavities* are in the Heart?

A. Two Auricles at its base, and two Ventricles in its body.

Q. What separates the right cavities of the heart from the left?

A. A middle septum, which is generally complete in the adult; but is performed by the *Foramen Ovāle* between the right and left Auricles in the fœtus.

Q. What is the *structure of the Auricles?*

A. The structure of the auricles is strictly muscular; and besides, they have muscular pillars on their inner surface, called *musculi pectināti*, which have smaller columns or threads running in different directions, exhibiting a reticulated appearance.

Q. What is the *structure of the Ventricles* of the heart?

A. The parietes of the Ventricles are composed of a congeries of muscular fibres variously disposed; on their inner surface are several eminences, called *columnae carneae*, running in different directions, forming a net-work; from many of their extremities the *chordae tendineae* arise, as so many tendons from muscles, and are inserted into the margin of the tricuspid valves.

Q. What *use* do the *Musculi Pectināti*, and the *Columnae Carneae* serve?

A. The former assist in the contraction of the Auricles, and the latter in that of the ventricles: while the *chordae tendineae*, occupying less space and attachments to the Valves, prevent them from going back into the Auricle.

Q. In what do the right auricle and ventricle differ from the left?

A. In the thickness and strength of their parietes; for the left ventricle having to propel the blood into the arteries of the system, is composed of parietes of greater thickness and consequent strength for that purpose. Whereas the right ventricle having to propel the blood only through the lungs, is furnished with much thinner and weaker parietes.

Q. Are the right auricle and ventricle of a larger capacity than the left?

A. In the dead body the cavities in the right side of the heart seem the largest, in consequence of being distended with blood; but the actual capacities of these cavities in each side must be equal in the living body; otherwise an accumulation of blood would take place in the lungs.

Q. What is the situation and structure of the *Tricuspid Valves?*

A. Between the right Auricle and Ventricle there is a tendinous ring, from the whole margin of which a circular membrane arises, and forms three triangular or *tricuspid valves*, which when shut and applied to each other, completely prevent the blood from flowing out of the ventricle into the auricle. The chordae tendineae attached to their margin keep them directly transverse when shut.

Q. What is the situation and structure of the *Mitral Valve?*

A. Between the left auricle and ventricle, there is a circular margin from which the valve rises membranous, and is divided into two portions, which when shut, are adapted to each other, and close the passage. The Valvula Mitralis has all the apparatus of the tricuspid valves.

Q. Are both the portions of the *Mitral Valve* equal in size?

A. No; one of the portions, considerably larger than the other, shuts the mouth of the Aorta while the valve is open, and the blood is flowing into the left ventricle; and when the regurgitation of the blood shuts the two portions of the valve in order to prevent its reflux into the left auricle by the contraction of the ventricle, the blood is propelled into the open Aorta.

Q. Are *Valves* placed at the *Mouths of the Pulmonary Artery*, and *Aorta?*

A. Yes; *Semilunar Valves* are placed at the mouth, or beginning of each.

Q. What is the structure and appearance of the *Semilunar Valves?*

A. They consist of three membranous portions, each of which adheres to a third part of the internal circumference of the artery; the other edge is loose and thicker, having a hard corpuscle in the middle, called *corpusculum* AURANTII vel MORGAGNI. When these three portions are shut, they come close together, and prevent the reflux of blood into the ventricles, during which they are convex towards the ventricle, and concave next the arteries.

Q. Do the *Sinus Venōsus* on the right side of the heart, and the Sinus Venōsus on the left, differ in structure from the proper Auricles?

A. Yes; the proper auricles of the heart are composed of strong muscular fibres: but the sinuses are formed by the junction of veins, and by consequence have the same structure as veins.

Q. Is the *structure of the veins muscular?*

A. Some anatomists have thought so; but it is generally believed that the veins have no muscular coat, and that they are composed of strong membranous coats possessed of much elasticity.

Q. Describe the veins which form the *Sinus Venosus* on both sides of the heart?

A. The *right sinus venosus* is formed by the junction of the Superior and Inferior Venae Cavae, which resembles a membranous bag; the *left sinus venosus* is formed by the union of the four Pulmonary Veins, making a sac equal to the size of the right sinus. The structure of both the venous sinuses of the heart, therefore, is purely membranous, as that of the veins is, which compose them.

Q. Describe the *course of the blood through the right side of the heart?*

A. The two Venae Cavae pour their blood into the right sinus and auricle, which make but one cavity; by the contraction of the auricle it is propelled into the right ventricle, which it stimulates to contraction, by which it is propelled into the Pulmonary Artery; for the Tricuspid valves being shut, prevent its reflux.

Q. Describe the *course of the blood through the Lungs?*

A. The blood propelled into the Pulmonary Artery stimulates it to contraction, by which the semilunar valves are shut, and the blood is forced into the smaller branches of the artery. The extremities of the branches of the Pulmonary Artery are minutely dispersed around the air-cells of the bronchial tubes, and there transmit their blood into the extremities of the Pulmonary veins, which unite into larger and larger trunks, that carry their blood towards the left auricle.

of the heart, in which they ultimately terminate in four trunks.

Q. Describe the *course of the blood through the left side of the heart?*

A. When the blood is poured by the four pulmonary veins into the left auricle, it is stimulated to contraction, by which the blood is driven into the left ventricle, which in turn being stimulated, contracts, shuts the Mitral valve, and propels the blood into the Aorta, and other arteries of the system, from which the veins receive it, and carry it again back to the heart.

Q. What prevents the blood from flowing into the Venae Cavae and pulmonary veins when the auricles of the heart contract themselves?

A. The weight of the column of blood in the veins, commonly called the *vis a tergo;* because no valves are placed at the terminations of the Venae Cavae and pulmonary veins.

Q. But is the blood completely prevented from flowing back into the veins near the heart?

A. No; its reflux from the auricles is sometimes perceived as far as the jugular, and always in the venæ cavæ, forming a perceptible pulse. The extent of this pulse depends upon the quantity of blood in the right auricle, which cannot be passed into the ventricle, and also, upon the obstruction, which may exist to its passage through the lungs, retarding it also in the pulmonary artery.

Q. The cavities of the heart do not then at each contraction expel all their blood?

A. No: observation proves that both in the right auricle and ventricle, the whole of the blood is not expelled; so that the right side of the heart is actually never empty.

Q. In what manner does the *Heart receive its own nourishment?*

A. From the blood which the two *Coronary Arteries* transmit into its substance.

Q. Describe the *origin* of the coronary arteries?

A. The *two Coronary Arteries* arise from the beginning of the aorta, opposite to two of the semilunar valves, which cover their mouths when the blood flows into the aorta ; and when these valves are shut during the contraction of the aorta, the blood flows readily into the Coronary Arteries.

Q. What is the *course* of the Coronary Arteries ?

A. The one runs in the depression between the right auricle and ventricle, and chiefly sends its blood to the right side of the heart ; the other runs between the left auricle and ventricle, and partly also between the ventricles on the foreside of the heart. Their branches communicate freely.

Q. Describe the *course* of the *Coronary Veins*?

A. The Coronary Veins are all collected into one called the *Great Coronary Vein*, which turning from the left side and running between the left auricle and ventricle, terminates in the under part of the right auricle, where it is covered by a semilunar valve peculiar to itself.

Q. What is the cause of the beating of the heart against the side ?

A. It depends upon three causes ; 1. upon the dilatation of the auricles, during the contraction of the ventricle; 2. The dilatation of the aorta and the pulmonary artery, the consequence of the introduction of the blood which is driven into it ; 3. The projection of the curve of the aorta, by contraction of the heart.

Q. How many pulsations does the heart make in a minute ?

A. They decrease with age ;

at birth they are from	130 to 140 in a minute;
at 1 year - -	120 to 130
at 2 years - -	100 to 110
at 3 years - -	90 to 100
at 7 years - -	85 to 90
at 14 years - -	80 to 85
at the adult age -	75 to 80
at old age commencing	65 to 75
in confirmed old age	60 to 65

Other circumstances, however, vary these data very much, as affections of the mind, diseases, &c.

Q. What is the force of the contraction of the ventricles?

A. It is difficult to determine; age, stature, and many other causes have an influence upon it: the heart also exerts great power in dilating the ventricles as well as in contracting them, as is evident by attempting to compress it with the hand when an animal is still alive.

Q. From whence does the heart derive its power of motion?

A. By the experiments of Legallois it appears, that the cause of the motion of the heart is derived from the spinal marrow, because in proportion as it is destroyed, the heart becomes debilitated; and when the spinal marrow is completely removed, its action ceases altogether; as, however, the heart still continues to contract after it is removed from the body, the spinal marrow must be regarded as one of the causes which influence this organ.

Q. What is the amount of the whole quantity of blood in the body?

A. From 24 to 25 pounds: it varies according to innumerable causes.

Q. How rapidly does the blood move?

A. It is different in different persons, and in different parts of the arterial and venous systems; very rapid in the great trunks, diminishing towards the extremities; increasing again in the veins as it passes towards the heart.

Q. What different appearances or symptoms do these different degrees of motion produce?

A. The contractions of the heart produce pulsations in the arteries; contraction and diminution of their cavity, succeed; the first is called the pulse; which is best examined at the place where the artery passes over a bone.

Q. What qualities of the blood-vessels are known by the pulse?

A. The quickness, power or weakness, regularity and irregularity of the motions of the heart; also the quantity of the blood in the system; if it is great the artery is round, large and resisting: if it is small in quantity, it is small and easily compressed. Certain states of the arteries also influence them and render the pulse different in different parts.

Q. Has this pulsation of the arteries any effect upon the functions of the different organs?

A. It is thought to favour the operation of their functions; this is, however, hypothetical. The arteries are curved and very much divided in entering the brain, to prevent the effect of the sudden shock upon that organ which would otherwise take place.

Q. What is the influence of the nervous system on the blood?

A. The nerves influence the circulation in two ways: 1. in modifying the movements of the heart; 2. in modifying the capillaries, by accelerating or retarding the blood.

Q. What is meant by the transfusion of the blood?

A. It is the injection of the blood of an animal or a person into the veins of another; formerly it was used with the vain hope of producing a renewal of youth; now for the purpose of experimenting on the properties of the arteries, veins, and of medicines, and for supporting the strength in hemorrhages from the womb, exhaustion by inanition, &c.

Q. How is it used to discover the properties of medicines?

A. The medicine is injected into the veins, and if poisonous it soon shows itself: in this way medicine operates in a smaller dose. In Copenhagen they administer medicine to horses; with the above exceptions it is not now applied to the human system, as idiocy and death have resulted from it.

Q. What are the organic diseases of the heart?

A. They are specified below.

PATHOLOGY OF THE HEART AND ITS MEMBRANES.

AORTITIS.

Q. What are its symptoms?

A. Considerable development of the pulsations of the aorta, and sometimes of the large arteries; those of the aorta can be recognized at the depression at the top of the sternum. In some cases there is a sensation of heat or pain, which is referred to the inflamed part, accompanied at the same time by sinking and anxiety. When aortitis becomes chronic, the arterial pulsations usually become more slow, and then we observe symptoms of dilatation or hypertrophy of the heart. Accidental tissues developed in the trajet of the aorta may simulate aortitis, particularly when their density is such as to facilitate the transmission of the pulsations of the vessel.

Q. What are the diseases with which it may be confounded?

A. They are any accidental productions developed in the course of the aorta, particularly when they are so dense as to facilitate the transmission of the pulsations of the vessel.

Q. What are its anatomical characters?

A. Redness of the lining membrane of the aorta, variable in degree, and appearing in some cases as if it had been painted. This colour is, in general, circumscribed; in most cases it is scarlet; but when it extends to the right cavities of the heart and pulmonary artery, it is of a more or less deep shade of violet. The lining membrane presents no distinct traces of injection; it is, however, quite otherwise with the cellular coat; it is not much thickened. On its surface we sometimes find a layer of coagulable lymph; it is also frequently the seat of deposits of fibrous lamellæ, or of osseous or calcareous matter; in this latter case all the coats of the artery are thickened, friable, and destitute of their usual elasticity. We sometimes find spots of ulceration affecting the lining membrane only, or penetrating more deeply into the coats of the vessel.

ANEURISM OF THE AORTA.

Q. What are its symptoms?

A. This affection is marked by strong and loud pulsations, synchronous with those of the pulse, and accompanied by a "*bruit de soufflet.*" The seat of these symptoms varies according to the situation which the tumour occupies; and if it be so situated as to compress the trachea or bronchi, it will determine a peculiar hissing sound during the act of respiration or speaking. The sound of the chest is diminished, and sometimes above the heart there is a murmur or thrill perceptible by the stethoscope, or even by the hand.

When the aneurism is seated in the ascending aorta, the pulsations are most perceptible at the sternum and cartilages of the ribs; but when the descending aorta is dilated, then they are perceived along the dorsal vertebræ; finally, when it occurs in the abdominal aorta, we observe them with great distinctness, and to a great extent in the abdomen. Aneurism of the thoracic aorta may be confounded with contractions of the orifices of the heart; that of the abdominal portion of the vessel may be simulated by tumours placed upon its trajet.

Aneurism of the thoracic aorta may be mistaken for a contraction of the orifices of the heart; that of the abdominal aorta may resemble the effects of tumours placed along its course.

Q. What are its anatomical characters?

A. Dilatation of the aorta occurs most usually in its curvature and ascending portion; it may occupy the whole circumference of the vessel, or only a part of it; in which latter case it generally occupies the anterior or lateral part of the tube. The three coats of the artery almost always have some degree of redness, together with some exudations, ulcerations, or spots of ossific matter. In some cases the dilatation does not, (as in true aneurism) extend to all the coats of the vessel, the inner and middle coats are torn, the cellular alone forming the wall of the sac. Finally, we sometimes find the coats of the artery both dilated and torn, the blood being effused beneath the cellular membrane, which serves as its investment. The fibrine of the blood, which lines aneurismal tumours, is disposed in successive concentric layers, deposited one upon the other. Of these the external ones are the most dense in texture and dark in colour, and also most firmly united to each other: they are thinner in the true aneurism than in that which is accompanied by ulceration of the two inner tunics, and complete rupture of the walls of the artery.

INDURATION AND CONCRETION OF THE VALVES OF THE HEART.

Q. What are their symptoms ?

A. From the very commencement there is habitual dyspnœa (which is increased by the least exercise,) together with palpitations; and during the contractions of the heart, the sound it emits is rough, and, as it were, stifled. Such symptoms as these may induce us to suspect an incipient contraction of the orifices; but when it becomes considerable, it may be recognized by the following signs: If the affection is seated in the auriculo-ventricular openings, we hear, during the contraction of the auricles (which is then prolonged beyond its usual duration) a slight "*bruit de rape*," (sound of a file) or a "*bruit de soufflet*," (sound of a bellows.) These phenomena are constant in their duration ; the former depends on an osseous induration of the valves, the latter is heard when its structure is that of cartilage or fibro-cartilage. When the contraction is seated in the arterial openings (*aortic* and *pulmonary*,) the sound above indicated is synchronous with the pulse and contraction of the ventricles : if the left orifices (the *mitral val-*

vulės, and sigmoid valves of the aorta,) are contracted, the "bruit de rape" or "de soufflet," is heard between the cartilages of the fifth and seventh ribs at the left side, whilst, if it occupies the orifices at the right side of the heart (the tricuspid valves, and sigmoid of the pulmonary artery,) the sound is most distinctly heard at the inferior part of the sternum. This murmuring, or thrilling, is in some cases sensible to the hand placed on the region of the heart; particularly when the mitral valve is ossified, and the contraction of the left auriculo-ventricular opening is considerable. In this disease the palpitations are frequent; the strokes of the heart generally intermittent, unequal, and sometimes very strong, whilst those of the pulse, on the contrary, are small and concentrated; they are more irregular when the contraction occurs at the left than at the right side. The face is of a violet hue, the limbs are œdematous, the patient is constantly afflicted with a dyspnœa, which increases until it proves fatal.

These productions may be mistaken for dilatation or hypertrophy of the heart; for pericarditis or palpitations.

Q. What are their anatomical characters?

A. When the valves of the heart are affected by these alterations in their whole extent, their natural form is lost, they become coiled upon themselves in such a way as to contract the orifice at which they are placed, which in some instances has been thus reduced to a diameter of three or four lines. The surface of the valve, which is the seat of the induration, is sometimes red, and is always smooth, unless there be osseous particles or other depositions upon it; its consistence is that of fibro-cartilage, cartilage, or even bone. Sometimes the fibrous band which exists between the layers of the valves is alone affected; sometimes it is the points of the valve that contract adhesions to one another, and so reduce the orifice to the form of an osseous canal; in other cases we find, in the duplicatures of the valve, nothing more than some osseous or cartilaginous concretions, which may pierce through it, and so come into immediate contact with the blood; finally, the valves may contain in their free border, some pisiform concretions. These different alterations occur most usually in the mitral valves, and sigmoid valves of the aorta, particularly in the former, whilst, on the other hand, they are very rarely found in the tricuspid valves, or sigmoid valves of the pulmonary artery.

Vegetations on the valves exhibit the appearance of veruncæ, and are usually seated on the surface of the valves of the left cavities; they are round, rough, elongated, placed close to each other; their colour is somewhat blue, violet or red; they adhere closely to the subjacent parts, their texture is fleshy, resembling that of compact polypous concretions: there sometimes exists in their centre a small dot of black blood. These vegetations sometimes resemble small cysts, adherent to the valve, usually at its free border, and most commonly are found on the aortic and mitral valves.

PERICARDITIS.

Q. What are its symptoms?

A. These are very uncertain; still when the following phenomena are present, we may suspect the existence of pericarditis. When the contractions of the heart, in a man otherwise healthy, without any perceptible cause, begin to give a strong impulse, and produce a sound more intense than in the natural state; when at intervals its stroke becomes more weak and short, corresponding to intermissions of the pulse, which is very small and frequent, or even insensible. In some cases we hear a sound, similar to the crackling of new leather, but this lasts only for a few hours. There is more or less of dyspnœa; considerable anxiety, acute pain, and fainting on the slightest exertion; sometimes the patient feels an acute or lancinating pain, or of heat and weight at the region of the heart; occasionally the sound of the thorax in this part is dull. When the disease is chronic, these symptoms are less decisive and come on more slowly. When the pericardium adheres to the heart, Dr. Sander informs us that a continued undulating motion is perceptible, distinct from that undulation which naturally exists at the region of the heart; sometimes the contractions of the auricles are more obscure than in the healthy state. To establish the diagnosis of pericarditis, all these symptoms should be present, and even so, some doubts must rest upon it.

Pericarditis may be confounded with pleuritis, hydrops, pericardii, or with certain tumours developed in the vicinity of the heart.

Q. What are its anatomical characters?

A. The redness of the pericardium in this affection is not intense; it is sometimes dotted on the surface; in the chronic form it is more strongly marked, and diffused in patches, but there is no perceptible thickening of the membrane. In the greater number of cases a layer of false membrane is deposited on the serous surface of the pericardium, which in most cases covers its whole extent, but in some only a part of it. The cavity of the pericardium contains more or less of a straw coloured serous effusion, in which float some small albuminous flocculi; the quantity of this fluid diminishes when the disease is of long standing.

HYDROPS PERICARDII.

Q. What are its symptoms?

A. By no means decisive, the sound emitted by percussion is more dull than natural; there is a sensation of weight and oppression in the region of the heart, its pulsations are perceptible in a very wide range, but vary both in degree and situation every instant, being sometimes towards the right side, sometimes towards the left, but always tumultuous and obscure; the pulse small, frequent, and irregular; the extremities œdematous, the patient is threatened with suffocation if placed in the horizontal position, and is subject to faintings, but not often to palpitations.

Q. What are the diseases with which it may be confounded?

A. Pericarditis, pleuritis, and some organic affections of the heart.

Q. What are its anatomical characters?

A. The heart is usually sound, so is the pericardium, it contains, however, a quantity more or less considerable, of a transparent citron-coloured serous fluid; this is sometimes tinged with blood, its quantity is less when the affection is connected with a general dropsy than when it is purely local; in some cases air is also contained in the serous membrane.

HYPERTROPHY OF THE HEART.

Q. What are its symptoms?

A. The left ventricle gives a very strong impulse between the cartilages of the fifth and seventh ribs, to which space the pulsations of the heart are circumscribed, and on which the sound on percussion is dull. The impulse of the ventricle is very much lengthened when the hypertrophy is considerable; the contraction of the auricle, on the contrary, is very short, and when examined in the præcordial region its sound is scarcely perceptible, whilst at the superior part of the sternum, and under the clavicles, it is loud and distinct. The stroke of the heart is heard only in a very small space, and is scarcely perceptible at the top of the sternum, or under the left clavicle, and scarcely at all at the right side, though it is continually perceived and heard by the patient. We usually find the pulse strong and full, the sound on percussion at the region of the heart dull, and the face presenting a red tinge. These are symptoms of secondary importance, but still deserve attention.

When the hypertrophy occurs in the right ventricle, the stroke of this cavity is stronger than natural, and the impulse which it gives is perceived more plainly at the bottom of the sternum than between the cartilages of the fifth and seventh ribs. It is also more strongly marked at the right than at the left side of the chest. The sound on percussion is dull in this same region, and the patient is frequently attacked by hæmoptysis.

When the hypertrophy exists in both ventricles at the same time, we of course find the symptoms peculiar to each; those which indicate hypertrophy of the right ventricle usually predominate.

This affection may be confounded with contraction of the orifices of the heart or aorta, or with inflammation of the latter vessel.

Q. What are its anatomical characters?

A. There are some differences according to the ventricle which is affected. When the hypertrophy attacks the left ventricle, there is an increase of thickness, and also of density in its walls and in its base; but the thickness diminishes gradually towards its apex. It is also less in the septum ventriculorum; it is however in proportion to that of the columnæ carneæ; its muscular substance is more firm and deeply coloured than in the natural state, and its cavity is diminished in proportion to the increase in thickness of its walls. The size of the right ventricle is diminished in proportion as that of the left is increased; it becomes flattened, and appears as if it were a cavity contained within that of the left. When the hypertrophy is seated in the right ventricle, its thickness and density are always less than in the left cavity; it does not collapse when divided; its thickness is uniform over its whole extent, except probably towards the tricuspid valves and origin of the pulmonary artery; the columnæ corneæ are also increased in thickness.

DILATATION OF THE VENTRICLES AND AURICLES OF THE HEART.

Q. What are its symptoms?

A. When the left ventricle is dilated, the contractions of the heart give rise to a clear and loud sound between the cartilages of the fifth and seventh ribs. The loudness of this sound, and extent in which it is perceptible, are in proportion to the degree of the dilatation; when the dilatation is at the right side the sound of the heart is louder at the inferior part of the sternum, than opposite the cartilages of the ribs. The extent in which the sound is heard is in proportion to the degree of the dilatation; when palpitations occur their impulse is more weak than in the natural state. The external jugular veins are swollen, but do not present any pulsation; the countenance is usually of a purple colour; in most cases dilatation of the heart occurs in both ventricles at the same time.

It may be confounded with contraction of the orifices of the heart.

Q. What are its anatomical characters?

A. The capacity of the ventricles or auricles, is found to be increased, and the thickness of their walls proportionally diminished, particularly towards the point of the left ventricle. The dilatation is sometimes partial, being confined to a single point. The substance of the heart is more or less deeply red; in some cases its colour is altered, and its firmness considerably diminished.

DILATATION WITH HYPERTROPHY OF THE VENTRICLES.

Q. What are its symptoms?

A. The impulse of the ventricles is strong, and their contraction determines a sound; that of the auricles also is sonorous. The stroke of the heart is heard over a very wide range, and is perceived particularly in thin and young persons, even to the posterior part of the right side of the chest. The contractions of the ventricles are perceptible to the hand, when placed at the region of the heart, and are sometimes interrupted by short and even violent pulsations. When the left side of the heart is affected, these results are perceived by the cylinder placed between the cartilages of the fifth and seventh ribs. In these cases the pulse is usually strong, hard, vibrating and resisting; but when the right cavity is the seat of the affection its contractions are perceived at the inferior part of the sternum. We may infer that the two sides of the heart are affected, when the phenomena above described are perceived equally at the right and left side.

This affection may be confounded with inflammation of the heart.

Q. What are its anatomical characters?

A. They partake of the characters above enumerated, when treating of each of these affections.

DILATATION, WITH HYPERTROPHY OF THE AURICLES.

Q. What are its symptoms?

A. The contraction of the auricles emits a dull sound, instead of the clear one which exists in the natural state. Conjointly with this dull sound of the auricles, we usually find symptoms which indicate an induration of the valves, for dilatation of the auricles is the necessary consequence of a contraction of the corresponding auriculo-ventricular opening; that is to say, dilatation of the right auricle is the result of a contraction in the right auriculo-ventricular opening, that of the left auricle being dependent on the contraction of the left auriculo-ventricular opening. When dilatation with hypertrophy of the auricles occurs together with hypertrophy of the ventricles, the contraction of the auricles is most distinctly heard at the superior part of the sternum, and under the clavicles.

This affection may be confounded with contraction of one or other of the auriculo-ventricular openings.

Q. What are its anatomical characters?

A. The name expresses the lesion of structure found on examination. The cavity of the auricle is found increased in its capacity, and its walls thickened.

CARDITIS.

Q. What are its symptoms?

A. Pathologists have not, as yet, been able to ascertain with sufficient precision any symptoms which enable us to indicate satisfactorily, the existence of inflammation of the substance of the heart.

Pericarditis, aortitis, pleuritis at the left side, may be confounded with this affection.

Q. What are its anatomical characters?

A. Carditis is a rare disease. The inflammation is usually confined to some detached part of the substance of the heart; in these cases pus is usually found diffused amongst the fleshy fibres of the organ, or united into one cyst. When ulcerations exist, they are found more frequently on the internal surface than at the external.

"RAMOLLISSEMENT," OR SOFTENING OF THE HEART.

Q. What are its symptoms?

A. They are very obscure; so much so, that its existence is often not even suspected. When the disease is in its acute state we usually find a degree of anxiety in the patient; his pulse small, soft, and accelerated, the contractions of the heart are quick, hurried, and, as it were, convulsive; the sound which they emit is dull, the impulse is feeble. Patients under such circumstances are subject to fainting fits, and death takes place suddenly. When the "ramollissement" of the heart is chronic, its contractions, as well as those of the pulse, are usually frequent, and very feeble; in this respect, however, they are rather variable, being sometimes slow, sometimes hurried.

Pericarditis may be confounded with this disease.

Q. What are its anatomical characters?

A. The consistence of the heart is considerably diminished, and it may be torn very readily. It is so soft and friable that the finger easily penetrates into it; in some cases, this change of structure is found to exist only at one side of the heart. When the disease is acute the colour of the heart is deep red, or even brown; but if it has been chronic, it is found pale and yellowish. The walls of the ventricles, when cut through, collapse and sink down. When ramollissement is followed by rupture, which has happened in a few cases, this accident was observed to have occurred near the point of the left ventricle.

INDURATION OF THE HEART.

Q. What are its symptoms?

A. At the commencement of this disease we usually find the same symptoms as in hypertrophy of the heart; but in proportion as the induration makes progress, the stroke of the heart diminishes in energy. When the induration is moderate in degree, the contractions of the heart are sometimes so strong, as to be heard even at some distance from the patient. The diagnosis of this disease is still involved in great obscurity.

Hypertrophy may be mistaken for it.

Q. What are its anatomical characters?

A. The structure of the heart is sometimes of a rosy red; its consistence approaches that of fibro-cartilage, and when cut is found so firm as to grate under the edge of the scalpel. This induration, which is variable in degree, has not yet been observed to extend to the whole substance of the heart; it is usually confined to one or other of its surfaces. It is sometimes found in the form of incrustations, and seems as if it had commenced in the first instance in the pericardium. Induration of the heart does not necessarily give rise to any increase or diminution of the capacity of its cavity.

POLYPOUS CONCRETIONS OF THE HEART.

Q. What are their symptoms?

A. When the concretions are recent the contractions of the heart are obscure, confused, and so irregular as to be with difficulty analysed. These symptoms usually supervene in a person in whom the action of the organ was regular. We may presume that the obstacle to the transmission of the blood exists in the right cavities when these phenomena are perceptible at the inferior part of the sternum, but the left cavities are obstructed when the irregularity of the contraction is heard between the cartilages of the fifth and seventh ribs. The diagnosis becomes almost certain when the disturbance in the movements of the heart exists only at one side. When the concretions are of long standing, they give rise to a considerable degree of dyspnœa, extreme anxiety and anasarca, which is confined to the superior or inferior parts of the body, according as the concretions occupy the superior or inferior vena cava.

Pericarditis and contraction of the orifices may be confounded with it.

Q. What are their anatomical characters?

A. When the concretions are recent, the clot is surrounded at its margins by an opaque whitish layer, which does not adhere to the walls of the heart, or its vessels; but after some time a connection is established between them. These concretions are usually free from the colouring matter of the blood; they resemble a mass of fibrine, the consistence of which varies in different cases; in some instances they become organized. In dropsical subjects, the concretions at their commencement, are gelatinous and semi-transparent; they are usually found in the sinus of the right auricle, in the venæ cavæ, and in the left ventricle; the columnæ carneæ, to which they adhere, are flattened. The walls of the auricles, and also the sinuses, may be lined with concretions of much less consistence than those just described, being like a mere paste, and therefore presenting none of the characters of fibrine.

COMMUNICATION BETWEEN THE RIGHT AND LEFT VENTRICLE OF THE HEART.

Q. What are its symptoms?

A. The colour of the skin and mucous membranes is livid, blue, or violet, particularly when the affection exists from the time of birth. The respiration is always laborious; palpitations of the heart and syncope frequently occur; the general heat of the body is diminished, and the patient is very susceptible of the impression of cold. In some cases all the symptoms of hypertrophy of the right cavities are present.

This disease may be simulated by contraction of the auriculo-ventricular openings, or of the arterial orifices; but as these latter affections seldom occur before the age of puberty, the history of the case will clear up the diagnosis.

Q. What are its anatomical characters?

A. The foramen ovale is found to have continued open, or to have been again opened after it had been closed, the two lamellæ of the valve which exists in the fœtus not having been completely united, so that a probe can readily be passed from the right to the left auricle. The walls of the right ventricle are usually found thickened, the auricle at the same side being dilated. In some cases an obstacle to the transmission of the blood is found either in the ventricle or pulmonary artery; the foramen ovale and ductus arteriosus sometimes continue as in the fœtal state. The septum which separates the ventricles may be perforated to a greater or less extent; so much so, that sometimes the two ventricles seem to form one cavity. This accident usually takes place towards the base of the heart, in which case the aorta receives blood from the right ventricle as well as from the left. The two auricles have been found imperfectly separated, and opening into the right ventricle which communicated freely with the left; this latter being deprived of its auricular opening, but giving rise to the aorta as usual. Finally, several other malformations may be found.

ANGINA PECTORIS.

Q. What are its symptoms ?

A. The patient complains of a sense of constriction in the chest, with very acute and lancinating pains in the region of the heart, occurring suddenly, and in fits. When the disease is recent, these occur usually in the day, and are of very short duration, lasting only a few seconds. The dyspnœa is considerably increased when the patient walks against the wind. The pulse during the attack is frequent and almost insensible, but is not intermittent or irregular, unless the affection be complicated with some other. Pain extends down the left arm, and sometimes, but rarely, to the right. The patient is troubled with palpitations, anxiety, and a sense of impending suffocation. As the disease makes progress, a painful sensation of numbness extends to the fore-arm, and even to the fingers ; the attacks become more frequent, and of longer duration, and the patient is afflicted by the constant apprehension of death. This disease, which is always mortal, is neither regular in its progress or fixed in its duration, which remark is also true with regard to the recurrence and duration of the fits.

Angina pectoris may be confounded with various organic affections of the heart, particularly with dilatation of its cavities ; also with emphysema of the lungs, with hydrothorax, hydrops pericardii, and abscess situated in the interior mediastinum.

Q. What are its anatomical characters ?

A. They are altogether unknown. In some cases we find various alterations of the valves, old adhesions of the pericardium, ossification of the coronary arteries, or deposits of fat round the heart and its large vessels.

PHYSIOLOGY OF THE VOICE.

Q. By what organs are vocal sounds uttered ?

A. By the Cartilages of the Larynx, or the Trachea, and of the Bronchial tubes, and by the lungs propelling the air with force sufficient to excite sound.

Q. Describe the manner in which the *Voice* is produced.

A. A pretty full inspiration is taken in, and while the glottis and epiglottis are prepared by the action of their respective muscles for producing a certain sound, the air is voluntarily propelled from the lungs, by which the ligaments are put into tremors that agitate the air passing through the aperture of the glottis, and thus produce sound.

Q. How are those *Sounds* or *Tones* of the voice changed ?

A. They are changed by an alteration in the aperture of the Larynx, by stretching or relaxing the trachēa; and by propelling the air from the lungs with more or less force.

Q. How is this proved ?

A. By experiment; if the trachea of a man or an animal be taken and blown into from its lower end, towards the larynx, no sound is produced; but if the arytenoid cartilages are approached so that they touch on their interior faces, the sound peculiar to the animal when alive will be produced : it will be more or less grave according as the cartilages are more strongly pressed together, and the sound will be more or less intense in proportion as it is blown into with a greater or less force; proving evidently that it is the ligament of the glottis which produces the sound : for an opening made into the trachea any where below the ligaments, prevents the voice completely. On the contrary a wound made above the ligaments of the glottis produces no effect. These ligaments are tightened or relaxed by the action of the thyro-arytenoid muscles, and in this mode, according to their force or relaxation, is produced the peculiar modifications of the voice.

Q. If the muscular contraction have any thing to do with it, the destruction of the nerves which go to them will prove it ; is it so ?

A. Yes; if the two recurrent nerves be cut, which supply these muscles, the voice is destroyed: cut one, and it is only half left.

Q. But how do we explain the cries of animals which sometimes take place after the recurrents are completely divided?

A. They resemble the sounds produced by blowing with violence into the trachea of an animal recently dead, when the arytenoid cartilages are approximated, but they have not the character of articulate sounds; they arise from the influence of branches of the superior laryngeal nerves, which are distributed to the arytenoid muscle, which contracts, and draws together the arytenoid cartilages, rendering the passage of the glottis sufficiently close to produce vibrations and sounds.

Q. How is the intensity of the voice produced?

A. The intensity of the voice is regulated by the extent of the vibrations, which depends upon the length of the ligaments acted upon by a strong current of air, and is proportional to the strength of this current. A strong man in health has a voice of great intensity; let him become feeble, and his voice becomes so likewise, because he has not the same power of chest. Women, children and eunuchs whose larynges are small, have always weaker voices.

Q. How are the different tones produced by the voice explained?

A. By the experiments of Magendie, it appears that the grave sounds are produced by vibrations of the ligaments of the glottis throughout their whole length, and the expired air is discharged through the whole extent of the glottis: but in the more acute sounds the ligaments vibrate only on their posterior part, and the air only passes through that part of the glottis which vibrates, so that when the sounds become very acute, the ligaments only vibrate at the extremity next to the arytenoid cartilage, and when the sound is raised as high as possible and ceases from its acuteness, the air ceases to pass.

Q. What is the mechanism by which this effect is produced?

A. The arytenoid muscle; as Magendie proved by the section of the nerves, appropriated to that part. It was attended with complete loss of the power of forming acute sounds.

Q. What does the mouth, fauces and nose contribute to the voice?

A. The larynx is raised in the acute and depressed in the grave sounds, it of course in the former makes the cavity of the mouth and fauces (which may be considered as the pipe of the instrument, the larynx corresponding to the mouth piece) longer when grave sounds are uttered, and shorter when acute are formed, both of which are most favourable for these respective sounds: when the larynx is depressed for the formation of grave sounds, the cavity of the mouth and fauces is rendered larger, of course more favourable to the production of such sounds; and the contrary, when the sounds are acute, it is narrowed by the raising of the larynx and the parts about it.

Q. What is the use of the ventricles of the larynx?

A. To leave the ligaments free to vibrate, which they would not be if these ventricles were filled up, as is proved from the presence of foreign bodies behind them, which makes the voice feeble.

Q. What is the use of the epiglottis?

A. From some experiments related by Magendie, it would appear that it has the effect of preventing the sound from becoming acute, when it becomes necessary to increase its intensity, by discharging the air from the lungs with more force.

Q. What is the influence of the vocal pipe formed by the fauces and mouth, &c. on the voice?

A. The intensity of the voice is increased by the mouth being more open, the tongue thrown back and the palate raised, shutting out all communication with the nose. If on the contrary the lips are approached, and carried forward, the sound has more rotundity, and an agreeable pitch, but it loses its intensity: for the same reason, when it passes through the nose it becomes dead, and less intense.

Q. What effect has the cavity of the mouth and pharynx, fauces and nose, upon the pitch of the voice?

A. As in the last case, the breadth and length of the passage after the sound leaves the larynx, the contraction of the pharynx, the open or shut state of the passage to the nose, the volume of the tongue, &c. all influence the pitch: when it passes through the nose it becomes disagreeable.

Q. How is the voice divided?

A. Into natural and acquired.

Q. What is meant by the natural voice?

A. It consists of those sounds which are pronounced instinctively, and are intended by nature to excite emotions of fear and pity in those who hear them: it is common to men and animals.

Q. What do you mean by the acquired voice?

A. The acquired voice does not differ from the natural excepting in its intensity and pitch; they are both formed of inappreciable sounds. It is said to be acquired, because idiots, the deaf, and the lower animals, who cannot be exposed to the moral circumstances which require it, do not possess it: if it was derived from nature they would.

Q. What do you mean by pronunciation?

A. It is that formation of the vocal organs, by which letters, the components of words, are pronounced; thus some are formed principally by the tongue, others by the teeth (as d and t), others by the lips (as b and p), by the palate and tongue (as l), by the throat (as g and k), by the nose (as m and n), by the larynx alone, (as the vowels.) If there be a defect in any of these structures, the pronunciation will also be defective.

Q. Does language consist only of the articulation of words?

A. No; it presupposes the existence of mind, without which language means nothing; as in the case of complete idiots; their sounds are irregular, confused, and without meaning.

Q. How does the singing differ from the speaking voice ?

A. It is formed of appreciable sounds, of which the ear can easily distinguish the intervals, and with which it is easy to form sounds in unison: the native voice or the cries of men and animals, as also the speaking voice, have not these qualities.

Q. What is the extent of the singing voice ?

A. Ordinarily about eight tones; never above two octaves in perfect and good tones.

Q. How many kind of voices are there ?

A. There are two; the grave and the treble: the difference between them is about an octave. By raising the voice above its natural power of forming perfect tones, treble ones can be produced: the voice is then said to be in falsetto; no doubt produced by the imperfect vibration of the larynx: the treble voice is only found among eunuchs, women and children. The bass voice is divided into counter, tenor and bass. There are, however, differences of the voice, which cannot be appreciated by these circumstances, as we hear of strong, sweet, correct, flexible voices.

Q. What is meant by declamation ?

A. It is that kind of speaking in which the intervals of the tones are not entirely harmonic, and the tones themselves are not completely appreciable.

Q. Are articulated sounds formed by expiration alone ?

A. No; they can also be produced by inspiration; how this is done, it is difficult to say.

Q. In what does the art of the ventriloquist consist ?

A. In imitating the exact degree of intensity, pitch, and modification, which is produced upon sounds by distance, &c. in every situation; thus persons believe necessarily that the sound proceeds from the person or place with which that sound is ordinarily associated, and in proportion to the accuracy of the imitation will be the deception: all motion of the lips is avoided by not pronouncing the labials; articulation is performed in this act as in common speaking, and not from the belly as the term ventriloquism imports.

Q. What is the difference in the organs of voice in the different ages?

A. Every part of the larynx and thyroid cartilages is smaller in proportion, which continues till puberty, when the structure enlarges and the voice changes. In man, at the adult age a slight ossification takes place in the cartilages; in old men it becomes nearly complete; the muscles of the glottis lose their elasticity, and the voice grows hoarse and disagreeable. It is the changes of structure from infancy to old age that makes the difference of voice.

Q. Whether do the organs of the *human voice* possess the properties of a *stringed* or *wind instrument*?

A. They possess the properties of both; for the tension and tremors of the trachēa and bronchia, and even of the cartilages of the ribs themselves, correspond to the properties of a stringed instrument; while the adaptation of the aperture of the glottis, by means of the muscles of the Larynx, and by the application of the Epiglottis, corresponds to the properties of a wind instrument.

Q. Does the *human voice* possess also the *property of articulation*?

A. Yes; while the human voice possesses all the properties of stringed and wind instruments, it also by the assistance of the tongue articulates the tones into intelligible words, and thereby possesses also the properties of speech.

Q. Describe the situation and structure of the Thymus Gland?

A. This gland is situated in the upper part of the thorax, between the layers of the anterior Mediastinum; it has two long cornua, extending upwards to the fore part of the neck, and two broad lobes below, lying over the Pericardium. It seems peculiar to the foetal state; a whitish fluid may be squeezed out of it; no excretory duct has been detected issuing from it. It is large in the fœtus; but, in the adult, it is so completely absorbed, that scarcely a vestige of it remains, except cellular substance.

Q. What is the use of the Thymus Gland?

A. It seems to be of great importance in the foetal state, as it is then large, and always present; but its use in the system has not hitherto been ascertained.

METHOD OF EXAMINATION APPLICABLE TO DISEASES OF THE CHEST.

Q. What particular train of symptoms are to be investigated, after examining the external conformation of the thorax, local pains, the seat and character of the disease?

A. 1st, From the act of respiration;
2d, Those which depend on the voice;
3d, The product of expectoration;
4th, The symptoms given by percussion;
5th, Those which are referable to the heart and its connexions.

OF THE PHENOMENA WHICH RESULT FROM THE ACT OF RESPIRATION.

Q. What are the phenomena which are characteristic of healthy respiration?

A. Inspiration and expiration are performed slowly and with ease, none of the muscles appearing to make any particular effort; they succeed each other regularly, their rythm is constant and uniform; all the ribs are alternately elevated and depressed, and the dilatation and contraction are equal at both sides, except in cases of deformity of the thorax. Respiration in children is performed in a great degree by the motion of the ribs alone; in adults, by that of the ribs and diaphragm; and by this last muscle alone, in old persons in whom the cartilages have become ossified.

The younger the subject is, the more frequent is the respiration. Thus, during the first year, an infant respires about thirty-five times in a minute, but an adult makes about eighteen or twenty respirations in the same time. Its frequency is greater in women and persons of a nervous or irritable habit.

Q. What are the phenomena which appear in the organs of respiration in a state of disease?

A. The movements of the chest present many varieties, which may be referred to the following heads: They may be frequent or unfrequent, quick or slow, regular or irregular, great or small, equal or unequal, easy or difficult, complete or incomplete; and, finally, the respiration may be abdominal or thoracic. All these phenomena are within the reach of the ordinary means of examination; but auscultation conducts us to the knowledge of others, which we now proceed to detail.

Q. How is auscultation conducted?

A. Auscultation may be made either by applying the ear to the walls of the thorax, or by means of the stethoscope invented by Laennec.

Q. In what cases is immediate auscultation to be used?

A. Immediate auscultation is more particularly useful to persons who have not acquired much experience in this mode of examination; for when the phenomena have been rendered sensible by the application of the ear, and the observer has formed some idea of them, it becomes more easy for him to seize their minute shades, than if he had commenced in the first instance by employing the stethoscope. However, it should be remembered that there are cases in which the use of the instrument is altogether indispensable, where, in fact, the ear cannot be applied; for instance, immediately above and below the clavicle, in the hollow of the axilla, and beneath the mammæ in females. Besides, the head can scarcely follow the movements of the chest, as it is elevated and depressed; and even if it could, the friction it produces must render the sound somewhat confused.

Q. Describe the manner in which the stethoscope is to be used.

A. When using the stethoscope, it should be held like a writing pen, the fingers being so placed on the instrument, as to feel at once its extremity and the point of the thorax to which it is to be applied. It should be also placed evenly upon the surface, and perpendicular to it.

Before we begin the examination, or at all events before we note its results, we should wait until any impression this process may have made on the patient shall have passed away; for if this precaution be necessary in examining the state of the circulation by means of the pulse, it is no less so when investigating the respiration by the stethoscope. The phenomena which exist in the healthy state of the organs should first be studied, in order that they be not confounded with those which are produced by disease; and that their various changes may be accurately estimated, or their absence determined, which is by no means an unusual occurrence.

Q. How is the respiration to be examined in its healthy state?

A. When examining the respiration, the funnel should be removed from the end of the cylinder. On applying its extremity to the chest, we perceive in a healthy adult, during inspiration and expiration, a slight, though distinct murmur, marking the entrance of the air into the cells, and its passage out of them. This murmur is loud in proportion to the depth and frequency of the respiration—to the youth of the subject, to the thinness of the walls of the thorax, and completeness of their dilatation. In females it is more strongly marked than in males, and still more so in children, whence the term "*puerile*" is applied to respiration when it becomes very sonorous.

The respiratory murmur is most perceptible in the hollow of the axilla, in the space between the anterior border of the trapezius muscle and the clavicle, immediately beneath this bone, and at the inferior and posterior part of the chest; for these are the parts in which the lungs are nearest to the surface.

Opposite the trachea, larynx and root of the bronchi, the sound of the respiration is much more loud and distinct; it is not unlike that of a bellows, and gives the idea of a considerable column of air passing through a tube of large diameter; the air also appears as if sucked in from the cylinder, during inspiration, and expelled again during expiration. To this peculiar sound the term "*tracheal* respiration" is applied.

Q. How is the respiration to be examined in disease?

A. The respiratory murmur may be stronger or weaker than natural, may be altogether suppressed or heightened, so as to resemble what we have described as the "*tracheal*" respiration; and, lastly, it may be pure, or mixed with some of those various sounds, to which the term "*râle*" has been applied.

When the respiration becomes more strong than natural, it assumes the character it manifests in children, and therefore is termed by Laennec "*puerile respiration.*" This intensity of sound is not owing to a lesion of the part of the lung in which it is heard; on the contrary, it is heard only in the healthy parts, whose action becomes momentarily increased to supply that of the diseased parts. Thus, in pneumonia, we usually find the "puerile" respiration, in those portions of the lung which are not yet attacked by the inflammation.

Q. How are we to judge of the state of the lungs by the respiratory murmur?

A. As the respiratory murmur presents a number of varieties even in the healthy state, it is only by comparing different parts of the lungs that we can judge of any diminution of its intensity that may occur. It is always easy to make this comparison; for the respiration is seldom weakened in the entire of the lung, or in both lungs at the same time. But its degrees vary from a slight weakening of its natural intensity to total suppression. A diminution of the movements of the thorax seems to be the most usual cause of this weakening of the respiratory murmur; it sometimes arises from a partial obstruction of the smaller bronchial tubes, either by a thickening of their mucous membrane, or by the presence of some viscid matter. It is also found to occur in cases in which false membranes are yet soft and just beginning to be organized.

Complete suppression of the respiratory murmur arises from various causes. It occurs when the lung becomes impermeable to the air, or when there is interposed between it and the walls of the thorax any liquid or gaseous exhalation, which prevents the sound from being transmitted. It seldom happens that the sound is suppressed through the whole extent of a side of the chest. Some trace of it can almost always be discovered near the clavicles, and opposite the root of the lung; and probably it is never altogether inaudible at the latter of these points.

When treating of the natural phenomena, we described the "*tracheal*" respiration, and indicated the points in which it is heard. It sometimes happens that a similar sound is emitted from other parts, besides those in which it is audible during health. This occurs either when there are cavities of a certain extent communicating freely with the bronchi: or when the tissue of the lung becomes indurated, and so transmits more readily the sounds which the air produces in passing through the large bronchial tubes. In the parts of the lung which remain unaffected, we find that the respiration has become "*puerile.*"

Q. What are the other varieties of the respiratory murmur?

A. The respiratory murmur, whatever be its degree of intensity, may be pure, which indicates that the air tubes are free from obstruction; or it may be blended, and as it were disguised by other sounds, to which the term "*râle*" has been applied. By "*râle*" *or rattle, is understood any sound produced by the circulation of the air in the bronchi and air-vesicles, diffe-*

*rent from that murmur which it determines in the healthy state.**

The "râle" seldom occupies the entire extent of the lung; they are usually audible only in a certain part of it, the respiration remaining natural, or becoming "*puerile*" in the rest. They indicate either a contraction of some part of the bronchial tubes, or the presence of a fluid which obstructs them or the air vesicles. The "râles" are divided into four species;—1st, the "râle muqueux;"—2d, "râle sonore;" 3d, "râle sibilant;" 4th, "râle crepitant."

Q. Describe the "râle muqueux."

A. The "*râle muqueux*," or mucous rattle, is produced by the passage of the air through sputa accumulated in the bronchi or trachea, or through softened tubercular matter. The character of the sound indicates that the fluid, which fills up the air-tubes, is unctuous but not tenacious. Sometimes it is weak, and audible only from time to time, at others it is rather loud and continuous. In the former case the air meets only at intervals portions of mucus, which determine the sound; in the latter the bronchi are almost entirely filled with it. When carried to a very high degree, it constitutes a gurgling, or "*gargouillement.*" This is the term that has been applied to the loud murmur, which is produced by the agitation of

* Some persons seem disposed to use the English translations of these terms. It appears, however, preferable to adopt at once the terms devised by Laennec, which will save us from having new translations of them, according to the whim or the fancy of particular persons. The inconvenience of this practice, should it become general, will soon be rendered apparent, as histories of cases begin to be published, containing statements of the signs furnished by the stethoscope. For as all these consist of simple ideas, if each of them be not marked by a term precise and definite, it will lead to endless confusion and discrepancy. The terms devised by Laennec, are purely terms of art—and if we paraphrase or translate them, we can never be sure that they will excite in the minds of hearers or readers the precise ideas which he meant them to express, and which we seek to convey.

the matter of tubercles, or puriform sputa, by the passage of air through them. This "râle" occurs in catarrh and in softened tubercle.

Q. Describe "the râle sonore."

A. The "*rale sonore*" consists of a sound more or less grave, and occasionally very loud, resembling sometimes the snoring of a person asleep, at others the sound of the bass string of an instrument when rubbed by the finger, and not unfrequently the cooing of a dove. It seems to be caused by a contraction of the bronchial tubes, by a thickening of their mucous membrane, or by some change in the form of these canals, induced probably by the thickening of the spur-like processes or folds of membrane at the points of division of the bronchi; at least this change is almost constantly observable in subjects that have died during the existence of chronic catarrh, of which this "rale" is characteristic.

Q. Describe the "râle sibilant."

A. The "*râle sibilant*," consists of a slight, though prolonged, hissing round, which occurs either at the termination or commencement of inspiration. It may be grave or acute, dull or sonorous. These two varieties may exist at the same time in different parts of the lung, or may succeed each other at variable intervals, in the same part. It is owing to the presence of mucus, thin, and viscid, but not abundant, which obstructs, more or less completely, the smaller bronchial ramifications, which the air has to pass through before it arrives at the air-cells. This "râle" seems to indicate a more serious affection of the lungs than the one last described, inasmuch as it is seated in the more minute bronchial ramifications; hence, when it extends to any considerable portion of the lung, it is attended by great difficulty of respiration. It is during the existence of this "râle" that the sputa present that aborescent appearance, which resembles so much the form, dimensions, and ramifications of the small bronchial tubes, from which they have been expelled by the efforts of coughing. It occurs in the first stage of bronchitis.

Q. Describe the "râle crepitant."

A. The "*râle crepitant*" resembles very accurately the crackling or crepitation of salt, when thrown into a heated vessel, or that emitted by a piece of dried lung, when pressed between the fingers. It depends on an exhalation of blood on the internal surface of the air-cells, such as occurs in the first stage of pneumonia, of which this "rale" is the distinctive sign. It occurs also in hæmoptysis and œdema of the lungs.

These are the different "râles" which the stethoscope enables us to recognize. It would appear from this description of them, that their characters are so strongly marked, that they cannot be confounded or mistaken one for the other; but still it frequently happens that their differences are not so striking, and that they glide into each other, by a sort of transition indicative of a mixed lesion, or one more nearly allied to one than the other. It is by habit and practice alone that we can learn to appreciate these shades; words cannot convey an adequate idea of them.

OF THE PHENOMENA WHICH DEPEND ON THE VOICE.

Q. Describe the varieties of the phenomena of the voice, as ascertained by the stethoscope.

A. When examining the voice, the funnel should be retained in the extremity of the cylinder, and then the phenomena will be found to vary: 1st, according to the points at which they are examined; and, 2d, according to the natural character of the voice.

When a person speaks or sings, his voice thrills in the interior of the chest, and produces in its whole extent a trembling motion, which we can readily perceive on the application of the hand. This phenomenon is not of much importance, and seldom demands any particular attention. However, when a large cavity happens to exist, the trembling becomes so forcible, as of itself to make us suspect its existence. When the cylinder is applied to the thorax;

we hear a confused resonance of the voice, the intensity of which varies in different points of its extent. It is most distinctly heard in the arm-pit, at the back, between the internal border of the scapula and the vertebral column, and anteriorly at the angle formed by the clavicle with the sternum. We do not hear any thing distinct or articulate, it is rather a sound more or less confused, which seems to waste itself against the walls of the thorax. In other parts of the chest, particularly posteriorly and inferiorly, the sound is much more weak, and produces only an indistinct murmur. It is in all cases rendered more manifest where old adhesions exist.

In persons whose voice is deep and grave, the degree of resonance is greater, but it is confused, and nearly equal at all points of the thorax; but in females and children, whose voice is acute, it is clear and distinct.

Q. Describe the varieties of the phenomena furnished by the voice in disease.

A. *In Disease, the phenomena furnished by the voice* are referable to three heads: Resonance, Pectoriloquy, and Ægophony. By the term resonance, is understood a thrilling of the voice more loud than is natural, or its existence in a part in which it is not heard during health. It sometimes becomes so strong as that the sound seems to be produced at the very extremity of the cylinder which is placed on the thorax, but it never conveys the impression as if it traversed the length of the tube to reach the ear of the observer. A thickened and hardened state of the lung, caused either by a mass of crude tubercles, or by inflammation, produces this phenomenon, by rendering the lung a better conductor of the murmur of the voice in the bronchi. Hence the origin of the term "*broncophony.*" This symptom, though not usually of much importance, becomes occasionally of considerable value; when it co-exists with phenomena furnished by other means of examination, and also as enabling us to make a comparison between the state of the two sides of the thorax.

Q. What is meant by "pectoriloquy."

A. This phenomenon is said to exist when the voice of the patient, distinctly articulated, seems to issue from the point of the chest on which the cylinder is applied, and traverses its whole length to strike the ear of the observer, with its natural tone, or probably more strongly. These are the circumstances which constitute *perfect* pectoriloquy; but it admits of two other degrees, namely, the *imperfect* and the *doubtful*. It is termed *imperfect*, when the voice thrills strongly under the cylinder, seems to approach the ear, but never traverses the whole length of the tube. And, lastly, it is said to be *doubtful*, when the voice seems acute and suppressed like that of a ventriloquist, and is arrested at the thoracic extremity of the tube, thus approaching to the character of simple resonance.

Q. What are its other varieties?

A. Pectoriloquy presents some varieties, which depend on the tone of the voice, the size and form of the excavations, the firmness of their walls, the degree of facility with which the air can penetrate them; and finally, the existence or non-existence of adhesions with the pleura costalis.

The more acute the voice is, the more evident does the pectoriloquy become; hence, in persons whose voice is grave and deep, the thrilling or vibration of the walls of the thorax may be sufficiently intense to mask it, and render it doubtful.

In cases of aphonia, the pectoriloquy is not entirely suppressed. It sometimes occurs that we can distinguish better what the patient endeavours to express, by placing the cylinder on the point corresponding to the excavation in the lung, than we can by the naked ear at the same distance.

The pectoriloquy is sensibly affected by the size of the cavities. Thus, when they are unusually large, it becomes changed into a very full and grave sound, similar to that of the voice transmitted to some distance through a tube, or cone of paper. In very small cavities, on the contrary, it becomes doubtful, particularly when parts of the lung which surround them, are still permeable to the air.

The more dense and firm the walls of the excavation are, the more perfect is the pectoriloquy. It sometimes acquires even a metallic tone when the cavity has become lined by a membrane, whose structure approaches that of fibro-cartilage.

It is also rendered very distinct when the cavity is superficial, and its walls thin, and adherent to the pleura costalis; but when there is no adhesion, and the sides of the cavity become compressed together during expiration, the pectoriloquy becomes doubtful; the existence of the excavation must then be ascertained by other symptoms.

Again, its force becomes increased, and the voice seems as if transmitted through a tube, when new cavities begin to communicate with those already existing; but if the excavations become very numerous and tortuous, the sound is rendered somewhat confused and indistinct.

The less liquid the cavity contains, the more evident is the pectoriloquy, for then the communication with the bronchi is usually open, and allows a free passage to the air.

If this communication be obstructed for any time by the accumulation of matter in the bronchi, the pectoriloquy is rendered doubtful, and acquires somewhat of an intermittent character.

It sometimes happens that we can find scarcely a single individual with pectoriloquy in the wards of a hospital, though at the previous visit there had been several; in such cases, we observe that in the greater number of the patients, the expectoration had been very much diminisbed or altogether suppressed.

Q. What is meant by "Ægophony?"

A. This phenomenon consists of a strong resonance of the voice, which is more acute and sharp than that of the patient, but never seems to traverse the cylinder as pectoriloquy does; its tone is thrilling and tremulous, like that of a goat; whence the term is derived.

Though its limits are usually circumscribed, they are not so much so as those of pectoriloquy; it is found between the base of the scapula and vertebral column, towards the inferior angle and external border of that bone, and sometimes in the direction of a line, which may be conceived to pass from its centre to the sternum, following the direction of the ribs. When ægophony exists at both sides at the same time, it is difficult to determine whether it is produced by disease; for in some persons the natural resonance of the voice presents this acute and tremulous character at the root of the lungs. If old adhesions exist at one side of the chest, the ægophony becomes much more evident.

Ægophony, though it may vary in its force and extent, always indicates the existence, in the cavity of the pleura, of a moderate quantity of fluid, or of false membranes, somewhat thick and soft: it ceases when the effusion becomes too considerable: hence, in the former case it indicates pleurisy in its first stage: and in the latter, it marks its passage to the chronic state, if the general symptoms still continue after the cessation of the ægophony; but it is not a sign of its resolution, if these symptoms cease as it disappears.

Ægophony does not prevent us altogether from hearing the respiratory murmur, when it is not suppressed by hepatization of the lung.

Q. What is meant by Metallic tingling, Respiration, and Resonance?

A. The *Metallic Tingling*, *Respiration*, and *Resonance* are very remarkable phenomena, with which we shall conclude this account of the signs furnished by the voice and respiration.

The metallic tingling, or "tintement metallique," resembles the sound produced by any very small hard body striking against a metallic or glass cup. When the phenomenon is not so strongly marked, it produces only the *metallic resonance;* lastly, the respiration also may assume this character, in which case it resembles the murmur produced by air blown into a metallic vessel with a narrow aperture; these different sounds cease occasionally for a short time, but recur soon after.

The metallic tingling occurs when there exists a large excavation filled with air and fluid, communicating with the bronchi, and is heard when the patient coughs or speaks.

The metallic respiration occurs when there is a fistulous communication between the bronchi and the cavity of the pleura.

The metallic resonance and respiration indicate, in addition to the fistulous communication between the bronchi and pleura, an effusion of gaseous fluid into the cavity of that membrane.

When the metallic tingling occurs together with the metallic resonance and respiration, it denotes the existence of a vast excavation, whose walls are thin, adherent and compact.

OF THE EXPECTORATION.

Q. What are the qualities of the expectoration in the healthy state?

A. *In the Healthy State,* the expectoration consists of a viscid, ropy fluid, which is transparent, colourless, inodorous, insipid, and exists only in sufficient quantity to moisten the inner surface of the air passages.

Q. What are its qualities in disease?

A. *In Disease,* the sputa sometimes consist of a transparent, limpid, and slightly viscid fluid, the consistence of which gradually increases, until it ultimately becomes changed into an opaque, yellow, or greenish mucous matter, such as usually occurs in pulmonary catarrh.

In other cases, the expectoration is composed of a transparent mucous fluid, so tenacious as to adhere closely to the bottom of the vessel in which it is deposited, even when it is inverted. This may be marked by bloody striæ, or the blood may be combined with it in greater or less quantity, so that its colour varies from a yellow slightly tinged with red, to that of the deepest mahogany. These are the characters of the expectoration in acute pneumonia.

We sometimes observe the product of expectoration to consist of a frothy, colourless fluid, containing, suspended, several portions of flocculent matter, or presenting on its surface some yellow, rounded, purulent masses, in greater or less quantity : in other cases it is composed of mucous matter, marked by striæ of a dull white colour. These varieties occur during the early stages of pulmonary tubercles. As the disease advances the quantity of the yellow diffluent fluid increases, and ultimately forms the whole of the matter expectorated. It sometimes contains bubbles of air, and presents more or less the characters of pus. Such is the expectoration in the last stage of phthisis.

In some cases the sputa are ejected forcibly, and in large quantity at a time, so that the patients seem to vomit them. This occurs when an effusion into the cavity of the thorax finds an exit through the bronchi.

Again, we sometimes observe portions of false membrane expectorated, either in the form of lamellæ, or moulded into that of the bronchial tubes, trachea, or larynx. This is characteristic of croup.

Lastly, the expectoration may consist of pure blood, sometimes of a bright, at others of a dark red colour, as occurs in hæmoptysis. When a large quantity is brought up at a time, we should take care to examine whether the blood is frothy, and accompanied by cough, as these are the symptoms which distinguish hæmoptysis from hæmatemesis.

In all cases the observer should ascertain whether the sputa exhale any particular odour, particularly when the general symptoms induce him to suspect the existence of a gangrene of the lung, or of a tubercular cavity, or collection of pus, which may have opened a passage for itself from the pleura into the bronchi.

In cases of gangrene of the lungs, the sputa are as dark as the lees of wine, or greenish ; and the odour is so strong as to prevent any mistake as to their real character.

OF PERCUSSION.

Q. Describe the sounds perceived on, and the mode of applying percussion in the healthy state of the chest.

A. The value of percussion, as a mode of examination, has not been by any means diminished by the discovery of auscultation. It is still considered a very efficient means of distinguishing diseases of the chest. Though it appears to be a very simple operation, it requires some precautions in performing it, so as to obtain satisfactory results. The fingers should be semi-flexed, their extremities placed closely together, and so adjusted as to be on the same plane, none of them passing beyond the others. In this way they are made to strike the chest perpendicularly, the integuments being made tense by the fingers of the other hand. The percussion should be made alternately on the corresponding points of each side of the chest, with the same degree of force and same angle of incidence. The wrist should be free and unrestrained, so as not to strike too forcibly and cause pain. Percussion may occasionally be made, by striking the walls of the thorax with the hand flat and extended ; but in this case allowance must be made for the sound emitted by skin.

The position of the patient should also be properly adjusted. He should be made to sit upright, his arms being carried backwards when the anterior part of the chest is to be examined ; elevated towards his head, when percussion is being made on the lateral parts, or crossed in front, whilst we strike the back. He should at the same time be directed to bend forwards, so as to give the back an arched position. These several measures are intended for the purpose of rendering tense the muscles which cover the walls of the thorax.

The condition of the external parts should be attended to; thus the sound will be more clear when the patient is thin and his fibres dry, than when he happens to be very fat, or when the flesh is soft and flaccid; but if the integuments be infiltrated by a serous effusion, no sound will be emitted on percussion.

The sound is more clear when we make percussion on those parts that are covered merely by the skin, or by thin and tense muscles; for instance, on the clavicles, or immediately below them to the distance of two fingers' breadth on the sternum;—towards the cartilages of the ribs, within the margins of the axilla as far as the third rib; and posteriorly on the angles of those bones;—on the spine of the scapula, and, in thin subjects, on its supra and infra spinous fossæ.

The sound must obviously be dull at the region of the heart, opposite the mammæ in females, and great pectoral muscle in males; and also inferiorly at the right side, in consequence of the position of the liver; at the left side, on the contrary, the sound is rendered more clear by its vicinity to the stomach, particularly if that viscus be distended by flatus.

Q. Describe the sounds perceived on applying percussion in disease?

A. The sound emitted by the chest, frequently becomes altered, being rendered dull, obscure, or even totally suppressed; or, on the contrary, may become more clear than in the natural state; so much so, as in some instances to give rise to a gurgling, or even a metallic tingling. When this phenomenon occurs, it is observed most usually beneath the clavicles. This exaltation of sound occurs when the lungs contain a greater quantity of air than is natural, or when this fluid is effused into the cavity of the pleura.

When the elasticity of the lung is diminished by its becoming infiltrated, without at the same time losing altogether its permeability to the air, the sound is rendered dull or obscure, according to the degree in which the pulmonary tissue is affected. This change takes place in cases of intense catarrh, in the first degree of pneumonia, and in œdema of the lungs.

The sound is suppressed altogether in the second degree of pneumonia, when the substance of the lung becomes dense and heavy like that of the liver, and so is rendered impermeable to the air. The same effect is produced when the lung is compressed by a fluid effused into the cavity of the pleura, or by the development of any accidental production in its substance. This suppression is, however, but partial in most cases. Its extent depends on that of the effusion, hepatization, or tumour with which it is connected, the remainder of the side still emitting its natural sound on percussion.

When the lung contains an unusual quantity of air, or when an elastic fluid is effused into the pleura, the sound becomes more clear than natural. And lastly, its tone may be increased so as to resemble a metallic tingling, in cases of pulmonary excavations, or pleuritic abscess, which are circumscribed and filled partly with air, partly with fluid.

OF THE PHENOMENA REFERABLE TO THE HEART.

Q. How are these divided?

A. Laennec has referred them to four heads:—1st, the extent in which the movements of the heart are perceptible; 2d, the impulse which they communicate; 3d, the sound which accompanies them; 4th, their rythm.

Q. What are the qualities of its pulsation on examination?

A. In a healthy man whose heart is properly proportioned, we can distinguish its pulsations only in the præcordial region; that is, in the space between the cartilages of the fifth and seventh ribs; and at the inferior part of the sternum. The movement of the left cavities is most perceptible in the former situation, that of the right, in the latter; but if the sternum be very short, they are sensible even in the epigastrium.

In some corpulent persons we cannot by the hand distinguish the pulsations of the heart, and the space in which we can perceive them by the cylinder, is very limited, being not more than a square inch; but in emaciated persons, particularly when their chests are narrow, they are heard in a much wider range, namely, in the inferior fourth, or probably three-fourths of the sternum, or, occasionally, even along the whole length of that bone, under the left clavicle, and sometimes even as far as the right.

When the stroke of the heart is confined within these bounds, and when it is less strong under the clavicles than in the præcordial region, in persons of that conformation which has just been described we may still consider the organ as retaining its proper proportions.

The stroke of the heart, will, of course, be heard in situations different from those here stated, in cases in which a transposition of the viscera has existed from infancy.

Q. What is meant by the impulse of the heart?

A. When one extremity of a stethoscope is placed on the cartilages of the ribs, or base of the sternum, and the ear is applied to the other, a sensation is communicated as if it were elevated by each stroke of the heart; this is termed its impulse.

It is very slight in a healthy person, particularly if somewhat corpulent; but even when altogether imperceptible by the hand, it is rendered distinct by the cylinder. In general, it is distinguishable only in the præcordial region, or, at farthest, along the inferior half of the sternum.

It is most forcible opposite the cartilages of the ribs, being the part which corresponds to the point of the heart. Its degree of strength is extremely variable; we learn, however, by practice, to distinguish when it is more intense than it ought to be.

Q. What is known of the motions of the heart, by the sounds which are emitted?

A. The alternate contractions of the auricles and ventricles, emit sounds peculiar to each; which, though imperceptible by the ordinary means of investigation, are rendered quite manifest by the cylinder, no matter how small the volume and force of the organ may be.

In the healthy state, there are two distinct sounds; one, dull and lengthened, coincides with the arterial pulse, and sensation of impulse above described, and therefore indicates the contraction of the ventricles; the other clear and sudden. somewhat like that of the valve of a bellows, corresponds with the systole of the auricles.

The sound of the right cavities is heard most distinctly opposite the base of the sternum, that of the left at the cartilages of the ribs.

When the walls of the heart happen to be more thin than usual, which may occur in persons who are enjoying uninterrupted health, the pulsations are heard in a greater extent of space than in persons differently constituted, but the sound is always louder in the region of the heart than in any other part. In such persons we also observe that the contraction of the auricles is more audible under the clavicles than that of the ventricles, which is not the case either at the base of the sternum, or cartilages of the ribs.

In some cases, the anterior border of the lung is prolonged in front of the pericardium, which renders the sound of the auricles more dull than that of the ventricles, but still not so much so as to make it indistinct. This evidently arises from its being masked by the murmur of respiration, or by that of the air forced out from this process of the lung, by the compression x erted upon it by the heart.

Q. What is rythm ?*

A. The movements of the heart are performed in a determinate order, which constitutes their rythm. Each contraction of the ventricles coincides with the dilatation of the arteries, and is accompanied by a dull, prolonged sound; this is instantly followed by a clear and rather quick sound, which is owing to the contraction of the auricles; a moment of repose succeeds, when the ventricle again acts, and so the succession goes on.

OF THE PHENOMENA FURNISHED BY THE HEART.

Q. What are these in a state of disease ?

A. When treating of the derangements of the heart, we shall follow the arrangement adopted when considering its actions in health.

Extent.—The pulsations of this organ are sometimes heard, beyond the limits above assigned to

* By means of the stethoscope, we can analyse the heart's action, and assign the time occupied by the contraction of each of its cavities. When the instrument is applied to the præcordial region, we hear at first a dull lengthened sound, synchronous with the arterial pulse, and therefore produced by the contraction of the ventricles; this is instantly succeeded (without any interval) by a sharp quick sound, like that of a valve, or the lapping of a dog; this corresponds to the interval between two pulsations, and therefore marks the contraction of the auricles; then comes the interval of repose. The relative duration of these three periods may be thus stated—one half or somewhat less may be assigned to the contraction of the ventricles—a quarter or a little more to that of the auricles—the remainder for the repose.—According to this statement, if we take any given period, say 24 hours, we at once are compelled to conclude that the ventricles are in action 12 hours, and therefore rest 12 hours, the auricle sare in action 6 hours, and rest 18 hours.

This calculation is applicable to a healthy adult, whose pulse beats 70 strokes in a minute. It assumes, wha tsome will be disposed to deny, that the heart is passive in its dilation—but opinions on the subject are so various that it would be impossible to give any summary of them in a note.—See Laennec, Vol. 2.

them, or they may be restricted and confined to a very limited portion of the walls of the thorax.

The increase of extent is perceptible, first along the left side from the axilla to the region of the stomach, then for the same space at the right side, next at the posterior part of the left; and, finally, but very rarely, in the same region of the right side; the intensity of the sound becoming progressively less in the order here indicated.

The possibility of thus perceiving the pulsations of the heart in these different points always indicates a diminution of the thickness of its walls, particularly those of the ventricles. It also marks a weakness or dilatation of the organ, which in the latter case strikes the sternum and ribs with a large surface. However, it should not be forgotten, that similar effects are occasionally produced by causes altogether independent of any affection of the heart; for instance, narrowness of the chest, emaciation, hepatization of the lung, or its compression by a liquid or gaseous effusion, the presence of an excavation with firm walls, nervous agitation, fever, or in a word, by any thing that can increase the frequency of the pulse.

Sometimes the pulsations of the heart are distinguishable only in a very circumscribed extent of space. This is a more rare occurrence than the preceding, and is produced by an increased thickness of its walls.

It sometimes happens that we perceive the pulsations more distinctly at the right side than at the left, or more high or low than usual. These variations are determined by the existence of a fluid or tumour at one side of the thorax, in the mediastinum, or in the cavity of the abdomen; and finally, the seat of the pulsation may vary, being perceptible now in one place, now in another.

Q. What is known of the heart from the impulse?

A. As the intensity of the impulsion communicated by the heart varies very much during health, it becomes difficult to decide positively upon its absolute increase or diminution in disease, unless it be very strongly marked, or be more manifest at one side than the other, which is the deviation most usually found to exist. This increase is sometimes very slight, but in some cases becomes so great as to elevate the walls of the thorax so strongly as to render this movement perceptible at a considerable distance. This is the pathognomic sign of hypertrophy of the heart.

The force of the impulse is directly proportioned to the thickness of the walls of the ventricles, and therefore, to the narrowness of the limit within which their contractions are audible. When the ear is applied to a stethoscope laid on the cartilages of the ribs, a jirking motion is communicated to it, which is strongly felt by the observer, and manifest to all around him.

Whatever increases the activity of the circulation, such as walking, running, fever, &c., may momentarily determine this state; and causes of an opposite tendency, rest, bleeding, &c., produce the contrary effect: hence, when we want to examine a patient, we should wait until a perfect calm is established.

The diminution of the heart's impulse is never so strongly marked as its increase. It depends sometimes on the weakness of the organ and the thinness of its walls, and therefore occurs in cases in which its contractions are perceptible in a wide extent of space; at others, it is produced by extreme embarrassment of the respiration and difficulty of the pulmonary circulation, and then may co-exist with a well-marked hypertrophy; we also observe this diminution to occur towards the close of this latter disease. Certain emotions, such as fear and depressing passions, may also produce it.

Q. What is known of the diseases of the heart from its sound?

A. The sound of the heart's contractions may become more dull, or more clear and loud than natural; or sounds altogether new may be produced, which bear no similitude to any that are emitted in the healthy state of the organ. A diminution of the intensity of the sound is caused by an increased thickness of the walls of the heart; but if it occurs together with a weakness of the impulsion, it indicates a "ramollissement," or softening of its structure.

The alteration most usually observed, is an increased loudness and clearness of the sound, which always denotes a thinness of the walls of the heart. This may be emitted by the auricles or by the ventricles The place in which it is audible marks its seat, and the time determines whether it arises from the contraction of the auricles, or that of the ventricles.

As to the sounds, which possess no similitude with any that occur during health, a knowledge of which is necessary as a means of distinguishing several of the derangements of the heart, they may be referred to the three following heads:—

Q. Describe that sound called the "Bruit de Soufflet," or the sound like that of a bellows.

A. Its name accurately expresses the character of this phenomenon. It may accompany the contraction of the ventricles, auricles, or large arteries; it may be continued or intermittent; the slightest cause being sufficient to induce its return after it has ceased. It is observable sometimes in hysterical and nervous persons, and also in those disposed to hæmorrhagies, even though there is no alteration of the functions or structure of the heart; however, in other instances, it co-exists with affections of that organ.

Q. Describe that sound called "Bruit de Râpe," or sound of a file, and what it indicates.

A. This, like the former, may occur during the contraction of either of the cavities of the heart, but it is not intermittent; when once developed, it invariably continues, with, however, some occasional changes in its degree of force. The contraction of the auricles or the ventricles, is more prolonged than natural, and emits a sound, hard, rough, and as it were, stifled.

This phenomenon indicates a contraction of the orifices by cartilaginous deposits or ossification of the valves. The place and time in which it is heard, indicate its situation. If it coincides with the systole of the ventricles, the contraction exists in the sigmoid valves; if, on the contrary, it occurs during the contraction of the auricles, it occupies the auriculo-ventricular opening.

Q. What is indicated by the Craquement de Cuir, or sound like the crackling of new leather?

A. It was observed by M. Collin in the case of pericarditis, of which he looks on it as symptomatic.

Q. What does the rythm of the heart indicate?

A. The contraction of the ventricles may be lengthened beyond their ordinary duration, so may that of the period of repose also; this indicates hypertrophy of these cavities, which is the more considerable, as the time of the contraction is the more prolonged.

In other cases, on the contrary, the contractions are found to be more rapid, and the repose more short than natural: this variation may coincide with quickness, or even with slowness of the pulse, and is not considered as indicative of any morbid alteration.

The time of the systole of the auricles is rarely observed to be lengthened, or shortened. Their contraction seems, sometimes, to anticipate that of the ventricles, particularly during palpitation, the consequence of which is that the sound of the auricles is masked by that of the ventricles, and in cases of strongly marked hypertrophy becomes altogether imperceptible.

Sometimes, during one systole of the ventricles, the auricles may make two or three contractions, or, on the contrary, while the auricles are making one, the ventricles may make two. within the time of an ordinary contraction. These phenomena do not mark any particular lesion; the pulse even, does not participate in their anomalies.

We sometimes observe several equal contractions, followed by one or more, which are shorter and quicker than the rest, or by a perceptible pause constituting an intermittence;—this should be considered as indicative of disease.

Sometimes again, the contractions are so frequent and irregular, that it is impossible to analyse them; this is always connected with some organic affection.

After having examined the heart, attention should be directed towards the region of the sternum and the first ribs on the right side, to ascertain whether there are any pulsations determined by an aneurism of the arch of the aorta.

Having thus concluded our remarks on the method of examination, applicable to the heart as the central organ of the circulation, we shall, in the next place proceed to consider the varieties which the pulse presents, though these are not confined to affections of the chest, more particularly than to those of the other cavities.

Q. Describe the method of examining the pulse.

A. The observer should wait until any emotion, which his presence may have caused, has subsided. He may then proceed to examine the pulse at the wrist, temple, lateral parts of the neck, or, in a word, in any other part where an artery of a certain size happens to be superficially seated. After having ascertained that the course of the blood is not interrupted in the arm, by tight clothes, or by a ligature, he takes the wrist of the patient, who ought to be either sitting, or lying in such a way as that the weight of his body may not incline more to one side than the other; the arm being placed in extension, and the fore-arm in pronation, supported by its ulnar border while the radical is somewhat elevated, the artery is felt with the hand opposite to that of the patient.

The fingers should be laid in a right line on the course of the artery, the index finger on the anterior, and the thumb on the posterior or dorsal side of the wrist, furnishing a support to the others. The little finger, which receives the first impulse of the blood, should be applied to the vessel but slightly, but the others may compress it more or less. We should continue this process for a minute or two, and always observe the precaution of examining the pulse in both arms. The abdominal aorta and crural arteries may be examined by means of the stethoscope, which enables us readily to distinguish the circulation in those vessels. A watch, with a second hand, is in general necessary, in order to ascertain exactly the number of pulsations that are made in a given time.

In Health the pulse is equal and regular, of a moderate degree of strength and frequency. The number of its beats vary according to the age, sex, temperament, stature, and idiosyncracy of each individual. In the first months of life there are one hundred and forty arterial pulsations in a minute; up to the completion of the second year, there are about one hundred; at puberty the number is reduced to eighty; in middle life we count from sixty to seventy-five; and finally in old age from fifty to sixty. The pulse is generally more frequent in females, and persons of a nervous temperament; it becomes quickened after meals and exercise, during pregnancy, or after any sudden emotion; but it is rendered slow by repose, fasting and blood-letting.

The observer should also recollect, that the pulse is subject to variations, both as to the duration and order of its beats; it is necessary to bear this in mind, lest he attribute to disease what may be altogether independent of it.

In Disease the pulse may be quick or slow, strong or weak, full or small, hard, contracted, resisting, or soft and compressible, requiring a greater or less pressure on the artery to measure its degree. It may also be frequent or the reverse, regular or irregular, in which latter case there are sometimes intermittences coinciding with the contraction of the auricles; and further, it may be equal or unequal, distinct or confused, thready or insensible.

In general, the larger the artery is, the stronger is the pulse; this should be taken into account when it happens to be stronger in one arm than in the other. The strength of the pulse diminishes gradually, when a tumour is developed near the trajet of the artery, as we observe in cases of aneurism of the arch of the aorta, when the subclavian artery suffers compression against the walls of the thorax.

The veins sometimes present pulsations synchronous with those of the arteries. This may be observed in the jugular veins, when, in consequence of an aneurism of the right cavities of the heart, a reflux of blood is determined into them, which may occasionally be perceived even as far as the superior part of the neck. When a communication is established between an artery and vein which are contiguous, it determines a similar result.

There still remain to be described two other means or procedures, which are occasionally used in examining diseases of the chest.

OF THE MEASUREMENT OF THE THORAX.

Q. How is the thorax to be measured?

A. This process may be performed as follows:—The patient being placed in a sitting posture, or standing upright, with his arms hanging freely by his sides, or raised towards his head, a cord is drawn round his chest at any part of it; if this be doubled upon itself, we ascertain the natural extent of each side. The cord should then be applied successively to each side, beginning at one of the spinous processes of the vertebræ, and extending to the middle of the sternum, care being taken that it passes in a right line from one of these points to the other; by comparing the result of this latter measurement with that given above, we ascertain the dilatation or contraction, that may exist at either side of the cavity.

In making this calculation, we should, however, recollect, that even in the healthy state, the two sides rarely present the same capacity, and that in persons who have been attacked by very severe pleurisies, the side that remained unaffected, acquires an increase of development, whilst that which had been the seat of the disease becomes narrowed and flattened; the point of the shoulder is depressed, the side hollowed, and the muscles thin and wasted. Sometimes, also, in cases of phthisis we observe the upper ribs somewhat depressed, which is caused by adhesions between the pleura costalis and pulmonalis.

The thorax is dilated in cases of fluid or gaseous effusions into the cavity of the pleura or pericardium, or of any considerable development of accidental tumours. It is contracted by original malformation, or after the termination of pleurisies, as has been already stated.

OF SUCCUSSION.

Q. What is meant by succussion?

A. This process consists in giving to the body one or more slight jerks, for the purpose of ascertaining the existence of a fluid supposed to be in the thorax. This motion determines a sound similar to that produced by shaking a bottle which is half full.

The sound is not emitted unless the effusion consists at the same time of air, or gas and liquid. For if the effusion be liquid only, then the lung will fill exactly all the rest of the cavity, and cannot be compressed by the fluid, sufficiently for the succussion to excite any sound; and again, if the gaseous effusion be too abundant, or not sufficiently so, no result will be obtained. Hence these fluids must be combined in certain fixed proportions.

These are the principal indications which mark the different affections of the chest.

Q. What other circumstances are worthy of note in examining the chest?

A. The observer should also note the expression of the countenance, the colour of the cheeks and lips, their state of emaciation or injection, the manner in which the patient lies, the distribution of temperature in the limbs, the existence of partial sweats, and the state of the blood after bleeding, particularly in acute disease.

In phthisical cases, he should always inquire whether there be any hereditary predisposition. We shall recur to each of these points more in detail, when treating of the diseases peculiar to each organ.

Q. Give a summary of the different points to be attended to in this investigation?

A. He should begin with examining the expectoration, as being of considerable value in distinguishing diseases of the chest. If limpid and viscid, it indicates acute catarrh; if, after presenting this appearance, it becomes opaque, yellow, greenish or puriform, it marks chronic catarrh; if it adheres firmly to the vessel in which it is received, and is more or less tinged with blood, it announces pneumonia; if round and opaque masses float in a quantity of frothy fluid, or if they are puriform, and streaked with white lines, and containing small white masses insoluble in water, we conclude that they are produced in a tubercular excavation. If the expectoration is fluid, purulent, and suddenly coughed up in great quantity, it should make us presume, that a fluid contained in the pleura, has made its way through the bronchi, and so is evacuated. When pieces of false membrane are expectorated, they are recognized at once as the product of croup; and a dark green fluid, exhaling a fetid smell, marks gangrene of the lungs. In hæmoptysis, bright red, and frothy blood is expectorated; this should not be confounded with that which occurs in hæmatemesis, or with the bleeding which occasionally comes from the gums or the nares.

The effects of percussion should next be attended to, as they tend to direct the observer in the examination he is about to make with the assistance of the stethoscope. It should not be forgotten that, even in health, there are some parts of the chest which give a dull sound, as for instance the region of the heart, and the lower part of the right side; there are others in which the sound is heightened, as the lower part of the left side. Percussion indicates the parts in which the sound has become more dull, and those in which it is more clear than natural; diminution and absence of the natural sound, characterize pneumonia,—accidental tissues developed in the lung or cavity of the pleura, hypertrophy of the heart, and effusions into the pleura or pericardium; increased loudness of sound occurs in emphysema of the lung, or effusion of gaseous fluids into the pleura; finally, the gurgling and metallic tingling indicate pulmonary excavations, or circumscribed cavities in the pleura, communicating with the bronchi.

Inquiry should next be directed to ascertain the state of the respiration, (whether it be painful and provokes cough,) the character of the cough and also of the voice, which may be hoarse, croupal, &c. after which by the stethoscope the observer may ascertain the parts of the lung which are or are not permeable to the air. The "râle crepitant" will indicate to him the first degree of pneumonia, œdema of the lung, and pulmonary apoplexy; acute catarrh will be distinguished by the "râle sonore" or "sibilant,"—chronic catarrh, and the gurgling of softened tubercle, by the "râle muqueux," and interlobular emphysema, by the peculiar sound described above, as the *murmur frictionis.*

The phenomena of the voice should be explored in the different parts of the chest. If pectoriloquy is heard under the clavicle, or in the hollow of the axilla, particularly at one side, it indicates phthisis;

ægophony is the proper sign of effusion into the cavity of the pleura; finally, the metallic tingling announces a cavity communicating with the bronchi, and the metallic respiration, a simple bronchial fistula.

When any symptoms of effusion exist, it will be necessary to measure each side of the chest, and try by succussion to discover the presence of the fluid supposed to be present.

When the heart is supposed to be affected, the observer, after having ascertained that there is no unnatural enlargement in the præcordial region, and after making percussion, should proceed to examine the pulsations of the organ, between the fifth and seventh ribs, and at the base of the sternum. He should consider these in reference to their extent, impulsion, sound, and rythm. If they are feeble, and heard in different parts of the thorax, he may suspect a dilation of the ventricles; if, on the contrary, they are strong and circumscribed, they indicate hypertrophy; if they emit a clear sound, it is a symptom of thinness of the walls of the heart. The disease is proved to exist at the right or left side of the organ according as these effects are more audible at the base of the sternum, or between the cartilages of the ribs; and the time at which they are heard, marks whether it is the auricles or ventricles that are affected. When the "bruit de rape," or sound like a file, is heard at the left side, and is synchronous with the contraction of the ventricle and the pulse, it indicates a narrowing of the sigmoid-aortic, and mitral valves: when, on the contrary, it is synchronous with the contraction of the auricles, the narrowing is at the auriculo-ventricular opening: when it is heard at the base of the sternum, it is a sign of contraction of the tricuspid or sigmoid valves of the pulmonary artery.

The observer should examine the anterior part of the sternum, to ascertain whether there be an aneurism of the arch of the aorta, and the posterior part of the thorax, to determine that of the descending portion of this vessel. In all these cases he should attend particularly to the state of the pulse, whether it be frequent, small, irregular, contracted, or developed; lastly he should conclude this examination by noting the expression of the countenance, the appearance of the body, and the symptoms referable to affections of other organs.

ANATOMY OF THE ŒSOPHAGUS.

Q. What are the situation and course of the Œsophagus?

A. The Œsophagus begins from the upper part of the Pharynx, descends on the fore part of the cervical vertebrae behind the trachea; in the thorax it passes down between the layers of the posterior Mediastinum behind the base of the heart, and turning slightly to the right, descends upon the fore and right side of the Aorta Descendens; towards the lower part of the thorax, it inclines forwards, and rather to the left, perforates the muscular portion of the diaphragm about the ninth dorsal vertebra, and terminates in the left and upper orifice of the stomach, called *Cardia.*

Q. How many *Coats* has the *Œsophagus?*

A. *Four;* a cellular, muscular, nervous, and mucous or villous; the external cellular coat connects the muscular to the surrounding parts; the muscular consists of two layers of fibres, the external layer has strong longitudinal fibres which shorten the tube, the internal has circular ones, which contract its diameter; the nervous coat connects the muscular to the mucous or innermost coat, which is continuous from the mouth, and has many longitudinal plicae when the œsophagus is collapsed, but they disappear when it is distended; this innermost coat is well lubricated with mucus.

Q. Whence does the *Œsophagus* receive its *blood?*

A. The cervical part of it receives branches from the Inferior Laryngeal arteries; the thoracic part from the Œsophageals, and branches of the bronchials which arise from the descending Aorta.

Q. What is the *use* of the *Œsophagus?*

A. It transmits the aliment from the mouth and pharynx to the stomach.

Q. What *Organic Derangements* is the *Œsophagus* subject to?

A. A fungous tumour hanging from the Pharynx, spasmodic stricture, stricture from a thickening and puckering of the inner membrane; it sometimes becomes partly cartilaginous.

ANATOMY OF THE ABDOMEN.

Q. What are the boundaries of the Abdomen?

A. It is bounded by the diaphragm above, by the pelvis below, by the abdominal muscles before and on the sides, and by the lumbar vertebrae behind.

Q. Into how many *regions* is the *Abdomen* generally divided?

A. Into nine; a transverse line from the last rib of the one side to that of the other, marks out the three superior regions, viz. the Epigastric in the middle, and the right and left Hypochondric on either side of it; another transverse line between the superior anterior spinous processes of the Ilia, divides the three inferior, viz. the Hypogastric region in the middle, and the right and left Iliac; from the three middle transverse regions, viz. the Umbilical in the middle, and the right and left lumbar regions on either side of it.

Q. What *Viscera* are contained in the *Abdomen?*

A. The Chylopoietic Viscera; namely, the Stomach, Intestines, Omenta, and Mesentery; and the Assistant Chylopoietic Viscera, viz. the Liver, Spleen, and Pancreas. The Kidneys, fundus of the bladder, and of the Uterus in gestation, are also in the abdomen.

Q. What is the *situation* of the Peritoneum?

A. The Peritoneum is situated in the abdomen, is in the form of a shut sac, the anterior and lateral parts of which, line the parietes of the abdomen ; the posterior cover and involve the intestines ; and the superior part of it lines the under surface of the diaphragm.

Q. What is the structure of the Peritoneum ?

A. It is a thin firm elastic membrane ; its external surface is rough and cellular, adhering to the contiguous parts ; its internal surface is very smooth, and lubricated by a fluid exhaled from its own vessels.

Q. What is meant by the *cavity* of the Abdomen?

A. The cavity of the abdomen is between the anterior and lateral portions of the Peritoneum which line the parietes of the abdomen, and that portion of it which covers the intestines.

Q. What retains the Viscera of the abdomen in their respective situations ?

A. The *Peritoneum*, which includes the intestines in a duplicature, and its substance forming two layers constitutes the Mesentery, Meso-Colon, and Omenta.

Q. What is the *Mesentery?*

A. It is a doubling of the Peritoneum, including between its two layers numerous blood-vessels, lacteals, glands, nerves, fat, and cellular substance, which binds them together.

Q. What is the *situation* of the *Mesentery?*

A. It commences at the duodenum, where the intestine becomes moveable, includes the whole length of the Jejunum and Ilium, in its duplicature, ends at the termination of the Ilium, and is situated between these small intestines and the lumber vertebrae, where it becomes so contracted as to be attached to the first, second, and third lumbar vertebrae, running obliquely downwards towards the right side.

Q. What is the *Meso-Colon?*

A. It is that portion of the peritoneum, which after including the Colon in its duplicature, passes double between it and the body, and fixes it in its situation.

Q. How many *Omenta* are there ?

A. *Three;* the Omentum majus, or Omentum Gastro-colicum ; the Omentum minus, or Omentum Hepato-gastricum ; and the Omentum Colicum.

Q. What is the situation and formation of the *Omentum Gastro-Colicum?*

A. The Peritoneum gives a covering to the stomach ; the portion of it covering its anterior and superior side, and the other covering its posterior and inferior, meet at the large curvature of the stomach, are united by cellular substance ; this anterior layer being double descends below the umbilicus, and is then reflected backwards and ascends, forming the posterior layer of the Omentum, and is attached to the transverse arch of the Colon The Omentum majus thus composed of four layers of the peritoneum, neither adheres to the abdominal muscles, nor to the small intestines.

Q. Does the *Omentum majus* contain any thing between its layers?

A. It contains much adipose matter, which exudes from it, and lubricates the external surface of the intestines.

Q. What seems to be the *use* of this *Omentum Gastro-colicum?*

A. It is interposed between the abdominal muscles and the intestines, as a soft cushion to defend them from injuries, and to facilitate their peristaltic motions by its lubricating quality.

Q. What is the *situation* of the *Omentum minus?*

A. The Omentum Hepato-gastricum is composed of two layers of the peritoneum, and extends from the under and back part of the Liver, to the whole small curvature of the stomach and beginning of the duodenum ; it does not contain much fat between its layers.

Q. What is the *situation* of the *Omentum Colicum?*

A. It descends double from the right portion of the arch of the Colon in a wedge-like form, and is connected with the Caput caecum coli.

THE ANATOMY OF THE CHYLOPOIETIC VISCERA.

Q. Into what parts is the *Alimentary Canal* divided?

A. Into the Pharynx, Œsophagus, Stomach, Duodenum, Jejunum, Ilium, Caput Caecum Coli, Colon, and Rectum.

THE ANATOMY OF THE STOMACH.

Q. What is the situation of the Stomach?

A. The Stomach is situated obliquely across the superior and posterior part of the abdomen in the left Hypochondric and Epigastric regions.

Q. What is the *form* of the stomach?

A. It is long and round, being much larger at the left extremity and tapering towards its right; it is curved from end to end. Between the Cardia, its left orifice, and the Pylorus, its right, the smaller curvature is placed; and the larger curvature extends along its inferior and anterior margin from the left to its right extremity.

Q. What parts is the stomach contiguous to?

A. Its large or left extremity is in contact with the Spleen, and is considerably higher than its pyloric extremity, which lies under the left lobe of the Liver; its superior part is in contact with the diaphragm, its inferior, with the intestines.

Q. By what is the stomach retained in its situation?

A. It is connected by the Cardia to the Œsophagus, by the Pylorus to the Duodenum, by the Peritoneum and blood-vessels to the Spleen, by the Peritoneum to the root of the Liver and transverse arch of the Colon, and by blood-vessels to the Aorta.

Q. Is the Stomach *moveable* at the *Cardia*?

A. The œsophagus at the Cardia, binds it firmly down, and retains it in situ, but its body and larger curvature can rise up as it becomes distended with food, and form almost a right angle with the œsophagus.

Q. Is the *Pyloric extremity* of the stomach fixed in situ?

A. The Pyloric extremity of the Stomach situated under the left lobe of the Liver on the right side of the vertebræ is lower, turned more forward than the Cardia, is quite moveable, so that it can be drawn towards the Cardia by the contraction of the stomach longitudinally.

Q. How many *Coats has the Stomach ?*

A. *Four;* the peritoneal, muscular, nervous or cellular, and the inner or villous coats, bound together by cellular substance.

Q. Describe *these coats ?*

A. The *peritoneum* is reflected over the stomach, and gives it its external coat. The *muscular* situated immediately under the peritoneal coat, to which it adheres, by cellular substance, is composed of two planes of fibres; the external plane is longitudinal, being continued from the œsophagus, extends from the large to the small extremity; and on each side of the small curvature being collected, they form a strong thick band: the internal plane has thick, strong, circular, and transverse fibres. The *nervous coat* is composed of cellular substance intermixed with aponeurotic-like filaments crossing each other obliquely. The *inner* or *villous coat*, being the same as that of the œsophagus, only having a great many more prominent Villi crowded with minute vessels.

Q. Are the *nervous* and *villous coats* more extensive and larger than the others ?

A. They are thrown into many *rugae* of a waving transverse direction when the stomach is empty; this appearance is the effect of the natural partial contraction of the fibres of the muscular coat; but when the stomach is filled, they are stretched, and the rugae disappear: hence, they are not more extensive than the other coats.

Q. What *use* can *these rugae serve* in the internal surface of the stomach?

A. They support the vessels and nerves dispersed in them; enlarge the internal surface of the stomach, and thus favour the flow of the Gastric Juice; and perhaps they tend to retain the aliment in the stomach till it be properly chymified.

Q. By what *apparatus* is the *Gastric Juice secreted?*

A. It is secreted by the extremities of the Arteries on the internal surface of the stomach.

Q. What is the *nature of the Gastric Juice?*

A. It is a limpid fluid, somewhat similar to saliva, of very great solvent power, of antiseptic properties, and well calculated to dissolve our food.

Q. Is there a *sphincter at the Cardia?*

A. No proper sphincter; but the muscular fibres are so disposed in various directions around it, and the end of the œsophagus projects a little into its internal surface, that nothing can return from the stomach towards the mouth, even when the head is turned downwards, unless ejected by vomiting.

Q. Describe the *Sphincter of the Pylorus.*

A. The two innermost coats of the stomach form a large circular ruga or fold, which includes a fasciculus of muscular fibres, which form a ring projecting into the internal part of the passage. This muscular ring contracts and completely shuts the passage from the stomach into the duodenum, and thus constitutes the Sphincter Pylori.

Q. What *Arteries* are sent to the Stomach?

A. The *superior gastric*, which is a branch of the Cœliac; the *right inferior gastric*, sent off from the Hepatic; and the *left inferior gastric*, sent off from the Splenic, are the principal arteries; but besides, the *arteriae breves* from the splenic are dispersed upon the left extremity of the stomach; and the *Pyloric branches* from the hepatic are distributed near to the Pylorus.

Q. Where do the veins of the stomach terminate?

A. They have their names from the arteries, they follow their course, and terminate in the Vena Portae.

Q. Has the *Stomach* many *Absorbents?*

A. Yes, the absorbents of the stomach are both numerous and large; they however convey Lymph and not Chyle, because chyle is not formed in the stomach.

THE ANATOMY OF THE DUODENUM.

Q. Describe the course and situation of the Duodenum.

A. The Duodenum being the commencement of the small intestines, begins at the Pylorus, turns up and backwards by the neck of the gall-bladder; then bends downwards before the great vessels going into the liver, and before the renal artery and vein; and near the under part of the kidney it makes a turn to the left side, going before the Aorta and Vena Cava at the first or second lumbar vertebra, and perforating the root of the Mesentery and Meso-colon, it turns forwards and terminates at the left side of the spine in the Jejunum.

Q. How *many Coats* has the *Duodenum*?

A. It has three complete coats, the muscular, nervous, and villous, and a partial coat from the peritoneum, which covers the anterior portion of it only; the posterior part of the Duodenum being fixed to the parts behind by cellular substance.

Q. Is there any thing peculiar in the coats of the Duodenum?

A. Its muscular coat is very thick and strong; its villous coat has many mucous glands under it, especially near the pylorus; the Villi are very conspicuous, and becoming longer, are converted into Rugae; and lastly, into Valvulae Conniventes, towards the termination of the duodenum.

Q. Do any of the *Lacteal Vessels* arise from the Duodenum?

A. Yes; when the Villi and Valvulae Conniventes become considerable near the end of the duodenum, the Lacteals are apparent.

Q. What is the *form* and *use* of the *Valvulae Conniventes*?

A. They are fixed to the internal surface of the intestine by one side, and hang loose with the other; they are of different lengths, and the end of one is insinuated between the ends of two, occupying the interstices of each other. They afford a very extensive surface, on which the mouths of the Lacteal vessels open and absorb the Chyle. They also in some degree retard the passage of the Alimentary mass, and give more time for the formation of Chyle.

Q. Is the *Duodenum perforated* by the entrance of any *ducts ?*

A. Yes; the end of the Ductus Communis Choledochus, and the end also of the Pancreatic Duct, penetrate the coats of the Duodenum, very obliquely, in its posterior part just at the root of the Mesentery and Meso-Colon, and terminate in its cavity.

Q. Do the Biliary and Pancreatic Ducts terminate separately in the posterior part of the Duodenum ?

A. They most commonly terminate together, and sometimes separately, but always near to each other.

Q. Do the contents of the Duodenum not return into the open terminations of these Ducts ?

A. No ; their termination is so oblique in penetrating the coats, particularly the planes of muscular fibres, that the contents of the Ducts can be poured into the Duodenum when it is a little distended, but nothing can return into the Ducts.

Q. Why do these Ducts terminate in the posterior part of the Duodenum rather than in the anterior ?

A. The posterior part of the Duodenum is always fixed, and affords a ready exit to the contents of the Ducts at all times : whereas, the anterior part of it is moveable, particularly when the presence of aliment stimulates it to strong action ; the terminations of the ducts therefore would have been constantly changing their situation, and the egress of their contents would have been uncertain, and often interrupted.

THE ANATOMY OF THE JEJUNUM.

Q. What is the situation of the Jejunum ?

A. The Jejunum begins at the duodenum, where

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the gut becomes moveable, forms numerous convolutions in the upper part of the Umbilical Region, and terminates in the Ilium.

Q. What is the *structure* of the *Jejunum?*

A. It has four coats; a complete one from the Peritoneum; a thin muscular, a nervous and a villous coat; the Villi, Valvulae Conniventes, and Lacteals, are very numerous and conspicuous on its internal surface. It is smaller than the duodenum.

THE ANATOMY OF THE ILIUM.

Q. What is the situation of the *Ilium?*

A. It commences where the Jejunum terminates; the limit, however, is not well determined, the Jejunum is generally empty; the Ilium is smaller in diameter and of a paler colour, it occupies the under part of the umbilical region, extending to the Hypogastric and Iliac regions, and in women sometimes to the cavity of the Pelvis.

Q. Do the *Coats of the Ilium* differ in any respect from those of the Jejunum?

A. The coats of the Ilium are generally thinner; its internal surface exhibits fewer and smaller Lacteals; the Valvulae Conniventes, though large at its commencement, gradually decrease in size and number towards its termination, and at last disappear. Mucous Glands are numerous and large near its termination.

Q. Where does the *Ilium terminate?*

A. Its extremity passes across to the right Iliac Region, and terminates in the left side of the Colon, about three inches from its beginning.

Q. Is there any *Valve* placed at the termination of the Ilium?

A. Yes, the *Valvula Ilea,* or *Valvula Coli;* the Villous and nervous coats of the Ilium form a duplicature which encloses some circular muscular fibres, it projects into the colon in the form of two lips, which are placed transversely in the posterior and left side of the Colon. The lips of the Valve are bound in their situation by the *Retinacula*, or *Fraena* MORGAGNI, and admit of the passage of the alimentary mass into the Colon, but prevent any thing from returning into the Ilium.

THE ANATOMY OF THE COLON.

Q. Into what parts is the Colon divided?

A. Into the Caput Caecum Coli, Colon, and Rectum.

Q. Where is the Caput Caecum situated?

A. The *Caecum*, about three inches long, and nearly the same in diameter, is situated in the Right Iliac Region; its extremity is shut. The Appendix Vermiformis hangs from it.

Q. What is the *course of the Colon?*

A. It encircles the small intestines, beginning at the Caput Caecum, it ascends in the right Lumbar Region over the Kidney, to which it is connected, from the Kidney it forms an arch across the abdomen, first passing, in the right Hypochondric, under the liver and Gall-Bladder, then in the Epigastric, and lastly, in the left Hypochondric region, under the stomach, being connected to the Duodenum; this is called the *Great Arch* of the Colon. In the left Hypochondric region, the Colon turns backwards under the Spleen, and descends in the left Lumbar region on the foreside of the Kidney to which it is attached; in the left Iliac region, it forms the Sigmoid Flexure, which is continued down into the Rectum.

Q. What fixes the *Colon* in its situation?

A. The Peritoneum surrounds the Colon, and between it and the body its two layers are connected by cellular substance, and thus form the Meso-Colon, which keeps the Colon in its place.

Q. How many *Coats* has the *Colon?*

A. Four; they are stronger and thicker than those of the small intestines. The longitudinal fibres of the muscular coat are collected into three fasciculi or bands, which begin at the root of the Appendix Vermiformis, and are continued along the Colon to the Rectum. The internal surface is divided into cells by transverse folds running from one longitudinal band to another.

Q. By what means is the feculent mass thrown out of these cells and moved along?

A. The muscular longitudinal bands are shorter than the rest of the Colon ; the transverse muscular fibres included between the layers of the two internal coats, forming the folds or partitions, and the circular muscular fibres dispersed upon the whole substance of the Colon, contract themselves, and move along the contents of the gut.

Q. What is the *use* of those *Cells* of the Colon?

A. The transverse septa answer the same purpose as the Valvulæ Conniventes: they enlarge the inner surface of the intestine, and retard the too rapid movement of the feculent mass, that every particle of a nutritive quality may be absorbed.

Q. Are many Mucous Glands placed in the Colon?

A. In the Caecum there is a considerable number of pretty large ones; the appendix vermiformis too contains a number, and pours their mucus into the Caecum; many others are dispersed over the internal surface of the Colon, and the Rectum is well supplied with them.

Q. On what part of the Colon are the *Appendiculae Pinguendinosae* situated?

A On the outer surface of the muscular, and under the Peritoneal coat of the Colon these Appendiculae, thin at their roots, and becoming larger and thicker in their bodies, are situated, at different distances from one another.

Q. What is the *use* of the Appendiculae Pinguedinosae?

A. They seem destined to lubricate the external surface of the intestines in a manner similar to the Omentum.

Q. What is the precise *situation* of the Rectum?

A. It begins at the last lumbar vertebra, descends curved upon the fore part of the Os Sacrum and Os Coccygis, and ends in the Anus.

Q. Describe the *Rectum* particularly ?

A. The Rectum becomes wider as it descends towards the Anus, and thus forms a reservoir for the faeces. Near to the Anus its internal surface is disposed in longitudinal folds, but higher up they are transverse. The muscular fibres of the Rectum are strong, thick, and spread uniformly over it ; and at its extremity they are collected into a firm circle, which forms the *Sphincter Ani.*

OF THE ASSISTANT CHYLOPOIETIC VISCERA.

Q. What viscera are denominated Assistant Chylopoietic ?

A. The Liver, Spleen, and Pancreas.

THE ANATOMY AND PHYSIOLOGY OF THE LIVER.

Q. What is the *situation* of the *Liver?*

A. It is situated immediately under the diaphragm in the right Hypochondrium and Epigastrium chiefly, and partly also in the left Hypochondrium.

Q. What is its *colour* and *figure?*

A. It is of a dusky reddish colour ; its upper surface in close contact with the diaphragm is convex ; its under surface is concave, and receives the convexity of the stomach, duodenum and colon; it is thick on its right and posterior parts, becomes thin towards its left, and acute before.

Q. Into how many *Lobes* is the *Liver divided?*

A. Into *two*, the right or great lobe, and the left or small lobe : and besides, into *three* lobules.

Q. What is the precise *situation* of the *Right Lobe?*

A. It is situated obliquely in the right hypochondrium, following the curve of the diaphragm, and rests upon the pylorus, colon, and top of the right kidney.

Q. What is the *situation* of the *Left Lobe?*

A. It is situated nearly in a horizontal position, in the Epigastrium chiefly, and reaching a small way into the left hypochondrium.

Q. Where are the *Lobules* situated?

A. On the under surface of the right lobe.

Q. Describe their relative situations?

A. The *Lobulus* SPIGELII being the largest, is situated near the spine between the *fossa* of the *ductus venosus* on the left side, and the *fossa* of the *vena cava* on the right, and behind the *sulcus transversus;* the *Lobulus Caudatus* is an angle of the former, inclining towards the middle of the right lobe; the *Lobulus Anonymus*, or *Quadratus*, is a small portion of the right lobe between the fossa ductus venosi and the gall-bladder.

Q. How many *fossae* or *sulci* are observable on the inferior surface of the Liver?

A. *Four;* the *fossa umbilicalis* situated between the right and left lobes; the *sinus portarum*, or *sulcus transversus*, situated across the right lobe, between the lobulus Spigelii behind, and the lobulus anonymus before; the *fossa venae cavae* between the right lobe and the lobulus Spigelii; and the *fossa ductus venosi* is situated between the left lobe and the lobulus Spigelii.

Q. How many *Ligaments* retain the *Liver* in its situation?

A. *Five;* the *Coronary* Ligament, which connects the root of the Liver to the tendinous part of the diaphragm; the *Broad* or *Suspensory* Ligament, which is triangular, and runs from the umbilicus and ensiform cartilage to the fossa umbilicalis between the right and left lobes; the *Round* Ligament, which was the umbilical vein in the foetus, runs in a doubling of the former along its inferior margin to the Liver, between its left lobe and the lobulus Spigelii; the *Right Lateral* Ligament, which is short, and fixes the back and right portions of the great lobe to the diaphragm; and the *Left Lateral* Ligament, which connects the left lobe to the diaphragm.

Q. Has the *Liver* no other *Ligaments?*

A. Yes; the celebrated Haller described the *Hepatico-colicum*, which passes from the sinus portarum and gall-bladder, over the duodenum to the colon, and the *Hepatico-renale*, which runs from the root of the Liver to the right kidney.

Q. How many *Coats* has the Liver?

A. *Two; a peritoneal*, which surrounds the liver, except at the coronary ligament; and a condensed thin *cellular coat*, which both covers the surface, and enters into the substance of the Liver.

Q. What *vessels* enter the *Liver?*

A. The hepatic artery, vena portae, hepatic veins, absorbents, and biliary ducts.

Q. What is the *structure* of the Liver?

A. It is glandular, being of the conglomerate kind. The Vena Portae, and Hepatic Artery, enter the Porta of the Liver, branch out into repeated and minute ramifications in its substance; their extremities are coiled up in cellular substance so as to form innumerable pulpy corpuscles, called *Acini;* which constitute the glandular apparatus for secreting the Bile. The Hepatic Veins and Biliary Ducts also commence in these glandular Acini, and accompany the branches of the Vena Portae through the substance of the Liver.

Q. What *Vessels compose* the *Vena Portae?*

A. It is made up of the Veins of the Stomach, of the Intestines, of the Spleen, of the Pancreas, and of the Omenta. These veins all meet at the Porta of the Liver, and form one large trunk, which is thence called *Vena Portae.*

Q. What is *peculiar in the Vena Portae?*

A. Its partaking of the nature of a Vein, and of an Artery, while its branches coming from the different abdominal Viscera are uniting and forming larger trunks, and all these ultimately conjoined constitute the *Vena Portae:* It partakes of the nature of a Vein; but when it enters the Liver, divides into branches, which are again and again minutely divided in the substance of the Liver, and ultimately terminate in the Acini, it clearly partakes of the nature of an Artery.

Q. Does the *Vena Portae*, when performing the office of an Artery in the substance of the Liver, *pulsate?*

A. *No ;* its coats are thick and strong, but membranaceous, as those of the other veins are ; of course having no muscular coat, it cannot pulsate.

Q. Is the *blood* in the *Vena Portae* of the Liver *arterial ?*

A. No ; it is venous.

Q. Is the *Bile secreted* from *Venous blood ?*

A. Yes ; but some extremities of the Hepatic Artery anastomose with those of the Vena Portae, and thus its arterial blood may assist in affording bile.

Q. Can *Bile* be *secreted* from *arterial blood* alone ?

A. Yes ; in one or two cases the *Vena Portae* did not enter the Liver, but terminated in the Vena Cava; in such cases the bile was found to have been secreted from the arterial blood of the hepatic artery.

Q. Describe what happens in the *Acini* of the Liver ?

A. The glandular extremities of the Vena Portae prepare and secrete the Bile, which is instantly absorbed by the *Tubuli Biliferi*, and carried into the biliary ducts : the blood, after the bile is secreted, passes into the extremities of the Hepatic Veins, which accompany the arteries and branches of the Vena Portae.

Q. What *course* do the *Biliary Ducts follow ?*

A. They form larger and larger trunks by their repeated junction, and follow the branches of the Vena Portae towards the root of the Liver, where they become one trunk, called *Ductus Hepaticus.*

Q. Where do the *Hepatic Veins terminate ?*

A. The Hepatic Veins receive the blood partly from the extremities of the Hepatic Artery, and partly from those of the Vena Portae, unite by degrees, accompanying the branches of the Vena Portae towards the root of the Liver, where they form two or three large trunks, which terminate in the ascending Vena Cava just before it perforates the Diaphragm.

Q. What connects these *sets of vessels together?*

A. Fine cellular substance deprived of fat enters into the composition of the innumerable Acini, surrounds the different vessels, and supports them in their relative situations.

Q. Where have the *Lymphatic vessels* of the Liver their course?

A. They are very numerous, and cover almost all its external surface; they form larger trunks, which terminate partly in the beginning of the Thoracic Duct, and partly in a Plexus situated behind the sternum.

Q. What is the *situation of the* GALL-BLADDER?

A. It is situated obliquely transverse on the inferior or concave part of the right lobe of the liver, with its cervix at the Sinus Portarum, and its fundus at the anterior margin of the Liver, and sometimes beyond it when full: its fundus is rather lower than its cervix, when the body is erect.

Q. Describe the *Vesicula Fellis?*

A. It is a small pyriform sac, consisting of a cervix, a body, and a fundus, composed of three coats, and a partial one from the *Peritoneum.*

Q. What is the *fabric of its Coats?*

A. It receives a covering from the *Peritoneum*, except where it is attached to the Liver; some pale fibres scattered in various directions have been considered its *muscular coat;* under which is cellular membrane, frequently considered its *nervous coat;* and its innermost *villous* or *mucous coat*, exhibits numerous rugae.

Q. Is the internal surface of the *Gall Bladder* copiously supplied with *Mucus?*

A. Yes; it is perforated by innumerable ducts of small follicles situated under it, which pour out much Mucus to defend its surface from the acrimony of the Bile.

Q. What connects the *Gall-Bladder* to the *Liver?*

A. A cellular substance, Blood-Vessels, and Absorbents.

Q. Has the *Gall-Bladder* a *Duct?*

A. Yes; its neck is twisted and folded upon itself, and contracted into a duct, called *Cystic*, which runs about an inch and a half, and then joins the Hepatic Duct.

Q. Describe the *Common Duct* formed by the junction of the Hepatic and Cystic Ducts?

A. It is called *Ductus Communis Choledochus*, of the size of a goose-quill; it descends under the head of the Pancreas, to the back part of the Duodenum, which it enters about five inches from the Pylorus.

Q. Describe the *passage* of the *Ductus Communis Choledochus* through the coats of the Duodenum.

A. It is generally joined by the Pancreatic Duct, either while passing through the coats of the Duodenum, or before it enters them; having pierced the muscular coat obliquely, it runs a considerable space in the cellular or nervous coat along the gut, and then opens upon a considerable eminence of a fold of the inner coat of the Duodenum. This oblique entrance through the coats answers all the purposes of a *Valve*.

Q. What is the *structure of the Biliary Ducts?*

A. They have two coats; the external of which is fibrous and strong; the internal mucous coat is reticulated in such a manner as to catch a probe pushed along the duct as a valve would do; hence these transverse folds have been mistaken for real obstructions. These coats admit of great dilatation, as sometimes happens in *Gall-stones*.

Q. Is the Bile constantly secreted in the same quantity?

A. No; its secretion is constantly going on, but its quantity depends upon the state of the circulation and a ready passage into the Duodenum.

Q. How can the *state of the circulation* of the Blood affect the *secretion of Bile?*

A. When the blood flows with great strength and velocity, a much greater quantity is sent into the Liver in a given time, than a slower and weaker circulation could have sent, hence the quantity of Bile secreted is much larger; this may explain the superabundance of bile in hot climates, particularly in Fevers.

Q. How can a ready or difficult passage of the Bile into the Duodenum affect its secretion?

A. When the coats of the Duodenum are collapsed in consequence of no digestion going on, or when the Ductus Communis Choledochus, or the Hepatic Duct, is obstructed, or at least nearly impervious in its diameter by Calculi; or when constipation retards the natural actions of the Intestines and has induced indigestion, then the Bile accumulates in the ducts, produces a *Bilious plethora* in them, and prevents the secretion of new bile; in such a case the blood passes into the hepatic veins without the natural bile being secreted from it; and that accumulated in the ducts is partly absorbed, and produces *Jaundice.*

Q. How does the Bile get into the Gall-bladder?

A. When the coats of the Duodenum are collapsed, or the extremity of the duct any way obstructed, the Bile cannot flow readily into the duodenum; the cystic duct being free and open, it naturally turns into the Gall-bladder, as a receptacle, and fills it.

Q. By *what means* is the *Bile propelled* from the *Gall-bladder?*

A. By the pressure of the distended stomach against the Gall-bladder, and partly perhaps by a contractile power of the coats of the Gall-bladder itself, while the entrance into the Duodenum is free, in consequence of digestion going on, and the *Chyme* passing into the duodenum.

Q. Is the *quality of the Bile changed* in the Gall-bladder?

A. Its thinner part is absorbed if it is detained long in the Gall-bladder; and the remainder becomes more acrid, thick, and bitter: but when it is detained for a short time, it is very little changed.

Q. Is the *quality of the Bile* ever *vitiated?*

A. Yes; its quality is vitiated by several circumstances, such as by a slight inflammation of the Liver; or even by irritation of it in consequence of a large influx of blood into it in hot climates, or in acute Fevers.

Q. When the quality of the Bile is vitiated, is its *quantity* also *increased?*

A. Yes, in general; it then becomes thinner, and more acrimonious, as its effects upon the stomach clearly show. We have a good example of a changed quality and quantity of the mucous secretion of the nostrils in *Catarrh.* Instead of the bland mucus in spare quantity, the secretion is very copious, thin, watery, and so acrid sometimes, as to excoriate the nostrils and upper lip. Something very analogous happens to the Bile when its quantity is much increased, and its quality vitiated and acrid; it excites great uneasiness and pain in the liver, stomach, and intestines.

Q. What is the *use of the Bile?*

A. The Bile and Pancreatic Juice are poured into the Duodenum, and there mixed with the *Chyme;* it occasions various rapid compositions and decompositions in the Alimentary mass, by which the *Chyle* is generated and separated; it gives a considerable stimulus to the intestines, as its deficiency in *Jaundice,* and its increase in *Fevers* show; it checks too much acidity in the intestines; and it carries off some impurities from the mass of blood.

Q. How can it be proved that the *Bile carries off impurities* from the Blood?

A. This is most evident in the foetus, which receives no food into the stomach, passes neither urine nor faeces, and yet a great accumulation takes place in the intestines: whence can it, the *Miconium,* come, but chiefly from the Liver, and in small quantity perhaps from the intestines? In the adult, the same discharge of impurities by the Bile continues.

Q. What Chemical Constituents does the *Bile* consist of?

A. Dr. John Davy found by analysis, that the Bile of a person executed, consisted of 86.0 Water, 12.5 Resin of Bile, and 1.5 Albumen in the hundred. Thenard however found, that 1100 parts of Human Bile consisted of 1000.0 Water, 2 to 10 Yellow insoluble matter, 41.0 Resin, 42.0 Albumen, 5.6 Soda, 4.5 Sulphate of Soda, Muriate of Soda, Phosphate of Soda, Phosphate of Lime, and Oxide of Iron.

THE ANATOMY, PHYSIOLOGY, AND PATHOLOGY OF THE SPLEEN.

Q. Describe the *Spleen ?*

A. It is a soft, very vascular viscus of a dark purple colour, of an irregular oval figure, smooth and convex externally, and rather concave next the spine.

Q. What is the *situation* of the *spleen ?*

A. It is situated in the left Hypochondric region, between the left or large extremity of the stomach and false ribs, with its lower end behind the colon, and over the left kidney.

Q. What parts is the *spleen attached to ?*

A. To the large extremity of the Stomach by cellular membrane, by the omentum, and by the vasa brevia; to the left extremity of the Pancreas by cellular membrane, and blood vessels; to the Diaphragm, Colon and left kidney, by cellular substance and reflections of the Peritoneum.

Q. What is the *structure* of the Spleen ?

A. It has two coats, a peritoneal, and a proper coat: they are closely connected to each other; it consists of a congeries of blood-vessels, lymphatics, and nerves, involved in, and supported by much cellular substance. The extremities of the arteries are coiled up into *penicilli*, which have been mistaken for a glandular apparatus.

Q. Is the *Spleen not a Gland ?*

A. No ; it has much the appearance of one, but no excretory duct has hitherto been discovered proceeding from it, and in consequence, it is generally considered not glandular.

Q. Are there any real glands in the system from which no excretory ducts have been traced?

A. Yes; the *Thyroid* and *Thymus Glands* are of this description, no excretory ducts have been detected issuing from them; but their glandular structure has never been disputed.

Q. What *Blood-vessels enter the Spleen?*

A. The Splenic Artery, which is very large in proportion to the size of the Spleen; this artery enters it in a very winding serpentine manner, and is divided in its substance into innumerable branches, which ultimately form plexuses and penicilli, with which the extremities of the veins communicate.

Q. What *Arteries are sent off* from the *Splenic?*

A. Two or three small branches to the Pancreas, the *Gastrica Inferior Sinistra,* which runs along the large curvature of the stomach towards the pylorus, communicating freely with the Gastrica Superior, and Gastrica Inferior Dextra; and three or four considerable short branches, named *arteriae breves,* or *vasa brevia,* which are dispersed upon the large extremity of the stomach.

Q. What is the *use of the Spleen?*

A. Various opinions have at different times been entertained of the use of the Spleen. The Ancients thought it the Receptacle of Black Bile; others more lately, that a particular Menstruum is secreted in it, and transmitted to the stomach for the purpose of Digestion; others, that it assists in forming the red globules of the blood; others, that when it is compressed by the full stomach, a greater quantity of blood is sent to the Pancreas to promote its secretion; others lately, that the blood undergoes some change in it useful in the secretion of the Bile; but it seems most probable that the use of the spleen is to allow the free circulation of a quantity of blood through it, which, when the Stomach is empty and its coats collapsed, is not wanted for the secretion of *Gastric Juice*: but when the stomach is distended with food, it presses upon the Spleen, interrupts the free circulation of the blood through it, and turns the current of circulation into the stomach through the Gastrica Inferior Sinistra, and the Vasa Brevia; from which increase of blood in the Stomach *Gastric Juice* is secreted in large quantity at a time, when it is indispensibly necessary for Digestion. Thus the *Spleen is useful* for regulating the quantity of blood sent to the stomach, and also the quantity of Gastric Juice for the purposes of Digestion.

Q. What Organic Derangements is the *Spleen* subject to?

A. The coats of the Spleen have been found inflamed, adhering to the contiguous parts, and in some instances cartilaginous; its substance too has been found in a state of inflammation; it is sometimes extremely soft, and much enlarged; sometimes diminished in size; it sometimes contains much purulent matter, which has been evacuated by tapping, or which has burst into the abdomen and proved fatal; it is frequently indurated and enlarged; it is in some rare cases tuberculated; hydatids, and calculous concretions have been found in it; it has been ruptured when unnaturally large; several small ones have been found near to the natural spleen; it has been found wanting.

THE ANATOMY AND PHYSIOLOGY OF THE PANCREAS.

Q. Describe the Pancreas?

A. It is a flat conglomerate gland about six inches long, not unlike the tongue of a dog; it resembles the Salivary Glands in colour, consistence and structure.

Q. What is the *situation* of the *Pancreas*?

A. It is situated in the Epigastric Region, across the spine, behind the stomach, and before the Aorta, Vena Cava, part of the splenic vessels, and the edge of the transverse part of the Duodenum.

Q. What are its *attachments*?

A. The right extremity of the *Pancreas* is attached to the duodenum; its left extremity is fixed to the spleen by the omentum majus; its body is connected with the Duodenum, Aorta, Vena Cava, and Spine, and it is covered anteriorly by the meso-colon.

Q. Describe the *structure of the Pancreas ?*

A. It is composed of a number of lobules, in which are Acini; from each lobule a small duct arises, which terminates in the common *Pancreatic Duct* running from the left extremity to the right, becoming gradually larger till it attains the size of a crow's quill. From the right extremity of the Pancreas, an elongation or process is sent downward adhering to the Duodenum, this process is called the *head* of the Pancreas, or sometimes the *Pancreas minus ;* the principal duct of this joins the other common pancreatic duct before its termination in the Duodenum, along with the Ductus Communis Choledochus.

Q. What is the use of the *Pancreas?*

A. It secretes a *liquor* or *juice* resembling saliva in appearance, and chemical properties.

Q. What is the use of the *Pancreatic Juice* or *Liquor ?*

A. It dilutes the Chyme, and incorporates it with the Bile so as to produce the chemical changes necessary for the formation of *Chyle.*

THE METHOD OF EXAMINATION APPLICABLE TO DISEASES OF THE ABDOMEN.

Q. What are the phenomena presented by the abdomen in the healthy state, which are necessary to be known ?

A. Its size and form present some varieties, according to the age, sex, and temperament of the individual. In infancy, the size of the abdomen is considerable ; its walls are thick, its form round, particularly in the inferior region, but its size diminishes as the person advances in age. In the adult it presents no prominence, unless such as depends on obesity, or particular conformation depending on temperament. In the male it is much more flat than it is in the female, in whom, after repeated pregnancies, it becomes prominent, particularly in the hypogastric region. In persons who exhibit the physical signs of the sanguineous temperament, the abdomen is in general rather small; but if the lymphatic temperament be combined with the preceding, then it is susceptible of considerable enlargement. On the contrary, in persons of a nervous temperament, the abdomen is small, and as it were constricted; finally, in those who eat much, it becomes considerably enlarged, as in them the abdominal viscera become very much developed. In health, it is not sensible to pressure, it is soft and compressible; its temperature is moderate—percussion causes a dull sound.

Q. What is the mode of examining the abdomen?

A. The patient being placed on his back, the abdomen exposed, and the head inclined forward on the chest, supported by pillows, the thighs and legs should be placed in the flexed position, so as to relax the abdominal muscles as much as possible; the examination is proceeded with as follows:

The temperature may be at once determined by ascertaining its degree in other parts of the body, and then placing the hands on the abdomen.

In order to ascertain the state of its sensibility, the hand should be laid flat on the centre of the abdomen, and then pressed successively on every part of it, observing at the same time the patient's countenance, which will at once indicate pain, if the abdomen be sensible. Care should be taken not to make pressure with the ends of the fingers; for then, by being applied to one point, it becomes considerable, and will excite pain where there may be no disease.

Finally, to determine the presence of fluid in the cavity, if the patient cannot get out of bed, it becomes necessary to render the abdominal muscles tense; but if possible, it is better to place him in the erect posture, then laying one hand steadily on the side, percussion should be made with the fingers of the other.

When flatus is suspected to be confined in the intestines or peritoneal cavity, percussion should be made with one or two fingers; the phenomenon will, however, be made more evident by the aid of the stethoscope applied on the abdomen.

EXAMINATION OF THE DIGESTIVE APPARATUS.

Q. How is the examination of the digestive apparatus to be conducted?

A. The observer should first examine the state of the tongue and mouth, then the manner in which deglutition is performed, and the effect which the passage of the food produces on the œsophagus; he will inquire concerning the state of the appetite, and digestion, and also whether the breath exhales any particular odour; if there be vomiting, it will be advisable to know how soon after taking food it occurs, and what are the appearances which the matter vomited presents. If the bowels be constipated, then the tenesmus, flatus, sense of distension, character of the stools, and the existence of hæmorrhoidal, or other tumours round the anus, form the proper subject of inquiry. Attention should, in the next place, be paid to the degree of sensibility manifested by the different parts of the digestive system, and the various modifications they may present in reference to their form, size, hardness, temperature. Lastly, a rapid view may be taken of the systems that are connected by sympathy with it, as well as of the manner in which the process of nutrition generally is carried on. It is under this head that we generally find included the headache, dull pain of the limbs, and cramps which so often accompany affections of the intestines, and also the marasmus, peculiar expression of the countenance, and altered colour of the skin.

We shall now recur to these different phenomena, and treat of each of them more in detail.

Q. What qualities are perceived in the tongue?

A. Its colour may be white, dirty grey, yellowish white, with red dots, red more or less deep, or it may be brown, dusky, or even black. These different shades, which are sometimes observable at the same time, may occur on the whole surface of the tongue, or only on some part of it; its base and centre are usually white, brown or yellow; its margin and point red. These conditions are attended with more or less dryness, which sometimes goes on to such a degree, as to make the surface chipped and rough like a rasp. Sometimes, however, it is red, dry, smooth, and rounded at its point, at others elongated and pointed; lastly, it may be flat and broad, but then is moist and free from redness. As to the colour of the tongue, we may here remark, that when its point and margin are red, and its base white, we should make some estimate of the effect of the contrast of the two colours, by which the red may be made to appear more deep than it really is.

The tongue is frequently covered with a coating, more or less thick, whose colour is variable, being either whitish, yellow, grey, brown, black, or dusky, adhering intimately to its surface, or capable of being easily detached from it, in which case it leaves it red, and stripped of its epidermis. This coating does not extend to the margin of the tongue.

The tongue may be enlarged and swollen so as to protrude out of the mouth, when it is inflamed, or it may be covered with small white vesicles or aphthæ. These different conditions may lead us to suspect the following derangements:

The red and dry tongue indicates inflammation of the stomach and small intestines.

When it is dusky and tremulous, it marks acute inflammation of the intestine, particularly of its ileo-cœcal portion.

When white, clean, and broad, it usually indicates chronic irritation of the intestinal canal, or derangement of the chylopoietic viscera, also certain nervous affections.

Q. What do the mouth, teeth, &c. indicate?

A. The lips and teeth may be dry, and covered, under the same circumstances as the tongue, with a coating which may be considered as indicating intense inflammation of the gastro-intestinal mucous membrane.

Q. What qualities of the digestive apparatus are indicated by vomiting?

A. This may occur without any effort, immediately after deglutition, as in cancer of the œsophagus: in which case the food is covered with mucus, but has suffered no change except that by mastication. In other cases it occurs some time after the food has passed into the stomach, when it is found changed more or less. It may be habitual or accidental, may occur with or without effort, afford sensible relief, or produce serious accidents, such as cramp, violent pains of the stomach, &c.—finally, it may take place without deranging the health in the slightest degree.

The contents of the matter vomited, must of course be various—consisting of half digested pieces of food, mucus, yellow or green bile, aqueous and colourless fluids, or such others as have been drunk. In some cases it is black or brown, resembling chocolate; in others it consists of coagulated blood, or fœcal matter. Pus, biliary calculi, lumbrici, have been brought up by vomiting; the quantity of the matter ejected must be very variable. In its passage along the throat and œsophagus it gives rise to a dry and parched sensation.

Q. What is denoted by the state of the alvine evacuations?

A. These may be soft, fluid, yellow, brown, or black, intensely fœtid; or they may be colourless, grey, harder than natural, marbled, or elongated and compressed, as occurs in cases of scirrhus of the rectum. In some instances the stools consist chiefly of greenish bile, mucus, and an acrid serous fluid; in others they are tinged with blood, or intimately blended with it; finally, they may be mixed with pus, sanious fluids, layers of membrane, or different sorts of intestinal worms.

Tenesmus, sense of heat, lancinating pains are often excited at the arms and lower part of the rectum by the passage of the fæces, and sometimes even along the anterior part of the thighs, as in dysentery. In some cases, on the contrary, the colic pains which previously existed, cease altogether after the evacuation. When any acute pain is seated in the rectum, it becomes necessary to introduce the finger, and ascertain its cause. It is in this way that we discover the various alterations which so frequently occur, such as contraction of the gut, excrescences, hæmorrhoids, foreign bodies, &c. &c.

Q. What is denoted by the various modes of the sensibility of the abdomen?

A. In order to judge of the sensibility of the abdomen, it is not sufficient merely to question the patient, pressure should be made on different parts of the cavity; for it sometimes happens, that there is no sensation of pain except it be compressed. The mode as well as the degree of the pressure will be different, according as it is sought to determine the sensibility of the walls of the cavity, or that of the contained viscera. Its direction may be perpendicular to the point on which the fingers are applied, or it may be so oblique as to affect only a part beneath it. Thus, though direct pressure affects the stomach, that from above downwards acts against the transverse colon.

The observer should note with care, the sort of pain caused by this pressure as well as the region in which it is felt; thus, if in the epigastrium, it indicates inflammation of the stomach or transverse colon, according to the direction in which it is applied; if in the umbilical region, it marks that of the small intestines and mesenteric glands; towards the loins, between the false ribs, and crest of the ileum, it indicates inflammation of the kidneys, or ascending, or descending colon, according to the side at which it exists; in the hypogastrium it coincides with cystitis or matritis; in the iliac regions it induces a suspicion of inflammation, of the cœcum at one side, or of the descending colon at the other.

Pressure may not excite any pain in some cases, it may even diminish it, as in painters' colic ; so also, when it is directed not against the part affected but on those of its neighborhood. In these cases, there is no heat at the surface, and the general symptoms of acute inflammation of the intestine are wanting ; or if they exist, they are disguised by stupor, or some affection of the nervous system.

In all cases the temperature of the different parts examined should be attended to, and compared with the state of the sensibility. In acute inflammations of the intestinal canal, the surface of the abdomen is usually hot, dry, and even pungent; its degree marks that of inflammation.

Q. What is denoted by size and hardness ?

A. An increase of size may depend on flatus, which may be general or partial, and confined to some particular part, as the epigastrium, or one of the hypochondria. By percussion, a clear sound is emitted, which proves that the effect is owing to the presence of an elastic fluid ; but when the increased size is caused by a tumour, percussion produces a dull sound.

Tumours in the abdomen may be prominent and visible, or they may be so situated as to be discoverable only by careful examination. Their situation should always be stated, and also all the other important circumstances connected with them, for instance, where they are hard, soft, irregular, or nodulated ; pulsate or fluctuate; whether the pulsations are synchronous with those of the pulse, are produced by the impulsion of an adjacent artery or by the expansion of their own walls.

A tumour in the epigastrium may make us suspect an organic disease of the stomach or pancreas ; at the umbilicus, it indicates some affection of the small intestines ; but in these cases we should not forget that indurated fæces may accumulate in the alimentary canal, and stimulate tumours of a very different character. In such cases we may be assisted in our diagnosis by knowing when the patient was at stool, and also by making pressure on the abdomen, which will sometimes displace the hardened fæcal matter.

When any increased development occurs in the hypochondria, we suspect some organic affection of the liver or spleen, but we ought to ascertain whether the alteration of size depends on a dilatation of the abdomen, or exists in the thorax. In the former case, the anterior extremity of the ribs, and lower border of the thorax are projected forwards; in the second, the convexity of the ribs is merely increased.

The abdomen may in some cases be more or less contracted, so that its anterior paries is compressed upon the vertebral column. This is most perceptible in the epigastric and umbilical region, and occurs generally in nervous or painters' colic.

In some cases, though rarely, evacuation by stool is altogether suppressed, the abdomen becomes swollen and irregularly distended, and then vomiting supervenes. As these phenomena may arise from strangulation, internal as well as external, examination should always be made to ascertain whether there is a hernia, which may be the cause of the derangement. If this does not exist, we should then endeavour by pressure directed to the different parts of the abdomen, to discover whether the suppression be not caused by an accumulation of fæces; if not, it may be caused by an internal strangulation.

The throat and fauces should always be examined, particularly if any pain be referred to these parts, as they are not unfrequently covered by false membranes, or attacked by ulceration and gangrene. The condition of the functions with which the digestive system sympathises should also be attended to, as the pulse, skin, expression of the face, the existence of headache, dull pains or cramps; lastly, in cases of intense inflammation of the gastro-intestinal mucous membrane, the state of the mind should be noted.

PHYSIOLOGY OF THE STOMACH.

Q. What is the object of the preparation of food by the art of cookery?

A. To render it easy of digestion, and agreeable.

Q. Is this the end generally attained in this art?

A. No; it is too often prostituted to excite appetites worn out by too much indulgence, or to gratify vanity. It is therefore necessary for a physician to know exactly what is proper for the stomach, and the errors generally made in this art, in order to warn his patients against them.

Q. What are the comparative nutritive qualities of different kinds of food?

A. According to the report of Percy and Vauquelen, it is as follows:—In bread, every hundred pounds weight are found to contain eighty pounds of nutritious matter. Butcher's meat, averaging the various sorts, contains only thirty-five pounds in one hundred. Broad beans, eighty-nine. Pease, ninety-three. Lentils (a kind of half-pea, but little known in England,) ninety-four pounds in one hundred. Greens and turnips, which are the most aqueous of all the vegetables used for domestic purposes, furnish only eight pounds of solid nutritious substance in one hundred. Carrots, fourteen pounds. And, what is remarkable, as being in opposition to the hitherto acknowledged theory, one hundred pounds of potatoes only yield twenty-five pounds of substance, valuable as nutrition.

One pound of good bread is equal to two pounds and a half, or three pounds of the best potatoes; and seventy-five pounds of bread, and thirty pounds of meat, are equal to three hundred pounds of potatoes. Or, to go more into detail, three-quarters of a pound of bread, and five ounces of meat, are equal to three pounds of potatoes; one pound of potatoes is equal to four pounds of cabbage, and three of turnips; but one pound of rice, broad beans, or French beans, is equal to three pounds of potatoes.—*Edinburgh New Philosophical Journal.*

Q. What difference is there in the organs of digestion in animals, which live on different kinds of food?

A. In herbivorous it is more complicated, in carnivorous more simple. In man, who lives on both vegetable and animal matter, it is a medium between the two.

Q. Whence are the nerves of the stomach derived?

A. From two branches of the 8th pair, and the sub-diaphragmatic ganglion of the great sympathetic.

Q. What are the structures, which discharge fluids into the intestines?

A. 1st, the mucous membrane, which secretes fluids from its surface; 2d, mucous follicles, for the discharge of mucus; 3d, mucous follicles about the isthmus of the fauces; 4th, mucous glands, in the œsophagus, in the arch of the palate, and on the sides of the jaw; 5th, the parotid glands, the submaxillary, the liver and pancreas.

Q. Of what is the fluid of the stomach composed?

A. It consists of a frothy fluid slightly viscous, and acid; with a small quantity of mucus floating through it, composed of the saliva, the mucus of the passages, and the proper secretion of the stomach or the gastric juice: By the analysis of Thenard, it is composed of a great quantity of water, a little mucus, and some salts, with a base of soda and lime, without any sensible acidity; lactic acid, with hydrochlorates of ammonia, soda, and potash have also been found in it.

Q. What are the fluids of the intestines?

A. The intestines are covered with mucus, as the stomach is, and receive the juice of the pancreas, the bile, with the chyme from the stomach; it is from the fluids first mentioned that purges produce a great discharge, though the person has eaten nothing for some time before.

Q. What kinds of air do these organs contain?

A. Atmospheric air, and sometimes carbonic acid are found in the stomach; azote and carburetted or sulphuretted hydrogen are found in the small intestines.

Q. Whence does the œsophagus derive its nerves?

A. From the eighth pair.

Q. Does the œsophagus obey the will in its motions?

A. Its upper two thirds are entirely obedient to the will; but the lower third has a motion peculiar to itself. This motion is involuntary, and commences at the junction of the lower third with the upper two thirds, continues for about 30 seconds, rendering the œsophagus in that part hard like a cord: when it commences, it continues for a variable space of time; its object is no doubt to pass the food into the stomach, as this part of the canal, unlike any other part of it, is not capable of distention.

Q. What is the nature of hunger?

A. It is a sensation intended to warn us of the necessity of taking food, and its phenomena are either local or general: the local are the following; after 24, 48, or 60 hours of complete abstinence, the dimensions of the stomach still continue considerable; about the 4th or 5th day it becomes somewhat smaller, the pressure of the abdominal parietes is less, and on this account it is that the gall-bladder becomes filled with bile, which never is found in the stomach except some disease is present. The quantity of blood which circulates in the stomach is less when the stomach is empty than when it is full.

Q. What are the general phenomena of hunger?

A. General debility of all the organs, diminution of the heat of the body, of the secretions and circulation, and the respiration becomes slower.

Q. What circumstances increase the feeling of hunger?

A. Exercise, cold baths, frictions on the skin, a cold and dry air, winter, spring, and all circumstances which increase the motion of the blood without adding to the nourishment of the system.

Q. What circumstances diminish it ?

A. Depressing passions, as grief, hot climates, and wet situations, opium, and hot drinks.

Q. What is the cause of thirst ?

A. The want of water in the system ; this is the whole history of our knowledge on this subject. To say that it is owing to the foresight of the mind, or to the state of the nerves, as has been done, is of no account ; such statements are not matter for the philosophy, but for the history of physiology.

Q. What are the causes which increase thirst ?

A. The dryness and heat of the atmosphere, the loss of a great quantity of fluid by the body; salted meats; a substance stopped in the throat; the habit of drinking frequently, to prove the quality of certain liquids, as spirits of wine, wine, &c. It differs however in different constitutions; some never feel thirst, others drink a great deal.

Q. What are the processes performed by the mouth on the aliment previous to swallowing it ?

A. Its temperature approaches to that of the mouth, its parts are intimately divided, by the teeth and tongue, and they are mixed with the saliva.

Q. How is the mass pushed forward into the œsophagus ?

A. The tongue gradually presses the mass back into the œsophagus by raising itself from the tip gradually to the base, till it is thrown into the passage, the sides of which contract behind and gradually push it on till it arrives at the stomach : the upper two thirds contracting by something like a voluntary power; the lower third being involuntary, continues in a contracted state for some instants after the mass has gained admittance into the stomach.

Q. What effect has the admission of aliment into the stomach on the adjoining viscera ?

A. Distension is its most general effect, which produces difficulty of breathing, of speaking, singing, and often a desire to go to stool.

Q. What prevents the escape of the food from the stomach, when it is very much distended?

A. The contraction of the œsophagus, at the cardia, which experiment proves to be very considerable; the alternate contraction of its lower third becomes the more considerable and its relaxation short, in proportion as the stomach is more distended; the contraction of the œsophagus corresponds with the movement of inspiration, when the stomach is most pressed upon, and the relaxation with expiration. The pylorus is straitened by a ring of circular fibres which forms it, and above it there is often another contraction of the fibres, which prevents the descent of the food to the pylorus; and also by a reversed peristaltic motion, which is propagated from the duodenum upwards and throws the aliment in the stomach towards its splenic portion. Besides, as the pressure occasioned by the distension of the stomach is general, the food has no tendency to pass into the smaller intestines.

Q. When this distension is complete, is the feeling of hunger always removed?

A. The removal of this sensation does not depend alone upon distension, for substances which have not nutritive qualities will not produce this effect; the stomach, therefore, has a peculiar sensibility to the qualities of the substances, which it takes in; thus certain poisons produce great pains, and a small portion of matter exceedingly nutritive is sufficient to satisfy hunger. Its internal surface is much injected with blood after taking in food, which shows that its surface is greatly excited, and no doubt for the purpose of secreting the gastric juice.

Q. What is meant by the chyme?

A. It is the fluid which is the result of the first process of digestion in the stomach; it differs according to the aliment of which it is formed, being more easily produced from animal than vegetable substances; for parts of the latter often pass into the intestines without change, except a slight loss of colour: it appears more frequently near the pyloru than in any other part, though it is sometimes found on the surface of the food ; its taste and smell are always slightly acid ; and it reddens the tincture of turnsole: during its formation very little air is formed; Magendie discovered, in one instance, a portion of air which contained oxygen, azote, and carbonic acid : in general, in animals, there was no air discovered in the stomach during digestion, an important fact, which shows that miasmata, as has been believed, are not taken down with the air in this mode.

Q. What quantity of chyme is seen in the stomach at one time ?

A. Magendie says it occurs in quantities from one to two ounces.

Q. How is the chyme discharged into the duodenum ?

A. By a motion of the stomach from left to right, the pylorus opening as it approaches. When the stomach is full, the motion is confined to that portion of it which is near the pylorus; when nearly empty, it is more extensive, and can even be felt by some persons.

Q. What are the substances which are most easily converted into chyme ?

A. The farinacea, and the fleshy parts of certain animals, as mutton, beef, and fowls, are more digestible than tendon, cartilage, the whites of eggs, mucilaginous and sweet vegetable substances. The bones, the cuticle, hair, and feathers, are entirely indigestible. In all cases the size of the portion swallowed affects the digestion of every substance, it being more difficult as the substance is larger. The quantity, the chemical nature as regards their solubility, their more or less complete mastication, and the powers of digestion of the individual, all influence digestion.

Q. How is the chyme formed ?

A. It is most probably the result of the action of a fluid secreted by the stomach acting on the food kept at the temperature of 98°, and mixed intimately with the saliva, and continually moved by the diaphragm, and carried away by the peristaltic motion, which exposes a new surface to its action; the particles thus collected at the bottom of the stomach form the chyme.

Q. Have the nerves any effect upon digestion?

A. It is certain that the section of the eighth pair in the neck prevents digestion, but as it also influences respiration and renders it imperfect, it is impossible to say whether it acts on the stomach by disturbing the functions of the lungs, and thus producing an imperfect digestion, or directly on the stomach, or both: it has been supposed that electricity passing through these nerves from the brain is the cause of digestion, but of this there is no direct proof.

Q. What general effects has digestion on the system?

A. In persons of ordinary health, excepting distension, and a slight influence upon respiration, no effect is perceived. In delicate people, sleepiness, discharge of flatulency, sense of weight, burning at the stomach, are sometimes felt, but their digestion is equally complete after it is over as others who have not these symptoms.

PHYSIOLOGY OF THE SMALL INTESTINES.

Q. What is the office of the small intestines?

A. They appear to secrete a viscous, ropy, saltish fluid, which reddens the tincture of turnsole, and which has been denominated the intestinal juice, and has been supposed to possess properties similar to the fluid of the stomach.

Q. How does the chyme find its way into the small intestines?

A. The duodenum takes on a vermicular movement towards the pylorus, which contracts; the stomach above the pylorus takes on the same movement, directed from the pylorus towards the side of the spleen, in which direction the chyme is thrown; immediately after a contrary motion takes place, by which the chyme is thrown from the splenic side towards the pylorus, which opens, and it passes into the duodenum. These motions cease and are repeated after short intervals, and are increased towards the conclusion of the process of digestion in the stomach.

Q. How is the chyme passed from the small intestines to the large?

A. By a vermicular contraction taken on at intervals similar to the above, as appears from observations made upon living animals; the peristaltic motion, which takes place in recently dead animals, is constant and does not at all resemble the above.

Q. What changes does the chyme undergo in the small intestines?

A. None, till it meets the bile and pancreatic juice; from being a greyish thick fluid of a sourish smell, a taste slightly acid, it becomes, on mixing with the bile and pancreatic juice, yellow, bitter, with a smell less sour; and when it is formed of substances of an oily nature, filaments are seen forming of a flat and sometimes a round figure, which attach themselves to the valves, and appear to be the chyle in its rude or forming state; what the process of precipitation is which produces it, is unknown; these are the facts: the same changes go on throughout the upper two thirds of the small intestines; in the lower third, the chyle becomes yellowish, dark and fæcal, giving to the ilium a colour quite distinct from the duodenum and jejunum. In the cœcum it becomes quite stercoraceous. In the whole tract the process varies somewhat with the quality of the aliment.

Q. Do the intestines contain any air?

A. The small intestines rarely contain any air during the formation of chyme; according to the experiments of Magendie, carbonic acid, azote and hydrogen in somewhat variable proportions have been found in the intestines of persons recently executed: whence they come is not certainly known. Magendie has seen gas escape from the chyle as it was forming in one instance, in a man four hours executed, from the opening of the bile duct, to the ilium.

Q. How long is the chyle in forming?

A. It is supposed it requires three or four hours after eating.

CHANGES PRODUCED IN THE LARGE INTESTINES.

Q. What kind of air is found in the large intestines?

A. The same species as mentioned above, only in somewhat different proportions. Carbonated and sulphuretted hydrogen are also found. The fixed air increases in the lower intestines.

Q. How are the contents of the lower intestines discharged?

A. By the power of the abdominal muscles and diaphragm, and the contraction of the muscles of the rectum, which alone is sufficient if the contents are fluid.

Q. How often should the contents of the rectum be discharged in a healthy state of the body?

A. Once in 24 hours; its contents have been retained for 8 or 10 days without deranging the health in the least. In women, clysters are absolutely necessary: exercise, fluid aliments, and the habit of going to stool at a certain hour, will at length make the bowels regular every day.

CHANGE PRODUCED ON DRINKS BY DIGESTION IN THE STOMACH.

Q. How are liquids divided in respect to their digestibility?

A. Into such as are convertible into chyme in whole or in part, and into those which do not form chyme at all.

Q. What are those substances, which are convertible into chyme in whole or in part?

A. Oil is almost wholly converted into chyme, and remains a long time in the stomach; gelatine, albumen, osmazome, sugar, gum, fecula, colouring or astringent matters; these are digested as other solid substances are, and the fluids, as water or spirits of wine, with which they are mixed, are either absorbed or they pass into the small intestines.

Q. What are the changes which simple water or diluted alcohol undergoes when introduced into the stomach?

A. It is mixed with the mucus and absorbed from the stomach or passes into the small intestine, and if the water be without any air, as in distilled water, it remains in the stomach a long time, and no changes are produced in it; well water, in which there is a great deal of salt, has the same effect, and is followed by a sense of weight.

Alcohol acts rather differently: it coagulates the albumen of the mucus, which is increased in quantity; it disappears very soon, producing drunkenness or death according to the quantity. Milk coagulates immediately, and is digested. In general the watery part of wine, of soup, &c. is absorbed, and the solids remain to be digested, as usual.

Q. How do liquids influence digestion?

A. By dividing and softening them, they favour their digestion; alcohol stimulates the secretion of the gastric juice and thus increases the power of the stomach, but as it becomes accustomed to the stimulus, and requires an increase, it is a bad practice.

Q. How are the matters contained in the stomach rejected?

A. By eructation, which consists in the simple discharge of air, contained in the stomach; by regurgitation, which is the involuntary passage of matters contained in the stomach into the mouth, and may happen when the stomach is too full as after a meal, or when it is nearly empty, as happens often in the morning: it is then effected principally by the pressure of the sides of the belly. It is sometimes a voluntary, but most generally an involuntary, power. In the former case it is considered and stated as the power of vomiting at will. This power resembles rumination, which some few possess.

Q. In what does the process of vomiting consist?

A. It consists in sudden repeated and violent contractions of the abdominal muscles and diaphragm pressing on that viscus and expelling its contents, the stomach being entirely passive; it is proved that the diaphragm and the abdominal muscles can each produce it separately, though in ordinary cases they both contribute to it.

Q. What effects have the organs of digestion on the senses?

A. A moderate appetite sharpens, hunger destroys or weakens, a full stomach blunts their power.

Q. What effects have the organs of digestion on the muscular system?

A. They increase the activity and produce the exercise of it in order to procure food, and during digestion it becomes languid: in cold countries however, the presence of food in the stomach, renders the muscular system more active.

Q. What effect have the organs of digestion on the mind?

A. During hunger, the pleasure of eating is continually present to the mind; the state of the mind on the contrary affects the digestion, thus fear often takes it away for two or three days; joy and laughter always increase it.

OF THE CHYLE.

Q. What are the properties of the chyle?

A. It is a white milky fluid, rather heavier than water, saltish, with a slightly alkaline taste, separating in a short time into three parts; 1. a coagulum, which sinks to the bottom; 2, a watery substance; and thirdly, a part which swims on the surface of the liquid. When there is no fat in the food, it is transparent. The coagulum is formed of fibrine and a red colouring matter. The chyle is in fact the blood nearly formed.

PATHOLOGY OF THE ABDOMEN.

AFFECTIONS OF THE DIGESTIVE ORGANS AND THEIR CONNEXIONS.

INFLAMMATION OF THE GUMS.

Q. What are the symptoms of inflammation of the gums?

A. The gums swollen and red; when pressed, allow blood to ooze out from their surface. They become painful, and if the inflammation passes to the chronic state, excrescences shoot out from the surface, supported by a pale red pedicle, and often extend to such a length as to cover the teeth. In some cases, they become so firm in their texture as to resemble fibro-cartilage, in which case they cease to be painful. Inflamed gums are often attacked by ulcerations, or abscess; they occasionally continue for a considerable time soft and spongy.

Q. What are its anatomical characters?

A. They are merely what we have just enumerated.

APHTHÆ.

Q. What are the symptoms of Aphthæ?

A. These consist of an eruption of small white, superficial vesicles, single or confluent, filled with a glutinous or puriform fluid. They usually are succeeded by a crust, or by ulcerations, the surface of which may be grey or reddish. The vesicles are seated in the mucous membrane of the cheek, extending backwards to the fauces; they produce a sensation of heat, with some difficulty of mastication and of deglutition. This affection is sometimes endemic, and occasionally contagious; it usually affects children in early infancy. It is not dangerous, except it passes to the state of gangrene, or extends to the digestive tube, or larynx and trachea; in which cases it constitutes œsophagitis, or gastro-enteritis?

GLOSSITIS.

Q. What are the symptoms of Glossitis?

A. The tongue is attacked by an acute or pulsating pain; it becomes red, hard, and very sensible, then swollen, and covered with a thick mucous coating. The tumefaction is sometimes so great that it shuts down the epiglottis, compresses the larynx, and tends to produce suffocation; it is pendent outside the mouth, becomes immoveable, and incapable of serving the purposes of articulation. The mouth is open, and from it flows a viscid, and sometimes fetid saliva; deglutition is impossible, respiration much impeded, and the face red and swollen; there is usually some cough, and more or less fever.

AMYGDALITIS, OR ANGINA TONSILLARIS.

Q. What are the symptoms of Amygdalitis, or angina tonsillaris?

A. Heat and pain, increased by deglutition, in the posterior part of the mouth, with swelling and redness of one or both tonsils, which are studded with whitish specks; the inflammation sometimes extends to the Eustachian tubes; the mucus of the fauces which is at first diminished, afterwards increases in quantity, is expelled with pain and difficulty; redness, swelling and extension of the uvula, which causes a frequent desire of swallowing. If the inflammation be intense, and attacks both tonsils at the same time, the respiration becomes impeded, sometimes to such a degree as to threaten suffocation. Amygdalitis is frequently combined with inflammation of the larynx. The tongue is generally covered with a thick coat of a yellowish white colour; it is seldom red, even at the edges. It may be confounded with pharyngitis, or with angina laryngea.

Q. What are its anatomical characters?

A. Redness and tumefaction of the tonsils, more or less considerable; suppuration or induration of these glands.

PHARYNGITIS.

Q. What are its symptoms?

A. Swelling and redness in the back part of the pharynx, which is generally spotted with whitish patches; deglutition difficult, often impracticable; no impediment to respiration; heat and dryness of the pharynx, followed by a copious secretion of mucus, which is expelled with pain; the tongue is generally foul and coated, but without redness. Pharyngitis is often accompanied by amygdalitis.

Q. What are its anatomical characters?

A. To the morbid alterations which have been pointed out in treating of glossitis and amygdalitis, we may add, that the inflamed tissue may be increased in thickness, penetrated by pus, or covered with a false membrane.

CANCER OF THE PHARYNX.

Q. What are its symptoms?

A. The first symptoms of this affection are very obscure, and usually consist of uneasy sensations in the throat, and slight impediment to deglutition, consecutive, in general, to inflammation of the pharynx; afterwards prickly pains, supervening at intervals, are often perceived in the inferior part of the pharynx; deglutition becomes painful; fluids are rejected as soon as swallowed. If the pharynx be examined, it is found tumefied, hard and insensible to pressure; at a more advanced period ulceration takes place, and the ulcer presents an uneven surface with everted edges, and secretes a foul, putrid sanies; at this period acute lancinating pains are experienced.

Q. What are its anatomical characters?

A. The parietes of the pharynx are thickened, hard, and transformed into a scirrhous substance; encephaloid matter is sometimes, though very seldom, to be found there. The mucous and muscular coats are almost always distinct, though degenerated, at least whenever the scirrhus does not become softened; one or more ulcers, with thick, hard, and everted edges, present themselves; their surface is unequal, granular, or fungous. The disease extends more or less to the adjacent parts.

ŒSOPHAGITIS.

Q. What are its symptoms?

A. Pain in a part of the œsophagus, increased by pressure applied to the neck, when the inflammation is seated in its superior portion, between the trachea and spine; difficulty of swallowing; solids and fluids produce a burning sensation along the whole or some part of the œsophagus; they are sometimes rejected by the nostrils; continued hiccup. When this affection assumes a chronic form it is usually accompanied by vomiting, which supervenes immediately after taking food. It may be confounded with cancer of the œsophagus.

Q. What are its anatomical characters?

A. Redness and thickening of the mucous membrane, more or less conspicuous; it is sometimes lined with a false membrane, very thin and intimately adherent.

CANCER OF THE ŒSOPHAGUS.

Q. What are its symptoms?

A. This disease frequently commences with hiccup, and shooting pains in the course of the œsophagus, with interruption to the free passage of food immediately after deglutition. When it affects the superior portion of the œsophagus, its symptoms are the same as those of cancer of the pharynx. If it be situated lower down, gnawing pains, and a burning sensation is experienced behind the trachea, particularly if the patient make use of drinks containing spirit, which always exasperate the disease. If the disease be seated near the cardia the food remains for a short time in the œsophagus, and is then rejected without effort, mixed with mucus. If it communicates with the air tubes, deglutition is always followed by a violent fit of coughing.

Q. What are its anatomical characters?

A. Similar to those of cancer of the pharynx. The cavity of the œsophagus is narrowed by the thickening of its walls; sometimes the degenerated part retains the cylindrical form of the œsophagus; sometimes it is transformed into an irregular mass adhering to the trachea, to the lungs, or even to the dorsal vertebræ.

ANGINA GANGRENOSA.

Q. What are its symptoms?

A. There are no signs at the commencement of this disease by which we would be led to suspect its real nature, as all its primary symptoms are perfectly similar to those of common amygdalitis; but in a short time it assumes its peculiar characters, and all doubts as to its nature are removed by the appearance of gangrene, which sometimes occurs so early as the first day. From the severity of this affection, we should always be on the watch, in inflammation of the throat, and dread its approach; 1st, in delicate women and weak children; 2d, in persons who are already affected with gangrene of other parts; 3d, in cases of sore throat, occurring in scarlatina, or other eruptions of a livid colour; 4th, when the disease is epidemic; 5th, when the individual affected has attended others in the complaint, for under some circumstances it appears contagious; 6th, when the inflamed parts are livid, or of a deep red: or when, after having been of a lively red, they become pale, at the same time that the patient complains of dryness of the fauces, and considerable general depression; or when the parts are covered with those false membranes, which so frequently occur in all inflammations of the throat; 7th, in fine, when general or local bleeding induces a state of weakness, neither proportionable to the strength of the patient or quantity of blood drawn.

Angina gangrenosa may be known by the small white or ash-coloured specks which appear on the tonsils and other parts of the mucous membrane, spreading with rapidity, and running into one another so as to form large patches; the surrounding membrane is of a pale or livid colour; these patches become grey, or even black, towards the conclusion; as soon as they are completely developed, the throat ceases to give pain, deglutition becomes easy, the breath loses its fœtor; but symptoms of general prostration supervene.

When the breathing through the nostrils becomes difficult, and the voice nasal, the gangrene has extended to the nasal parts; when this occurs, an irritating discharge flows from the nares, the circumference of which becomes inflamed.

When gangrene is about to extend into the air-tubes, it is preceded by pain in these parts, together with difficulty of respiration, cough, and aphonia.

When it extends to the œsophagus, deglutition becomes impossible. When the isthmus faucium is affected, the affection is at once recognized by the appearance which the part presents, by the sense of suffocation, and impossibility of deglutition. It partakes of the characters of angina.

Q. What are its anatomical characters?

A. The amygdalæ, velum, palate, pharynx, mucous membrane, the cheeks and nares, œsophagus, larynx and trachea, are either together or separately covered with eschars, which may be white, grey, or black, adherent or detached; these can scarcely be said to be putrescent, or in a state of complete decomposition. We also, in general, observe ulcerations, perforations, and loss of substance to a greater or less extent.

ANGINA "COUENNEUSE."

Q. What are its symptoms?

A. These are the same as in the preceding disease, but seldom so severe. The white ash-coloured patches never become black; there are merely some false membranes, which fall off without destroying the substance beneath them, and are thrown up by vomiting or coughing; sometimes they gradually decay, and are in a manner absorbed.

ANGINA PULTACEA.

Q. What are its symptoms?

A. Slight sore throat, with patches of a pultaceous cheesy matter, of a white, grey, or yellowish colour, spread at intervals over the affected part; easily removed by the fingers, but appearing again in a short time, and ending by being coughed up.

GASTRO-ENTERITIS ACUTUS.

Q. What are its symptoms?

A. This affection is usually marked by the following symptoms:—viz. uneasy sensations of compression and weight are experienced in the epigastric region, accompanied by wandering pains in the abdomen; general lassitude and dull pains in the extremities; restlessness, heat, and dryness of the throat, with thirst, accompanied by a particular desire for cold drinks; the eyes are dull and heavy; the complexion pale and sallow; the appetite usually diminished, sometimes increased; the digestion accompanied with colicky pains, flatulence, hiccough and nausea. It often begins by a dislike for food, and distension of the stomach; the mouth becomes clammy; the tongue is red at its point and margins.

Again, it makes its attack more suddenly and without any precursory symptoms; first appearing by vomiting and frequent alvine evacuations, with tormina and tenesmus. These symptoms may exist conjointly or separately, according as the inflammation may be seated in the stomach or small or great intestines. The epigastrium becomes tender and particularly sensible to pressure; however, this symptom is often altogether absent. The head-ache is generally constant, and the brain or its membranes may become secondarily affected. In the course of the disease, the sensibility and activity of the senses and mental faculties are blunted, which does not necessarily imply any structural alteration of the nervous centre; and even the locomotive powers are more manifestly deranged than in many essential disorders of the brain.

The pungent heat and dryness of the integuments is remarkable; the pulse frequent, the tongue red, which depends upon the degree of the inflammation. Stupor and muscular prostration are more frequent in this affection than paralysis or spasms: if these last appear and affect one side only, they show that the brain is implicated. The pulse, during the progress of the disorder, is usually frequent; in the onset it is full, but soon becomes small, concentrated, irregular, and intermittent; when the inflammation is intense, however, this frequency is sometimes less remarkable, particularly if the patient be of the lymphatic temperament.

The urine is small in quantity, and red; the external margins of all the mucous membranes are red; the conjunctiva injected; the pituitary membrane dry; the mouth which is at first clammy, becomes hot and parched when the inflammation is at its height; the tongue, white or yellow in the commencement, becomes red at its tip and edges, and even over all its surface in the course of the disease. Now and then its anterior portion is found covered with a multitude of small projecting red or violet-coloured spots, separated by the mucous membrane, which is pale or covered with mucus; this appearance rather indicates a slight or chronic gastro-enteritis. More frequently, however, the tongue is covered by a thick adherent coat, which becomes dry and rough as the inflammation becomes more intense. At this period the tongue, gums, lips, and teeth are encrusted with a brownish-black matter.

The thirst is considerable, and increases as the disease extends from the stomach to the small intestines; the skin is dry and arid, with a pungent heat, which is extended over all the body, or only occupies the chest and abdomen.

Finally, towards the conclusion the countenance is indicative of suffering, the eyes are red, hollow, and dull; the nostrils expanded, and the cheek-bones projecting, of a deep red colour.

Q. What are its anatomical characters?

A. The external membrane of the stomach is usually natural; sometimes this viscus is distended with air; but occasionally it is contracted. The mucous membrane of the stomach is sometimes studded with red dots, or covered by patches arising from the effusion of blood into the substance of the membrane itself; at other times a uniform redness is diffused over its whole extent, being particularly conspicuous, and a deeper shade around the cardia and pylorus.

Occasionally the redness follows the course of the blood-vessels, which are injected and arborescent; this colour is of a vivid red or of a darker shade, almost brown; both shades are alternately mixed or intimately blended one with the other. In some cases an effusion of gas takes place beneath the mucous membrane.

Gangrene is rarely met with; ulceration is also unusual, and seldom penetrates as far as the muscular coat. When the mucous follicles are affected, they resemble small reddish pimples.

When contraction of the stomach accompanies inflammation the creases of the mucous coat are conspicuous, and of a deeper tint than the surrounding parts.

The exterior of the small intestines usually appears healthy, but when the inflammation is intense the redness of the subjacent mucous coat is visible through its thin parietes; they may be ultimately contracted or distended.

The redness of the internal coat is interrupted suddenly in various parts, and is less deeply marked in the duodenum than at the further extremity of the intestine.

If the inflammation be slight, the valvulæ conniventes are alone affected, the intervals which separate them appearing perfectly natural. In a more advanced degree, the vessels are strongly injected, and we perceive patches of paler or deeper red ; the membrane is covered with an adhesive mucus. The muscular and serous coats seldom participate in the disease.

Gangrene of the intestine is of very rare occurrence ; when it takes place the intestine becomes black, dull and friable, and emits a gaseous odour. Ulceration, on the contrary, is very common, and is found in the ileum, particularly in the neighbourhood of the ileo-cœcal valve ; it is in general confined to the mucous coat, but it sometimes extends to the other tissues, and not unfrequently produces perforations through the intestine.

The edges of the ulcers are sometimes quite perpendicular, and other times rugose, thick and irregular ; their circumference is red or pale ; their floor is often formed by the muscular coat.

During the process of cicatrization their edges sink down, approach each other, and unite by a little eminence, which in the course of time gives place to a small depression.

If the ulcer be large, the cicatrix is formed by a whitish or rosy pellicle, and if it be still more considerable the mucous membrane is puckered and drawn in, so that the intestine may be contracted in this part.

Thickened patches or excrescences are frequently met with in the small intestines, formed of a white, greyish, or red substance, possessing considerable tenacity, and chiefly occupying that portion of the gut which is placed next the ileo-cœcal valve, the rest of the intestine generally remaining sound. These occur most frequently in young subjects.

The mucous follicles resemble so many pimples, hard and depressed in the centre, which afterwards soften and suppurate, or appear in the form of brownish patches, circumscribed and without swelling. The invaginations which are occasionally met with in enteritis are formed by the introduction of the superior portion of the gut into the inferior, or the reverse takes place, which is infinitely more unusual.

GASTRO-ENTERITIS CHRONICUS.

Q. What are its symptoms?

A. This occurs as a consequence of the former disease, or supervenes in a very slow and gradual manner, with symptoms more mild, but in other respects resembling those of the acute form. There is epigastric uneasiness, often with a sensation as if a transverse and painful band is perceived extending from one side to the other, and particularly evident at the right; it may be continuous, interrupted, or remittent, and is increased after meals, more or less, according to the quantity and quality of the food, and is exasperated by the depressing passions.

The pain is gnawing, pungent and burning, accompanied by a sense of constriction in the œsophagus, or with difficulty of deglutition and respiration, with a sensation of compression along the base of the thorax, or in some part of it only; it is sometimes attended with a dry cough; occasionally the pain exists solely in the epigastric region, which is then incapable of supporting the slightest pressure. Usually the patient experiences a dislike for food; but now and then he has an extraordinary appetite, which, however, soon gives place to a distaste for every sort of food.

The digestion is imperfect, and accompanied by bitter acrid eructations; thirst, and a sense of epigastric fulness are not unusual. The ideas become confused, and the head heavy; dullness, somnolency, and a dislike to movements of any description take place.

The skin is hot, particularly on the palms of the hands; the pulse is tense, and generally frequent; vomiting takes place when the stomach is overloaded or much irritated; there is habitual and obstinate constipation, giving place occasionally to diarrhœa of short duration.

In general the tongue is small and red at its tip and edges, or even over all its surface, but in other cases it is merely dotted with red specks or covered with a dry mucous coat. The breath is fetid; the heat and thirst are augmented after meals; the pulse becomes frequent towards evening; a bitter taste is complained of in the morning; the complexion is sallow.

The patients become sad, uneasy, low spirited, distrustful and peevish, and suffer hallucinations, errors of judgment, and other mental disorders, particularly if they be of the nervous temperament; the countenance is furrowed, its expression altered, and its colour changed to a pale sallow, whilst the cheeks remain red or become livid; the muscular powers are weakened, and there is the greatest objection to taking exercise. The skin adheres to the bones and muscles, and insinuates itself into their interstices, and exchanges its natural colour for that of an obscure red, or ochery yellow.

Such are the symptoms of this disease; but they are never all united in the same case; indeed, we often meet with only one or more of them, variously combined, so as to form almost innumerable varieties of this perplexing affection.

It may be confounded with peritonitis, scirrhus of the stomach, hypochondriasis.

Q. What are its anatomical characters?

A. The left end of the stomach is frequently found thinned, and admits of being torn with the greatest facility. The mucous coat, softened, varies in colour from a white or grey to the deepest shade of red;

scraped with a knife it is easily detached, in the form of a pulpy matter; occasionally it presents slight erosions.

If the vessels be injected, the blood appears of a bluish tint, and patches, varying from violet to the darkest brown, are seen on the internal surface; the lining membrane is usually thinned, particularly towards the fundus, so much so, as sometimes to occasion perforations with irregular edges.

As we proceed from this part, the mucous membrane becomes thick and red, which arises in some cases, from a varicose state of its vessels. Ulcerations are very common, especially near the pylorus, where they penetrate through the coats of the viscus; occasionally it becomes of a slate colour or entirely black, without in any degree changing the consistence of the membrane.

The small intestines are generally pale externally, and sometimes contracted or almost entirely obliterated. Ulcers are very common in the jejunum and ileon: they are more extensive and deeper than in the acute form of the disease; finally, the mucous coat changes to a bluish slate colour, nearly analogous to that of the stomach itself.

CANCER OF THE STOMACH.

Q. What are its symptoms?

A. This disease is generally a consequence of chronic inflammation of the stomach, and seldom occurs except in those who have passed thirty, and have been addicted to an immoderate use of spirits or some medicinal excitants.

It may be recognised by a sense of uneasiness and obtuse pain, situated in the region of the epigastrium, and sometimes extending to the œsophagus, hypochondria, or even the lumbar regions; giving rise to habitual flatulency with irritating, acid eructations, nausea and vomiting of a liquid, at first aqueous, then mixed with the undigested food, and afterwards combined with a brownish matter, becoming more and more frequent, and finally habitual.

All aliments are not equally offensive, and not unfrequently the most indigestible are those which agree best with the stomach. The epigastrium at this period becomes the seat of a tumour, which is irregular, and sometimes projects so as to be perceptible externally either to the sight or touch. This affection usually gives origin to a cough, attended with an abundant aqueous expectoration. The skin soon becomes dull and yellowish ; the appetite is completely destroyed, and the patient wastes or becomes œdematous ; the matter ejected from the stomach assumes a sooty blackness ; the countenance is shrivelled ; the pains acquire more and more intensity ; the diarrhœa gives place to constipation ; the fever increases ; and the patient expires, preserving to the last the intellectual faculties entire.

We may judge from the following symptoms what particular part of the viscus is chiefly affected. If the pylorus be the part exclusively or chiefly affected, the vomiting is very abundant, and occurs at a certain precise period after taking food ; the epigastrium is much more distended with flatus ; the tumour is seated more towards the right side, between the false ribs and the navel ; diarrhœa does not supervene till after its obstruction, or the ulceration of its edges.

If the cancer be seated in the cardia there is no tumour of the epigastrium ; the pains are only felt in the superior part of the stomach, and in the back ; the patient often brings up a mouthful of mucous matter, or even of the undigested food, and is harassed by an abundant salivation.

When the affection attacks the body of the viscus the lesser curvature more generally suffers ; the sufferer takes little food or drink, as they always occasion a very painful distension, and are ejected up almost as soon as swallowed.

Universal degeneration of this viscus produces almost unceasing pains, and is attended with scarcely any vomiting, a circumstance which may also be remarked, when this organ has contracted adhesions with the adjacent viscera.

Nausea only exists when the pylorus is contracted, the stomach partially ulcerated or recently perforated; or when some abdominal inflammation is existing.

This disease may be mistaken for certain chronic nervous vomitings; for chronic gastritis; or may be confounded with aneurism of the abdominal aorta, or tumours formed by the accumulation of fœcal matter in the colon.

Q. What are its anatomical characters?

A. When the change of structure is seated in the pylorus, the stomach is enlarged; in almost all other cases this viscus is found smaller than in the natural state. It is filled with a blackish liquid, which exists in the absence as well as presence of ulcerations. The thickness of the morbid part varies from two lines to half an inch or more; its internal surface is uneven, ulcerated, and covered with a whitish grey or blackish fungous matter, in the intervals of which numerous depressions are perceived; its external surface may be either free or adherent to the liver, peritoneum, or other neighbouring parts. The morbid matter is composed of the cancerous tissue; of cerebriform matter, or sometimes of both combined. In the beginning the mucous may be distinguished from the other coats of the stomach; it is of a dull white and homogeneous structure, whilst the muscular coat becomes more firm and thick, and appears of a bluish colour. Sometimes, though rarely, the disease spreads from the cardia to the œsophagus, and from the pylorus to the duodenum.

HÆMATEMESIS.

Q. What are its symptoms?

A. Flatulence, anxiety, general lassitude, pain of the stomach, coldness of the extremities, and vomitings of blood at longer or shorter intervals; the blood is sometimes pure, never frothy, but more usually black, clotted, or mixed with the matter contained in the stomach; these are attended with cough, but no fever, and accompanied with a distension of the left hypochondrium; when the blood accumulates to a certain extent in the stomach, the stools often appear bloody. *It may be confounded* with Hæmoptysis.

Q. What are its anatomical characters?

A. Sometimes the mucous membrane of the stomach is of a brownish black, and its vessels appear gorged with blood; the hæmorrhage arises from simple exhalation from the surface. Sometimes the membrane is red, and presents at intervals patches resembling ecchymoses covered with adherent blood, and retaining their colour, though submitted to frequent ablution.

COLITIS ACUTUS.

(*Acute Inflammation of the Large Intestine.*)

Q. What are its symptoms?

A. Slight diarrhœa, unaccompanied by disturbance of the constitution, if there exist only irritation or slight inflammation; usually wandering pains of the abdomen, particularly about the navel, increasing in severity by starts; eructations, a sense of weight in the pelvis preceding the evacuations, and again recurring some time afterwards; frequent scanty dejections, consisting of a mucous, serous, or bilious matter, giving rise to a sense of heat at the margin of the anus, to tenesmus and straining, particularly if they occur at very short intervals. When colitis exists to this extent, it is complicated with gastro-enteritis, and consequently with fever, and the other symptoms peculiar to this disease.

DYSENTERIA.

Q. What are its symptoms?

A. Often epidemic, having the peculiarity of becoming contagious when it is joined to typhus fever;

commencing by slight symptoms, or by a general prostration of strength, with severe pains in the abdomen, becoming more and more insufferable, and producing a sensation of twisting along the course of the colon from its origin to the anus; frequent calls to stool, attended with considerable and often unavailing efforts, followed by the dejection of some filamentous mucus mixed with red streaks, or even pure blood, which only gives momentary relief; painful strainings, pungent and burning sensations in the rectum in the intervals of griping; abdominal pressure does not occasion very great pain; the weakness, which is sometimes extreme, is generally in relation to the violence of the gripings, and frequency of the evacuations. It may be confounded with peritonitis, colic, or cholera-morbus.

Q. What are its anatomical characters?

A. The large intestines usually appear natural: they are contracted if the inflammation be recent, and very much dilated if it be of longer standing. Internally the ileo-cœcal valve and large intestines present numerous red dots, and occasionally large dark coloured patches. Ulcerations are not unfrequent. The parts bounding the ileo-cœcal valve are frequently studded with brown or reddish pustules, occasioned by the inflammation of the mucous follicles. In dysentery the ileo-cœcal valve and the commencement of the colon are the parts principally affected; the sigmoid flexure and rectum more slightly. The mesenteric glands, corresponding to the inflamed parts, are often found red and tumefied.

COLITIS CHRONICUS.

Q. What are its symptoms?

A. This succeeds the acute form, or exists primarily in a mild or mitigated character; in this last case it frequently arises from a chronic affection of a neighbouring viscus. The tormina and tenesmus are slight, or perhaps do not occur. The diarrhœa is abundant, but less frequent than in the former affection; the evacuations vary in colour, consistence, and quantity; the food sometimes passes unaltered along the whole track of the intestinal tube, a state which constitutes what is called *lientery*. The countenance becomes pale, furrowed, and of a dirty yellow colour; the skin is dry, rough, and assumes a clayey aspect; morning sweats occur, the superior extremities are infiltrated, and the sufferer usually is carried off by an acute gastro-enteritis, which supervenes on the primary disease. It may be confounded with enteritis of the small intestines, with hypochondriasis, or cancer of the intestine.

Q. What are its anatomical characters?

A. Thickening and ulceration of the ileo-cœcal valves are discovered, with unusual density of the lining membrane, which appears of a brownish black colour. The inflammation is sometimes pustular, sometimes diffused; the inflamed follicles resemble white or reddish fleshy pimples depressed in the centre; in a more advanced stage they are filled with pus, and assume a whitish colour, whilst their base is surrounded by a red circle. The subjacent cellular tissue occasionally passes into suppuration, and then the mucous membrane may be detached in shreds, more or less extensive.

CANCER OF THE INTESTINES.

Q. What are its symptoms?

A. Habitual constipation occurring after a chronic enteritis; pains, transient at first, but after some time becoming constant and accompanied by eructations and painful distention of the abdomen without loss of appetite or perceptible alteration of the pulse; progressive wasting, and occasionally liquid alvine evacuations, containing blood or purulent matter. The distention of the abdomen is more considerable, according as the disease is distant from the pylorus, and obliterates more or less perfectly the calibre of the intestine. When the cancer is large, it presses against the integuments, and may be discovered by pressure with the hand. This affection is extremely difficult to be detected, and may be confounded with tumours, having their seat in the cavity of the abdomen.

Q. What are its anatomical characters?

A. Similar to those of cancer of the stomach.

DYSPEPSIA.

Q. What are its symptoms?

A. A sense of weight and fullness in the stomach, usually supervening some hours after meals, particularly when the food has been too abundant or of bad quality, and accompanied with distention and sensibility of the epigastric region with general uneasiness, nausea, some difficulty of respiration, pain and heaviness over the orbits, and eructations, and sometimes hiccough; signs which may disappear in part after the occurrence of vomiting. Occasionally, diarrhœa, flatulency, and borborygmi are added to these.

Q. What are its anatomical characters?

A. The stomach is filled with half digested matter, and distended, as well as the intestines, with an acid gas; the jejunum is usually filled with food, and the ileum contains a liquid matter, which has already the appearance of excrement. Sometimes the gastro-intestinal mucous membrane appears slightly inflamed. We sometimes discover food or drink in the trachea, which had entered it whilst vomiting.

CHOLERA.

Q. What are its symptoms?

A. Vomitings, and very frequent alvine dejections, of a green, whitish, or brown mucous or bilious fluid; supervening suddenly and continuing with such violence as to threaten speedy dissolution, accompanied with violent pain of the stomach, severe gripings, not increased by pressure, extreme præcordial anxiety, anguish, syncope, and in most cases cramps of the extremities. In this disease, which may occur as an endemic or epidemic, especially in hot climates, the pulse is small and contracted, the extremities cold, and the countenance, even from the commencement, suffers a peculiar and very remarkable change; this affection sometimes proceeds from irritating undigestible matter taken into the stomach. It may be confounded with gastritis, enteritis, peritonitis, or intus-susceptio.

Q. What are its anatomical characters?

A. When death occurs in a few hours after the invasion of the disease, the mucous membrane undergoes no alteration; in some epidemics, however, the intestines are found inflamed and contracted; when death takes place, after some days, the lining membrane appears more or less strongly injected.

INTUS-SUSCEPTIO.

Q. What are its symptoms?

A. In general the diagnosis is extremely difficult. The disease usually commences by obstinate constipation, which yields to no purgative; it may happen that an enema may bring away some fœcal matter accumulated in the large intestine, but this does not continue to take place, and even the flatus ceases to escape. The abdomen soon swells and hardens, occasionally in an unequal manner, so that the convolutions of the intestines are perceptible externally. To these succeed nausea, hiccough, colic pains, and in some cases a fixed pain in a particular part of the abdomen; thin mucous, bilious, and infirm stercoraceous vomitings occur; these last however are not common. In some instances obstinate constipation, prostration of strength, and coldness of the limbs, are the only symptoms that precede death. It may be confounded with peritonitis, ileus, or constriction of the colon.

Q. What are its anatomical characters?

A. On some occasions the strangulation is produced by bands, or adhering false membranes, the consequences of former inflammations existing between the affected part and the epiploon, or convolutions of the intestines; the intestine slips in between these productions, and becomes compressed and strangulated; in other cases, without the intervention of any of these causes, it becomes twisted and contorted on itself; the knot which results from this, becomes more and more strained as the tube increases in volume from the distention caused by the evolution of gas, or by the enemata or drink given to the patient.

SPASMODIC COLIC.

Q. What are its symptoms?

A. This disease commences suddenly with a sensation of twisting, usually occupying the umbilical region or the course of the colon: the pain is not increased by pressure, on the contrary it is usually alleviated; it is accompanied by borborygmi, constipation, small contracted pulse, anxiety, and a particular expression of countenance.

It may be confounded with peritonitis, colitis, or cholera morbus.

Q. What are its anatomical characters?

A. The viscera of the abdomen suffer no perceptible alteration.

COLICA PICTONUM.

Q. What are its symptoms?

A. Acute pains in the abdomen, attacking those persons only who have been employed in working lead, or some of its preparations; not increased, being even relieved by pressure; pain and difficulty at stool, then constipation; retraction and hardening of the abdomen, nausea, and vomiting; pain in passing urine, sometimes strangury; wandering pains of the extremities, with paralysis, or extreme weakness of the extensor muscles of the fingers; occasionally convulsions of the superior extremities; slowness and hardness of the pulse; in some cases severe headache, dyspnœa occurring at intervals, and a sensation of constriction at the præcordia, coincident with the numbness of the arms. It may be mistaken for peritonitis or enteritis.

Q. What are its anatomical characters ?

A. None to be discovered.

CANCER OF THE RECTUM.

Q. What are its symptoms ?

A. Weight and pain in the fundament; burning pain, especially whilst at stool; then tenesmus, with or without griping, borborygmi, and a scanty sanguineous or mucous discharge; on introducing the finger into the rectum, its orifice is found hard, contracted, and unequal; irregular furrows, or a circular induration are perceived on its internal surface, not insensible to pressure; soon after lancinating pains are felt, which are seldom increased by pressure. The anus becomes more and more contracted, and violent tormina occur; the fæcal matter, if it be soft, is always voided in a cord like form, and causes great agony in its passage. When ulceration is established, a sanious or purulent discharge takes place, which is attended with diarrhœa or obstinate constipation.

Cancer of the rectum may be mistaken for lymphatic indurations in the neighbourhood of the parts, for venereal ulcers, or certain species of hæmorrhoids.

Q. What are its anatomical characters ?

A. The disease is not always confined to the verge of the anus, it sometimes extends up the gut for two or three inches or more; the appearance of this cancer and its morbid structure, are perfectly similar to that which occurs in the œsophagus, and which has been already described.

HÆMORRHOIDS.

Q. What are their symptoms ?

A. A determination of blood towards the end of the rectum recurring periodically or irregularly; accompanied with a sense of weight, tension, and itching about the anus; with a sense of bearing down in the loins and perineum, and with frequent calls to stool;

giving rise to an oozing of a sanguineous, or more rarely, of a mucous matter, and producing in its course the development of tumours, which may be either dry or contain a bloody fluid, painful or indolent, or sometimes dependent upon a varicose state of the veins of the rectum, or they may be cellular in their structure, and formed at the expense of the gut itself. Piles may be mistaken for venereal excrescences, or fungoid tumours in the rectum.

Q. What are their anatomical characters?

A. Piles appear under the form of tumours, varying in size, and more or less thickly set, arising from the dense cellular tissue which connects the mucous to the muscular coat. Contained in a sort of cyst, thin, smooth, or sometimes villous as to its interior, and adhering by its external surface to the sub-mucous cellular membrane. In many instances, these tumours are formed of a reddish vascular spongy tissue, or of a sort of parenchyma or fungous flabby tissue, analogous to the erectile. Sometimes they depend upon a partial dilatation of the veins, which may be easily proved by the introduction of a probe into the vessels.

WORMS.

Q. What are their symptoms?

A. They vary according to the species of the worms: direct symptoms are sometimes observable; such as sudden disgust for food, increase of appetite, nausea, vomiting, pain of the belly, hiccough, borborygmi, tenesmus, flatulency, &c.; occasionally sympathetic signs, the principal of which are dilatation of the pupils, itching about the nose, disturbed sleep, perspirations, irregularity of the pulse, and disagreeable breath. They may be confounded with inflammation of the intestines, hypochondriasis, or inflammation of the brain.

Q. What are the symptoms of Ascarides Lumbricoides?

A. A sense of itching with sharp pains in one or more points of the intestines, particularly about the navel; the ejection of one or more worms by the mouth or anus.

Q. What are the symptoms of Ascarides Vermicularis?

A. Dull irritation and itching about the anus, increasing towards the evening; the escape of many of the worms with the stools.

Q. What are the symptoms of Tænia?

A. Twisting and weight in the abdomen, with a sense of pinching or gnawing in the vicinity of the stomach; swelling and irregular retraction of the lower part of the abdomen; enormous appetite; ptyalism; the rejection of part of the worm by stool or vomiting.

Q. What are their anatomical characters?

A. They differ according to the species of the worms.

Q. What is the appearance of the Ascarides Lumbricoides?

A. Body whitish or of a reddish grey; round, from four inches to a foot in length; very elastic; tail terminating in a blunt end; head furnished with three oblong tubercles, between which the head is placed.

Q. What is the appearance of the Ascarides Vermicularis?

A. Body very thin, and from two to nine inches in length; tail terminating in a very fine and transparent point: head furnished with two vesicles, lateral and transparent, or with three tubercles.

Q. What is the appearance of the Tænia?

A. Flat and articulated, having at its smaller extremity a tubercular head and mouth, surrounded by four suckers: there are many varieties of them.

HEPATITIS.

Q. What are the symptoms of Hepatitis?

A. A heavy dull pain, occurring in the right side, increased by pressure, deep inspiration or cough: sometimes, however, it is alleviated by doubling the body forwards: in some cases an acute pain is felt in the right shoulder, and along the vertebral column: the size and consistence of the liver may be augmented, in which case it projects beyond the false ribs and extends more or less into the abdomen. The patient lies on the right side, and finds it sometimes almost impossible to rest on his back or left side. Respiration and digestion are impeded, and there is occasionally a slight dry cough: very generally a yellow tinge is communicated to the skin and conjunctiva: the urine is of a saffron colour: there is constipation, and the feculent matter is found greyish and discoloured. If the disease terminate in suppuration, a fluctuating tumour may be felt beneath the integuments of the right side. This affection, which is of more frequent occurrence in hot countries than in our temperate climate, is always difficult to be detected: writers have constantly assigned to it the symptoms which belong to the inflammation of the peritoneum, on its concave or convex surface. Hepatitis may be easily confounded with pleurisy or with inflammation of the peritoneum, enveloping the substance of the liver.

Q. What are its anatomical characters?

A. The size of the liver is not increased by acute inflammation; its investing membrane adheres less firmly to it than in the healthy state; its surface is brown or reddish, and marbled. The substance of the organ becomes brittle and friable in proportion to the degree of the inflammation; and when cut, blood oozes from its surface, but cannot be said to flow from its vessels, as in the natural condition. It is also granular, the granulations consisting of the parenchymatous structure; they are, however, increased in size; some of them are red, more or less bright; others yellowish, which gives rise to a striated appearance. In this state the liver resembles much the aspect of an inflamed lung before it has become completely solid; but when pressed between the fingers it is very friable, and is reduced to a soft pulp like an inflamed spleen, which arises from the quantity of sanguineous fluid which is poured into its texture: its weight is evidently increased; the lining membrane of the different biliary canals is injected, and of a reddish brown colour. These are the appearances presented by the liver when inflamed, and before suppuration has set in. When the latter takes place, the pus is infiltrated into the substance of the liver, sometimes it is found in several small abscesses, and mixed with blood, which gives it a greenish yellow colour; sometimes it is united with one large cyst which may make its way either into the abdomen, into the chest, and bronchial tubes, into the intestines directly, or by means of the biliary canals, or lastly, may point externally through the integuments of the abdomen, and so be evacuated.

CANCER OF THE LIVER.

Q. What are the symptoms of cancer of the liver?

A. The marks of this affection are very uncertain; it cannot be detected till the organ extends itself below the edges of the false ribs, and affords an opportunity of perceiving the projections, varying in size and number, which exist on its surface. The digestion is attended with pain and difficulty, but without vomiting, and is most generally accompanied by constipation, colic, borborygmi and more or less acute pain of the right hypochondrium and shoulder of the same side, with uneasiness in the epigastric region; emaciation commences; the skin and conjunctiva become jaundiced; the limbs are affected with œdema; and ascites soon supervenes, which speedily carries off the patient. It may be confounded with any of the diseases of which this organ is susceptible.

Q. What are its anatomical characters?

A. The liver commonly extends across the epigastrium; sometimes occupying the left hypochondrium. Its surface is covered with furrows, occasionally pretty deeply marked. When the substance is cut into, tumours are met with in different parts, of a cancerous nature, and mixed with tuberculous or encephaloid matter in various degrees of advancement. The structure of the viscus surrounding these is usually natural, and is, in many cases, attached to the tumours, (which are now and again very numerous,) by vascular connexions only, which admit of being easily separated; in other cases, however, the connexion is more intimate, and the parenchyma of the organ seems gradually to degenerate. When these morbid degenerations, which compose the cancerous substance, become softened, the whole is converted into a pultaceous mass, which increases by degrees, at the expense of the lower tissue of the viscus. This softening, however, is seldom general, several of the tumours usually preserving their original consistence.

ENCYSTED DROPSY OF THE LIVER.

Q. What are the symptoms of encysted dropsy of the liver?

A. A smooth shining tumour, little or not at all painful; without discoloration of the integuments, and with evident fluctuations; seated in the right hypochondrium and epigastric region; not being displaced by change of position: the patient is unable to lie on the back or left side. It may be mistaken for encysted abscesses in the liver.

Q. What are its anatomical characters?

A. These cysts are sometimes formed of fibrous tissue, sometimes of serous; their size is very variable; they are developed occasionally in the substance of the liver, and contain a serous or semi-gelatinous liquid, containing, in some instances, a greater or lesser number of hydatids.

BILIARY CONCRETIONS.

Q. What are their symptoms?

A. Very difficult, generally impossible to be distinguished; the presence of the concretions in some cases gives rise to a sort of pressure in the epigastric region, to violent colic, to eructations, to obstinate vomitings, and to acute pain, seated in the course of the common duct, and increased after taking food. These symptoms become more certain if the patient has voided any biliary calculi, either by vomiting or stool.

INFLAMMATION OF THE SPLEEN.

Q. What are its symptoms?

A. This affection is seldom observed during its acute stage; it is marked by pains felt under the left false ribs: increased by pressure or by motion. The patient finds it disagreeable to rest on his side. The skin is discoloured, being of a yellow tinge, but not sufficiently deep to stimulate jaundice. In some cases of splenitis, blood is occasionally vomited. It occurs epidemically in low and marshy districts, and on the sea shore. When chronic, it is more easily recognised; for besides the symptoms above mentioned, a hard, large tumour is felt in the left hypochondrium, which is sensible to pressure. Splenitis is a common consequence of intermittent fevers. It may be confounded with gastritis, peritonitis, or tumours in the left hypochondrium.

Q. What are its anatomical characters?

A. The substance of the spleen is sometimes softened, gorged with blood, and almost diffluent; its size is generally much increased; it is sometimes filled with pus, accumulated into a mass, or diffused in its substance. The spleen has often been found filled with tubercles, either indurated or softened. Its external membrane is sometimes torn through, at others it is thickened and hardened, being almost cartilaginous.

PERITONITIS.

Q. What are its symptoms?

A. Acute pain, producing an extreme degree of weakness, occurring over the whole extent, or part of the abdomen, increased by the slightest pressure; obstinate constipation and burning heat of the abdominal integuments; pulse small, contracted, concentrated, and frequent; particular expression of countenance; the patient lies on his back, with his thighs drawn up; urine scanty; in many cases vomiting and hiccough. The tongue is white, covered with mucus, and more or less dry; the respiration is difficult (particularly during inspiration), frequent, and chiefly carried on by the ribs.

If the disease attack women after their accouchment, the breasts become collapsed, and the lochia suppressed; the pain in that case usually commences in the hypogastric region. The symptoms of peritonitis are not always so well marked, particularly if it come on more slowly; or if the chronic form succeed the acute, it then becomes difficult to detect it, for the pain is often very obscure; the belly little distended, the pulse unaltered, and the constipation less conspicuous. The increased size of the abdomen, and the evident fluctuation which soon succeeds, are the symptoms chiefly to be depended on.

When it occurs in consequence of perforation of the intestine, it is rapid and violent in its progress, and soon causes death. It may be confounded with enteritis, hepatitis, and splenitis.

Q. What are its anatomical characters?

A. Numerous red spots are discovered on the peritoneum, penetrating its whole thickness, and separated one from the other by parts of the membrane, retaining their natural colour; in some cases the serous membrane is injected or thickened.

Inflammation more generally occupies the covering of the intestines, than the part which lines the walls of the abdomen. False membranes, varying in thickness and softness, according to the duration of the disease, are found spread over the peritoneum: these insert themselves into the intervals of the intestines, and unite them one to the other. The cavity of the abdomen is filled with a whitish, milky liquid of very fetid smell, containing suspended a great number of small albuminous streaks of a white, greyish, or red colour; the contained fluid sometimes consists of a bloody serosity, more or less limpid, particularly if the disease had lasted but for a very short time, and that death quickly supervened.

Peritonitis sometimes also shows livid patches and real gangrenous spots. In the chronic form the albuminous concretions possess more solidity, and these bands which unite the intestines often become cellular; finally, peritonitis often gives rise to hard, semi-transparent granulations, and the serosity which then exists in the cavity is limpid, and contains a few albuminous streaks; it resembles whey, slightly turbid.

ASCITES.

Q. What are its symptoms?

A. Tumefaction of the abdomen, commencing from below upwards, and unaccompanied by the symptoms of peritonitis; a sensation of fluctuation upon striking the parietes of the abdomen, which appear smooth, then stretched and covered with turgid veins; the liquid changes place when the patient changes his position; the urine is much less abundantly secreted than in health; and difficulty of respiration, varying in intensity, according to the distention of the abdomen, is complained of. It may be confounded with encysted dropsy, and tympanitis.

Q. What are its anatomical characters?

A. Abdomen distended to a greater or less extent by citrine transparent serosity, without the slightest trace of albuminous streaks; peritoneum sound; there usually exists some organic alteration of some one of the abdominal viscera, generally the liver or spleen.

OF THE URINARY ORGANS.

ANATOMY OF THE KIDNEYS.

Q. What is the *situation of* the *Kidneys?*

A. They are situated in the Lumbar Regions, one on either side of the spine, extending about five inches from the eleventh rib to near the crest of the Os Ilei. They lie upon the Diaphragm, the Psoae Magnae, Quadrati Lumborum, and Transversales Abdominis Muscles. The right is placed under, and at the back part of, the great lobe of the Liver, and behind the Colon ; it is a little lower than the left. The left is placed at the under and back part of the Spleen, and behind the left portions of the Stomach, of the Pancreas, and of the Colon.

Q. What is the *general figure* of the *Kidney?*

A. It is rounded before, flattened behind, convex on its outer margin, has a deep sinus towards the spine, and surrounded with unequal edges: it is somewhat broader behind than before, broader and more curved above than below.

Q. What are the Connexions of the Kidneys ?

A. The right Kidney is connected to the Liver and Duodenum, the left to the Spleen, and both to the Psoae and Quadrati Lumborum muscles, to the Colon, and Renal Glands, by cellular Substance, and by the Peritoneum.

Q. How many *Coats* has the Kidney ?

A. Two ; the tunica adiposa, which covers both the Kidney and its large vessels ; under the adipose coat is its proper coat incorporated with cellular membrane.

Q. What is the exterior appearance of the Kidney ?

A. It is generally smooth and uniform ; sometimes however, it is irregular and lobulated.

Q. What is the interior appearance of the Kidney?

A. It exhibits an exterior *cortical*, and an interior *medullary* part. The cortical, considered the secerning part, surrounds the kidney, forming one third of its breadth, and sends processes towards the pelvis, which divide the medullary part. The medullary, considered the uriniferous part, is redder coloured than the cortical, and is separated into a number of distinct columns, each of which terminates in a *Papilla.*

Q. What *Arteries* are sent to the *Kidney?*

A. The *Emulgent* or *Renal Artery* arises from the

Aorta, passes across, and enters the Kidney at the upper part of the sinus ; it then divides into numerous branches, which become very minute, anastomose frequently, and form arches in the cortical substance ; their extremities at last wind in toward the medullary substance, and are coiled up into *Acini*, which seem corpuscles disposed in clusters.

Q. Is the *Urine secreted* in these *Corpuscles?*

A. Yes ; in these corpuscles situated in the cortical substance the urine is secreted, and received by the extremities of the Uriniferous tubes, which commence there, and gradually uniting together, form larger tubes, that converge in a radiated manner towards the pelvis of the Kidney, and ultimately terminate in the Papillae.

Q. How many *Papillae* are generally in a Kidney?

A. They vary in number, but in general are twelve or fifteen.

Q. Into what vessels do the *Papillae* pour the Urine ?

A. Into *Infundibula*, or *Calices*, which are tapering membranous tubes; each arising from around the base of a Papilla.

Q. Are there as many *Infundibula* as *Papillae* in each Kidney?

A. Yes, they are generally the same in number; sometimes, however, two or three Papillae open into the same Infundibulum.

Q. Where do the *Infundibula terminate?*

A. Their apices converge, join, and form two or three trunks, which ultimately unite into a dilatation of considerable size, called the *Pelvis* of the Kidney.

Q. Is *each Papilla* to be considered a *distinct gland ?*

A. Yes ; in the foetal state the Kidney consists of a number of separate glandular Lobules, each of which generally forms a Papilla ; the number of Papillae therefore depends on the original number of Lobules. In the course of time they are firmly united externally into one smooth kidney.

Q. Is the *Pelvis of the Kidney* without its body?

A. The pelvis is conical, and partly within, and partly without the Kidney; it contracts gradually into a tube of the size of a common goose quill called *Ureter*.

Q. What is the *course of the* URETERS ?

A. They descend obliquely inwards behind the Peritoneum, pass over the Psoae muscles and Iliac Vessels, in a wavering manner into the Pelvis, and terminate in the lateral and back part of the Bladder near its cervix.

Q. What is the *structure of the Ureters* ?

A. They are composed of *three coats* and a partial covering from the Peritoneum on their anterior part. Their external coat is membranous; their middle one is muscular, consisting chiefly of circular fibres; and their internal coat is villous or mucous, as it is very vascular, and perforated by many small ducts, which pour out mucus on its internal surface, to defend it from the acrimony of the Urine.

OF THE RENAL CAPSULES.

Q. What are the Renal Capsules ?

A. They are two small, flat, glandular-looking substances, of a dark yellow colour, and somewhat of a triangular figure, about two inches long.

Q. What is the *situation* of the *Renal Capsules* ?

A. They are situated, one on each side, at the upper, inner, and fore part of the Kidneys, higher than the Renal vessels over the Psoae muscles and diaphragm.

Q. What parts are they connected with ?

A. The right Renal Capsule is connected with the Liver; the left with the Spleen and Pancreas; and both with the small muscles of the diaphragm, and with the Psoae muscles and Kidneys by cellular substance.

Q. What *Coats* have they?

A. They are surrounded by cellular substance, which is a part of the *tunica adiposa* of the Kidneys;

and they have besides a thin proper coat adhering firmly to them.

Q. What is the *use* of these *Renal Glands* or *Capsules?*

A. Their use is unknown; they seem however to be useful in the foetal state, as they are proportionally larger than in the adult: perhaps to divert the blood from the Kidneys.

Q. What ORGANIC DERANGEMENTS are the *Kidneys* subject to?

A. To inflammation, abscesses, scirrhus, scrofulous tumours, calculi, hydatids, great spongy softness, enlargement or diminution of size, ossification, to a cartilaginous state, and to dropsy.

Q. What DISEASED APPEARANCES have the *Renal Capsules* presented?

A. They are very seldom found diseased: but they have become enlarged, and exhibited a white matter similar to a scrofulous absorbent gland; sometimes they have become cartilaginous, or have contained calcareous granules in their substance.

Q. What ORGANIC DERANGEMENTS are the *Ureters* subject to?

A. To inflammation, and a thickening of their coats from the irritation of Calculi, to dilatation in consequence of an obstruction near the bladder, to pus, hydatids, to spasm, and to be ruptured.

OF THE URINARY BLADDER.

Q. What is the situation of the Bladder?

A. It is situated in the anterior part of the Pelvis, before the Rectum, and behind the Ossa Pubis; when distended, it rises up above the brim of the Pelvis, almost to the Umbilicus.

Q. To *what parts* is the *Bladder* attached?

A. It is attached by cellular substance to the Ossa Pubis; by the peritoneum reflected from its sides, and by cellular substance to the Pelvis, and below to the Rectum; by two or three ligaments, viz. the urachus and shrivelled umbilical arteries, to the Umbilicus; by a strong ligamentous expansion from each side of its neck and Prostate Gland to the inside of the Arch of the Pubis; and by the Urethra to the Penis.

Q. How many *Coats* has the bladder?

A. *Four;* the *Peritoneal,* which covers it all except its cervix; the *muscular,* composed of fleshy fibres disposed in fasciculi, of which the external are longitudinal, and are connected at the under and fore part of the Bladder with the Ossa Pubis; the internal fibres run in all directions, and are interwoven with each other: at the neck of the bladder they are collected into the Sphincter Vesicae; the third coat called *nervous* is composed of cellular substance, which connects the muscular to the innermost *mucous* coat.

Q. How many *openings* are in the Bladder?

A. *Three;* one for the Urethra, anteriorly coming off at almost a right angle with the Bladder; and two openings formed by the termination of the Ureters on the posterior and lower part of the bladder at about an inch and a half's distance from each other, and from the commencement of the Urethra.

Q. In what manner do the *Ureters terminate?*

A. They run down between the peritoneal and muscular coats a long way, and then penetrate the muscular coat obliquely, and passing between it and the mucous coat, ultimately pierce it also obliquely, and terminate by open oval mouths in the bladder.

Q. Can the urine not return from the Bladder into the Ureters?

A. No; the obliquity of the termination of the Ureters in passing through the coats of the Bladder answers all the purposes of valves.

Q. What is the *use* of the Bladder?

A. It receives the urine guttatim from the Ureters, and retains it till a convenient opportunity occurs for passing it.

Q. What retains the urine in the bladder?

A. This question is difficult to solve; the angle made by the Urethra with the Bladder has some effect; the action of the levatores ani probably much more: by pressing the bladder upwards, and thus approximating its sides, they shut its posterior orifice.

Q. By what means is the Urine expelled from the Bladder?

A. Its expulsion is partly voluntary, and partly not. When the stimulus of the Urine and the distention of the bladder are great, it is expelled involuntarily: but in general by the contraction of the bladder itself, assisted by the Abdominal Muscles and Diaphragm, we can pass urine at pleasure.

Q. What are the chemical properties of the Urine?

A. It is composed of water, mucus, uric, phosphoric, and lactic acids, muriate of soda and ammonia, of phosphate of soda, ammonia, lime, magnesia, sulphate of potash, lactate of ammonia, and silex.

Q. Do these properties vary according to circumstances?

A. Yes; thus, rhubarb or madder taken by the mouth, colours it, the former yellow, the latter red; the breathing of spirits of turpentine gives it a violet odour; large draughts of water render it watery; sugar, gum, butter, or oil taken as the principal food, cause the uric acid almost wholly to disappear; on the contrary, it increases as the regimen becomes more substantial, and as the exercise is diminished: certain salts taken into the stomach appear in small quantities in the urine.

Q. Is there any other passage to the bladder than through the blood?

A. It has been believed so from the appearance of certain salts in the bladder, after swallowing them; as nitre, the prussiate of iron. Magendie from experiments concludes that the blood conceals the salts, which are absorbed into it, and therefore they appear not to pass by the blood, but by the supposed passage.

OF THE ORGANS OF GENERATION IN THE MALE.

Q. What parts does the Penis consist of?

A. Of five principal parts, the two corpora cavernosa; the corpus spongiosum, the glans, the prepuce, and the urethra.

Q. Describe the situation of the *Corpora Cavernosa Penis.*

A. They form the upper and lateral parts of the penis, and are covered by a strong, elastic, ligamentous sheath. Their crura arise from the crura of the Ischium and Pubis, at the lower part of the symphisis they are united, and continue closely applied to each other, till they terminate in a rounded extremity at the Glans. There is a depression above, in which the principal Vein of the Penis runs; and another between them below for the Urethra.

Q. What is the *structure* of the *Corpora Cavernosa?*

A. Their ligamentous sheath sends up a triangular process to be fixed to the Symphisis Pubis, called the *Ligamentum Suspensorium*, which supports the Penis in its proper position: their internal structure is reticulated, and divided into *Cells*, which are very similar to the cancelli in the extremities of long bones, and communicate very freely with each other; among these cells the Arteries are copiously dispersed, and pour their blood into them, distend them, and thus produce an erection of the Penis.

Q. Do the *Cells* of the *one Corpus Cavernosum* communicate with those of the other?

A. Yes; the membranous sheath forms an imperfect septum between them; and between the cords or fibres of which, fissures of communication are left, through which the blood easily passes from the one corpus cavernosum to the other.

Q. What is the *situation* of the *Corpus Spongiosum Urethrae?*

A. It is situated under, and between the Corpora Cavernosa Penis; it begins nearer the bladder than the junction of the Corpora Cavernosa, is connected firmly to them by condensed cellular substance, and terminates at the point of the penis, projecting considerably farther than the Corpora Cavernosa.

Q. Describe the *Corpus Spongiosum Urethrae.*

A. Its posterior part is dilated into a longitudinal conical prominence, called the *Bulb* of the Urethra, its anterior is expanded into the *Glans*, which covers the extremity of the Corpora Cavernosa.

Q. Describe the *Glans Penis?*

A. It adheres to the Corpora Cavernosa by a continuation of the ligamentous sheath, which covers them; its posterior part forms a prominent circle, termed *Corona Glandis*, behind which is the Cervix; the surface of the Glans is furnished with numerous blood vessels and nervous Papillae covered by a delicate membrane continued from the inside of the *Prepuce.*

Q. What is the *Prepuce?*

A. It is a loose fold of the common Integuments, which generally covers the Glans, and preserves its sensibility; it can be moved forwards and backwards; it is connected to the under and anterior surface of the Glans by a triangular fold, termed *Fraenum Preputii.*

Q. Are there any *Mucous follicles* situated under the *Prepuce?*

A. Yes; around the Cervix and Corona Glandis are many *Glandulae Odoriferae*, which throw out a sebaceous secretion, for keeping the parts moist, and facilitating the movements of the Prepuce.

Q. What is the *Structure* of the *Corpus Spongiosum Urethrae?*

A. Its structure is cellular, being the same as that of the Corpora Cavernosa, only its cells are smaller; the Bulb of the Urethra, and the Glans Penis are also cellular in their internal structure.

Q. Describe the *canal of the Urethra.*

A. It proceeds from the under and fore part of the Bladder, bends round the Symphisis Pubis, runs along the Corpus Spongiosum, and terminates in the point of the Penis.

Q. Has the *Urethra* any *Dilatations* or *Contractions* in its course?

A. Yes; it has *three Dilatations*, the first at the

Prostate Gland, the second in the Bulb, and the third at the beginning of the Glans: and it has *three* slight *Contractions*, one at its Origin near the neck of the Bladder, another between the Prostate Gland and Bulb, and the third at the point of the Glans.

Q. Describe the *internal part* of the *Urethra.*

A. Between the Prostate Gland and the Bulb, the Urethra is entirely membranous, and covered only by cellular substance; its internal membrane is very vascular and sensible, possessed of very considerable contractibility, and moistened by mucus, which is poured out from numerous Lacunae, situated between it and the Corpus Spongiosum.

Q. Has the *internal surface* of the Urethra any *Glands?*

A. Yes; these *Lacunae* are mucous follicles, two or three larger than the rest are situated near the Glans; but at the sides of the membranous parts of the Urethra, *two* about the size of a garden pea, have been called COWPER'S *Glands.*

Q. What *Arteries* are sent to the *Penis?*

A. Branches from the Pudic, and from the Femoral Arteries are sent into the Penis; they inosculate freely with each other, and pour their blood chiefly into the Cells, and partly into the Veins.

Q. Whence do the *Veins* of the Penis commence, and where do they direct their course?

A. The Veins commence chiefly by open mouths from the Cells, and partly from the extremities of the arteries. The greater number unite and form the *VenaMagnaPenis*, which runs in the superior groove between the Corpora Cavernosa: it is furnished with Valves.

Q. What produces an *Erection* of the Penis?

A. An influx of blood into its cells, which become distended.

Q. What seems to be the cause of that influx?

A. A venereal affection of the mind; a local stimulus from the semen masculinum; or from a collection of Urine in the Bladder; or from irritation of the Rectum, or of the Penis ; or sometimes from heat, aided by some of the above.

Q. Where have the *Lymphatics* of the Penis their course ?

A. Those arising from the Prepuce run on the dorsum of the penis and pass into the inguinal glands ; those from the Glans and deep parts accompany the arteries into the under part of the Pelvis.

Q. What are the ORGANIC DERANGEMENTS of the *Urethra ?*

A. Inflammation of its internal membrane ; stricture in the membranous part, or two or three inches from the Glans; Dilatation near the bladder, in consequence of Obstructions near the extremity of the Urethra; Abscesses; Fistulae; Calculi; Ulcers; Caruncle, or a small fleshy excrescence ; preternatural Orifice of the Urethra placed where the fraenum usually is; and a layer of earthy matter along its whole length.

OF THE PROSTATE GLAND.

Q. What is the exact situation of this Gland ?

A. It is situated on the beginning of the Urethra, with its base at the neck of the bladder, and its apex immediately behind the under part of the symphisis pubis: it closely embraces the neck of the bladder and urethra below, and projects with its two lobes on either side of it.

Q. Describe the *Prostate Gland.*

A. It is of the size of a walnut, and of the figure of a heart, its internal structure is spongy, and rather firm; it sends out *ten* or *twelve ducts,* which open obliquely at the beginning of the Urethra, and pour out a thin whitish fluid.

Q. What is the *use* of this *secretion* of the *Prostate Gland ?*

A. It is supposed to dilute the semen, and facilitate its passage along the Urethra : perhaps in ordinary it lubricates the posterior part of the Urethra.

Q. What are the ORGANIC DERANGEMENTS of the *Prostate Gland?*

A. The Prostate Gland is sometimes inflamed, enlarged and hardened, or scirrhous; suppurates, and forms an Abscess containing common pus, or scrofulous white curdy matter: calculi are found in its ducts: it is sometimes preternaturally small.

PATHOLOGY OF THE URINARY ORGANS.

NEPHRITIS.

Q. What are its symptoms?

A. A dull weight or pain, in general perceived on one side only of the lumbar region, soon giving place to sharp deep seated pain, causing a sensation of tension and bearing down; occasionally lancinating or pulsatile, increased by pressure, or by lying on the belly or unaffected side; scantiness or suppression of urine, which is, in general, red, tinged with blood, and voided with difficulty; the pain often extends itself from the loins to the bladder, penis, or groin, and is accompanied with a numbness or tremulous motion of the thigh, and with painful retraction of the testicle: vomiting with general febrile symptoms usually supervenes. In some cases, the pain ceases for a time, but returns again with increased violence; when this happens, we may suspect the existence of calculi in the kidneys, particularly if the urine at the same time contains some calcareous matter. When the complaint is chronic, the pains are less, a heaviness is complained of in the loins, and the urine usually becomes troubled, and contains a purulent fluid. It may be confounded with cystitis, peritonitis, or lumbago.

Q. What are its anatomical characters?

A. We seldom meet with more than one affected kidney, which is red, indurated, and infiltrated with pus: the ureters sometimes participate in the disease, and are then found red, their mucous coat thickened, and covered with pus.

GRAVEL.

Q. What are its symptoms ?

A. Urine depositing, soon after being voided, a gravelly matter more or less fine, hard, and resisting the pressure of the fingers, which is composed of uric acid united to animal matter, and, in some few instances, of oxalate or phosphate of lime : acute pains, with a sense of heat and heaviness in the lumbar regions: urine generally voided with pain and difficulty. This complaint is very commonly met with in gouty subjects. It may be confounded with nephritis or hæmatura.

Q. What are its anatomical characters ?

A. A gravelly substance similar to that which exists in the urine, is usually detected in the kidneys, ureters or bladder. The substance of the kidney, in most cases, of a perfectly natural appearance.

DIABETES.

Q. What are its symptoms ?

A. The urine is considerably augmented in quantity, and is clear, white, or yellowish, insipid or sweet, and preceded in most instances by frequent calls to make water, and pain in the course of the ureters: thirst insatiable, appetite immense, wasting and extreme debility.

Q. What are its anatomical characters ?

A. The kidneys are at one time found red, and unusually large, at others they present a remarkable flaccidity; their vessels are occasionally considerably distended with fluid, dilated, and easily torn: in other instances their substance has suffered a sort of disorganization or solution more or less complete. Again, they have been found smaller than natural.

CYSTITIS.

Q. What are its symptoms ?

A. Acute permanent pain and heat in the hypogastrium, which is sometimes protruded : weight and tension of the perinæum: frequent, painful, and often ineffectual efforts to make water: frequent and painful erections: the urine, at first limpid, becomes troubled and reddish, and is voided with pain and scalding heat: a concomitant fever generally attends. When the chronic form succeeds the acute, the fever disappears, the heat and tension of the hypogastrium and perinæum are also diminished: the calls to make water become less urgent, and the scalding during emission is considerably less distressing: the patient often voids, with an effort, a viscid fluid, resembling the semen in appearance, but differing in smell. On other occasions, chronic cystitis comes on gradually: a heaviness and uneasy sensation is experienced in the perinæum, and the patient finds a desire to void his urine, which can be accomplished with difficulty: the urine is yellow, and deposits a mucous matter more or less abundantly, similar to the white of eggs; the pain is slight and permanent, or returns at intervals: finally, the introduction of the sound is attended with great difficulty and intense suffering. It may be confounded with nephritis, peritonitis, or matritis.

Q. What are its anatomical characters?

A. Redness of the lining membrane of the bladder, more or less considerable, confined to some particular parts, or diffused over its whole surface. When cystitis is chronic, the viscus is lessened and contracted; or, on the contrary, distended by a fetid urine mixed with blood or purulent matter; its parietes are thickened in proportion to the duration and slow progress of the disease; its internal surface is of a reddish brown colour: we often meet with a net work of vessels distinctly developed, similar to varicose veins, and particularly resembling the venous plexus which surrounds its neck; it is in general furrowed more or less deeply, according to its degree of contraction. The mucous follicles are considerably developed, and ooze out, when pressed between the fingers, a glairy matter similar to that deposited by the urine. Ulcerations of the internal coat of the bladder are also frequent, and it then contains more of pus than of this glairy fluid. In some cases gangrene or even perforations, exist: and, finally, it is occasionally changed into the true cancerous tissue.

HÆMATURIA.

Q. What are its symptoms?

A. A passing of blood through the urethra, which may proceed from the kidney, ureters, bladder, or urethra: when it proceeds from an affection of the kidneys, it is attended with a sense of heat and pain in the loins, and not unfrequently by coldness of the extremities: it is only when the blood accumulates in considerable quantities that the hypogastrium increases in size, and becomes tender, and that the calls to pass urine are frequent and urgent. When the disease is seated in the ureters, it causes a sense of pain and tension along the line of their course. Hemorrhage from the bladder is usually preceded by frequent desire of passing urine, by heaviness and tension above the pubis, extending to the perinæum, groins, and lumbar regions; sometimes the patient complains of tenesmus, constipation, and heat about the anus; the passing of urine is attended with pain and difficulty; the blood is scarcely or not at all combined with the urine. When the hemorrhage takes place from the urethra, a pain is perceived in a particular part of the canal, and the blood is red, liquid, and pure, and generally voided without effort. It may be confounded with nephritis, cystitis, or menorrhagia.

Q. What are its anatomical characters?

A. Sometimes the mucous membrane, which has given rise to the effusion, is tumefied and red, and the blood still oozes from it when pressed between the fingers; on the other hand, it is occasionally pale, and shows no marks of congestion: in other instances we find rupture of the vessels, or some other morbid changes in the kidneys, ureters, bladder, or urethra, which have given rise to the hemorrhage.

OF THE TESTES.

Q. What is the situation of the Testes ?

A. They are generally situated in the cavity of the Scrotum : sometimes one or both are retained in the abdomen.

Q. What are the *coverings* of the Testes ?

A. They are covered by the Scrotum externally, and by the Tunica Vaginalis, and the Tunica Albuginea internally.

Q. What is the *structure of the Scrotum* ?

A. It is a continuation of the common integuments, contains no fat, is copiously supplied with sebaceous follicles, on its internal surface is a vertical longitudinal Raphe : its internal surface is lined with cellular substance of a red and fibrous appearance, which has been supposed a muscle called Dartos. A middle partition divides the Scrotum into two separate cavities.

Q. Describe the other two Tunics of the Testes.

A. The *Tunica Albuginea* adheres most firmly to the surface of the Testes, covers the Epididymis, and supports it in its situation : it is strong, thick, dense, and inelastic ; it is very smooth on its surface : the *Tunica Vaginalis* incloses the testicle, is much larger than merely to surround it, in order to allow it room to change its place, adheres to the tunica albuginea behind, where the vessels enter the testis ; its external surface is connected with the cremaster muscle : both coats are derived from the Peritoneum.

Q. How do the *testes* happen to receive these *two coats* from the Peritoneum ?

A. In the foetus, the *Testes* lie in the abdomen on the Psoae muscles, a little below the Kidneys ; they receive a covering from the Peritoneum as the other viscera of the abdomen do, which is their *Tunica Albuginea* ; they receive also their arteries from the Aorta, and their nerves from the aortic plexus : the testes slide downwards carrying their blood-vessels and nerves enveloped in the peritoneum along with them: at the upper abdominal Aperture they come in contact with the Peritoneum, which lines that aperture, push it down before them through the inguinal canal, through the external abdominal Ring into the Scrotum, and there it forms the Tunica Vaginalis Testis.

Q. About what period does that *change of the position* of the *Testes* take place ?

A. Generally from the fifth to the seventh or eighth month of the fœtus in utero: their descending progress is slow, during which the vessels and peritoneum become so much elongated as to allow their descent easily.

Q. What is the *Distribution of the Spermatic Arteries* in the *Testicle ?*

A. The internal part of the Testicle is composed of Septulae or partitions,formed by cellular substance, which extend in a radiated manner from its back part towards its circumference ; on these the minute ramifications of the arteries are dispersed in a very intricate convoluted manner.

Q. Describe the origin of the *Seminal Vessels.*

A. The *Tubuli Seminiferi,* after communicating with the extremities of the arteries, are collected into bundles, which are coiled up into others of a smaller size, and of a conical form, with their apices towards the posterior edge of the Testicle, and are placed between the Septulae. These tubes are extremely small, have no division into branches, and when drawn straight are several feet in length.

Q. What vessels are continued from these ?

A. From these Convoluted Seminal Tubes an equal number of straight vessels is sent backwards, called *Vasa Recta,* which communicate and form an irregular plexus, termed *Rete Vasculosum Testis.*

Q. What vessels proceed from the Rete Vasculosum Testis ?

A. From it *twelve* to *eighteen* straight tubes are sent out, called *Vasa Efferentia,* which are soon rolled up into Cones, called *Coni Vasculosi.*

Q. What vessels communicate with these Cones ?

A. These *Coni Vasculosi*, connected by cellular substance, compose rather more than a third part of the *Epididymis;* they gradually unite into one tube, called *Epididymis*, which is much convoluted; and then becomes larger and straighter, termed *Vas Deferens.*

Q. Recapitulate the different parts of the *Seminal Tubes.*

A. From the coiled up extremities of the Tubuli Seminiferi, Vasa Recta arise, and by their communications form the Rete Vasculosum Testis, from which the Vasa Efferentia arise, and terminate in the Coni Vasculosi, which unite and form the Epididymis, and this again ends in the Vas Deferens.

Q. What is the *Caput Gallinaginis ?*

A. It is an eminence on the lower part of the Urethra, where it is surrounded by the Prostate Gland: it is larger towards the bladder, and stretches forwards into a narrow point. On either side of its summit the two canals common to the Vasa Deferentia and Vesiculae Seminales open; around which the ducts of the Prostate, and of mucous follicles terminate.

Q. What vessels compose the *Spermatic Cord?*

A. The Spermatic Arteries, Veins, Lymphatics, Nerves, and Vas Deferens, connected by cellular membrane, and surrounded by the peritoneal process, which forms the vaginal coat of the testicle.

Q. What is the *Structure* of the VAS DEFERENS ?

A. Its coats are of considerable strength and thickness; its outer one seems condensed cellular substance, and its inner one thin and dense mucous membrane: perhaps some muscular fibres are interspersed between them. When compressed between the finger and thumb, it communicates the same sensation as whip-cord does.

Q. Describe the *course* of the *Vas Deferens.*

A. It arises from the posterior and inferior part of the Epididymis, ascends on the back part of the spermatic cord through the abdominal apertures, at the upper of which it separates from the cord, passes down on the Psoas muscle to the lateral part of the bladder; and descending obliquely inwards behind the umbilical artery, it crosses the ureter at the lower surface of the bladder, and near the prostate gland joins the cylindrical canal of the Vesicula Seminalis at an acute angle; which canal, common to both, being about an inch long, perforates the prostate gland, and opens on the under surface of the Urethra at the side of the *Caput Gallinaginis.*

Q. What ORGANIC DERANGEMENTS affect the *Spermatic cord?*

A. Scirrhus, varicose veins, and dropsy.

Q. What is the situation of the VESICULAE SEMINALES?

A. They are placed obliquely on the inferior and posterior part of the bladder, their apices at the neck of the bladder nearly touch each other, but their bases recede from each other as they extend backwards. They have a flattened pyriform appearance, and are surrounded by much cellular substance.

Q. What is the *structure* of the Vesiculae Seminales?

A. Each of them is composed of a single Tube, much convoluted, and bulging out into irregular processes, which resemble cells; it has a strong coat of condensed cellular substance, and an internal mucous coat: and is covered and compressed by part of the Levator Ani Muscle.

Q. What is the *use* of the *Vesiculae Seminales?*

A. Various opinions have been entertained concerning their use: some have supposed that they secrete a fluid for diluting the semen, and facilitating its passage along the urethra; others, that this fluid was in some way useful in generation: but the most probable and most simple opinion is, that they are Reservoirs in which the semen is lodged after it has been secreted in the Testes, and sent thither until it be ejected in coitu or absorbed.

Q. Does any *mechanism of the Vessels* favour the last opinion?

A. Yes; the Vesiculae Seminales can be filled with a coloured injection when it is thrown into the Vasa Deferentia, without any of it passing into the urethra. The semen, therefore, in proportion as it is secreted, fills the seminal tubes of the Testicles, by its own stimulus is propelled along the Vasa Deferentia, and when it comes to the canals of the Vesiculae Seminales, it returns into them. This reflux of the semen, and temporary retention of it in the Vesiculae Seminales, is very similar to those of the Bile in the Cystic Duct and Gall-Bladder.

Q. Enumerate the Organic Derangements of the *Vesiculae Seminales?*

A. They have been found inflamed, scrofulous, scirrhous, terminating in a cul-de-sac, very small, and sometimes one wanting.

PHYSIOLOGY OF THE TESTICLE.

Q. Of what is the Semen composed?

A. Of the liquor of the Vesiculae Seminales, and the proper secretion of the testicle.

Q. What are the properties of the semen?

A. It is of a slightly opaline colour; it liquefies in a few minutes after ejection, it has a strong and peculiar smell, a saltish and slightly acid taste, and is composed, according to Vauquelin, of 900 parts of water, 60 of animal mucilage, 10 of soda, 30 of phosphate of lime; and when examined by the microscope, numberless small animals are seen floating through it, which have a round head, and a long tail, and which avoid the light, and fly to the shade.

Q. At what time does the secretion of the seed commence?

A. At puberty; the hoarseness of the voice, the appearance of the hair in certain places, the growth of the muscles and the bones, are intimately connected with the appearance of the semen; for if these organs be taken away, these changes do not take place.

In eunuchs, the timorous air, the beardless chin, the small larynx, and boyish voice continue: in their moral character they resemble women very much, and though they can never have children, yet their disposition to the indulgence of their passions with the other sex still remains.

Q. How is the erection of the male organ produced?

A. By the blood distending the Corpora cavernosa.

Q. What causes lead to this effect?

A. Mechanical excitements, as friction, venereal desires, fullness of the Vesiculæ Seminales, the use of certain aliments, and of certain medicines, certain diseases, and flagellation; of all causes the imagination acts the most rapidly: erection is generally followed by the discharge of a viscous fluid.

OF THE URINARY ORGANS IN THE FEMALE.

Q. In what does the *Urinary Bladder* of the *female* differ from that of the male?

A. It is generally larger and broader in proportion to the size of the pelvis.

Q. In what does the *female Urethra* differ?

A. In shortness, wideness, and straightness, being about two inches in length, and slightly bent.

Q. Has the *female Urethra* any *Prostate Gland?*

A. No; it has no gland, but is furnished with several Lacunae, which pour mucus into it in order to defend it from the acrimony of the urine.

Q. Enumerate the *External parts of the Female.*

A. The Labia Pudendi, Clitoris, Nymphae, and Vestibulum, or Fossa Navicularis.

Q. Describe the *Labia Pudendi.*

A. They extend from the Pubis to within an inch of the Anus; their upper part being covered with hairs on the pubis, is called *Mons Veneris;* they are thickest above, and becoming thinner below, terminate in a transverse fold, called the *fraenum* or *fourchette,* between which and the Anus is the Perineum.

Q. What is the *structure* of the Labia pudendi?

A. They are composed of the integuments elevated by much cellular substance and fat, and lined by a very thin vascular membrane, constantly moistened by the secretion of sebaceous follicles.

Q. Describe the *Clitoris.*

A. It is situated between the upper parts of the Labia, about an inch in length, and bound to the fore part of the Symphisis Pubis; it is very vascular and sensible, has two corpora Cavernosa, separated by a septum, and two crura twice the length of its body, which arise from the crura of the Ischium and Pubis; it has its Ligamentum Suspensorium and Glans, has no perforation like the penis; is covered by a continuation of the sensible delicate membrane of the Labia, and at its inferior part forms a fold, called *Preputium Clitoridis.*

Q. Describe the *Nymphae.*

A. They arise from the under and outer part of the clitoris, narrow from the prepuce of the glans, and are formed by a production of the inner membrane of the Labia; they run downwards along the inside of the Labia, increasing in breadth nearly for an inch and a half, and then suddenly diminish to their lower extremity at the Vestibulum.

Q. What is their *structure* and *use?*

A. The nymphae contain cellular substance, blood-vessels, nervous papillae, and sebaceous follicles between their layers, by which they are very sensible, and always well moistened. They lie close together, and cover the orifice of the Urethra and of the Vagina, and assist in directing the urine from the Urethra.

Q. What is the *Vestibulum,* or *Fossa Navicularis?*

A. It is the smooth depression between the Nymphae and Perineum; it leads to the Urethra above, and to the Vagina below.

Q. What is the precise situation of the *Orifice of the Urethra?*

A. Its orifice is in a direct line, about an inch down from the glans of the clitoris, between the Nymphae, situated in a slight spongy eminence projecting below, which is perforated by Lacunae of considerable size for lubricating its extremity.

Q. Describe the *Orifice of the Vagina?*

A. The external orifice of the Vagina is situated immediately under the Urethra, about half an inch below the symphisis pubis; it is surrounded and contracted by its corpus cavernosum, and its *sphincter* muscle; and generally in Virgins, two thirds of it are closed by a thin dense membrane called the *Hymen*, generally of a semi-lunar shape, placed next the perineum.

Q. Is the Orifice of the Vagina not partly contracted also by the *Carunculae Myrtiformes?*

A. Yes; in the posterior and lateral parts of the orifice are three or four little bodies, of the size of myrtle berries, supposed to be the remains of the ruptured hymen; they seem, however, rather to be corrugations of the inner membrane of the Vagina, for admitting of its dilatation, which is naturally rather contracted near the sphincter.

Q. What are the organic diseases of the *Labia Externa?*

A. The Labia are sometimes aedematous, and very large; are inflamed, adhere to each other, and leave no opening into the vagina, but a small one before for the discharge of urine; are sometimes affected with Erisipelas, which spreads rapidly; are ulcerated; Venereal excrescences, and Polypi grow from them: scrofulous and scirrhous tumours have their seat in them.

Q. What *Organic derangements* happen to the *Nymphae?*

A. They are sometimes so much elongated as to protrude beyond the Labia, and occasion inconvenience in walking.

Q. What Organic derangements is the *Clitoris* subject to?

A. It is occasionally so much enlarged and elongated as to be mistaken for a male penis : its enlargement is sometimes accompanied by induration, thickening, and cancerous ulceration.

Q. What are the *Organic derangements* of the *Hymen*, and *Carunculae Myrtiformes?*

A. The *Hymen* in some rare cases is so thick that it cannot be ruptured by the ordinary means ; it is sometimes imperforated, and retains the menstrual fluid behind it ; the *Carunculae Myrtiformes* are sometimes of an unnatural length, and occasion much uneasiness.

OF THE INTERNAL PARTS IN THE FEMALE.

Q. Enumerate the internal Organs of Generation in the female.

A. They are the Uterus and its appendages, viz. the Ovaria, Fallopian Tubes, Broad and Round Ligaments, and the Vagina.

Q. What are the *figure* and *dimensions* of the Uterus?

A. Its figure much resembles a pear, somewhat flattened, with its base or fundus uppermost, and its cervix below: the Uterus varies in size, becoming larger in women who have had children : in Virgins, however, it is about two inches and a half long ; one and a half, or at most, two inches broad at the fundus; one at the cervix, and about one inch in thickness.

Q. What is the situation of the *Uterus?*

A. It is situated in the unimpregnated state in the Hypogastric Region ; the anterior and inferior part of its body, and its cervix adhere firmly to the Bladder; and the posterior part of its cervix, to the Rectum, by cellular substance, and by the Peritoneum reflected over the bodies of both.

Q. To what parts is the *Uterus attached?*

A. To the bladder and rectum as we have just mentioned ; to the sides of the Pelvis by the Ligamenta Lata ; and to the external parts by the Vagina.

Q. Describe the *structure of the Uterus?*

A. Its external coat is smooth and polished, being a portion of the Peritoneum; under which is its muscular coat of compact structure, firmly connected by cellular substance; it is very vascular in its body and fundus; it is lined by a very soft vascular membrane, rather of a villous appearance; its cervix is contracted by numerous *rugae*, between which are many follicles for secreting mucus to lubricate the parts.

Q. Describe the *mouth of the Uterus*?

A. The lower part of the cervix projects into the Vagina, something similar to the Glans penis, and is perforated by a transverse slit, called *Os Tincae*, a little larger in a Virgin than the orifice of the male urethra, but much larger in a woman who has born children. The *Os Tincae* is formed by two thick lips, the anterior of which is the larger, hangs farther down, and gives it an oblique direction backwards.

Q. Describe the Broad Ligaments of the Uterus?

A. The Peritoneum, after giving a coat to the Uterus, is reflected forwards upon the bladder, and backwards over the rectum; it then passes laterally from the edges of the Uterus, and upper extremity of the Vagina, to be fixed to the sides of the Pelvis, thus forming the *Broad Ligaments* by its doubling.

Q. What *purposes* do the *Broad Ligaments* serve?

A. They, together with the Uterus, divide the Pelvis into an anterior and a posterior cavity: they attach the edges of the Uterus to the sides of the Pelvis; support the Round Ligaments, its blood-vessels, lymphatics, and nerves between their layers; contain and support the Ovarium on either side in their posterior layer, and the Uterine or Fallopian Tube in their anterior ala, or layer.

Q. What is the situation of the Uterine or Fallopian Tubes?

A. These Tubes are connected with the corners of the fundus of the Uterus, open into it by a very small perforation, and pass laterally in the duplicature of the Broad Ligaments towards the sides of the Pelvis.

Q. Describe the *Fallopian Tubes*?

A. These Uterine Tubes begin small near its fundus, are about three inches in length, a little curved, become larger and convoluted; but near their extremity they are suddenly contracted and terminate by open mouths, which can contain a goose-quill; their extremity is free, loose, and fimbriated. They are lined by a soft pulpy membrane converted into many small longitudinal plicae.

Q. What Organic Derangements affect the *Fallopian Tubes*?

A. Inflammation; obstruction from adhesion of their sides; dropsy when both ends are shut; an ovum inclosed by its proper membranes has been found lodged in the Tube; the Tube has been found to end in a cul-de-sac; and tumours grow from their outside.

Q. What is the situation of the Ovaria?

A. The Ovaries are situated in the posterior layer of the broad ligaments, one on either side of the fundus, about an inch from the Uterus.

Q. Describe the *figure* and *size* of the *Ovaria*?

A. The Ovary is somewhat of the figure of the Testicle, but rather less in size, is placed transversely, is largest in the prime of life, becomes smaller and shrivelled in old age.

Q. What is the *structure* of the *Ovaria*?

A. They have an external coat from the peritoneum, and a dense cellular coat, within which is a complicated intermixture of vessels and nerves, very much resembling a glandular structure, and a number of small vesicles, called Ova, containing a limpid fluid.

Q. In what do the *Ovaria* of a woman, who has never born children, differ from those of one who has?

A. In a woman who has never been impregnated, the surface of the Ovaria is smooth and uniform; but in the Ovaries of a woman who has had children, a cavity is found, called Corpus Luteum, from which the impregnated ovum had escaped; and these Corpora Lutea have been found to correspond with the number of impregnations of the same woman.

Q. From what part of the Uterus do the ROUND LIGAMENTS arise ?

A. They arise, one on each side, from the corners of the fundus of the Uterus, before and rather below the Fallopian Tubes, they descend obliquely, becoming rather smaller in the Ligamenta Lata.

Q. What are the *course* and *termination* of the *Round Ligaments?*

A. They pass along the Broad Ligaments to the sides of the pelvis, pass through the abdominal apertures or Rings, as the Spermatic Cords do in the male, and are afterwards divided into a great number of branches, which terminate upon the Mons Veneris, sides of the Pudendum, and groins.

Q. What parts compose the *Round Ligaments?*

A. The Round Ligaments are of a pale red colour, composed of strong longitudinal ligamentous fibres, blood-vessels, nerves, and cellular substance interposed.

Q. What is the *use* of the Round Ligaments ?

A. They seem to assist the Ligamenta Lata, to give the proper inclination to the Uterus forwards in pregnancy, and to direct its ascent before the intestines.

Q. Do the *Round Ligaments* increase in size and length as the Uterus rises in pregnancy ?

A. Yes ; they are augmented in the same manner as the other parts of the Uterine system are.

Q. What is the *situation* of the VAGINA ?

A. The Vagina is situated at the under and posterior part of the bladder and urethra, before the rectum, to all which it is firmly connected by cellular substance: it reaches from the Pudendum to the cervix of the Uterus, extending higher up at the posterior than the anterior part. It is slightly curved.

Q. What is the *structure* of the *Vagina?*

A. It is a thick, strong, membranous canal, having numerous rugae on its anterior and posterior internal surface, which diminish its diameter; and also many nervous papillae, which give it great sensibility. Between the rugae a great number of mucous follicles is situated for moistening the canal. The external end of the vagina is covered on each side by a substance composed of blood vessels and cells, similar to those of the Penis, called *plexus retiformis*, or *corpus cavernosum Vaginae;* which corpora are compressed by the sphincter vaginae, and tend very much to contract the orifice, and to increase the sensibility of the parts during coition.

Q. What ORGANIC DERANGEMENTS have been found in the *Vagina?*

A. Inflammation; adhesion of its sides; ulcers; scirrhous tumours; deficiency in length or width; too wide, being preternaturally stretched by tumours or polypi; and inversion from procidentia Uteri.

Q. What ARTERIES are sent to the UTERUS?

A. The *two Spermatics*, which are sent off from the Aorta; and the *two Uterine* Arteries, from the Internal Iliacs. The former are dispersed upon the Ovaria, Fallopian Tubes, and Uterus near its fundus; the latter much larger than the former, run to the under part of the Uterus, send branches to the Vagina, and bladder, and are reflected upwards along the edges of the Uterus towards its fundus. They are all very tortuous in their course, and anastomose most freely with each other.

PHYSIOLOGY OF THE UTERUS.

Q. What is the usual period of menstruation?

A. Four weeks; in some few women fifteen days; in others two months, and in others it comes on at irregular seasons.

Q. What are the symptoms that precede menstruation?

A. Lassitude, pain in the breasts, pricking in the skin; sometimes there are no premonitory symptoms.

Q. What is its most general quantity?

A. In from one to three days are discharged four, five, or six ounces; to this, there are exceptions; it amounts to several pounds in some ; in others hardly a few drops of almost colourless fluid, are discharged at different times in the same day.

Q. What is the state of the system during menstruation ?

A. It is extremely susceptible of fear and of anger: the state of the system has a great effect upon the prevailing symptoms during the discharge ; the quality of the latter, its regularity or its irregularity, and its duration, are also much altered by the state of the health.

Q. What part of the uterine system furnishes the menstrual blood ?

A. The internal surface of the womb, as appears from dissection. When the womb, or the general system is out of order, other parts perform this function ; as, the eye, the stomach, the lungs, the surface of sores and different points of the skin.

Q. At what period does this secretion usually make its appearance ?

A. Sooner in hot than in cold countries: it generally appears at thirteen or fourteen in this climate, and disappears at fifty.

Q. How are the menses connected with conception ?

A. The power of conception generally ceases with the disappearance, and commences with the first appearance of the menstrual flux; though this is not universal, as women have conceived both before the appearance, and after the disappearance of the menses, and some, who have never menstruated, have notwithstanding borne children.

Q. In what respects is the *Uterus changed by pregnancy?*

A. It receives a new stimulus, by which it becomes enlarged, in proportion to the growth of the Ovum, Embryo, and Foetus: its mouth, immediately after conception, is sealed up by a ropy mucus, and its internal surface forms the membrane, called Decidua, or spongy Chorion. The menstrual flux is stopt,

Q. Are the parietes of the uterus thinner in consequence of its enlargement?

A. No; the increased action of the arteries deposits new matter sufficient for the increase of all its parts without any diminution of the size or thickness of their texture.

Q. Do the *arteries* and *veins* become less tortuous by the enlargement of the Uterus?

A. No; they increase in size, and retain their tortuous course in proportion to the increase of the Uterus.

Q. Is the enlargement of all the parts of the Uterus owing to the deposition of new substance?

A. Yes; particles of new matter are deposited sufficient for the growth of all its parts.

Q. By what means is the enlargement of the Uterus diminished after the birth of the foetus?

A. By *Absorption*, and by the *Lochial Discharge*, which gradually removes the great determination and influx of blood to the Uterus, and reduces it to its usual size.

Q. How is fecundation effected?

A. This is one of the mysteries of nature; some of the circumstances under which it takes place are known, but these only certainly in the lower animals: Spallanzani, for instance, has proved that three grains of seed, put into two pounds of water, communicate to it the fecundating power, which is entirely independent of the animalcules floating in it, and also of the halitus of that fluid.

Q. Is there any thing certain in the symptoms, which are said to precede fecundation, such as universal starting, dull look of the eyes, dilated pupils, pale visage?

A. They sometimes occur, but are by no means universal.

Q. What changes take place in the ovary on fecundation?

A. Its vessels increase in size, its exterior membrane becomes thicker, changes from a grey to a yellow colour within from 24 to 30 hours after a successful coition. It is then called the corpus luteum: the vesicle enlarges the second, third and fourth day; the corpus luteum grows in the same proportion, and contains in its areolæ a white liquor, resembling milk; at the end of that term the vesicle breaks the external coat of the ovary, and hangs by one of its sides; in the bitch it is of the size of an ordinary hazel-nut: the corpus luteum remains in the ovary and contracts gradually and slowly.

Q. How is it conducted to the womb?

A. The ovum is received by the fringed extremity of the fallopian tube, and conducted to the uterus; the tube enlarging as the ovum passes along, and contracting afterwards. In women, it is thought that the ovum does not arrive at the womb before the twelfth day.

Q. What changes take place in the womb after fecundation?

A. The egg unites to the sides of the uterus and gradually grows larger, the womb changing its form, and enlarging accordingly.

Q. What are the stages of this enlargement?

A. In the three first months, it is confined to the pelvis; it then is so large that it passes into the hypogastrium, gradually growing larger till the end of the ninth month, and displacing all the viscera: the neck of the womb is little changed during all this time, its neck preserving its conoid shape; but next, the neck diminishes in length, opens and is effaced almost entirely, the womb assuming a shape resembling that of an egg, and is about twelve times as great as when completely empty.

The uterus is drawn forward by the round ligaments which are put upon the stretch; the ovaries fall by its side; the abdominal parietes are distended and present on the surface of the skin streaks, after two or three pregnancies. The womb becomes more lax in its texture, has a red color, and is considerably spongy: its fibrous texture is more evident; the interior surface has a membrane which is very adherent to it, and is called by Mr. Hunter, the deciduous membrane; and is intended to favour the adhesion of the ovum to the sides of the womb. The arteries of the womb grow larger, and also the veins, and the lymphatics.

Q. What changes take place in the system of the female?

A. The eyelids look swelled and bluish; the countenance is discolored; the perspiration has a peculiar odour; the face is pale, with disgust for particular kinds of food; constant nausea, headache, sometimes loss of sleep occur; sometimes terrible diseases cease, the delicate and valetudinary becoming healthy; the mind is dispirited, easily alarmed and affected by melancholy impressions: pregnancy is also attended with spasms of the extremities, swelling of the veins, with costiveness and difficulty of making water.

Q. What is the progress of the ovum at different periods?

A. In the course of the second month, it begins to grow and to send forth vessels which are implanted in the deciduous membrane. In the third month one side only of the ovum is seen, the remainder of it has become thicker and larger, and is implanted in the caducous membrane, forming the placenta: the remaining surface of the ovum, presents a soft caducous reflected membrane called the reflected decidua: it enlarges till birth, its two membranes thickened and more resisting: the outer called the chorion, the inner the amnios, inclose a fluid composed of water, albumen, soda, muriate of soda, and phosphate of lime: this fluid increases in quantity as the ovum increases in size.

Towards the end of the third week, there is perceived on the side of the ovum, which is transparent, a slightly opaque gelatinous substance, homogeneous in all its parts, adhering to the side of the womb: immediately two vesicles united by a pedicle, and nearly equal in size, of which one is adherent to the amnios by a small filament, appear: one of these is the embryo. In its middle appears a red point with yellow fibres; this is the heart: at the beginning of the second month, the head becomes visible, the eyes form two large black points, small openings shew the place of the ears, and the nostrils; the mouth, already very large, becomes smaller, by the formation of the lips, about the 60th day. It increases till about the middle of the fourth month, when it ceases to be called by the name of embryo, and assumes that of fœtus till delivery.

PATHOLOGY OF THE ORGANS OF GENERATION.

MATRITIS.

Q. What are its symptoms?

A. Obtuse pain and sense of bearing down in the hypogastric regions, sometimes joined to an obscure swelling or circumscribed tumour of the part; the last only occurs when the body of the viscus is inflamed. The pain, which is augmented by pressure, soon extends to the loins, perineum, pudendum, and superior part of the thighs; add to these a sense of weight about the rectum, frequent desire to pass urine and stools, and often also constipation and dysuria. When the inflammation occupies the neck of the uterus, it becomes extremely hard and tumefied, and acutely sensible to the slightest touch; it is contracted on itself, and its temperature is considerably augmented; a reddish liquid flows from the vagina, being preceded by colic and pains in the lumbar regions; the breasts are in general retracted and painful. In chronic hysterics these different symptoms are lighter, and there is usually an habitual flow of matter, sometimes very fetid, from the vagina. It may be confounded with catarrh of the uterus, or with scirrhus of that organ.

Q. What are its anatomical characters?

A. Augmentation of the size of the uterus, at least if death occur a few days after delivery; its walls are swelled, softened, and gorged with blood, and, in some instances, it is infiltered with purulent matter.

CANCER OF THE UTERUS.

Q. What are its symptoms?

A. Irregularity of menstruation, sometimes alarmingly abundant discharges, sense of pain and bearing down in the hypogastrium, tenesmus, dysuria, and wandering pain of the breasts: to these in a short time succeed acute lancinating pains in the neck of the uterus, uneasy sensations in the loins, hips, and hypogastrium; an abundant fetid fluor albus, or discharge of sanious matter through the vagina. If at this period the finger be introduced into the vagina, the neck of the uterus is found to have become softened over all its extent, or only in particular parts, the intervening portions appearing hardened. Its orifice is more open than natural, and of irregular form; upon pressing the os tincæ, a sanious or sanguinolent liquid escapes, and a flow of this matter is soon established; as the disease proceeds, the lancinating pains become more frequent and intense; the neck of the viscus becomes irregular, fringed, painful, and bloody, and if the disease be seated in the body of the womb, it evidently acquires an increase of size, which may be perceived externally; pressure on the hypogastrium augments the pains, which are then extended to the groin, thighs, lumbar and sacral regions. The examination of the neck of the uterus by means of the speculum, invented by Professor Recamier, gives us a certainty as to the nature of the affection, even in the very commencement: hence we should always have early recourse to it. It may be confounded with chronic matritis, scirrhus, or some forms of leucorrhæa.

Q. What are its anatomical characters?

A. In the greater number of cases, cancer commences in the neck of the uterus, more rarely in its internal surface. In the greater number of instances, the cancerous or cerebriform matter which constitutes the disease, or both united, are interiorly blended with the substance of the viscus; in other cases we only meet with an ulceration of its tissue, the ulcer appearing studded with fleshy vegetation, irregular, and reddish, or whitish, or covered with a fungous matter, or a kind of putrescent substance, varying in colour, and extremely fetid. When the body of the organ has not been destroyed, we find its structure perfectly healthy at some lines distant from the surface of the ulcer; its volume is not augmented in this case, but its internal surface is livid, tumefied, and discoloured. If, on the other hand, the ulcer first commences in the interior of the womb, its size is greatly increased, and the fungous matter which covers the ulceration is extremely thick; the os tincæ appears livid, blackish, tumefied, and converted into a lardaceous substance. The superior part of the vagina and the appendages of the uterus often participate in the disease, and are disorganized.

FIBROUS TUMOUR OF THE UTERUS.

Q. What are its symptoms?

A. A tumour varying in size, round, and slightly furrowed, which may be perceived by the touch; heaviness and dull pain in the loins, hypogastrium, and superior part of the thighs, frequent hæmorrhage, various irregularities or suspension of menstruation.

It may be confounded with cancer of the neck of the uterus.

Q. What are its anatomical characters?

A. These tumours are attached to the internal surface of the uterus, or to its neck—they are formed from a collection of whitish fibres, closely united, and are very firm and extremely tenacious, much more flexible than cartilage, but less so than cellular substance.

MENORRHAGIA.

Q. What are its symptoms?

A. An abundant flow of liquid or coagulated blood through the vagina, occurring continually or at short intervals, and accompanied with a sense of weight in the hypogastrium, loins, and thighs, and with painful contractions during the expulsion of the blood. It may be confounded with cancer, polypi, or fibrous tumours.

Q. What are its anatomical characters?

A. Redness and tumefaction of the lining membrane of the uterus; in other cases polypi, fibrous tumours, and other organic affections of this viscus are discovered.

ENCYSTED DROPSY OF THE OVARIES.

Q. What are its symptoms?

A. A partial tumour of the abdomen, occupying one side of the hypogastrium, or both, if the two ovaries be conjointly affected, proceeding slowly, and in general co-existent with some irregularity in menstruation; a sense of fluctuation in the tumour, which is not displaced when the patient changes position. It may be confounded with tumours developed in the pelvis.

Q. What are its anatomical characters?

A. A cellular or fibro-cellular cyst is usually found in the ovarium, containing a limpid citrine serosity, and in some instances a greater or lesser number of hydatids.

CATARRH OF THE UTERUS.

Q. What are its symptoms?

A. Slight itching of the pudendum and vagina, sometimes extending to the uterus, and accompanied by a discharge of a serous limpid liquid which progressively becomes more and more consistent, and assumes a green or yellow, and finally a white colour; from this period it begins to decline, and the urine in its passage ceases to give pain. The mucous membrane of the labia and vagina is red and tumefied, and the patient complains of pain in the groin, perinæum, and hypogastrium, and of scalding during emission of urine. When the affection is chronic, there is but little pain about the genital organs, and the discharge is abundant and lasting, or only occurs for a few days after the menses: it is accompanied, in such cases, by pain of the loins and thighs, by languor, by irregularities in digestion, and by a gnawing sensation in the stomach. It may be confounded with chronic matritis, or cancer of the uterus.

Q. What are its anatomical characters?

A. Redness, more or less evident, of the lining membrane, which in some instances appears rather thicker than in its healthy condition. In the chronic complaint, the membrane presents no marks of redness, but is occasionally covered with fungous vegetations.

INFLAMMATION OF THE TESTICLE.

Q. What are its symptoms?

A. This affection often arises from the suppression of acute or chronic gonorrhœa. It begins with a dull pain in the epididymis, which soon increases, extends to the testicle, and causes a swelling and enlargement of it. The pain becomes very acute, extends up to the loins, following the course of the spermatic cord, which is often sensible to the touch, and swollen; the scrotum frequently becomes inflamed, and increases the size of the tumour.

The diseases with which it may be confounded are hydrocele and sarcocele.

Q. What are its anatomical characters?

A. The testicle, and particularly the epididymis, is swelled, red, and increased in density; in some cases these parts have passed into the state of suppuration.

OF THE PLACENTA.

Q. Describe the Placenta?

A. It is composed of Arteries, which proceed from the Uterus in a tortuous manner, and terminate in cells of the Placenta. Veins receive the blood from the cells, and carry it back to the Uterus: these are termed the *Maternal Vessels:* they are on the side of the Placenta next the Uterus. The two Umbilical Arteries of the Foetus enter the Placenta by the cord on the Foetal side, divide into minute branches, which are distributed through the whole Placenta, and spread their terminations around the cells, into which the maternal blood is poured, without having any direct communication with them. The extremities of the Umbilical Vein receive the Foetal blood from the Arteries, and carry it back to the Foetus.

Q. Is the *distribution* of the arteries of the Foetus around the cells of the Placenta, similar to that of the Pulmonary Artery round the air cells?

A. Yes, very similar; the extremities of the Umbilical Arteries being very minute, are dispersed around the maternal cells of the Placenta, just as those of the Pulmonary Artery are around the Air Cells of the Lungs: and the extremities of the veins communicate with those of the arteries in both cases.

Q. Is any *change produced upon the blood* of the Foetus in the Placenta?

A. Yes; the *Placenta* to the Foetus in Utero seems to perform the same important function, as the Lungs do to the Adult, namely, *to purify the blood*, and thus to render it fit for the purposes of nutrition and growth of parts in the Foetus.

Q. What, besides the Maternal and Foetal Vessels, forms the substance of the Placenta?

A. Fine cellular substance completely destitute of fat is interspersed among them, supports them in their relative situations, and gives to the Placenta its necessary firmness and tenacity.

Q. What are the Organic Derangements of the *Placenta?*

A. It is occasionally ossified in certain points, and adheres firmly to the Uterus after the birth of the child. It has been found in some rare cases to have been converted into a mass of Hydatids.

OF THE PECULIARITIES OF THE FOETUS.

Q. In what do the bones of the Foetus differ from those of the adult?

A. They are generally soft, yielding, and often imperfect. Those of the head are joined by membrane, which admits easily of an alteration of form in facilitating parturition.

Q. Do the *Fluids* abound in the Foetus?

A. Yes; they are much more copious in proportion than in after life.

Q. Is there any difference in its *Nervous System*?

A. Yes, the Brain, Spinal Marrow, and Nerves of the Foetus, are proportionably larger and softer.

Q. Is there any difference in the *Glands*?

A. The *Thymus* Gland is larger in the Foetus, and seems to act some important part in its system: the Liver is very large, and indeed all the glandular organs.

Q. Is there any difference in the *Lungs*?

A. The Lungs of the Foetus in Utero are small, collapsed, and sink in water, and are of a dark red colour.

Q. What difference is there in the blood vessels of the Lungs?

A. The Pulmonary Artery divides in the Foetus, as in the adult, into a right and left branch sent through the respective lungs of the thorax: at its division in the Foetus, however, the *Ductus* or *Canalis Arteriosus*, larger than both the other branches, arises, passes obliquely over, and terminates in the Aorta, where it begins to descend: it forms nearly one half of the Aorta.

Q. In what does the *Heart of the Foetus* differ from that of the adult?

A. In having the *Foramen Ovale* in the back part of the septum between the Auricles; it has a thick muscular margin; upon the side of the foramen next the left Auricle, a membranous valve is placed, which allows the blood to flow through the foramen into the left Auricle, but prevents its return.

Q. What purposes do the *Canalis Arteriosus* and the *Foramen Ovale* serve ?

A. As the lungs are in a collapsed state in the foetus, a small quantity of blood only can circulate through them, the Canalis Arteriosus therefore transmits the remaining quantity, sent into the pulmonary artery, directly into the descending Aorta ; while a large part of the blood sent to the heart by the Venae Cavae, flows directly through the Foramen Ovale into the left Auricle.

Q. How is the *Circulation equal* in both sides of the Heart by these means ?

A. For the sake of demonstration, let us suppose that a *third part* of the blood flows directly through the Foramen Ovale at every dilatation of the Auricles, and that *two thirds* are propelled by the contraction of the right Auricle into the right Ventricle, and thence by its contraction into the pulmonary artery, which transmits *one third* through the Lungs, and the Canalis Arteriosus carries the remaining *third part* into the Aorta. The pulmonary Veins carry the *one third* circulating through the Lungs into the left Auricle, which by its contraction propels this third, together with the *other third* part which passed through the Foramen Ovale, into the left Ventricle. Each Ventricle therefore receives exactly *two thirds ;* and by this construction of parts, the same quantity of blood circulates through both sides of the heart in a given time.

Q. What difference do we find in the *Liver of the Foetus* from that of the adult ?

A. The Liver of the Foetus is so large, that it occupies the right and left Hypochondric, and the Epigastric Regions. It receives the blood from the umbilical vein. This vein returns the Foetal blood from the Placenta, is twisted round the Umbilical Cord, together with the arteries, enters the abdomen by the umbilicus, passes in the posterior and inferior duplicature of the Broad or Suspensory Ligament to the Porta of the Liver, and there sends off a pretty large branch, called *Ductus Venosus*, which runs in a waving direction to the left Vena Hepatica, where it enters the Cava and terminates; while the trunk of the Umbilical Vein itself terminates in the left branch of the Vena Portae, which is distributed through the left lobe of the Liver.

Q. What is the *use of such a distribution* of the Foetal Blood in the Liver?

A. By such distribution, nearly a half of the blood of the Foetus, which has been purified in the Placenta, is sent by the Ductus Venosus directly to the Vena Hepatica, which soon joins the Vena Cava, or to the Cava itself, to be transmitted to the Heart, and whole system; while the other part of the Foetal blood circulates through the left Lobe of the Liver, and perhaps throws off some other impurities to be discharged with the Bile into the Intestines, before it is sent to the heart again to circulate through the system.

Q. In what do the *Intestines* of the Foetus differ?

A. They are filled with black green, tar-like, viscid faeces, called *Meconium.*

Q. In what do the *Kidneys* of the Foetus differ from those of the adult?

A. They are irregular and lobulated on their surface; each lobule consists of a Cortical and a Medullary part, has its Papilla, and is covered by its proper membrane or coat: while their surface becomes smooth in the adult.

Q. Do the *Renal Capsules* or *Glands* differ?

A. They are large in the Foetus, and nearly equal to the size of the Kidneys.

Q. Does the *Urinary Bladder* of the Foetus differ from that of the adult?

A. It is of a longer form, rises nearly to the Umbilicus, and has the *Urachus* of a conical shape and solid consistence as a ligament, arising from its fundus between the umbilical arteries, and between the Peritoneum and linea alba, and extending to the Umbilicus, where it disappears in the umbilical cord.

Q. What difference takes place in the *Iliac Arteries?*

A. The common Iliac Artery of the Foetus divides into a small external, and a large internal branch on each side; the principal part, being the trunk of the Internal Iliac, is reflected upwards by the side of the Bladder on each side; on the outside of the peritoneum both Arteries perforate the Umbilicus, and are entwined in the Umbilical Cord.

Q. Is there any difference in the *Pelvis* of the Foetus?

A. It is very small, and its Viscera seem contained in the cavity of the abdomen.

Q. Is there any difference in the *Female Organs of Generation?*

A. The prepuce of the Clitoris is much larger; and in consequence a female has sometimes been mistaken for a male.

Q. What difference is there in the *Male Organs of Generation?*

A. The Testes, in the early months, are lodged in the Abdomen on the Psoae muscles a little below the Kidneys; between the Testicle and Scrotum on each side a fibrous vascular conical substance is extended, called Gubernaculum Testis, which is supposed to make way for the descent of the Testis, and to direct its course into the Scrotum, which happens about the seventh or eighth month of pregnancy. The Testes carry down with them their Coats, Vessels, and Nerves.

Q. State as shortly as possible the *Foetal Circulation of the blood in the Thorax,* beginning at the Vena Cava?

A. From the termination of the Cavae, a part of the blood is sent through the Foramen Ovale into the left Auricle, and the two parts retained in the right Auricle are propelled by its contraction into the right

Ventricle; which again by its contraction throws these two parts into the Pulmonary Artery, one of which it transmits through the Lungs, the other is carried by the Canalis Arteriosus directly to the descending Aorta. That part of the blood sent through the Lungs is collected and brought to the left Auricle of the Heart by the Pulmonary Veins; this part and that sent directly through the Foramen Ovale, making two, stimulate the left Auricle to contraction, by which they are propelled into the left Ventricle, which by its contraction throws them into the Aorta and systemic arteries.

Q. State also the *Foetal Circulation of blood in the Abdomen*, beginning at the Iliac Arteries?

A. The larger branches of the Internal Iliac Arteries, reflected upwards, pass out of the Abdomen by the Umbilicus, are entwined in the Umbilical Cord, enter the Placenta, are minutely divided into branches in its substance, and ultimately terminate around the innumerable Cells in which the mother's blood is contained. With the extremities of these Arteries Veins communicate, receive their blood, join again and again into larger and larger trunks, till at last they form one, the *Umbilical Vein*, which comes out of the Placenta where the arteries enter, is entwined along with them in the Umbilical Cord, enters the Abdomen at the Umbilicus, passes up to the Porta of the Liver, where it sends off the Ductus Venosus, which terminates in the Hepatic Vein just before it ends in the ascending Vena Cava, or sometimes in the Vena Cava itself: the Umbilical Vein afterwards terminates in the left branch of the Vena Portae, which is dispersed through the left lobe of the Liver, and the Hepatic Veins carry its blood to the Inferior Cava and Heart.

Q. Do the Blood vessels of the Foetus communicate with those of the Mother in the Placenta?

A. No; they have no direct communication; they do not anastomose; in some very rare instances a small branch or two may pass between the Maternal and Foetal vessels, but it is by no means a common occurrence.

Q. What is the result of injecting penetrating odorant substances into the blood vessels of the mother?

A. After a time they are perceived in the vessels of the foetus; the effect of purges taken by the mother on the child proves their absorption. As it is demonstrated that alcohol is absorbed into the blood vessels in its natural state, there can be no doubt but that the effect is the same upon the child as upon the mother, as also are all kinds of diet prescribed with a medical intention. There is therefore a communication between the blood of the mother and that of the foetus: whether on the contrary the blood of the foetus is conveyed back to the mother is not ascertained. Magendie states that no effect is produced upon the mother from the injection of poisonous substances into the umbilical cord, towards the placenta. The heart of the foetus is therefore the principal cause of the motion of the blood in its body.

PHYSIOLOGY OF THE FŒTUS.

Q. From what *source* does the *Foetus in utero* derive its *nourishment?*

A. Various opinions have been entertained on this subject, such as the nourishment of the Foetus being received from the mother's blood by a direct communication of the vessels of the mother and child: or by absorption from the blood of the cells by the veins of the Placenta: or from serum secreted into the cells and absorbed by Lymphatics of the Placenta and Umbilical cord: or from the Liquor Amnii being swallowed: but, it seems probable, that a nutritious quality is received from the blood of the mother, by the minute extremities of the Umbilical Vein spread round the cells of the Placenta, and conveyed to the blood of the Foetus; from which the Arteries form, and deposit proper nourishment in every part of the Foetal system.

Q. What appearances are observed in the stomach of the Foetus?

A. It contains a viscous, very acid, gelatinous fluid, which forms a sort of chyle, and from which is formed the meconium in the lower bowels: as hairs similar to those of the skin of the foetus are discovered in its stomach, there can be no doubt but that the substance swallowed is the liquor of the Amnios.

Q. What is the probable use of this function in the stomach?

A. The nourishment of the foetus. As in the case of foetuses without stomachs, the skin or some other part may assist in supplying the food, and thus support the system, these instances cannot be brought to invalidate the explanation.

Q. Is chyle or lymph discovered in the thoracic duct of animals in the foetal state?

A. Magendie says not.

Q. Do there exist exhalations in the internal cavities of the foetus?

A. There do, as in adults.

Q. Do the other secretions also go on in the foetal state?

A. The mucous and cutaneous follicles possess great activity, and the glands of digestion are also fully developed from the seventh month.

PATHOLOGY OF THE FOETUS.

Q. Enumerate some of the causes of disease in the foetus.

A. The physical and moral state of the mother is communicated to the foetus: if the nourishment taken be sufficient and wholesome, the foetus is affected in a correspondent manner: if she is terrified, the foetus is suddenly killed or becomes weak and emaciated. Fractures, dropsies, the smallpox, the venereal disease, gangrene, ulcers, cutaneous eruptions, are some of its maladies.

Q. Are there any other bodily defects in the foetus?

A. Yes; different parts of the body, as the stomach, the lungs, the head, the heart, are entirely wanting; sometimes parts exist in greater numbers than natural.

EXAMINATION OF THE GENERATIVE SYSTEM.

Q. Does the mode of investigating the different symptoms induced by diseases of the generative organs, differ in the two sexes?

A. It does: in man the parts affected can be viewed, hence the observer has only to describe what he sees; but he ought to pay particular attention to the cause which has produced the disease. We shall, for the present, merely refer the reader to the part of this work which gives the symptoms and characters of each of these affections; as to those which are connected with the generative system in females, they are more complex, and require more particular attention.

The best means of examination is the touch, which enables us to ascertain the state of the vagina, uterus, and adjacent cellular texture.

The touch consists of introducing into the vagina one or more fingers, while the other hand is placed on the abdomen, for the purpose of ascertaining the state of the uterus and its connexions.

It may be performed as follows: the bladder and rectum being previously unloaded of their contents, the physician proceeds to examine the uterus, the patient standing or laid on her back, according to circumstances; she should stand up when it is intended to examine a case of relaxation of the vagina, prolapsus uteri, or, in a word, any affection in which it is necessary to estimate the weight and mobility of the uterus: she should be lying on the back in order to have the state of the ovaria ascertained, or any other disease besides those just mentioned. In this latter case, the patient's head should be supported by pillows, so as to be raised above the trunk, the legs should be semi-flexed, in order to relax the abdominal muscles. The index finger of the right hand is most usually employed, and if the patient be standing, the physician kneels on the opposite (the left) knee. When the finger touches the neck of the uterus, pressure should be made with the other hand placed on the abdomen, so as to force down the uterus, which is felt as a hard and somewhat moveable body.

Q. Describe the Uterus in the healthy state?

A. The neck of the uterus somewhat resembles the extremity of a cylinder slightly flattened from before backward; it projects more posteriorly than anteriorly; its centre is marked by an oval aperture, whose longest diameter is from side to side; in females who have had children, this is from five to eight lines long, in the adult virgin it is about three. As this opening is placed nearer to the posterior than anterior part of the neck, it causes the anterior lip of the os uteri to appear somewhat thicker. The portion of the neck which projects into the vagina is about four or five lines anteriorly, and a little more posteriorly; its thickness from side to side is from eight to ten lines, and from before backwards from six to eight, as the neck is somewhat compressed in that direction. In women who have borne children, the neck is thicker, more rounded, and the orifice is more open; its margin uneven and puckered, sometimes presents one or two depressions, particularly at the left side. The neck of the uterus is about an inch in length, but it may be much more, which may lead to mistake, unless attention be paid to the projection formed by the two lips of the orifice, which will distinguish this from any of the tumours developed in the uterus.

Q. Describe it in disease?

A. The observer should examine whether there is any hardness at the neck of the uterus, or in its vicinity: if there be a tumour, whether it is hard or soft, is attached by a broad base, or slight pedicle: whether the orifice is dilated, giving passage to a tumour, foreign body, polypus, fungus, &c.: or whether it contains a fluid accumulated in it, as occurs when the menstrual flux is retained: this may be ascertained by the fluctuation. The size and weight of the body should be ascertained, also the length of the neck, the state of the os tincæ, its sensibility and temperature, which is sometimes increased, as in hysteritis. The nature of the fluid by which the finger may be stained should not be overlooked, whether it is blood, pus, sanies; what its colour is, &c. The touch will also ascertain the existence of spasm of the vagina, or its sphincter, and the consequent accumulation of menstrual blood, or mucus; it will distinguish tympanitis of the intestine from that in the uterus, ascites from uterine or ovarian dropsy, prolapsus of the vagina, or matrix from hernia, and anteversion from retroversion of the organ: and in some instances, the diseases which occur in the cellular tissue surrounding the vagina and rectum: in this last case, it becomes necessary to introduce the finger into the anus also.

We cannot conclude these remarks without recommending to the notice of the reader the *speculum uteri*, constructed by M. Recamier some years since. By means of it we can correct the errors and remedy the deficiencies of the touch, and gain a view of parts that seem totally removed beyond the reach of inspection.

Q. What phenomena are necessary to be attended to in discovering the diseases of the womb?

A. After having examined the state of the organ itself, the inquirer should proceed to investigate the sympathetic phenomena to which its diseases give rise. The following are the points to which his attention should be directed: the pain the patient suffers, and its characters, whether it is pulsating, lancinating, &c.; its situation, and whether it is increased by pressure; whether any sense of weight is felt in the rectum, or painful contractions in the uterus; whether the pain extends to the loins, the region of the sacrum, &c.; whether the menses are more or less abundant than usual, or occur at irregular periods; the character of the evacuation, if it is pure, or mixed with some other fluid; the existence of any vaginal or uterine discharge, whether the patient has had children, or is pregnant at the present time; the existence of any tumours in the abdomen, their probable cause, and progress; if there be a fluctuation, whether the fluid changes place as the patient varies her position; the existence of retention or incontinence of urine, and finally, the state of the digestive function. To complete what has been here suggested on the examination of the abdomen, it remains only to say a few words on a peculiar state of that cavity, which sometimes occurs, namely its hardness. This condition sometimes arises from the intestines contracting adhesions with one another, or with the peritoneum lining the abdomen; in such cases pressure made on the parietes of the cavity will displace, to a greater or less extent, the contained viscera; this occurs in chronic peritonitis. The hardness, in other instances, is caused by tumours in some of its regions, and is then considerable, unless the contents are fluid, which may be ascertained by the fluctuation. These tumours should be examined with great care, to determine whether they pulsate; and if so, whether the pulsation is synchronous with that of the pulse. Each of the organs should be examined in detail as well as the functions which they perform, in order that the positive information supplied by the organ affected, may be strengthened by the negative evidence deduced from this investigation of the other viscera. This is frequently the only means we possess of removing the difficulties that beset the diagnosis of these obscure affections. The hardness is sometimes diffused generally, whilst the abdomen becomes excessively sensitive: then gentle pressure should be made on different parts to ascertain the degree of their sensibility, the heat of the skin, &c. The observer should enquire if the bowels be constipated, and examine the state of the pulse which is usually small, concentrated and frequent; vomiting sometimes occurs, this gives him occasion to look at the colour of the tongue, and at the same time note that it is broad at its extremity; finally, if the disease occurs in a female, it becomes necessary to ascertain whether she did not lately lye-in. These symptoms decide the complaint to be peritonitis. We shall now conclude these remarks by stating the phenomena furnished by percussion.

Q. Describe the effect of percussion.

A. It gives different results according to the parts to which it is applied. The sound emitted is sometimes like that of a drum, and indicates the presence of some gaseous fluid in the intestines or peritoneum. We can generally ascertain its existence in the latter situation, by placing a stethoscope on the part which gives the tympanitic sound, and then striking the abdomen gently with the nails, when a very clear sound is heard, the character of which is intermediate between the proper tympanitic sound, and that produced by striking an empty jar with the finger.

Percussion sometimes produces only an obscure or altogether dull sound ; in which case, if the abdomen be struck with one hand, whilst the other rests on an opposite point of it, the latter receives an impulse communicated by the fluid contained in the peritoneum.

In cases of effusion it becomes necessary to ascertain whether the fluctuation is sensible in every part of the abdomen, or is confined to some particular part of it, which is the sign of encysted dropsy.

If the abdomen gives at its most prominent part a tympanitic sound whilst the patient is lying down, and if, when he stands erect, the sound is dull in the depending parts, it indicates the existence of ascites, together with flatus in the intestines ; for these, by their greater lightness, occupy the higher situation, when the fluid by its gravity sinks to the lower.

But if when the dropsy is considerable, a fluctuation is perceived at the most prominent part of the abdomen, whilst at the sides, towards which the intestines incline, the sound is tympanitic, we may infer the existence of encysted dropsy.

Q. Recapitulate generally what has been said on the diseases of the abdomen.

A. In summing up the symptoms which characterize the diseases of the abdominal viscera, we see that they differ according to the functions with which these organs are connected; and therefore, that it is in the disturbance of these functions, that we are to seek for the means of distinguishing them.

Pressure is the first means which we ought to resort to, as by it we ascertain the seat of the pain, and the organ affected. The patient, however, sometimes feels it himself from the commencement of the attack, and points to its situation. Its degree and extent should next be ascertained, namely whether it extends over the cavity, or is confined to some part of it; the heat of the surface should at the same time be noted. Irritation of the stomach and transverse colon is marked by increased sensibility in the epigastrium, that of the liver by pain in the hypochondrium and right shoulder—that of the small intestines and mesenteric glands, by pain at the umbilicus—of the ascending and descending colon and kidneys by pain in the lumbar regions—of the ilium, cœcum, and ovaria in females after accouchement, by pain in the iliac fossæ—and that of the bladder, uterus and rectum by pain in the hypogastrium and perinæum, and by the propensity to make water, or go to stool: finally, peritonitis is marked by great sensibility all over the abdomen, increased by the slightest pressure, but this seldom exists to any such degree in inflammation of the digestive tube.

Again, the observer should attend to the state of the tongue, whether it is moist or dry, white or red, clean, or coated—the state of the digestion, and the symptoms, which indicate the various lesions of the alimentary canal—if there be vomiting, what is the nature of the matter—also the appearance of the alvine evacuations. Diarrhœa indicates irritations in the large intestine, whilst obstinate constipation furnishes grounds for suspecting the existence of peritonitis, concurrently of course with the other indications of this affection. He should ascertain whether the intestines are glued together, in which case by pressure on the abdomen they are displaced, as it were, "en masse:" this marks chronic peritonitis. When percussion indicates a fluctuation in the cavity, it then becomes necessary to attend both to the present symptoms and previous history, to determine whether it is an encysted dropsy or ascites; and if it be the latter, whether it is symptomatic of an affection of some organ in the abdomen or thorax, or depends on chronic inflammation of the peritoneum.*

Pressure will determine the presence in this cavity of a tumour; its seat will pretty nearly mark the organ affected, but not with positive certainty, for sometimes a viscus is drawn somewhat out of its place, and the pressure which it produces on the adjacent parts, by disturbing their functions, will render the diagnosis obscure.

Percussion will indicate the degree of consistence of these tumours, the sound being dull if they are solid, and clear and tympanitic if they be produced by an elastic fluid: finally, if the tumour pulsates, it will be necessary to determine whether the pulsation is produced by elevation of its whole mass, or by dilatation of its walls; if it be the latter, and also synchronous with the stroke of the heart, it is referrible to aneurism of the aorta.

When any local pain or particular symptom, any accidental discharge, or alteration in the state of the alvine evacuations, urine, or menstrual flux, indicates a derangement of the rectum, uterus, or bladder, ex-

* The state of the muscles is often, of itself, sufficient to mark the existence of irritation of the mucous membrane, even without the aid of other symptoms, such as heat of skin, redness of tongue, head-ache, &c. On exposing the abdomen, and laying the hand on its surface, the muscles are instantly thrown into action, and present their outlines distinctly and strongly marked. It is this tense and rigid state of the muscles which prevents the indication of sensibility, by bearing off the pressure from the subjacent parts.

amination by the touch should be made, and if necessary with the speculum above recommended.

We cannot conclude these remarks on the methods of examination applicable to affections of the three cavities, without again urging the necessity of paying to each of them a degree of attention proportioned to its severity, and also to its complication with others. It should not be forgotten that the physician who wishes to arrive at an accurate diagnosis, should not be satisfied with examining the cavity which contains the organ apparently affected, he ought to go farther, and ascertain whether others are not affected at the same time; for symptoms are not merely the indication of a lesion of one organ—they are phenomena common to several—they are effects, with whose theory and cause we are but imperfectly acquainted; the observer therefore should never omit examining the three cavities; it js the only means by which he can collect complete histories of cases, arrive at a sure diagnosis, and practise his profession with success.

METHOD OF EXAMINATION APPLICABLE TO DERANGEMENT OF THE PRIMARY TISSUES.

Q. What are the rules to be observed when the disease exists in the skin, or is seated in the sub-cutaneous cellular texture?

A. The following rules will serve as a sufficient guide to the observer in this investigation.

The precise part of the skin that is affected should first be stated; also whether the disease is local—confined to one or two spots, or is diffused over the whole surface. Thus, for example, erysipelas in general is found only in some particular part of the skin, whilst *zona* encircles the whole trunk; tinea capitis attacks the hairy scalp, and measles and small pox cover the entire surface of the body. It is necessary to ascertain from the patient whether he ever had the disease before, what part of the body it occupied, whether it continued in one spot, or changed its place, as so often occurs in erysipelas.

Any change of colour presented by the skin or mucous membranes, should always be stated; also whether it is diffused, and loses itself insensibly in the adjacent parts, or is bounded by a defined line: we should also note the effect of pressure upon it—for in some cases the change of colour continues even when it is pressed, in others the blood flows back rapidly into the capillary vessels of the part; and lastly, we sometimes find that this occurs very slowly. These things deserve attention, as indicating the degree of activity in the capillary circulation, and the vitality of the part affected. The blood sometimes stagnates in the capillary vessels, assuming a blue colour as we see in certain spots on the skin: sometimes, on the contrary, it is red, presents all the characters of arterial blood, and gives to the skin a bright red colour. As, however, the various shades of colour presented by the skin and mucous membranes are almost infinite, we shall not extend these remarks farther; it is quite sufficient to indicate the method of ascertaining and the necessity of attending to them.

When we have to examine a case of eruptive fever, it is necessary, in the first place, to ascertain in what part of the body the eruption commenced, and then the parts to which it gradually extended. In cases of small-pox and varicella, we should always examine those parts of the body which are not exposed to the atmospheric air, such as the arm-pits, and loins, in order to ascertain whether it exerts any influence on the progress of the eruption: attention should also be directed to the roots of the hair, to see whether the pustules correspond with the pores of the skin. In every species of eruption, the colour of the areola deserves notice as well as that of the pustule, which present many shades caused by the liquid which it contains: when it is depressed at its centre, as occurs in small pox, we may ascertain by dissecting a pustule at an early period whether the depression is caused by a cellular band, whether it consists of only one cell, or is divided into several.

Tumefaction of the skin is either diffused or circumscribed, and presents a vast variety of characters according to the affections with which it is connected; thus in small pox and varicella it assumes the form of single or confluent pustules—in herpes, of irregular crusts—in erysipelas, of vesicles caused by the effusion of a serous fluid under the epidermis—in emphysema, of an elastic swelling, which crepitates when pressed on. In these different cases, the state of the skin, the extent of the swelling, and the effect of pressure upon it should be stated.

When gangrene occurs, we should always ascertain whether the skin had been previously red and inflamed, or whether the disease commenced with a black or white spot, and thence gradually extended to the neighbouring parts; the general symptoms should be attended to, an inquiry should be made to determine whether the mortification arose from inoculation of some morbid matter.

In some affections of the cellular texture and mucous membranes, such as furuncle, ophthalmia, &c. it is useful to ascertain whether the patient had any previous attacks of the disease. In exanthematous affections the progress of the inflammation from one mucous membrane to another should be noted; thus it usually begins with the conjunctiva, and then proceeds from above downwards, successively attacking the nasal fossæ, throat, trachea, and bronchi.

Q. How does pain indicate disease?

A. The character of the pain often leads us to ascertain the seat of the affection, of which the patient complains; hence it should be particularly attended to. The effects of pressure on the skin should be noted, but in order to press it alone, it must be pinched between the fingers, as otherwise we shall not be able to determine whether the pain arises from an affection of the skin or of the subcutaneous cellular substance. Pain of the skin is marked by a sensation of heat, itching, and tension—that of the cellular texture, on the contrary, is pungent and throbbing, but both are fixed and limited to the seat of the disease. When the mucous membrane is affected, it is quite otherwise; as the pain is sometimes felt only at the extremity of the canal, there being no indication of it in any intermediate part; thus irritation in the bladder caused by the presence of a calculus, is often indicated only by pain at the extremity of the glans penis; and irritation in the intestines, caused by worms, is marked by a sense of constriction in the throat, or itching at the nares, &c.

The changes induced in the secretion of the mucous membranes should be carefully examined; its quantity may be increased, or its colour and consistence altered. The observer should ascertain the temperature of the part affected, and also whether the sensation which the heat gives is parched or pungent; if there be any ulcerations, their appearance, colour, state of the margins, as well as of the adjacent parts, should be noted. In cases of exanthematous eruptions, the cause which may have produced them should be inquired into. Whether it be epidemic, contagious by inoculation, or the use of certain aliments, such as muscles, lobsters, &c. In such cases, attention should always be paid to the state of the mucous membranes, as in these the affection usually commences, the skin being attacked but secondarily. When reporting the case, the day on which the fever set in should be stated; then the appearance of the eruption, and the changes induced in the previous symptoms at this period: in the next place, the time at which the suppurative stage began, and its effects on the system generally, which are usually manifested by a new access of fever; and finally, the process of desquamation or desication. In cases of small-pox, particularly when it is confluent, the state of the lungs and their membranes should be indicated; and when the disease terminates favourably, the state of the skin and appearance of the cicatrices should not be overlooked.

EXAMINATION OF THE MUSCULAR, FIBROUS, SYNOVIAL, VASCULAR AND NERVOUS SYSTEMS.

Q. How is this to be effected?

A. After having ascertained whether there exists any swelling, heat, or redness, in the integuments covering the parts to which the patient refers the pain, the observer proceeds to determine which of the primary textures is affected, viz. the muscles, membranes, arteries, veins, nerves, or lymphatics.

These should be successively passed in review; the observer will have to ascertain whether the articulations are swollen, present symptoms of a fluid affused in their cavities, or of calcareous deposits. When the muscles are sensible to the touch, and when motion causes pain, it becomes necessary to learn the character of the latter; for if it consists in a sensation of dragging, tearing, or lassitude, it indicates fibrous or synovial rheumatism.

When the pain is felt along the course of the nerves, arteries, veins, or lymphatics, the observer should ascertain whether any tumor exists upon them, or whether they give the sensation merely of a hard cord sensible to pressure. The pain in such cases is very variable in its character. Sometimes it is marked by a shooting sensation taking the course of the nerves from the centre to the extremities, or *vice versa;* in other cases there is a feeling of numbness, heat, or cold; and lastly, it may be continued, or may only recur at intervals. Its mode of commencement should be stated, and also the effect produced upon it by heat, cold, moisture, dryness, rest or motion; or finally, by pressure applied to the muscles or in the course of the nerves. When the affection depends on the puncture of a vein in bleeding, the pain and swelling extend from the wounded point along the course of the vessel towards the heart.

OF THE BLOOD VESSELS OF THE SYSTEM.

Q. How are the Blood Vessels of the human body divided?

A. Into ARTERIES and VEINS.

Q. What are the *general characters* of the ARTERIES?

A. They are elastic tubes dispersed through the whole body, are distinguished from Veins by their *pulsation*, by the *whiteness* of their colour, and by the thickness of their coats.

Q. How many *coats* have the Arteries?

A. *Three;* the external is *membranous*, or *cellular;* the middle *muscular*, composed of transverse fibres forming the segments of a circle interposed between each other; and the *inner coat* is remarkably thin, smooth, and dense. They are connected by fine cellular substance.

Q. How do the *Arteries* receive their *own nourishment?*

A. Vessels termed *Vasa Vasorum*, sent from the nearest small branches of arteries, are dispersed upon the surface of the larger arteries and afford them nourishment.

Q. Do the *Arteries* receive their *Nerves* and *Lymphatics* in the same manner?

A. Yes: the nerves in the neighbourhood give small twigs to the Arteries; and the Lymphatics are frequently so numerous as to cover them.

Q. Have the *Arteries* any *Valves* in their internal cavity?

A. The only *Valves* in the arterial system are those at the commencement of the Aorta, and Pulmonary Artery.

Q. When an artery divides into branches, does its diameter diminish in proportion to their size?

A. Yes; the trunk of the artery is diminished, but the Areae of the branches conjunctly are nearly a half larger than that of the trunk.

Q. Why is the *Area* of the capacity of the branches larger than that of the trunk ?

A. That the momentum or velocity of the blood may be continued the same in the branches, where the friction of their sides is much greater, as in the trunk itself.

Q. In what different ways do the *Arteries terminate ?*

A. In *four* ways ; they terminate in Veins ; in Glands or Follicles ; in Exhalants or Capillary extremities, which open upon the internal surfaces, and upon the skin ; and in Cells, as those of the Penis, Clitoris, Placenta, and Corpora Cavernosa Vaginae.

Q. What effect has the curvature of the arteries on the movement of the blood ?

A. Contrary to the opinion of Bichat, it must retard it, since a certain degree of force is necessary to straighten the tube, which, of course, must be lost.

Q. What is the effect of the dilatation and contraction of the arteries on the circulation ?

A. The arteries dilated by the impulse of the heart, contract, by their elasticity, and drive on the blood to the smaller vessels. This is proved by the fact that ossification of the Aorta near the Iliacs, produces mortification in the toes, and also by direct experiments proving that when the impulse of the heart is removed by putting a ligature round the thigh so as not to compress the crural artery and vein, and then if another be put round the vein, and the artery be pressed between the fingers and the vein be punctured, the blood continues with an uniform jet, till the artery is wholly emptied, when the flow ceases.

Q. Do the lymphatics and blood vessels directly communicate ?

A. Injections pass easily from one to the other.

Q. What are the general characters of Veins ?

A. They are flexible elastic tubes, capable of greater distention than arteries, and composed of thinner, and almost transparent coats, through which the purple colour of the blood is conspicuous.

Q. How many *Coats* have the *Veins?*

A. *Three;* an external cellular, a middle membranaceous, and an internal firm, compact, thin coat. These coats, however, are so intimately united to each other, that some Anatomists have considered them only two, an external cellular, and an internal membranous.

Q. Are the *Veins* of the same size and number as their corresponding Arteries?

A. The size of the Veins is more than double that of their corresponding Arteries, excepting the pulmonary, bronchial, and renal veins, which are rather smaller.

Q. How are the *Valves in Veins formed?*

A. The Valves are formed of semilunar folds of the inner coat of the veins, placed in pairs at irregular distances: they are concave next the heart, and when applied to each other, prevent the blood from flowing along the trunk towards the extremity of the veins.

Q. Are *Valves* to be found in all the Veins?

A. No; the veins of the Cranium, of the Thorax, and of the Abdomen want Valves; excepting the Spermatic, and Internal Mammary Veins, and the Vena Azygos, which have Valves. All the Veins of the extremities, and of deep muscular parts, have numerous Valves.

Q. What is meant by secretion?

A. It is a power in certain glands and other parts, of producing from the blood new fluids.

Q. Enumerate the different secretions?

A. 1. The serous exhalation, which takes place in the head, pleura and peritoneum, which prevents the union of the viscera with their sides; and that which takes place between the fine plates of the cellular membrane, scattered every where throughout the body, to assist the motions of the parts. 2. The fat intended for different purposes, in different parts of the body; on the soles of the feet, to render pressure easy, and to prevent the loss of the caloric of the body. 3. The secretions of synovia in the joints to lubricate them, 4. The mucous secretions on the surface of the urethra, the intestines, the eye, nose, ear, larynx, trachea, and the bronchiæ, fauces, and mouth. 5. The perspiration from the skin.

PATHOLOGY OF THE VASCULAR AND NERVOUS TISSUES.

ELEPHANTIASIS.

Q. What are its symptoms?

A. Hard and permanent swelling, at first confined to the lymphatics of the diseased part, commencing with a fixed pain in a cluster of glands, or in the course of the lymphatic vessels; redness and irregular swelling, with difficulty of motion. When the disease has lasted for a few days, the swelling disappears, and returns again and again; the part becomes harder and harder, at the same time small irregular tubercles are formed; the feet, the legs, the hands, and the face, which are most commonly affected in this manner, lose all shape, and are covered with thick white crusts, or small ulcerations, which discharge sanious matter.

Q. What are its anatomical characters?

A. The lymphatic vessels and glands swollen, discoloured and softened; the coats of the former easily torn, if we attempt to inject them: the cellular tissue connecting these parts undergoes the same change, and appears as if scirrhous.

PHLEBITIS, OR INFLAMMATION OF VEINS.

Q. What are its symptoms?

A. Pain and swelling in the course of the affected vein, extending from the point where it commenced towards the heart; the cellular substance near the part, and sometimes that of the whole limb swollen: in the course of the vein a kind of cord is felt rolling under the finger. This affection is generally produced by bleeding.

Q. What are its anatomical characters?

A. On opening the body, the coats of the vein are found thickened, red, and easily torn, with pus effused into its cavity. The inflammation generally extends more towards the heart than in the opposite direction.

NEURALGIA.

Q. What are its symptoms?

A. Fixed pain in the trunk, or branch of a nerve extending along its course, speedily changing from one part to another, sometimes affecting all together, or confined to one or two branches. The pain is very various: an icy coldness is complained of by some, or burning heat, disagreeable numbness, sense of touch impaired, or a kind of electric shock; in others we have lacerating or quick lancinating pains, transitory pricklings, or permanent pulsations. This pain is very irregular, its paroxysms coming on generally without any evident cause. Pressure of the nerve or its filaments in the most violent paroxysms rather lessens the pain, or if it should cause any, none of the characteristic marks of neuralgia are observed; it is rather a slight numbness of the part which is pressed, but never that lancinating pain in the course of the nerve. No alteration can be observed in the integuments of the affected part; heat, in some instances, lessens the pain, in others, increases it; in the latter case, cold affords relief. Neuralgia may change instantaneously from one nerve to another; it may attack any nerve in the body, but as its symptoms are always the same, we shall only speak of its chief varieties. Neuralgia may be confounded with inflammation of the nerve, or certain rheumatic affections.

Q. What are the symptoms of *Neuralgia of the facial nerves ?*

A. Pain in some facial branch of the portio dura of the seventh pair, or in some of the numerous divisions of the fifth. This species is generally intermittent, and accompanied with the most violent and variable pains, and all the characteristic phenomena of which we have given an account. The paroxysms are commonly very short, but recur very frequently.

Q. What are the symptoms of *Neuralgia* (*Ileo-scrotal*) ?

A. Of very rare occurrence, situated in the second branch of the first pair of lumbar nerves. The pain commences at the crest of the ilium, extends to the spermatic cord, to the scrotum, attended by contraction of this covering and retraction of the testicles.

Q. What are the symptoms of *Sciatica ?*

A. Pain extending from the ischiatic notch, along the posterior part of the thigh, to the ham ; then affecting the knee, from that to the leg, on its fibular side, and terminating in the calf.

Q. What are the symptoms of *Neuralgia cruralis ?*

A. Pain following the course of the crural nerve, from Poupart's ligament on the inside of the leg to the dorsum of the foot.

Q. What are the symptoms of *Neuralgia* (*cubito digital*) ?

A. Pain from the internal condyle of the humerus, to the dorsal or palmar regions of the fore-arm.

Q. What are its anatomical characters ?

A. No alteration can be perceived in the affected parts.

INFLAMMATION OF THE NERVES.

Q. What are its symptoms ?

A. A fixed, lacerating, numbing, or lancinating pain in the trunk, or branch of a nerve, increased very much by pressure, but unaccompanied by the various characteristics of neuralgia ; it is generally continued, or its remissions are not well marked ; in some instances a slight swelling of the nerve may be observed.

Q. What are the diseases with which it may be confounded?

A. They are neuralgia and certain rheumatic affections.

Morbid appearance, more or less marked, redness of the nervous tissue, with injection of its vessels, or of those of the surrounding cellular substance; partial ecchymosis; sero-sanguineous or sero-purulent effusion in the nervous filaments: sometimes thick pus is found in the nerve. A few cases are related, in which the nerves were found gangrenous in many points; even small tumours like tubercles are said to have formed in the nervous tissue, or between the filaments of the nerve.

OF THE PULMONARY ARTERY AND VEINS.

Q. Repeat the *course* of the *Pulmonary Artery?*

A. It arises from the right Ventricle of the Heart, ascends inclining to the left to the arch of the Aorta, divides into right and left branches, which accompany the bronchial tubes, and divide again and again into numerous branches, that ultimately become very minute, and have their terminations spread round the Bronchial Cells.

Q. Repeat the *course* also of the *Pulmonary Veins?*

A. Their extremities being very small, receive the blood from the minute extremities of the Pulmonary Artery, unite repeatedly and form larger trunks, which accompany their corresponding arteries; all the veins of each Lung ultimately unite, and form two trunks, which uniting with the two trunks of the other Lung, terminate in the left Auricle of the Heart.

Q. *What happens to the blood* circulating through the *Lungs?*

A. The whole blood of the body is gradually sent through the Lungs, where it comes nearly in contact with the atmospherical air, the thin membrane of the cells only intervening: notwithstanding this membrane it comes within the sphere of attraction of Chemical Affinity; the Oxygen of the air attracts the Carbon from the blood, which immediately becomes more florid, has also its capacity increased for receiving the Caloric, disengaged from the Oxygen changing its state of combination in the air-cells. The blood now becomes arterial, and is fitted for being again transmitted by the arteries through the system.

OF THE AORTA AND ITS BRANCHES.

Q. Describe the origin and course of the Aorta?

A. It arises from the left Ventricle of the Heart, turns rather to the right, ascends backwards and towards the left, as far as the top of the thorax, where it is reflected obliquely backwards over the left branch of the Trachea, and then descends, running close upon the vertebrae; thus forming the Arch of the Aorta.

Q. What Arteries does the *Aorta* first send off?

A. The two CORONARY ARTERIES, which arise immediately above the Semilunar Valves at the origin of the Aorta.

Q. What is their *course?*

A. The *right Coronary Artery* is the larger, runs in a groove between the right Auricle and Ventricle, and is distributed upon the right side of the heart: the *left* being divided, runs partly between the left Auricle and Ventricle, and partly between the Ventricles on the fore part, is distributed upon the left side of the heart, and anastomoses very freely with the right Coronary.

Q. How many *Coronary* VEINS are there?

A. By far the greater part of the Coronary Veins, after uniting together repeatedly, form *one trunk*, termed the *Great Coronary Vein*, which terminates in the under part of the right Auricle, where its orifice is covered by a *semilunar Valve.*

Q. What *Arteries* arise from the *Curvature* or *Arch of the Aorta?*

A. From the upper or convex part of the Arch, three large Arteries arise, viz. the *Arteria Innominata* on the right side, which soon divides into the right Carotid, and right Subclavian; and on the left, the *left Carotid*, and *left Subclavian.*

Q. Describe the course and division of the CAROTID ARTERIES?

A. On each side of the Trachea they ascend between the cervical vertebrae and the sterno-mastoidei muscles, diverging a little from each other, till they reach the upper part of the Larynx, opposite to the Os Hyoides, where they divide into *external* and *internal Carotids.*

Q. How many principal branches does the EXTERNAL CAROTID send off?

A. The External Carotid is smaller than the Internal, and seems a continuation of the common trunk; it sends off seven *Arteries,* viz. the Superior Laryngeal, or Superior Thyroid; the Lingual; the Facial; the Inferior Pharyngeal; the Occipital; the Posterior Auris; and the Internal Maxillary; the trunk itself, ascending under the Zygoma, on the Temples, is named the temporal artery.

Q. These arteries may be divided into three orders; do so?

A. The first order may comprehend those running forward to the Thyroid Gland, to the Tongue, and to the Face; namely, the Superior Thyroid, Lingual, and Facial, which are much exposed, and are the subject of many particular operations. The second order comprehends the three smaller arteries running backwards and inwards to the Pharynx, the Occiput, and the Ear, namely, the Inferior Pharyngeal, the Occipital, and the Posterior Auris; which run so deep, that wounds in them are rare. The third order comprehends those running to the inside of the Jaws, and to the Temples, namely, the Internal Maxillary, and the Temporal, which are of great importance, and should be well known.

Q. Describe the SUPERIOR THYROID ARTERY?

A. It is named also *Superior Laryngeal, Superior Guttural*, it is large, and comes off just after the division of the Carotids; it runs downwards and forwards in a very tortuous form, and sends branches to the Os Hyoides and contiguous parts, to the Thyroid Cartilage; sends off the Laryngeal branch, and the trunk itself is dispersed in the Thyroid Gland.

Q. Describe the LINGUAL ARTERY?

A. The Arteria Lingualis comes off immediately above the Thyroid, runs forwards and upwards along the side of the tongue, sends a branch to the Pharynx; the *ramus hyoideus* to the muscles between the tongue and the larynx; the *dorsalis linguæ* to the fauces, amygdala, epiglottis, and pharynx; the *ramus sublingualis* to the sublingual gland and adjacent muscles; and the *ramus raninus* to the apex of the tongue.

Q. Describe the FACIAL or ANGULAR ARTERY, called also External Maxillary, or Labial?

A. The Facial or Labial Artery runs forwards deep under the Stylo-hyoideus, and tendon of the Digastric muscles, perforates the submaxillary gland, is very tortuous, mounts suddenly in a circular turn over the lower jaw at the under and fore part of the Masseter, then ascends tortuous by the side of the nose, towards the inner angle of the eye. In its course it sends off the *Palatina Inferior* vel *Ascendens* to the velum palati, and parts near it; several small twigs to the tonsil, tongue, inferior maxillary gland, muscles, and skin; the *Submentalis* to the muscles and adjacent parts; the *Inferior Labial* to the under lip; the *Inferior* and *Superior Coronary* to the margin of the lips: the trunk is then divided and spent upon the cheek and nose.

Q. Describe the INFERIOR OR ASCENDING PHARYNGEAL ARTERY?

A. This is a small artery, which arises near the

Lingual, runs upwards deep in the neck, and sends twigs to the pharynx, fauces, and base of the skull, where some of them enter the foramina, and are dispersed upon the Dura Mater: twigs are also sent to the sterno-mastoideus, and neighbouring glands.

Q. Describe the OCCIPITAL ARTERY?

A. It arises next the Pharyngeal from the back part of the Carotid, runs close upon the bones, then over the Internal Jugular Vein, then between the transverse process of the Atlas and Mastoid Process; it passes under the bellies of the Digastric, Trachelo-mastoideus, Splenius, and Complexus muscles, and becomes superficial near the middle ridge of the occiput, where it rises with many beautiful branches. It is very tortuous, and in its course gives off branches to the muscles already named, and to the glands; a branch, which runs backwards along the jugular vein, enters the cranium by the foramen lacerum posterius, and is dispersed upon the under and back part of the Dura Mater under the lobes of the Cerebellum: it, when among the muscles, sends down a long branch, which inosculates with a branch of the Axillary Artery, and also with the Vertebral Artery through the interstices of the vertebrae.

Q. Describe the POSTERIOR AURIS?

A. This artery sometimes comes off from the Occipital, or Pharyngeal, or is sometimes wanting. It comes off from the Carotid, very high in the substance of the Parotid Gland, passes across under the styloid process, then over the belly of the digastric, and lastly, runs up behind the ear. It sends small branches to the Parotid Gland, Digastric, and Sterno-mastoid muscles, to the Meatus Auditorius externus, to the Membrana Tympani, and the *Stylo-mastoid* branch goes through the Foramen Stylo-mastoideum to the Internal Ear and Tympanum: while the trunk itself is dispersed upon the back part of the ear, and side of the head.

Q. Describe the origin and course of the INTERNAL MAXILLARY ARTERY?

A. The Carotid passes up through the Parotid Gland; and the Internal Maxillary comes off from it, embedded in this gland, behind the broad plate, whence the condyloid and coronoid processes of the inferior Maxilla arise. It passes between the jaw, and external Pterygoid muscle, then ascends in a very tortuous manner to the back of the Maxillary Antrum, and there terminates in numerous branches.

Q. Enumerate the PRINCIPAL BRANCHES of the *Internal Maxillary Artery.*

A. It first sends a number of twigs to the external ear, to the glands near it, one enters the Tympanum by the fissura Glasseri, to the muscles of the Malleus, and sometimes one through the Foramen Ovale to the Dura Mater. The Internal Maxillary Artery then sends off *seven* branches, viz. the *Meningeal* or *Middle Artery* of the *Dura Mater*, which passes between the external and internal Carotids, then through the Foramen Spinale of the sphenoid bone, and ramifies beautifully over the surface of the Dura Mater, and inside of the Parietal bone, sending twigs to the substance of the bone and internal ear: Secondly, The *Inferior Maxillary Artery*, which enters the Foramen Maxillare Posterius, runs along the Inferior Maxillary canal, sends off twigs to the teeth, and substance of the jaw, and ultimately emerges by the Foramen Menti to be distributed upon the chin; it gives off small branches to the Pterygoid, Masseter, and Temporal muscles as it passes into the canal: Thirdly, The *Alveolar Artery*, which runs round behind the Antrum in very tortuous branches, some of which go to the soft parts, others to the substance of the bones, to the Antrum, and to the back teeth; the proper trunk enters into the substance of the jaw, runs in the Canal, and gives branches to the other teeth: Fourthly, The *Infra-Orbitar Artery*, which runs in the canal under the orbit, gives off small branches to the soft parts, the substance of the bone, the antrum maxillare, and fore-teeth, and then emerges by the Foramen Infra-Orbitarium to be dispersed upon the cheek: Fifthly, The *Palatino-Maxillary Artery*, which passes through the Foramen Palatinum posterius, runs between the bony and fleshy parts of the palate, sending twigs to them, and to the sockets of the teeth; it then frequently turns up through the Foramen Incisivum into the cavity of the nose: Sixthly, The *Superior Pharnygeal*, which is small, and comes off at the back of the orbit, it is dispersed upon the pharynx and adjacent parts, a twig runs towards the Pterygoid or Vidian hole, where it inosculates with a branch from the Internal Carotid: and lastly, The *Lateral Nasal Artery*, which passes through the Foramen Spheno-palatinum into the upper and back part of the nostril, where it divides into branches, of which one goes to the posterior Ethmoid cells, another to the cells of the Sphenoid bone, a third to the back part of the septum narium, a fourth passing through the spongy bones to the bottom of the nose, gives twigs to the mucous membrane, to the Antrum Maxillare, and inosculates with the termination of the Palato-Maxillary coming through the Foramen Incisivum.

Q. Describe the course of the TEMPORAL ARTERY?

A. After the trunk of the external Carotid gives off the arteries already described, it emerges from the substance of the Parotid Gland, between the Meatus Auditorius and root of the Zygoma, and is afterwards named the *Temporal Artery*, which forms some sharp turns before the ear; and a little above the Zygoma, where its pulsation can be felt, it divides into an anterior and a posterior branch, which run superficially between the aponeurosis of the temporal muscle and the integuments, and are distributed upon the brow, and side of the head.

Q. Describe the *branches* sent off from the *Temporal Artery?*

A. The Temporal Artery first gives off several branches to the Parotid Gland; then the *Transversalis Faciei* of considerable size, which runs across the cheek in the direction of the Parotid Duct, gives twigs to the parotid gland, to the articulation of the jaw, the masseter and buccinator muscles, and inosculates with the facial and internal maxillary arteries: then the *Articular* Artery, which sends branches to the articulation of the jaw, to the external meatus, and membrana tympani, and penetrates into the internal ear: then the *Deep Temporal,* which ascends obliquely forwards under the aponeurosis of the temporal muscle to the outer part of the orbit: then the *Anterior Auricular* branches, which are dispersed upon the fore part of the ear, and inosculating with the Posterior Auris, and then small twigs to the masseter.

Q. What is the distribution of the *Anterior Temporal?*

A. It is ramified in a very serpentine manner upon the side of the forehead, as far down as the orbit where it inosculates with the Facial, and upwards to the Sagittal Suture, where it communicates with its fellow of the opposite side. It is dispersed in the integuments and muscles.

Q. What is the distribution of the *Posterior Temporal?*

A. It seems the continuation of the trunk, ascends obliquely backwards, is distributed to the muscles and integuments, inosculates with the Anterior, with the Occipital of the same side, and with its fellow of the opposite side of the head; from all which, numerous small branches are sent to the Pericranium, substance of the bones, and even through the Sutures in young subjects to the Dura Mater.

OF THE INTERNAL CAROTID.

Q. Describe the course of the Internal Carotid into the cranium?

A. The Internal Carotid is very tortuous in its ascent, is inclosed in the same sheath with the Par Vagum and Great Intercostal Nerves; at the base of the cranium, it makes a bend forwards in entering the Carotic Canal, then upwards, again forwards, then upwards and forwards to emerge from the canal; after it leaves the canal, it turns upwards and then forwards by the side of the Sella Turcica, perforates the Dura Mater at the root of the anterior Clinoid Process, and then bends backwards and upwards, where it divides into branches.

Q. What *branches* does the *Internal Carotid Artery* send off?

A. The Arteria Ophthalmica; Arteria Communicans cum Vertebrali; the Anterior Cerebri; and the Media Cerebri.

Q. Describe the course and terminations of the OPHTHALMIC ARTERY?

A. It enters the Foramen Opticum; passes under the Optic Nerve towards the outer part of the orbit; it then takes a spiral turn towards the nose, and gives off the *Arteria Lachrymalis* to the lachrymal gland and adjacent parts; the *Centralis Retinae*, which penetrates the optic nerve, runs in its centre, and spreads out into numerous small branches upon the inside of the Retina; the *Ciliares* sent to the coats, the iris, and ciliary processes; the *Muscularis Superior* and *Inferior* dispersed upon the muscles, membranes, and fat of the eye; the *Ethmoidalis Anterior*, and *Posterior*, which pass through the Foramina Orbitaria Interna, anterius and posterius, to the nose, the frontal, ethmoidal, and sphenoidal sinuses; and the trunk itself of the Ophthalmic emerges from the socket of the eye, passes through the Foramen Supra-orbitarium, is then named the *Frontalis*, and is dispersed upon the forehead.

Q. Describe the ARTERIA COMMUNICANS CUM VERTEBRALI?

A. It goes directly backwards from the trunk of the Internal Carotid, and meets the posterior cerebral branch of the Vertebral Artery, and thus forms an important communication between the *Middle Artery* of the brain, which is the trunk of the Internal Carotid, and the *Posterior Artery*, which is the largest branch of the vertebral.

Q. Describe the *Anterior Cerebri?*

A. This, called sometimes *Arterior Callosa*, goes off from the Middle Artery or trunk, at nearly a right angle forwards, turns in towards its fellow, and they become almost contiguous near the fore part of the union of the Optic Nerves, where they anastomose by means of a short, but large *Transverse Branch:* the Anterior Cerebri is dispersed through the Anterior Lobe of the Brain, and is reflected backwards upon the Corpus Callosum.

Q. Describe the ARTERIA MEDIA CEREBRI ?

A. This Artery, called also *Arteria Fossae Sylvii*, runs outwards to the lateral part of the brain, along the Fossa Sylvii, is the trunk of the Carotid continued, and is distributed chiefly to the Middle Lobe, but it also gives branches to the Anterior and Posterior Lobes ; it inosculates with its fellow, with the Anterior Cerebri, and with branches of the Basilar Artery.

OF THE VERTEBRAL ARTERIES.

Q. What other Arteries are sent to the brain ?

A. The *Vertebral Artery* on each side, being very little smaller than the Internal Carotid.

Q. Describe the origin and course of the *Vertebral Arteries ?*

A. They arise from the Subclavian Arteries, and in a short space, each on its own side, enter the Canal formed by the perforations in the transverse processes of the cervical vertebræ, ascends in nearly a straight direction to the second vertebra, where it turns laterad ; in passing from the Dentata to the Atlas it bends still more laterad and forward ; after passing the perforations of the Atlas, it turns suddenly backwards, runs horizontally in a groove of the Atlas, turns upwards into the Foramen Magnum, perforates the Dura Mater, enters the Cranium, inclines towards its fellow, and at the beginning of the Medulla Oblongata, the two Vertebral Arteries unite, and form the *Basilar Artery.*

Q. Why do the *Vertebral Arteries* form such turnings before they enter the Cranium?

A. By these windings they are accommodated to the motions of the head without any risk of their being ruptured from over extension; but chiefly that the impetus or force of the circulating blood may be much diminished by those various and sudden turnings, before it enters the tender and delicate substance of the brain.

Q. Do the *Vertebral Arteries* send off any branches during their ascent in the neck?

A. Yes; they send some twigs outwards, between the vertebrae to the deep-seated muscles; and others inwards by the holes which transmit the Cervical Nerves to the Spinal Marrow, and its membranes.

Q. Do the *Vertebral Arteries* send off any branches where they enter the Cranium, before they form the Basilar?

A. Yes; each Vertebral Artery sends off the *Posterior Meningeal* to the posterior part of the Dura Mater, twigs to the Medulla Oblongata, and frequently the *Posterior Artery* of the Spinal Marrow: near its junction with its fellow, it sends down the *Anterior Artery* of the Spinal Marrow.

Q. Describe the Arteria Basilaris?

A. The *Basilar Artery* runs up between the basilar aspect of the Tuber Annulare, which it impresses, and the Cuneiform Process of the occipital bone; at the upper and fore part of the Tuber, it divides into four branches, two to each side, namely, the Anterior or Superior Cerebelli, and the Posterior, or Profunda Cerebri.

Q. Does the *Basilar Artery* send off any branches before its division into right and left branches?

A. Yes; from its sides several small twigs are sent off to the Tuber and adjacent parts; and one larger than the rest, called *Auditoria Interna*, enters the canal of the Portio Dura on each side, is spread on the Vestible, Semi-circular Canals, and Cochlea.

Q. Describe the *Anterior* or *Superior Cerebelli?*

A. It turns round the crura cerebri, gives branches to the Nates, Testes, and upper part of the Cerebellum, and is dispersed in its substance.

Q. Describe the *Posterior* or *Profunda Cerebri?*

A. This Artery is rather larger than the former, is distributed chiefly through the Posterior Lobe of the brain on each side ; sends a considerable branch into the posterior corner of the Lateral Ventricle, which inosculates with branches of the Carotid, and forms the posterior Arteries of the Choroid Plexus; near its root it receives the *Communicating Artery* from the Carotid, and this union forms the *Circle of* WILLIS.

Q. Mention particularly how the *Circle of* WILLIS is formed?

A. The two Anterior Arteries of the Brain, near the fore part of the junction of the Optic Nerves, have a free communication by means of a short large transverse branch, proceeding from the one to the other. This forms the anterior part of the Arterial communication, called a Circle. The communicating Arteries running on each side between the Internal Carotids, and the two Posterior Arteries of the Brain, form the sides of the Circle ; and the Posterior Arteries themselves issuing from the Basilar Artery, form the posterior part of the Arterial communication, or Circle, as it is called.

Q. What *purpose* does such a communication serve ?

A. It seems calculated to guard against accidents, which might obstruct the flow of blood in the Carotids, or in the vertebrals in different cases. For should the one Carotid be obstructed by Aneurism, or by a Tumour pressing upon it, the other, communicating with the two Vertebral Arteries by the Circle of Willis, would supply the deficiency of blood in the brain, and *vice versa.*

OF THE SUBCLAVIAN ARTERY.

Q. Describe the course of the *Subclavian Artery?*

A. The *Subclavian* arises from the Arch of the

Aorta on the left side, and from the Arteria Innominata on the right, ascends to the upper part of the thorax, then passes transversely outwards behind the origin of the Sterno-mastoideus, then between the Anterior and Middle Scaleni, and between the Subclavian muscle, and first rib ; which it crosses, and passes under the Pectoral muscles into the Axilla, where it is called the Axillary Artery.

Q. What branches does the *Subclavian Artery* on each side send off *upwards ?*

A. *Five;* the Vertebralis, Thyroidea Inferior, or Gutteralis, Cervicalis Anterior, Cervicalis Posterior, and Dorsalis Superior Scapulae.

Q. What branches does the *Subclavian* send off *downwards ?*

A. *Two;* the Mammaria Interna, and the Intercostalis Superior.

Q. Describe the course of the *Thyroidea Inferior,* as the *Vertebral* has been already described.

A. The *Inferior Thyroid Artery* ascends in a winding manner obliquely inwards behind the Carotid, and is chiefly dispersed through the Thyroid Gland, inosculating freely with the Superior Thyroid, or Laryngeal Artery.

Q. What branches does the *Inferior Thyroid* give off in its ascent ?

A. It sends branches to the Trachea, which descend into the thorax, and inosculate with the Bronchial Arteries ; it sends branches also to the Oesophagus, Pharynx, and Larynx.

Q. To what parts are the *Cervicalis Anterior,* and *Posterior,* distributed ?

A. To the muscles, glands, nerves, and integuments of the neck: the *Anterior* sends twigs through the inter-vertebral foramina, where the cervical nerves pass out, to communicate to the Spinal Arteries ; the *Posterior* sends a principal branch downwards to the parts about the top of the shoulder, and upper and lateral parts of the thorax ; while both anastomose with the Vertebral and Occipital Arteries.

Q. Describe the course and distribution of the *Dorsalis Superior Scapulae.*

A. The Superior Dorsal of the Scapula runs transversely behind the origin of the Sterno-mastoideus, perforates the notch in the superior costa of the Scapula, and disperses its branches through the muscles on the dorsum of the Scapula; it also sends branches to the shoulder-joint.

Q. Describe the course and distribution of the *Mammaria Interna.*

A. The Internal Mammary Artery descends between the pleura and cartilages of the true ribs, and between the internal Intercostal and Sterno-costal muscles, perforates the Diaphragm under the cartilage of the seventh rib, and is dispersed upon the posterior surface of the Rectus, and Obliqui Abdominis, muscles.

Q. What *branches* does the *Internal Mammary* send off in its descent?

A. It gives branches to the integuments near the Clavicle, to the Thymus Gland, to the Mediastinum, to the Pericardium, to the Diaphragm; and externally, to the Mamma, Pectoral muscles, and integuments.

Q. What are the *principal communications* of the Internal Mammary Artery?

A. It inosculates freely with the external thoracics, the Intercostals, the Phrenics, and the Epigastric.

Q. Describe the course of the *Inter-costalis Superior?*

A. The superior Intercostal descends near the vertebræ, and divides into two or three branches, which run forwards in the superior intercostal spaces corresponding to their number.

Q. Why do the superior intercostal spaces not receive their Arteries from the same source as the inferior?

A. Because the Aorta, after forming the arch, has not come near to the spine until it descends to the third or fourth dorsal vertebra, where it gives off the Inferior Intercostals; whereas the Subclavian Artery lies near to the head of the first rib, where, in consequence, it sends off the Superior Intercostal to supply the two or three upper intercostal spaces.

OF THE AXILLARY ARTERY.

Q. What is the situation of the *Axillary Artery?*

A. It lies in the Axilla between the Subscapularis and Serratus Major, is surrounded by lymphatic glands, veins, nerves, and fat.

Q. What *branches* does the *Axillary Artery* send off?

A. Four or six thoracics, the Scapularis Interna, Dorsalis Scapulæ Inferior, the Circumflexa Anterior, and Posterior.

Q. Describe the *Thoracic Arteries.*

A. These arteries vary in number and origin; but they are generally from four to six. They sometimes arise by two or three trunks, and branch out from one another: they are dispersed through the muscles lying upon the thorax; one longer than the rest, sometimes called *External Mammary*, is distributed through the Mamma. They inosculate with the Intercostals, and Internal Mammary, and with each other.

Q. Describe the *Scapularis Interna.*

A. It is also named *Subscapularis;* it often sends off the Dorsalis Scapulæ Inferior; it is large, and runs near the inferior costa of the Scapula, gives off several large branches to the Subscapular muscle, the Teres major, Latissimus dorsi, and to the joint and parts near it.

Q. Describe the *Dorsalis Scapulae Inferior.*

A. It turns round near the cervix of the Scapula to the *fossa infra-spinata*, and spreads out into branches among the muscles upon the posterior surface of the Scapula.

Q. Describe the *Circumflexa Anterior*, vel *Articularis.*

A. It arises from the Axillary, runs transversely round the fore part of the joint between the os humeri, and the heads of the Coraco-brachialis and Biceps, is dispersed upon the Capsular Ligament, Periosteum, and muscles covering the joint.

Q. Describe also the *Circumflexa*, vel *Articularis Posterior.*

A. It is larger than the former, passes between the Sub-scapularis and Teres Major to get to the joint; it then turns round backwards, between the os humeri and long head of the Triceps and Deltoid, gives branches to the joint, and adjacent muscles; and anastomoses freely with the Anterior Circumflex.

OF THE HUMERAL ARTERY.

Q. Describe the *Humeral* or *Brachial Artery.*

A. When the Axillary Artery passes down below the edge of the tendon of the Pectoralis Major, it is called the *Humeral* or *Brachial Artery*, which is continued down the inner side of the humerus, until its division into the Radial and Ulnar Arteries.

Q. Where does *its division* take place?

A. The exact place is uncertain, being sometimes higher and sometimes lower; but in general it divides near to the bend of the elbow joint.

Q. What is the *course* of the *Brachial Artery?*

A. It runs along the inner side of the Biceps before, and the Triceps behind, covered by the tendinous Aponeurosis, and giving off branches to the muscles in its course.

Q. What *principal branches* does it send off?

A. The *Brachial Artery* sends off *three:* the Profunda Humeri Superior vel Spiralis; Profunda Inferior vel Minor; and the Ramus Anastomoticus.

Q. Describe the *Profunda Humeri Superior.*

A. It arises opposite to the insertion of the Teres Major and Latissimus Dorsi, runs downwards and outwards in a spiral manner, between the Triceps and the bone, towards the outer condyle, where it anastomoses with the Radial Artery; near its origin it sends branches upwards, which inosculate with others from the Humeral and Scapular Arteries.

Q. Describe the *Profunda Inferior* or *Minor.*

A. It arises near the middle of the humerus from the Brachial, or frequently from a branch of the Profunda Superior; it is dispersed among the muscles on the inner side of the arm.

Q. Describe the *Ramus Anastomoticus Magnus.*

A. It arises from the Brachial two or three inches above the bend of the elbow, sends branches to the Triceps, Brachialis Internus, and parts contiguous; it also forms various anastomoses with other branches of the Profunda upwards, and with the Recurrents of the Radial and Ulnar downwards.

Q. Do no other branches arise from the Brachial Artery in its course along the humerus?

A. Yes; a great many smaller branches arise from it, which are short and dispersed in the contiguous muscles, periosteum, and bone; one of these is the *Medullary Artery,* which nourishes the bone.

Q. What branches, did we say, are formed by the *division* of the *Brachial Artery?*

A. The Radial, and Ulnar, and sometimes the Interosseal Arteries.

OF THE RADIAL ARTERY.

Q. Describe the origin and course of the *Radial Artery.*

A. The origin of the Radial Artery is most generally at that place where the Brachial divides into two branches, near to the elbow-joint, sometimes higher up; it passes over the Pronator Teres, passes along the Radius between the Supinator Longus and Flexor Radialis, and near the wrist it lies immediately under the integuments upon the Flexor Longus Pollicis; at the carpal end of the Radius it turns anconad, or towards the back of the hand, under the tendons of the Abductors and Extensors of the thumb, and gets between the metacarpal bones of the thumb and fore-finger, where it passes to the palm or vola, runs across ulnad close to the metacarpal bones, forming a curve convex towards the fingers, called the *Deep Volar Arch.*

OF THE ULNAR ARTERY.

Q. Describe the origin and course of the *Ulnar Artery.*

A. It is generally the continuation of the trunk of the Humeral Artery, and is larger than the Radial; it runs deep below the flexors of the hand, keeping its course a good way between the Flexor Sublimis, and Profundus Digitorum; near the Carpus it becomes more superficial, runs under the Fascia and over the Annular Ligament, close by the radial side of the os pisiforme, and thence under the Aponeurosis Palmaris towards the radial side of the Carpus, forming the *Superficial Volar Arch.*

OF THE INTEROSSEAL ARTERY.

Q. Describe the origin and course of the *Interosseal Artery?*

A. The Interosseal Artery arises generally from the Ulnar, sometimes from the Humeral at its division into the Radial and Ulnar: sometimes there are two Interosseal Arteries by different origins; but generally the Interosseal shortly after its origin sends off a *Posterior Interosseal* branch, which perforates the Interosseous Ligament, and runs along the anconal aspect of the arm. The *Interosseal* itself runs close upon the interosseous ligament, in the middle between the Radius and Ulna, always on the fore or thenal aspect; near the wrist the principal branch perforates the interosseous ligament, goes to the posterior side of the carpus and back of the hand, and divides into inosculating branches.

Q. Describe the Recurrent Arteries situated at the bend of the elbow?

A. At the elbow joint, Recurrent branches are sent upwards from the Radial, Ulnar, and Interosseal Arteries, which inosculate freely with others sent down from the Profunda, and Anastomotic of the Brachial Artery. These Recurrents are to be seen supplying the parts on all the four aspects of the arm.

Q. What advantage do we expect from these *Recurrents* in the *operation for Aneurism* at the elbow joint?

A. When the trunk of the principal artery affected by the Aneurism is tied, these Recurrent Arteries must carry on the circulation to the fore-arm and hand. They become much dilated, and in a short time are quite fitted for transmitting the usual quantity of blood without inconvenience.

Q. Do the *Radial, Ulnar*, and *Interosseal Arteries* send off branches in their course along the fore-arm?

A. Yes; after the Recurrents, they send off a great many nameless and irregular branches to the different muscles, membranes, and bones as they pass.

Q. From what arteries do the *Nutritious Arteries* of the Radius and Ulna rise?

A. From the *Interosseal Artery* which runs on the thenal aspect of the Interosseous Ligament.

Q. Describe the course, branches, and connexions of the RADIAL ARTERY *at the* WRIST more minutely?

A. When the Radial Artery turns under the extensors of the thumb towards the back of the hand, and gets between the metacarpal bones of the fore-finger and thumb, it sends off the *Arteria Magna Pollicis*, which runs along the side of the thumb next the fore-finger, or it sometimes divides and supplies both sides of the thumb; it also sends off the *Arteria Radialis Indicis*, which runs along the fore-finger next the thumb; and it sends off a *Thenal branch* running generally above the transverse Ligament of the Carpus, inosculates with the Ulnar Artery beneath the Aponeurosis Palmaris, and completes the deep *Volar Arch.* A number of irregular branches anastomose with others of the Ulnar and Interosseal Arteries.

Q. Describe the course, branches, and connexions of the ULNAR ARTERY *at the* WRIST *and* PALM, more minutely?

A. The Ulnar Artery at the wrist sends off a *Dorsal branch*, which passing behind the tendon of the flexor carpi ulnaris to the back of the hand, inosculates there with branches of the Interosseal and Radial, and forms a plexus, from which many small branches arise to the carpus, metacarpus, and fingers. From its Superficial Volar Arch branches are sent to the integuments and superficial parts; the *Ulnaris Profunda*, of considerable size near the root of the metacarpal bone of the little finger, passes deep, and inosculates with the Radial Artery, and forms part of the Deep Volar Arch; *three Volar branches* which run opposite to the interstices of the metacarpal bones, and at the roots of the fingers, divide into Digital Branches.

Q. Describe the course and connexions of the INTEROSSEAL ARTERY more minutely, *at the* CARPUS *and* HAND?

A. Near the carpus, the great Interosseal Artery passes chiefly to the back of the carpus and hand; and partly passes under the annular ligament of the carpus, inosculates with the superficial volar arch, and volar branches, and is dispersed upon the neighbouring parts of the wrist and palm. The posterior branch inosculates with the extreme branches of the Posterior Interosseal, which runs along the anconal aspect of the interosseous ligament, and is dispersed upon the muscles, tendons, and ligaments in its course; it assists in forming the arterial plexus or arch on the back of the carpus, and metacarpus, which sends three arteries downwards to the fingers along the spaces between the metacarpal bones.

Q. Do these Arches communicate with each other?

A. Yes; the Superficial and Deep Volar Arches anastomose by the Ulnaris Profunda, and by other smaller irregular branches; the Ancono-carpal Arch or Plexus on the back of the hand, inosculates with the perforating branches of the deep volar arch. In short there is a general communication among the arteries, both superficial and deep seated, of the palm, and also among the arteries on the back of the hand, and between them and those of the palm.

Q. What parts do the Volar Branches supply?

A. The Volar Branches spread upon the Interossei and Lumbricales muscles, and give twigs to them, and ultimately divide into the Digitals.

Q. Do other branches of Arteries run along and supply the anconal aspect, or back, of the interossei muscles?

A. Yes; branches sent from the ancono-carpal arch run along them, and perforants pass between them and the volar branches.

Q. Describe the origin, course, and termination of the Digital Arteries?

A. The three volar arteries, arising from the Superficial Volar Arch, receive at the roots of the fingers an equal number of branches from the deep Volar Arch: and then each of these volar arteries divides into two Digital branches, the one running along the radial, and the other along the ulnar side of the flexor tendons of all the fingers, except the ulnar side of the little finger, and the radial side of the fore-finger; the former is supplied from the Volar Arch, and the latter from the Radial Artery. Near the extremity of the distant phalanx, the Digitals gradually converge and inosculate with each other, forming the Digito-Volar Arch, which sends off a great number of small branches to the tip of the finger, where the sense of the touch is most acute.

OF THE THORACIC AORTA.

Q. What Arteries are sent off from the Descending Aorta in the Thorax?

A. The Thoracic descending Aorta, sends off three sets of Arteries, namely the Bronchials, the Œsophageals, and the Inferior Intercostals.

Q. Describe the Bronchial Arteries?

A. The Bronchial Arteries are three or four in number, and are generally sent off from the fore part of the Aorta; sometimes some of them arise from the Intercostals, or by common trunks with the Œsophageals. They are but small, and some of them are distributed to the right, and others to the left lung; they follow the ramifications of the bronchial tubes, and in their passage give twigs to the bronchial glands.

Q. Do the *Bronchial Arteries* inosculate with branches of the *Pulmonary Artery*?

A. Not in general; they sometimes anastomose by some of their minute branches, but this seems an accidental occurrence, as by far the greater number do not inosculate with the Pulmonary Artery.

Q. What is the *use* of the *Bronchial Arteries*?

A. They carry blood from which nourishment is derived to the whole substance of the lungs.

Q. Do the *Bronchial Arteries* send branches to any other parts besides the lungs?

A. Yes; they send small branches also to the œsophagus, to the posterior mediastinum, and to the pericardium, before they enter the lungs.

Q. Describe the Œsophageal Arteries?

A. The Œsophageals, four or five in number, are small, and arise from various parts of the Aorta, and from the Bronchials or Intercostals, and are dispersed chiefly upon the Œsophagus, and partly upon the posterior mediastinum, lungs, pericardium, and diaphragm.

Q. Describe the origin and course of the Inferior Intercostal Arteries?

A. They are sent off from the back and lateral parts of the Aorta on each side, and consist of nine or ten pairs. They run along the groove in the inferior margin of the ribs, towards the sternum between the external and internal layers of the Intercostal muscles; and give branches backwards to the spine, spinal marrow and its membranes; in their course forwards, to the intercostal and pectoral muscles, and to the pleura costalis. They anastomose freely with one another, and with the internal Mammary, and external Thoracics above; and with the Phrenic or Diaphragmatic, the Epigastric and Abdominal Arteries, as they descend to the last rib.

OF THE ABDOMINAL AORTA.

Q. What portion of the *Aorta* is strictly called *Abdominal?*

A. The Aorta passes down through the diaphragm between its long crura into the abdomen; and that portion of it from the last dorsal vertebra at the Diaphragm, to its division into the common Iliacs at the fourth lumbar, is properly called the *Abdominal Aorta.*

Q. Enumerate the ARTERIES sent off FROM THE ABDOMINAL AORTA from the Diaphragm downwards?

A. The Phrenic, Coeliac, Superior Mesenteric, Inferior Mesenteric, Renal or Emulgent, the Spermatic, Capsular, Adipose, Ureteric, the Lumbar, and the Sacra Media, Arteries, in the exact order of description.

Q. Describe the PHRENIC or DIAPHRAGMATIC ARTERIES?

A. They are two in number, and arise from the Aorta as soon as it passes through the Diaphragm, or sometimes from the Coeliac, are ramified on the con cave or abdominal side of the Diaphragm, and their extreme branches anastomose with the Inferior Intercostals, the Lumbar, and the Internal Mammary Arteries.

Q. Do the *Phrenic* Arteries send branches to other parts?

A. Yes; they generally send small branches to the Capsulae Renales, Cardia, and adjacent parts.

Q. Describe the origin and distribution of the COELIAC ARTERY?

A. The Coeliac Artery arises from the fore part of the Aorta, between the two crura of the Diaphragm, nearly opposite to the eleventh dorsal vertebra, at the upper margin of the Pancreas, below the Liver, behind the Stomach, and on the right of the Spleen; its trunk is scarcely half an inch long, when it divides into three branches, viz. the Superior Gastric, Hepatic, and Splenic.

Q. Describe the *Superior Gastric Artery?*

A. This Superior Coronary of the Stomach, as it is sometimes called, is the smallest of the three Coeliac branches, it runs along the smaller curvature of the stomach, from near the Cardia towards the Pylorus; it sends branches towards the left to the Cardia, which inosculate with the Œsophageals, Phrenics, and Vasa Brevia; in its course to the right it sends numerous branches to the sternal and dorsal aspects of the stomach, which anastomose freely with branches of the right and left Gastro-Epiploics, and of the Omentum, with the Pylorics, and Pancreatics.

Q. What seems to be the *use* of this *Superior Gastric Artery?*

A. It has its course in the concave gastric arch from the Cardia to the Pylorus, and spreads its ramifications on both sides of the stomach; in consequence of such a course and distribution, it carries a quantity of blood, nearly equal, to the stomach, whether it be full or empty. This equality renders it the most proper Artery for carrying nourishment to the coats of the stomach itself, hence it may be considered the *Nutrient Artery* of the stomach.

Q. Describe the course and distribution of the *Hepatic Artery?*

A. The Hepatic is the largest of the Coeliac branches, runs dorsad of, or behind, the right extremity of the Pancreas, and behind the Pylorus to the Porta of the liver, where it divides into the right Inferior Gastric, and the proper Hepatic.

Q. Describe the *Right Inferior Gastric Artery*, or *Right Gastro-Epiploic*, as it is sometimes called?

A. It runs along the convex arch of the stomach towards the left, and sends branches to both sides of the Stomach, which inosculate with the Superior Gastric, and with the Left Inferior Gastric; it sends branches also to the Pylorus, Duodenum, Pancreas, and Omentum.

Q. Describe the *Proper Hepatic Artery?*

A. The Hepatic Artery, having sent off the Gastro-Epiploica Dextra at the Porta of the Liver, soon divides into two branches, the larger of which is distributed through the right lobe, and the smaller through the left lobe of the Liver.

Q. Is the Bile secreted by the extremities of the *Hepatic Artery?*

A. Not in general; the blood which this Artery transmits, is destined for the nourishment of the Liver; while the extremities of the Vena Portae are coiled up into the Acini, which secrete the Bile. In some chance places of the Liver, some of the extremities of the Hepatic Artery and of those of the Vena Portae anastomose, but this seems accidental. In a very few rare cases indeed, the Vena Portae has been found to terminate in the Vena Cava, and the extremities of the Hepatic Artery, which was much enlarged, secreted the Bile.

Q. From what source does the *Gall-Bladder* receive its blood?

A. From the right hepatic branch the *Arteria Cystica* is sent off, which divides, and is dispersed upon the Gall-Bladder.

Q. Describe the *Splenic Artery?*

A. It runs first behind, and then along the upper margin of the Pancreas, to the concave side of the Spleen, where it divides into several branches, which send off the Gastro-Epiploica Sinistra or left Inferior Gastric, and the Vasa Brevia four or five in number: the Splenic branches enter the substance of the Spleen, and are minutely dispersed through it.

Q. Does the *Splenic Artery* send off any branches in its way to the Spleen?

A. Yes; it sends off several Pancreatic branches, and others to the Omentum, and Meso-colon.

Q. Describe the *Left Inferior Gastric* or *Gastro-Epiploica Sinistra?*

A. It runs along the convex or large curvature of the Stomach dextrad, or towards the right, until it inosculates with the trunk of the Right Inferior Gastric; in its course it anastomoses with branches of the Vasa Brevia, of the Superior Gastric, and the other Inferior Gastric on both sides of the Stomach.

Q. Describe the *Vasa Brevia* or *Arteriae Breves*?

A. These Arteries, generally from four to six in number, are distributed upon the left great extremity of the Stomach, where the branches sent from the Superior and Inferior Gastrics are but small and few in number; hence these Vasa Brevia copiously supply the deficiency on that part of the Stomach, and freely anastomose with the other left Gastrics.

Q. Which of these *Gastric Arteries* seem to contribute most to the secretion of Gastric Juice?

A. The Right and Left Inferior Gastrics, and the Vasa Brevia.

Q. How do you account for that?

A. When the Stomach is empty, and its coats considerably contracted and collapsed, the flow of the blood in these Arteries is very much impeded, and its positive quantity in a given time is most probably diminished by more than a half, while in the mean time it circulates readily through the Spleen and Liver without interruption. But, on the contrary, when the Stomach is distended with food, the blood flows freely in these Inferior Gastrics and Vasa Brevia, hence a much greater quantity is present, from which the Gastric Juice is copiously secreted, and at a time too when it is wanted for the purposes of digestion.

Q. Describe the origin and course of the Superior Mesenteric Artery?

A. It arises from the fore part of the Aorta immediately below the Coeliac, it lies behind the Pancreas, then passes over the Duodenum, enters between the layers of the Meso-colon and Mesentery, forming a large arch, and proceeding a little towards the right in its descent to the beginning of the Colon;

from the convexity of which many branches are sent off.

Q. What *branches* are sent off from the *Superior Mesenteric Artery*, and to what viscera are they distributed?

A. From its left or convex side between twenty and thirty branches are sent off, which are distributed upon the Pancreas, Duodenum, but particularly upon the Jejunum, Ilium, and Mesentery; from its concave or right side four pretty large branches arise, viz. the *Ileo-Colic*, which supplies the termination of the Ilium, Caput Caecum Coli, and part of the right side of the Colon; the *Colica-Dextra*, which inosculates with the former, and is dispersed upon the right Colon and part of its transverse arch; the *Colica Media* or *Anastomotica* is sent to the middle of the transverse arch, and there divides into a right and left branch; the former is dispersed upon the colon dextrad, and anastomoses with the Colica Dextra; the left branch runs sinistrad, and is dispersed upon the left side of the arch, and joins the Colica Sinistra and Inferior Mesenteric Artery; and several other smaller branches, which are distributed on the Omentum, and anastomose with branches of the Gastro-Epiploicae. Thus the *Superior Mesenteric Artery* supplies the Mesentery, Omentum, and the whole of the small and large Intestines, except the Left Colon and Rectum.

Q. In what manner are these numerous branches of the *Superior Mesenteric Artery* disposed in their course and termination?

A. They anastomose and form numerous arches, upon which others are again constructed in a beautiful manner, and this is continued repeatedly, till they reach the intestines, when the branches become straight, are minutely subdivided upon their villous coat, and terminate in the villi.

Q. Describe the INFERIOR MESENTERIC ARTERY?

A. It arises from the fore part of the Aorta, a little to the left, in the space between the Renal, and Common Iliacs; it descends obliquely behind the Peritoneum, upon the left Psoas muscle, and soon divides into branches, which join and separate, and join again, forming a number of arches, from which many branches are sent off; the principal are, the *Ramus Ascendens*, which divides into two branches, one of which anastomoses with the Colica Media, forming the Meso-Colic Arch, and the other is dispersed upon the left part of the Colon: the *Colica Sinistra*, which also divides into two branches, the one joins the Ramus Ascendens, the other is dispersed upon the Sigmoid Flexure of the Colon; and the *Haemorrhoidalis Interna*, which is the continuation of the trunk; it inosculates with the Colica Sinistra, and then descends upon the back part of the Rectum.

Q. Describe the Renal, or Emulgent Arteries?

A. They arise, one on each side, from the lateral parts of the Aorta, immediately below the Superior Mesenteric Artery, run transversely and obliquely downwards over the Psoas muscle, on each side to the Kidneys. The right Renal passes behind the Vena Cava, and is longer than the left, in consequence of the Aorta being situated on the left of the Vena Cava.

Q. What is the distribution of the *Renal Arteries in the Kidney?*

A. When the Artery comes to the concave edge of the Kidney, it divides into several branches, which enter the substance of the Kidney, surround its pelvis, divide repeatedly into smaller and smaller branches, which anastomose as they diverge towards the circumference, till their extremities become exceedingly minute in the Cortical substance, where they are coiled up into Corpuscles or Cryptae, which secrete the urine from the blood at the roots or bases of the Papillae.

Q. Describe the Capsular Arteries?

A. These Arteries generally arise from the Aorta laterally, sometimes from the Renal, or Diaphragmatic, and are dispersed through the Capsulae Renales.

Q. Describe the ADIPOSE ARTERIES?

A. These Arteries arise from the Aorta, and frequently from the Diaphragmatics, or Renals, or Spermatics, or Capsular, and are dispersed upon the Tunica Adiposa of the Kidney.

Q. Describe the URETERIC ARTERIES?

A. The Ureterics arise from the Aorta laterally, and sometimes from the Renal, Spermatic, or others in the vicinity, and are spread upon the Ureters.

Q. Describe the origin and course of the SPERMATIC ARTERIES.

A. They arise, one on each side, from the fore part of the Aorta, a little below the Renal, proceed at a very acute angle from the Aorta, over the surface of the Psoae muscles behind the Peritoneum; the right passes obliquely over the Vena Cava, the left passes behind the Colic Arteries, and both descend obliquely over the Ureters, to the Internal Abdominal Aperture, where each, in its respective side, is involved in the Spermatic Cord. They are very long, and rather small in size, but become larger before they reach the testicle, in consequence of the branch received from the Iliac.

Q. Describe the course and distribution of the *Spermatic Arteries* in the Cord and Testicle.

A. The Spermatic Artery, when it has joined the Cord at the upper Abdominal Aperture, receives a branch from the origin of the Epigastric Artery, and inosculates freely with it in its descent to the testicle, which it enters at its posterior part, and turns round in a serpentine form, waving along the upper part of the testicle, and sending coronary branches all over its convex surface, which terminate in the septulae, between which the fasciculi of the seminiferous tubes are situated.

Q. Are the *extremities of the Spermatic Arteries* coiled up in the manner of a gland?

A. They are so very minutely divided, and so intricately disposed, that it is not easy to say what is the precise form of their extremities in the numerous septulae in the substance of the testicle: it is very probable, however, that they are coiled up in a glandular manner to secrete the semen.

Q. Do the *Spermatic Arteries* send off many branches, and communicate with other arteries in their descent to the testicle?

A. Yes: the testes in the fœtus lie in the Psoae muscles, in the vicinity of the Kidneys, and before birth, pass gradually down into the Scrotum; hence they receive arterial branches from the Renal, and Capsular, as well as their principal artery from the Aorta; these inosculate, and in their descent communicate with branches of the Lumbar and Iliac Arteries. They give branches to the Spermatic Cord and Cremaster muscle, to the Scrotum, to the Epididymis, to the Septum Scroti, and they inosculate freely with each other in the substance of the Testicle.

Q. Do the *course and termination of the Spermatic Artery* in the Female differ from those in the Male?

A. Yes: the origin and course down the abdomen are the same in both: in the Female, however, the Spermatic does not pass through the Abdominal Ring, as in the male, but it descends into the Pelvis, between the layers of the Broad Ligament of the Uterus, spreads its branches upon the Ovarium, Fallopian Tube, Fundus of the Uterus, and Round Ligament, and it also inosculates with its fellow of the opposite side, and with the Uterine Arteries.

Q. Describe the LUMBAR ARTERIES.

A. They arise from the back and lateral parts of the Abdominal Aorta in pairs, in the same manner as the Intercostal Arteries do: they are generally four or five on each side; those on the right side are longer, and pass across behind the Vena Cava, and the Psoae Muscles, but before the Quadratus Lumborum; they then perforate the Transversalis and Oblique Muscles, and are dispersed upon them.

Q. What branches do the *Lumbar Arteries* send off?

A. They give branches backwards to the Spine, Spinal Marrow, and large muscles and integuments of the loins, others inwards to the Psoae, and Iliacus Internus.

Q. What arteries do the Lumbar communicate with?

A. The *Lumbar Arteries* inosculate with the Intercostals, Internal Mammaries, Diaphragmatics, Epigastrics, Circumflex Iliacs, and with each other.

Q. Describe the SACRA MEDIAN ARTERY.

A. This artery arises from the back and under part of the Aorta, just at its bifurcation; it is but small; it generally gives off a right and a left branch, which are distributed similar to the Lumbar Arteries; its trunk descends along the mesial line of the Os Sacrum and Os Coccygis, sending out lateral branches in its course.

OF THE ILIAC ARTERIES.

Q. Into what arteries is the AORTA divided?

A. The Aorta at the lower part of the fourth Lumbar Vertebra divides into the right and left *Common Iliac Arteries.*

Q. What is the course of the COMMON ILIAC ARTERIES?

A. The common Iliac Artery of the left side runs obliquely downwards and outwards on the lateral or left side of the Iliac Vein; that of the right side crosses over before the Vena Cava, and takes its situation also on the lateral or right side of the Common Iliac Vein: at the symphisis, which joins the Sacrum and Ilium, each divides into the *Internal and External Iliac;* the former follows the course of the Sacro-Iliac Symphysis into the Pelvis, the latter is considered the continuation of the trunk, and runs down on the inner or mesial aspect of the Psoae towards the Crural Arch.

OF THE INTERNAL ILIAC.

Q. Enumerate the *principal Branches* into which the *Internal Iliac* or *Hypogastric Artery* is divided?

A. The Internal Iliac soon divides into a number of Arteries, viz. the Ileo-lumbar, Lateral Sacral, Gluteal, Obturator, Umbilical, Vesical, Uterine, Hæmorrhoidal, Pudic, and the Sciatic or Ischiatic. Of these the Gluteal and Ischiatic are by much the largest.

Q. Describe the *Ileo-Lumbar Artery.*

A. It is small, and passes outwards under the Psoas, and is dispersed upon the Psoae, Iliacus Internus, and Os Ilium, giving to it its Nutrient artery. This artery has also several anastomoses with others, as the Lumbar, and Circumflex of the Ilium.

Q. Describe the *Sacrae Laterales.*

A. These Sacral arteries are generally two or three in number; they pass down by the foramina of the Os Sacrum, and give branches through each to the Cauda Equina; they supply the muscles, membranes, and nerves on the Sacrum, inosculate with the Sacra Media, and near the apex of the Sacrum join those of the opposite side, forming an arch.

Q. Describe the *Gluteal Artery.*

A. This is the largest branch of the Hypogastric, and by way of eminence has been called the Posterior Iliac. It passes out of the Pelvis at the upper part of the Iliac Notch, and is soon divided into branches, which are ramified principally through the Glutei Muscles, and inosculate with neighbouring arteries.

Q. Describe the *Obturator Artery.*

A. This Arteria Obturatoria arises sometimes from the Ileo-Lumbar, or Ischiatic, or Gluteal; it passes along the under side of the Psoas and upper edge of the Obturator Internus at the oval hole at the superior part of the Obturator Ligament, where, in company with the Obturator Nerve, it goes out of the Pelvis; it then divides into two sets of branches, the one set is dispersed upon the parts about the hip-joint, the other upon the Obturator Externus, and adjacent muscles.

Q. Describe the UMBILICAL ARTERY IN THE FŒTUS.

A. The Umbilical artery in the fœtus being a continuation of the trunk of the Iliac, rises by the side and fundus of the urinary bladder, and directs its course to the Umbilicus, where it and its fellow of the opposite side, pass out of the abdomen, are entwined in the Umbilical Cord, enter the Placenta, are minutely ramified in its substance, and ultimately spread their extremities around the cells, which contain blood of the mother.

Q. Do these *Umbilical Arteries* of the FOETUS terminate in the arteries or veins of the mother, or even anastomose with them?

A. Many anatomists have described the arteries of the Foetus, and those of the mother, as communicating in the placenta, but it is a mistake; the Foetal and Maternal vessels do not communicate or run into one another. Sometimes, indeed, a chance inosculation or two may be found in the Placenta, but it is not a common occurrence.

Q. Describe the *Umbilical Artery* in the ADULT.

A. This artery in the Foetus sends off several branches to the urinary bladder, which in the adult become much larger, and form the *Vesical Arteries*, while the Umbilical artery, which was large in the Fœtus, is shrivelled into a Ligament in the adult.

Q. What arteries are sent to the *Urinary Bladder*?

A. These *Vesicales* from the umbilical; branches from the Uterine arteries in the female; and branches from the other neighbouring arteries in the Pelvis.

Q. Describe the *Uterine Arteries*.

A. They arise either from the Internal Iliacs, or from some of their principal branches; they are larger than the Spermatic; they enter the Uterus near its Cervix, extend their branches to the Vagina and Bladder, and run in the edges of the uterus towards the fundus; they inosculate with each other, and with the Spermatics.

Q. Describe the *Haemorrhoidal Arteries*.

A. The Middle Haemorrhoidal Arteries arise either from the Internal Iliacs, or from some of their ramifications, and are irregular in their size, number, and extent of ramification. They are distributed to the Rectum, the Bladder, Vesiculae Seminales, Prostate

Gland, and to the Vagina: they anastomose freely with others.

Q. Describe the course of the *Pudic Arteries.*

A. This artery, on each side, arises either from the trunk of the Internal Iliac, or from the Ischiatic; it passes out of the Pelvis, along with the Sciatic artery, through the lower part of the Sciatic Notch of the Os Ilium, at the under edge of the Pyriform Muscle, over the upper Sacro-Sciatic Ligament. As soon as it gets outside the Pelvis, it gives off a few small branches, turns round the ligament into the Pelvis again, between the Sacro-Sciatic Ligaments to the inner side of the tuberosity of the Ischium, where it is lodged deep, and protected by a process of the larger Sacro-Sciatic Ligament from lateral pressure; it continues its course close to the inner side of the ramus of the Ischium and Pubis, behind the Crus Penis, till it reaches the Symphysis Pubis; then it turns suddenly on the dorsum of the Penis, stretches along it, parallel to its fellow under the Integuments, and terminates in the glans and prepuce.

Q. Does the *Pudic Artery* give off many branches in its course?

A. Yes: near its origin in the pelvis, it give branches to the Rectum, Bladder, Vesiculae Seminales, Prostate Gland, the Obturator Internus Muscle, the Vagina and Spermatic Cord; to the Pyriformis, Gluteus Maximus, the Coccyx, the Gemelli, the Ischium and muscles attached to it; and then having returned into the pelvis, it sends branches to the Rectum, called External Hæmorrhoidals, to the Levator and Sphincter Ani, to the Perineum and muscles there, to the Scrotum, the Corpus Cavernosum Urethrae, and Corpora Cavernosa Penis.

Q. What *Arteries* particularly belong to the *Penis?*

A. The trunks of the two Pudic arteries, about the size of a crow's quill, are continued along the Penis. Each of them at the Symphysis Pubis pierces the Corpus Cavernosum, and divides into two branches; of which the one runs along the Corpus Cavernosum near to the septum, through which it communicates with its fellow, and pours its blood, by numerous branches, into the cells, which, when filled and distended, produce erection; the other runs along the dorsum of the Penis till it reaches the Corona Glandis, which it encircles and terminates.

Q. Describe the *Sciatic* or *Ischiatic Artery.*

A. It is next to the Gluteal in size; it passes out of the Pelvis at the under part of the Sciatic Notch, accompanied by the Sciatic Nerve, between the Pyriformis and Gemelli, and being separated from the Gluteal Artery by the Pyriformis, it descends a considerable way with the nerve of the same name under the Gluteus Maximus, in the hollow between the Trochanter Major, and the tuberosity of the Ischium, but rather inclining to the latter. It is dispersed among the muscles, tendons, and ligaments, near the hip joint, viz. the Pyriformis, Gemelli, Quadratus Femoris, Coccygeus, Sacro-Sciatic and Capsular Ligaments, Levator Ani, Gluteus Maximus and Medius; and it inosculates frequently with other arteries.

OF THE EXTERNAL ILIAC ARTERY.

Q. Describe the course of the *External Iliac Artery.*

A. It appears in the adult to be a continuation of the trunk of the Common Iliac; it winds along the brim of the Pelvis, behind the Peritoneum, rises over the Psoas, passes under POUPART's Ligament, and, as soon as it emerges from the abdominal aperture, it is called the Femoral Artery.

Q. What arteries does the EXTERNAL ILIAC send off?

A. It sends off some small twigs to the Peritoneum, Muscles, and Lymphatic Glands; but two principal arteries, viz. the Epigastric and Circumflex Iliac.

Q. Describe the *Epigastric Artery.*

A. It arises from the mesial or inner side of the Iliac, just before it goes under the Ligament of POUPART, at nearly a right angle; it first ascends obliquely upwards and inwards, between the Peritoneum and Transversus Abdominis, then between the Peritoneum and Rectus, and lastly between the Rectus and its sheath, till it reach the Epigastric region. Near its origin it passes behind the Spermatic Cord in the male, and the Round Ligament in the female. It divides and sends off many branches, which anastomose with their fellows of the opposite side, with the adjacent arteries, such as the Lumbar, Inferior Intercostals, Internal Mammaries and Phrenics.

Q. Does the *Epigastric Artery* send off any branches near its origin?

A. Yes: it gives small twigs to the neighbouring parts, particularly a branch, in the male, to the Spermatic Cord; and, in the female, to the Round Ligament.

Q. Describe the *Circumflex Iliac Artery.*

A. It arises nearly opposite to the Epigastric, from the outer or lateral side of the External Iliac, it follows the curvature of the Crest of the Ilium on its central aspect between the Transversalis and Obliquus Internus, till it arrives at the highest point of the Ilium, where it ascends more directly, and inosculates with branches of the Epigastric, Lumbar, Inferior Intercostal, and Internal Mammary Arteries.

Q. To what parts are the branches of the Circumflex Iliac distributed?

A. To the Inguinal glands, to the different muscles in its course; and sometimes to the Cremaster and Spermatic Cord.

OF THE FEMORAL OR CRURAL ARTERY.

Q. Describe the course of the *Femoral* or *Crural Artery.*

A. It is the External Iliac continued, which, when without the abdomen, assumes the name of *Femoral* or *Crural.* It begins nearly under the middle of the Ligament of Poupart; runs *centrad*, or under the Fascia and Inguinal Glands, is surrounded by much fat, and unusually strong cellular membrane; has the Crural Nerve and Iliacus Internus situated *laterad*, the Pectinalis and the Crural Vein *mesiad;* descends in the hollow between the Adductors on the inner side, and the Rectus and Sartorius on the outer, covered first by the Integuments and Fascia, then by these and the Sartorius, and lastly by these and the Aponeurosis, which stretches down from the Vastus Internus to the Large Adductor, which it perforates, turning obliquely towards the ham, where it is called the Popliteal Artery.

Q. What *Arteries* does the *Femoral* send off?

A. It sends off the *Profunda* nearly opposite to the Trochanter Minor, and between this situation and the Crural Arch, it gives off *Inguinal* branches, Inguinal Pudics, and two Circumflex femorals.

Q. Describe the *Inguinal Branches.*

A. These *Inguinal Arteries* arising from the Femoral near the Crural Arch, are generally small and irregular in their number; they sometimes arise from the Inguinal Pudics, or Circumflex; they are ramified on the Inguinal Glands, neighbouring Muscles, Ligaments, and Integuments.

Q. Describe the *Inguinal* or *External Pudic Arteries.*

A. They are small and indefinite, are ramified on the Integuments of the Symphisis Pubis, on the Dorsum Penis, and Scrotum, and on the Labia Pudendi. They inosculate with other arteries in these parts.

Q. Describe the *Circumflex Arteries of the Thigh.*

A. The *Circumflexae Femoris* are two, the *Internal,* which is the larger, and is ramified deep among the Adductors of the Femur, and Flexors of the leg, arising from the Pelvis; and the *External,* which is ramified upon the Abductors of the Femur, and Extensors of the Leg.

Q. Describe the *Profunda Femoris.*

A. It arises from the Femoral artery, in general opposite to the Trochanter Minor; it frequently gives off the Circumflex; it runs down towards the insertion of the Adductor Brevis, and origin of the Vastus Internus in the linea aspera; crosses the linea obliquely, and terminates in the Flexors of the leg. In its course it sends off branches, called *Perforants*, which are distributed through the different muscles, some turn round close to the Femur, from the Popliteal to the Fibular aspect, to be dispersed upon the Vasti Externi and Gluteus Maximus. They inosculate with the Gluteal, Ischiatic, and other arteries, and with each other.

Q. Does the *Femoral Artery* send off from its trunk any *Perforant Branches?*

A. Yes; just before the *Femoral* perforates the tendon of the Triceps, it gives off the *Ramus Anastomoticus Magnus*, which descends with many ramifications on the Ligaments, Tendons, and Fascia, towards the Patella, and inosculates with the External Circumflex and other branches about the knee; near the same place it sends off also *Perforants* across the Poples, which succeed to those of the Profunda, to be distributed upon the Biceps and Vastus Externus.

OF THE POPLITEAL ARTERY.

Q. Describe the *Popliteal artery.*

A. When the Femoral passes down between the Condyles of the Os Femoris, it is called the *Popliteal artery.* It has the Popliteus and Capsular Ligament between it and the joint, the tendons of the muscles forming the ham-strings upon either side, and covered by the nerve, vein, much adipose substance, and the integuments; and a little farther down it is covered by the belly of the Gastrocnemius Externus, and integuments. It terminates at the under edge of the Popliteus, in the arteries named Tibialis Antica, and Postica.

Q. What *branches* does the *Popliteal Artery* send off?

A. An External and an Internal Superior Articular; and an External and Internal Inferior Articular; an Azygos or Median Articular, and two Surales.

Q. Describe the *Superior External*, and *Superior Internal Articular Arteries?*

A. They are circumflected *proximad* of, or above the Condyles; disperse their branches through, and under the two Vasti to the *Rotular* aspect, and form a part of the vascular plexus spread upon, and round the Patella. The *Internal* turning round by the Tibial aspect inosculates with branches of the Anastomotic, and Perforants of the Femoral; the *External* turning round by the Fibular aspect, inosculates with the External Circumflex.

Q. Describe the *Inferior External*, and *Inferior Internal Articular Arteries?*

A. They are circumflected nearer to the joint and the Lateral Ligaments—unite conspicuously with the Recurrents from the leg in forming the Plexus. In their course they send branches to the Soleus, Popliteus, Gastrocnemius, Tendons of the Flexors, Capsular and Lateral Ligaments, Ligament of the Patella, and Semilunar Cartilages.

Q. Describe the *Azygos* or *Median Articular?*

A. It arises either from the Popliteal, or from one of the superior Articular; it spreads between the Condyles on the Capsular Ligament, fat, Semilunar Cartilages, and Crucial Ligaments; it inosculates with the neighbouring Arteries.

Q. Describe the *Surales* or *Gastrocnemic Branches?*

A. These two Arteries arise from the Poplitical, between the origins of the Superior and Inferior Articular branches, and enter the heads of the Gastrocnemius; a branch often runs superficially down almost to the heel.

OF THE TIBIAL ARTERIES.

Q. Describe the *Anterior Tibial Artery?*

A. The Tibialis Antica is sent off from the Posterior Tibial at the Lower edge of the Popliteus Muscle, perforates the Interosseus Ligament, descends along its anterior surface, first between the Extensor Digitorum and Extensor Pollicis, and then between this and the Tibialis Anticus: near the ankle it becomes more superficial, rises upon the fore part of the Tibia, passes under the Annular Ligament, over the Tarsus, and along the interstice between the metatarsal bones of the great toe and index pedis, where it divides into the sole in the middle of the foot, and inosculates with the Plantar Arteries.

Q. *What Branches* does the *Anterior Tibial Artery* send off?

A. Near its origin it gives various small branches to the Soleus, Tibialis Posticus, Capsular Ligament, which inosculate with the Inferior and Arygos Articulars. Having perforated the Interosseous Ligament, it sends off a *Recurrent*, which ascends, and inosculates with the Articulars, and vascular plexus of the knee; in its course downwards, it gives small branches to the muscles on the fore part of the leg; near the Tarsus it gives off the *External* and *Internal Malleolar;* the *Arteria Tarsea,* which runs across the Tarsus under the tendons of the Extensors; the *Metatarsea,* which runs obliquely towards the root of the little toe, and gives branches to the Interossei Muscles; before it sinks into the sole, it sends off the *Dorsalis Pollicis* to the great and second toes.

Q. Describe the *Posterior Tibial Artery?*

A. The Tibialis Postica, being a continuation of the trunk, runs down under the Soleus, near to the Tibial Nerve, passes between the Tendo Achillis and Malleolus Internus into the sinuosity of the Os Calcis, where it divides into the *External and Internal Plantar Arteries.*

Q. What *Branches* does the *Posterior Tibial* send off?

A. About an inch below the origin of the Anterior Tibial, it sends off the *Fibularis* or *Peroneal;* and, in its descent, it gives off many lateral branches to the muscles and adjacent parts, as also the *Medullary Artery,* for the nourishment of the Tibia, about the middle of the leg.

Q. Describe the *Fibular* or *Peroneal Artery?*

A. It runs down on the inner or Tibial side of the Fibula, under the Flexor Pollicis Longus, towards the Malleolus Externus, behind which it runs deep by the Os Calcis, and is lost in anastomoses with the Posterior Tibial, External Plantar, and among the Muscles and Ligaments, near the external side of the Os Calcis.

Q. What *Branches* does the *Peroneal Artery* send off?

A. It sends off lateral branches to the muscles, fascia, interosseous ligaments, and bone, particularly the *Medullary Artery*, for nourishing the Fibula; about three inches above the ankle-joint, one branch, called *Peronea Antica*, larger than the other perforants, passes through the Interosseous Ligament, anastomoses with branches of the Anterial Tibial, and is dispersed upon the fore parts of the external ankle and Tarsus.

Q. Describe the *Internal Plantar Artery?*

A. It passes along the inner or Tibial side of the sole, between the Aponeurosis Plantaris and the Abductor Pollicis, towards the root of the great toe, passes under the Flexor Longus Pollicis, anastomoses with the Arcus Plantaris, and then gives off a branch, which divides it into two; the one runs along the Tibial side of the great toe, and the other along that of the toe next it.

Q. Describe the *External Plantar Artery?*

A. This is a continuation of the trunk of the Anterior Tibial, being larger than the former; it runs obliquely fibulad between the Flexor Brevis Digitorum, and Flexor Accessorius, to the base of the metatarsal bone of the little toe, where it bends forwards between the Flexors and Metatarsal bones of the small toes to the Tibial side of the foot, until it gets to the interstice of the metatarsals of the great toe, and index pedis, where it inosculates with the Internal Plantar, and forms the *Arcus Plantaris*.

Q. Do the *Plantar Arteries* communicate with those on the upper or convex part of the foot?

A. Yes, very freely, by many anastomoses, but particularly by the *perforating branch* of the *Anterior Tibial*, which passes down between the metatarsal bones of the great toe and the one next it, to join the *Plantar Arch.*

Q. *What Arteries* are sent out from the *Plantar Arch?*

A. *Two sets* of Arteries are sent from it, namely, the *Interosseal,* which are small, running to the spaces between the metatarsal bones, and the *Digital Arteries,* which are larger, running to the toes.

Q. In what manner do the *Digital Arteries,* direct their course ?

A. They are sent off from the Plantar Arch, run in the spaces between the metatarsal bones to the roots of the toes, and there each divides into two branches, which run along the sides of two contiguous toes corresponding to the metatarsal bones. The *Digitals* on both sides of each toe anastomose freely, and form an Arch or Plexus near their extremity.

ORGANIC DISEASES OF THE ARTERIES.

Q. Enumerate the principal *Diseases of the Arteries?*

A. The Arteries are subject to Ossification, Inflammation, Dilatation, and Rupture.

Q. In what particular part of the Artery is the *osseous matter* deposited ?

A. It is observed to be deposited in small points, in various parts of the Artery, or in thin spicular layers between the muscular and internal coats. These points or spicula increase in extent, and sometimes either surround the Artery, or, at least, the greater part of its circumference.

Q. By what circumstances and symptoms can we discover *inflammation of an Artery?*

A. If the Inflammation be considerable, by great pain, increased by violent pulsation, by a red streak on the integuments, painful to the touch, and by an increase of heat in the course of the Artery.

Q. Enumerate the Varieties of *Dilatation* or *Aneurism* of Arteries ?

A. The Circumscribed and the diffused True Aneurism; the Circumscribed and Diffused False; and the Aneurism by Anastomoses.

Q. What is understood by a *Circumscribed True Aneurism?*

A. It is when the circumference of the Artery is uniformly enlarged into a round circumscribed pulsating Tumour.

Q. What is meant by a *Diffused True Aneurism?*

A. It is so called when the tumour of the Artery is oblong, and not distinctly circumscribed; and when a sac communicates with the artery by a narrow neck.

Q. Is the trunk of the artery near to the Aneurism of its natural size?

A. It frequently is; but, at other times, it is considerably enlarged.

Q. What is meant by *Circumscribed False Aneurism?*

A. It is produced by the blood finding its way through an aperture, formed by a puncture or bursting of the coats of the artery into the annexed cellular substance, which becomes condensed, and forms a cyst, in which the blood is confined.

Q. What is understood by *Diffused False Aneurism?*

A. It is formed by the blood escaping as in the former case into the cellular substance, insinuating itself into its cells, and extending along the course of the Artery, for a very considerable way.

Q. What is signified by *Aneurism by Anastomosis?*

A. It is formed by the Dilatation of a cluster of small Arteries.

ANATOMY AND PHYSIOLOGY OF THE VENOUS SYSTEM GENERALLY.

Q. What are the physical qualities of the venous blood?

A. It is dark brown; of a peculiar odour; its specific gravity greater than that of water; its capacity for caloric greater than that of arterial blood; it forms, when drawn out of the vessels, a soft mass, separating by degrees into a transparent yellow liquid, called serum, and a soft substance nearly solid, of a dark reddish brown, called the cruor or clot; forming sometimes on its surface a pellicle called its buffy coat. Rest permits the formation of the coagulum more rapidly.

Q. What are the chemical qualities of the venous blood?

A. Put into contact with oxygen gas or atmospheric air, venous blood becomes scarlet; with azote, of a reddish brown; with ammonia, cherry red; it contains water, albumen, muriate of soda and potash, lactate of soda, and extractive and animal matters, phosphate of soda, and sometimes it has upon its surface a fatty matter; the clot is composed of colouring matter and fibrine; the former is solid, white, without taste or smell: phosphate of lime, charcoal and carbonate of ammonia are the principal ingredients yielded by this substance on combustion: a little phosphate of magnesia, carbonate of lime, and carbonate of soda are also found. The clot yields also carbon, hydrogen, oxygen and azote.

Q. What are the physical properties of the colouring matter of the blood?

A. They resemble small globules; dried and calcined in the air, they burn, and form a charcoal very difficult to reduce to ashes: oxide of iron principally, phosphate of lime, pure lime and carbonic acid form its component parts chemically considered.

Q. What are the causes of the coagulation of the blood?

A. It is not owing to congelation or to the contact of the air as has been supposed, but it is a peculiar property, which appears in certain situations, and not in others: thus blood coagulates speedily out of the body, though if thrown out into a cavity, as the scrotum, it does not for a long time.

Q. Is there any change of temperature upon the coagulation of the blood?

A. There is none according to the latest experiments.

Q. How are the Veins to be distinguished from Arteries?

A. The veins may be distinguished by their want of pulsation, by their bluish colour, by their larger size, and by the thinness of their coats.

Q. Do the Veins accompany the Arteries?

A. Yes, in general; in the extremities, however, and fleshy parts, one set of veins runs deep, and accompanies their respective arteries; while another set runs more superficially, and is termed subcutaneous.

Q. Do the Veins observe the same regularity in their situation, and division into branches, as the Arteries do?

A. No; they exhibit a much greater variety, both in the situation of their trunks, and in the division of their branches.

Q. Have veins as frequent anastomoses with each other as Arteries?

A. They anastomose much more frequently than the Arteries; and that too by large trunks, while the Arteries, with a few exceptions, anastomose by small branches.

Q. Whether are the Veins or Arteries capable of the greater distension?

A. The Veins are more flexible, and capable of bearing greater distension than the Arteries, and owing to this, their coats become so attenuated, that they are more subject to be ruptured.

Q. Why are the veins of the muscular and extreme parts furnished with *Valves?*

A. That the flow of the blood may not be retarded, but rather promoted by the muscular actions of those parts, while the Valves prevent it from flowing back towards the extremities.

Q. Why are the Veins of the Cranium, Thorax, and Abdomen, with a few exceptions, not furnished with Valves?

A. Because the veins in these cavities are not subject to pressure from muscular action, and, in consequence, the blood is not easily retarded, and rendered subject to regurgitation.

Q. What powers propel the blood in the Veins?

A. A velocity of very considerable strength is given to the blood in the Arteries, by the contractile power of the heart and arteries themselves; by which means it is propelled into the extremities of the Veins with considerable force, and then the elasticity of the coats of the veins, and the motions of the surrounding parts, assisted by the Valves, continue its movement with the same velocity towards the heart.

Q. Have the veins the power of absorbing substances placed in contact with them?

A. They have, provided these substances are soluble in fluids; thus, if camphor is introduced into one of the cavities, whether serous or mucous, the odour of this substance is discharged in the breath by the lungs; the absorption is more rapid in the serous membranes, as that of the peritoneum, than it is in the mucous, and is always more copious where the surface is very vascular, than where it is otherwise.

Q. How is it proved that the veins possess the power of absorption?

A. Odorous substances introduced into the intestines are, immediately after their introduction, perceived in the vena cava, and not for a long time after in the thoracic duct, or the lacteals.

Q. Do the veins of the skin possess the power of absorption?

A. According to Magendie they form an exception to the general rule, because the cuticle intervenes; if this membrane be removed, the veins absorb as usual: thus caustics, as arsenic applied to the skin, have produced death. Experiments made in the United States by Rousseau, Mussie, Klapp and others, prove clearly that the cuticle is no obstacle to the passage of certain substances through the skin.

VEINS OF THE INFERIOR EXTREMITY.

Q. Describe the deep-seated Veins of the Foot and Leg?

A. The *deep-seated Veins* being generally two in number, called Venae Comites, or Satellites, run close at each side of their respective arteries, from which they receive their names, and they unite into trunks where their arteries divide. They frequently anastomose with each other, and sometimes also with the subcutaneous veins. The *Plantar* unite and form the *Tibial* and *Fibular Veins*, which ascend to the Poples, or upper part of the leg, where they join and constitute the *Popliteal Vein*.

Q. Does the *Popliteal Vein* receive others?

A. Yes; the Popliteal Vein lies close upon the posterior part of the Artery of that name, and receives the Vena Surales, Vena Saphena Minor, and the Venae Articulares, in its ascent, becomes larger, and at the upper part of the Condyles is named the Femoral Vein.

Q. Describe the course of the *Femoral Vein?*

A. It ascends close by the side of the Artery, passes through the tendon of the Triceps with it; near the middle of the femur it lies deeper than the Artery, it then turns gradually to the inner, or Tibial, side of the Artery, and, in this situation, it passes under the Crural Arch into the Abdomen, where it receives the name of the External Iliac Vein.

Q. *What Veins* does the *Femoral* receive in its ascent?

A. It receives all the Veins which correspond with the branches of the Femoral Artery: namely, those of the Perforant branches of the Profunda below the Tendon of the Triceps; opposite to the Trochanter Minor, the trunk of the *Vena Profunda*, which has previously received the veins corresponding with the branches of the Arteria Profunda; above the Trochanter Minor, it receives small veins from the External Parts of Generation, Inguinal Glands, and from the Integuments of the fore part of the Abdomen and of the Groin.

Q. Describe the course of the *External Iliac Vein?*

A. It commences at the Crural Arch, runs up on the mesial or inside of the External Iliac Artery, and near to the vertebrae it crosses behind this Artery on the right side of the Pelvis, and behind the Internal Iliac Artery on the left side, where each joins its respective Internal Iliac Vein, and after their junction, the common Iliac Vein begins.

Q. *What Veins* does the *External Iliac* receive in its ascent along the brim of the Pelvis?

A. It receives at the Crural Arch the *Epigastric*, and the *Circumflex of the Ilium*, and sometimes the *Obturator Vein.*

Q. Describe the course of the *Hypogastric* or *Internal Iliac Vein?*

A. The different Veins which accompany the branches of the Internal Iliac Artery, are named after their respective Arteries, unite and form the *Internal Iliac*, or *Hypogastric Vein*, which is situated on the outer side, or lateral aspect, of the Internal Iliac Artery, and soon joins the external Iliac Vein, to form the common Iliac.

Q. Have the Veins, of which the *Internal Iliac* is composed, any *Valves* in their Structure?

A. The Veins, situated in the muscular fleshy parts, are uniformly furnished with Valves; other Veins, or a portion of others, not subjected to muscular pressure, have no Valves.

Q. Describe the *Common Iliac Vein?*

A. This Vein lies on the right side of the Common Iliac Artery, joins its fellow just below the bifurcation of the Aorta. By their junction the lower part of the Vena Cava is formed, and has its situation on the right side of the Aorta.

Q. What Veins does the *Vena Cava* receive in its ascent?

A. It receives first the *Sacral* Vein, the *Lumbar*, the *Renal*, and right *Spermatic*; and, at the Diaphragm, the *Diaphragmatic* and *Hepatic* Veins, after which it soon terminates in the Right Auricle of the Heart.

Q. In what manner do the *Left Lumbar Veins,* and the *Left Renal,* pass the Aorta ?

A. The left Lumbar Veins cross behind, and the left Renal passes over before the Aorta to terminate in the Vena Cava.

Q. Where does the *left Spermatic* Vein terminate ?

A. It terminates in the left Renal Vein.

Q. Are the *Spermatic Veins* furnished with *Valves?*

A. These Veins are much larger than their corresponding Arteries, are always furnished with valves without the Abdomen, and most frequently also within it.

VEINS OF THE SUPERIOR EXTREMITY.

Q. What Veins do we find in the hand ?

A. The *Veins of the hand* consist of a deep-seated set, which take their names from the arteries ; and of a superficial set, quite irregular in their course and distribution.

Q. What Veins form the *Cephalic Vein?*

A. The veins running up from the back of the hand, turning towards the radial aspect of the fore arm, unite, and by degrees form a large trunk, frequently called the *Cephalic Vein.*

Q. What veins compose the *Basilic Vein?*

A. The superficial veins on the ulnar aspect gradually unite in their ascent, and form a trunk, named the *Basilic Vein.*

Q. Are there any more superficial veins on the fore-arm ?

A. Yes ; between these on the thenal or volar aspect of the arm, several veins are seen anastomosing with one another, and sometimes with the Cephalic, sometimes with the Basilic : when they anastomose with the Cephalic they are called *Median-Cephalic,* when with the Basilic, *Median-Basilic.*

Q. Describe the course and termination of the *Basilic Vein?*

A. It lies near the Ulnar Condyle, and runs up the inner or ulnar side of the humeral artery, forming the *Humeral Vein*, which receives the superficial veins, and has various communications with the deep-seated in its course to the Axilla, where it joins the deep veins, and forms the Axillary Vein.

Q. Describe also the course and termination of the *Cephalic Vein.*

A. The Cephalic Vein ascends on the outside of the Biceps, receiving superficial branches, and forming several communications with the Basilic; then passing between the Pectoralis Major and Deltoid, it terminates in the Axillary Vein.

Q. Do the deep and superficial veins anastomose?

A. Yes; the deep seated or satellites run one on each side of their respective arteries, anastomose frequently with each other, and sometimes with the superficial veins.

Q. Describe the *Axillary Vein.*

A. The Axillary Vein, formed by the junction of the superficial and deep seated humeral veins, passes up towards the Clavicle, and when it goes between it and the first rib, it is then called the Subclavian Vein.

Q. What veins does the *Axillary* one receive?

A. The Axillary Vein receives the Circumflex, Scapular, and External Thoracic Veins.

Q. Describe the *Subclavian Vein*?

A. It commences from the Axillary, where it passes between the Clavicle and first rib, runs across near the artery, and over the anterior portion of the Scalenus Anterior muscle, joins its fellow of the opposite side, and both conjoined form the Vena Cava Superior.

Q. Does the *Subclavian Vein* of the left side differ in any respects from that of the right?

A. Yes; the *left Subclavian Vein* is much longer than the right, and passes across the fore part of the Arteries arising from the arch of the Aorta, to join the right Subclavian behind the cartilage of the first rib.

Q. What veins does the *Subclavian* receive in its course?

A. It receives several veins from the superior dorsal part of the Scapula, from the muscles and integuments of the neck, the *external* and then the *internal Jugular Veins*, and the *Vertebral Vein.*

Q. Does the *Subclavian* not frequently receive other Veins?

A. Yes; it frequently receives the Inferior Laryngeal, Anterior External Jugular, and Internal Mammary Veins; and on the left side the Superior Intercostal Vein.

Q. Do the *Vertebral Veins* not terminate in the Brain?

A. Yes; the Vertebral Veins, properly so called, terminate in the Inferior Petrosal, or Occipital Sinuses; but small veins from the Spinal Cord, and its membranes, and from the bones and deep seated parts, form a trunk, which occupies the place of the Vertebral Vein in the canal of the transverse processes of the Cervical Vertebrae, and in consequence is called the *Vertebral Vein.*

VEINS OF THE HEAD.

Q. Mention the principal veins of the external parts of the head and face?

A. Superficial and deep seated veins from the upper parts and side of the head, after several anastomoses with the frontal and occipital, unite and form the *Temporal Vein*, which descends near to the artery, penetrates the substance of the Parotid Gland, from which, from the ear and cheek, it receives branches, and passes down below the Inferior Maxilla, where it is joined by the Facial Vein.

Q. By what veins is the *Facial* formed?

A. Numerous small veins of the forehead form the *Frontal* Vein, which accompanying the artery of that name, passes downwards, receiving many branches from the great facial plexus, until it gets below the lower jaw, where it unites with the Temporal Vein, and their union constitutes the External Jugular Vein.

Q. What is the course and termination of the *External Jugular Vein?*

A. The External Jugular, formed chiefly by the junction of the Temporal and Facial Veins, descends on the neck, under the Platysma Myoides, or Musculus Cutaneus, and anterior to the Sterno-Mastoideus, until it terminates in the Subclavian Vein.

Q. What veins does the *External Jugular* receive in its descent?

A. It receives branches from the Internal Maxillary Vein, the Lingual, and some from the Occipital Vein.

Q. What veins form the *Anterior External Jugular?*

A. The Subcutaneous and Superficial Veins on the fore part of the neck form a small trunk called by that name, which descends and terminates in the Subclavian Vein.

Q. Into what veins are those of the EYE sent?

A. The Vena Centralis Retinae, the Ciliary veins, termed Venae Vorticosae, the Lachrymal, Ethmoidal, Muscular, and other veins in the orbit, by their union form the *Ocular Vein.*

Q. Describe the situation, connections, and course of the *Ocular Vein.*

A. It is situated at the nasal angle of the eye, where it forms large anastomoses with the Facial Vein, after which it runs across, covered by the Attollens, towards the temporal angle, and turning backwards passes through the Superior Orbitar Fissure into the Cranium, and terminates in the *Cavernous Sinus.*

VEINS AND SINUSES OF THE BRAIN.

Q. Where do the *Veins of the Brain* terminate?

A. The veins of the Brain are but small, run between the Convolutions, and terminate obliquely in the different Sinuses.

Q. Into which *Sinuses* do all the others pour their blood?

A. All the other Sinuses pour their blood into the *Lateral Sinuses.*

Q. Enumerate the manner in which the *Sinuses* communicate with each other?

A. The *Superior Longitudinal* divides into the *Lateral,* the *Inferior Longitudinal* terminates in the *Torcular* HEROPHILI, which again terminates in the commencement of the Lateral Sinuses. The *Circular Sinus of* RIDLEY, situated round the Pituitary Gland, pours its blood into the *Cavernous Sinuses,* which having their situation at the sides of the Sella Turcica, send it into the *Petrosal* Sinuses, which communicate with the Lateral. All the *Occipital* Sinuses communicate with the *Lateral,* which ultimately pass out of the Cranium on each side by the Foramen Lacerum Posterius, and terminate in the Internal Jugular Vein.

Q. Describe the *Internal Jugular Veins?*

A. The Internal Jugular receive all the blood carried to the brain by the Internal Carotid and Vertebral Arteries, descend in the neck behind the Sterno Mastoideus, included in a sheath of cellular substance along with the Common Carotid Artery; becoming considerably enlarged, they terminate in the Subclavian Veins.

Q. What veins does the *Interior Jugular* receive in its descent?

A. It receives branches from the Pharynx and adjacent muscles, the principal part of the Internal Maxillary Vein, several branches from the Occipital Vein, sometimes the Lingual, the Superior Laryngeal, and occasionally the Inferior Laryngeal, and also some irregular branches from the muscles of the neck.

VEINS OF THE THORAX.

Q. Describe the *Internal Mammary Veins ?*

A. They ascend near to the arteries behind the Cartilages of the true ribs, and terminate in the Subclavian Vein, sometimes the right terminates in the commencement of the Cava Superior.

Q. Are the *Internal Mammary Veins* furnished with *Valves?*

A. They very frequently have valves, but sometimes they have none.

Q. Where do the *Inferior Intercostal Veins* terminate ?

A. They accompany their arteries along the inferior margin of the ribs ; the lower left Intercostal Veins unite, and form the commencement of the Vena Azygos, which about the middle of the Thorax crosses the spine, generally behind the Aorta, sometimes before it, and ascends at the right side of the Aorta, over, or anterior to, the Intercostal arteries of the right side. The Vena Azygos, frequently with its lower extremity communicates with a Lumbar, or the Renal Vein, or the Cava itself; the inferior right Intercostal Veins unite also into a trunk, which ascends, after sending a communicating branch downwards to the Lumbar or Renal, and joins the trunk of the Vena Azygos, which receives the other Intercostal veins as it ascends, those of the left side crossing behind the Aorta, and those of the right uniting with it directly.

Q. Where does the *Vena Azygos* terminate ?

A. Near the upper part of the Thorax the Vena Azygos makes a bend forwards over the commencement of the right pulmonary vessels, and terminates in the Superior Cava.

Q. Has the *Vena Azygos* any *Valves ?*

A. Yes; it is generally furnished with valves ; but sometimes not.

Q. Where do the *Superior Intercostal Veins* terminate ?

A. Those of the right side terminate in the Vena

Azygos: those of the left side form a trunk, called the *Left Vena Azygos* or *Left Superior Intercostal*, which terminates in the Subclavian Vein.

Q. Where do the *Bronchial Veins* terminate?

A. The right Bronchial Vein terminates in the Vena Azygos; the left in the Superior Intercostal Vein.

Q. Where do the *Oesophageal Veins* terminate?

A. In the Vena Azygos, Left Superior Intercostal, and Subclavian Veins.

Q. Where do the *Thymic*, *Pericardiac*, and *Veins* from the *Mediastinum* terminate?

A. In the Subclavian Veins, or in the beginning of the Superior Cava?

Q. Describe the course of the *Vena Cava Superior?*

A. The Vena Cava Superior formed by the junction of the two Subclavian and Azygos Veins, descends on the right side of, and rather anterior to, the ascending Aorta, and soon penetrates the pericardium, and afterwards terminates in the right Auricle of the Heart, opposite to the Inferior Cava.

DISEASES OF THE VEINS.

Q. What *organic Diseases* are veins particularly subject to?

A. To Varicose enlargement, and to Inflammation.

Q. What is meant by *Varicose Veins?*

A. It is a permanently dilated state of a Vein, containing much blood, and impeding the circulation.

Q. What are the symptoms of an inflamed Vein?

A. Fever, acute pain and redness in the course of the vein, and swelling of the part affected.

OF THE ABSORBENT SYSTEM.

Q. Of what vessels does the Absorbent System consist?

A. It consists of Lacteal and Lymphatic Vessels, and of Conglobate Glands.

Q. Where are the *Lacteals* situated, and what is their peculiar office?

A. They commence in the small intestines, pass between the layers of the Mesentery, and carry the Chyle absorbed from the chymified mass of alimentary matter to the Thoracic Duct.

Q. Where are the *Lymphatic Vessels* situated?

A. They have been discovered in almost all parts of the system, and a strong presumption is afforded that they exist in all parts of it: although as yet they have not been satisfactorily demonstrated in the Brain, Placenta, and its Membranes.

Q. What is the *office* of the *Lymphatics*?

A. They take up the Lymph, and decayed parts of the system, and convey them into the general mass of blood.

Q. What are the properties of the Lymph?

A. It is red, and slightly opaline in colour; sometimes yellow, saltish to the taste, disposed to form reddish filaments; and thus to separate into two parts, the one a serous fluid, the other a coagulum, resembling in its qualities the clot of the blood.

Q. What are the chemical components of Chyle?

A. Water, fibrine and albumen, with the carbonate, the phosphates of lime and soda, also the muriate of soda, and the phosphate of magnesia.

Q. Where are the *Conglobate Glands* situated?

A. In the cellular substance under the skin, or upon the trunks of blood-vessels belonging to the viscera of the different cavities.

Q. What is their size and texture?

A. These Glands differ in size from a millet seed to a walnut; are generally found in clusters. Their form is somewhat oval and flattened; their colour is reddish brown, becoming paler in advanced age. They are composed of a congeries of vessels minutely dispersed through their substance, and connected by cellular substance, which forms a membranous covering on their surface.

Q. What is supposed to be the *use* of these *Conglobate Glands*?

A. The Lymphatic and Lacteal Vessels all pass through these Glands, by which the Lymph and Chyle are supposed to undergo certain unknown changes: but it is more probable that these Glands entangle acrid and noxious particles, and prevent them from passing into the mass of blood.

Q. Are the Vessels which enter a Gland, designated by names different from those which pass out of it?

A. Yes; the vessels entering it are called *Vasa Inferentia;* and those passing out at the opposite side, *Vasa Efferentia.*

Q. What is the *texture* of the *Lymphatics*?

A. They have two or three coats, thin, somewhat transparent, and strong; composed of fibres possessing contractile power to a considerable degree, and therefore have been supposed muscular by some Anatomists.

Q. Are the Lymphatics and Lacteals furnished with *Valves*?

A. Yes; Valves of a semilunar form, at small distances from each other, there being sometimes four, six, or eight, in the space of an inch, are placed in pairs throughout their whole extent, and prevent the retrograde motion of their contents.

Q. In what manner do the *Absorbent Vessels* commence?

A. They commence by open extremities or mouths of a calibre too minute to be visible to the naked eye.

Q. By what power do they take up their fluids?

A. They take in the fluids applied to their extremities by Capillary Attraction, and partly, perhaps, by a vital action of the vessels.

Q. Does the *Lymph* flow from their trunks to the extremities, or how?

A. No; it is absorbed by their extremities, and passes into larger and larger trunks in its course, to be poured into the mass of blood.

Q. By *what means* are the fluids propelled along the Absorbent Vessels?

A. They are sucked in by Capillary and Vital Attraction, are moved along by the elasticity or contractile power of the vessels, accelerated in their motion by the pulsation of the arteries and movement of surrounding muscles or parts, and prevented from flowing back by the valves.

Q. Where do the *Absorbents* terminate?

A. They all terminate either in the Thoracic Duct, or Veins.

Q. Have they any Valves at their terminations?

A. Yes; they have always one, generally two valves, placed there to prevent the contents of the Thoracic Duct, or Veins, from entering them.

LYMPHATICS OF THE LOWER EXTREMITY.

Q. Are the Lymphatics divided into superficial and deep seated?

A. Yes; in the same manner as the Veins.

Q. Where have the Superficial Lymphatics their course?

A. They are situated between the skin and muscles, are much more numerous than the Veins; they form a plexus or net-work with each other in their course, by joining and separating so repeatedly.

Q. Describe the general course of the *Superficial Lymphatics in the foot*?

A. They are observed to form a plexus around the toes, from which numerous branches are dispersed over the upper part of the foot forming a plexus: while others are dispersed in a similar retiform manner along the sole towards the heel and ankles.

Q. Describe their general course on the *Leg*?

A. From the plexus on the upper part of the foot many branches ascend diverging towards the ankles, and on the fore part of the leg, and many also from the plexus at the heel, ascend on the hind part of the leg: these Lymphatics communicate very frequently with each other, and pass up, some on the inside, others on the outside of the knee, and some enter the Popliteal Glands.

Q. Describe the course of the Superficial Lymphatics on the *Thigh?*

A. A plexus ascends from the inner side of the knee, spreading on the inner and fore parts of the thigh, to the groin; the other Lymphatics from the outside of the knee ascend, and form branches which either terminate in the inner plexus of the thigh, or in the Inguinal Glands.

Q. Describe the deep-seated Lymphatics ?

A. They are situated among the muscles, and generally accompany the blood-vessels, either running one or two on each side of them, or forming a plexus over them. Those of the foot and leg pass into the Popliteal Glands.

Q. Describe the situation and number of the *Popliteal Glands.*

A. These Glands are situated in the ham, around the Popliteal Artery, immersed in adipose substance. They are generally three or four in number.

Q. What deep seated Lymphatics arise from the Popliteal Glands ?

A. Two or more trunks of considerable size accompany the femoral Artery, anastomose frequently with each other, and with some of the superficial in their ascent, and ultimately terminate in the Inguinal Glands.

Q. Describe the situation and number of the *Inguinal Glands ?*

A. They are generally eight, twelve, or more in number ; some of which are situated external to the tendinous facia, others below it and close upon the blood-vessels of the groin.

Q. What Lymphatic Vessels do these *Inguinal Glands* receive ?

A. They receive the superficial and deep seated Lymphatics of the thigh ; the superficial ones of the Loins, Nates, Scrotum, Penis, Labia Pudendi, and under part of the abdomen.

Q. Where do the deep seated Lymphatics of the *Genitals* pass?

A. They pass generally into the abdomen, and terminate in the Iliac and Lumbar Glands: some of them sometimes terminate in the deep seated cluster of the Inguinal Glands.

Q. What Vasa Efferentia proceed from the Inguinal Glands?

A. A few trunks of considerable size go out of them, pass into the abdomen under the Crural Arch and over the blood vessels, and terminate in the Iliac and Lumbar Glands.

Q. Describe the *Lymphatics of the Urinary Bladder?*

A. They accompany its blood vessels, pass into Glands situated upon its sides, and terminate in the Iliac Glands.

Q. Describe the *Lymphatics of the Uterus?*

A. They accompany the Hypogastric and Spermatic Arteries, forming a plexus upon them, pass through Glands situated on the sides of the Vagina, and terminate in the Iliac Glands.

Q. Where do the *Lymphatics of the Rectum* pass?

A. They pass through small Glands situated between it and the os sacrum, and then terminate in the Lumbar Glands.

Q. What is the situation of the *Iliac Glands?*

A. They are scattered along the course of the Iliac Arteries, and are pretty numerous.

Q. What is the situation and number of the *Lumbar Glands?*

A. They are placed on the fore part of the Abdominal Aorta, of the Inferior Vena Cava, and of the bodies of the Lumbar Vertebrae. They are very numerous.

OF THE LACTEAL VESSELS.

Q. Describe the *origins of the Lacteals.*

A. Each Lacteal takes its origin by numerous short radiated branches in one of the Villi, on the internal surface of the Intestines; each radiating branch has an orifice by which it absorbs Chyle, and being four or six in number, they unite and form the Lacteal trunk, which runs a little way obliquely through the coats of the intestine, uniting with other trunks of the same kind, and becoming larger.

Q. What course do the Lacteals take?

A. They accompany the blood-vessels, but being more numerous, one or two are generally situated on each side of them.

Q. Do no *Lymphatics* arise from the Intestines?

A. Yes; Lymphatics appear between the peritoneal and muscular coats of the Intestines, run along them, and have fewer anastomoses than the Lacteals.

Q. Do these *Lymphatics* and the *Lacteals* unite?

A. Yes; they unite, and their different trunks form a plexus, which runs between the two layers of the Mesentery and Meso-colon.

Q. From which of the Intestines do the greatest number of Lacteals arise?

A. From the Jejunum the largest and greatest number arises; but from the termination of the Duodenum, and the upper portion of the Ilium, a great many also arise.

Q. Do the *Lacteals* pass through *Glands?*

A. Yes; a great number of Glands is situated in adipose substance between the layers of the Mesentery, at small distances from each other, and the Lacteals all pass through one or more of these Mesenteric Glands in their way to the Thoracic Duct.

Q. Are the Mesenteric Glands of the same structure as Absorbent Glands in other parts of the system?

A. Yes; they are whitish when containing Chyle, are flattened, and of different sizes from a mere point to a half or two-thirds of an inch in diameter.

Q. Are the Mesenteric Glands continued from the intestines to the Thoracic Duct?

A. No: They are seldom seen nearer to the Intestines than two or three inches, and they become fewer in number near to the Thoracic Duct.

Q. What is supposed to be the *use of the Mesenteric Glands?*

A. Their use is not known; but it is probable that they entangle noxious and poisonous fluids, and prevent them from getting easily into the mass of blood; and in this they agree with Lymphatic Glands in other parts of the system.

Q. Where do the Lacteals terminate?

A. After they have passed through the different Mesenteric Glands, they unite into two or three or more trunks which accompany the branches of the Superior Mesenteric Artery, and at the right side of the Aorta terminate in the beginning of the Thoracic Duct; or, sometimes, in the trunks of the Lymphatics of the inferior extremities, and thus constitute the commencement of the Duct.

LYMPHATICS OF THE OTHER VISCERA.

Q. Are the *Lymphatics of the Colon* as large and numerous as those of the small Intestines?

A. No; they are smaller, and comparatively fewer in number.

Q. Do they pass through Glands?

A. Yes; they pass through Glands situated between the layers of the Meso-colon.

Q. Are these *Meso-colic Glands* numerous and large?

A. They are neither so numerous nor so large as those of the Mesentery.

Q. Where do the *Lymphatics of the Colon* terminate?

A. Those of the Caput Caecum and right portion of the Colon, join the trunks of the Mesenteric at the root of the Superior Mesenteric Artery; while those of the left portion join large trunks near the root of the Inferior Mesenteric, and terminate either in the Lumbar Glands, or in the commencement of the Thoracic Duct.

Q. How are the *Lymphatics of the Stomach* disposed?

A. Into two fasciculi, the one composed of branches from both sides of the Stomach, occupies the small curvature, and passes through a few small glands situated at the junction of the Omentum Minus with the Stomach; they become larger, enter other Glands together with the deep-seated Lymphatics of the Liver, and, with them, terminate in the Thoracic Duct. The other fasciculus, formed like the former by branches from both sides of the stomach, occupies the large curvature; some of its vessels running to the left, and receiving the Lymphatics of that side of the Omentum Majus, pass through two or three small glands on the left of the curvature, and, together with the Lymphatics of the Spleen and Pancreas, terminate in the Thoracic Duct: others of its vessels running to the right receive the Lymphatics of the right side of the Omentum, pass through two or three Glands situated on the right, descend by the Pylorus, and, together with the plexus of the small curvature, and with the deep-seated Lymphatics of the Liver, terminate in the Thoracic Duct.

Q. Describe the *Superficial Lymphatics of the Liver?*

A. The Superficial communicate freely with the deep-seated Lymphatics of the Liver. They form a plexus on its convex surface, which sends several trunks to the Suspensory and Lateral Ligaments; these trunks perforate the Diaphragm, pass through Glands situated upon the anterior part of the Œsophagus, the Pericardium, or in some contiguous part, and then terminate in the Thoracic Duct.

Q. Do some of the Superficial Lymphatics of the Liver not terminate differently sometimes?

A. Yes; they sometimes run up between the layers of the Mediastinum Anterius, or in company with the Internal Mammary blood-vessels, and terminate either in the upper part of the Thoracic Duct, or in the large Lymphatic trunks on the right side of the neck.

Q. Where do the Lymphatics on the concave surface of the Liver direct their course?

A. They converge and run towards the Porta, where they are united with the deep-seated Lymphatics.

Q. Describe the course and termination of the *Deep-Seated Lymphatics of the Liver.*

A. They accompany the blood-vessels and biliary ducts in the substance of the Liver, pass through several Glands situated about the trunk of the Vena Portae, and, near the root of the Superior Mesenteric Artery, terminate in the Thoracic Duct.

Q. Describe the *Lymphatic Vessels of the Spleen.*

A. The Lymphatics of the Spleen form a plexus upon its surface, accompany its blood-vessels, pass through Glands situated about the Splenic Artery, receive the Lymphatics of the Pancreas in their course, unite with the Lymphatics of the Stomach, and with some from the concave surface of the Liver, they form a plexus near the head of the Pancreas, from which considerable branches are sent out, passing on both sides of the Duodenum to terminate in the Thoracic Duct near the entrance of the Lacteals.

Q. Describe the *Lymphatics of the Kidneys.*

A. The Lymphatics of the Kidney are seldom seen, excepting when the Kidney is in a diseased state. They, however, converge towards the pelvis, where the Superficial and deep-seated unite, forming a plexus round the blood-vessels, which sends out trunks that pass through some of the Lumbar Glands, and terminate in the large Lymphatics near the Aorta.

Q. Where do the *Lymphatics of the Renal Capsules* terminate?

A. They are numerous, and all go to join the Renal Plexus.

OF THE THORACIC DUCT.

Q. What vessels form the commencement of the Thoracic Duct?

A. The lower extremity of the Thoracic Duct is formed by the junction of the trunks of the Lymphatics of the right and left Inferior Extremities, and of the Lacteal Vessels.

Q. In what part of the spine does that union take place?

A. On the anterior part of the third Lumbar Vertebra.

Q. Describe the course of the Thoracic Duct.

A. The Duct so formed is large, and placed behind the Aorta; it crosses obliquely to the right, and ascends on the right side of the Aorta. At the first Lumbar Vertebra it dilates into an oval or pyriform shape, called the Receptaculum Chyli, situated above the right Renal Artery, and behind the right crus of the diaphragm: from this the Duct ascends between the crura of the Diaphragm into the Thorax, and there runs on the anterior part of the Spine in the Mediastinum posterius, still on the right of the Aorta, and on the left of the Vena Azygos. About the fourth Dorsal Vertebra, it ascends obliquely over to the left side of the spine, behind the Œsophagus and descending Aorta, till it reaches the left Carotid; it rises from the Thorax behind the Longus Colli and Internal Jugular Vein, to the sixth Cervical Vertebra, where it bends forwards and downwards, and terminates in the Subclavian Vein, at the upper and back part of the angle formed by the Internal Jugular.

Q. Does the *Thoracic Duct* observe a straight or winding course?

A. It forms several windings, and not unfrequently divides and unites repeatedly in its course.

Q. Is the *Thoracic Duct* furnished with *Valves?*

A. Yes; it has a great many valves in its internal surface.

Q. By what powers does it convey its contents upwards?

A. By its elastic contractile power, which is often increased by the division of the duct into branches, (for the smaller the vessel the greater is its elastic power, aided perhaps by capillary attraction,) by the pulsation of the Aorta, by the valves, and the Vis a tergo, after the fluid is put in motion.

Q. Describe the course and termination of the *Intercostal Lymphatics.*

A. One or two trunks accompany the Intercostal blood-vessels in the intercostal spaces, and all of them pass through glands situated near the dorsal vertebrae, before they terminate in the Thoracic Duct.

Q. Describe the *Lymphatics of the Lungs.*

A. The superficial ones form Areolae, which run between the Lobules, and cover almost the whole surface; they run towards the bronchia, and pass through the Bronchial Glands, where they are united with the deep-seated Lymphatics, which followed the blood-vessels and bronchial tubes in the substance of the lungs.

Q. Where do they terminate?

A. The greater number of the left lung form a trunk which terminates in the Thoracic Duct, behind the bifurcation of the Trachea; the rest pass through Glands behind the arch of the Aorta, and terminate also in the Thoracic Duct near its end. Those of the right Lung, after passing through the Bronchial Glands, terminate partly in the Thoracic Duct, and partly in the common trunk of the right side of the neck.

Q. Describe the course and termination of the *Lymphatics of the Heart.*

A. They follow the course of the Coronary Arteries; the right passes over the arch of the Aorta, goes through a gland behind the origin of the Carotid Artery, and terminates in the Common Lymphatic Trunk on the right side of the neck; the left Lymphatic trunk of the heart being the larger, composed of a branch running between the ventricles on its upper part, and of another running in the groove between them on its under part, runs through a gland placed behind the Pulmonary Artery, between the arch of the Aorta, and division of the Trachea, and terminates in the upper end of the Thoracic Duct.

LYMPHATICS OF THE SUPERIOR EXTREMITY.

Q. Describe the Lymphatics of the *Hand.*

A. The Lymphatics of the Superior Extremity, like those of the Inferior, are divided into superficial and deep-seated. The superficial commencing upon the fore and back parts of the fingers, have frequent communications with each other, and soon form a plexus upon the back of the hand, and also in the palm, from which they rise upon the fore-arm.

Q. Do the Superficial Lymphatics observe any definite course in the *fore-arm*?

A. No; they are found generally near to the veins; hence they may be said to accompany the numerous ramifications of the Cephalic and Basilic Veins. The Lymphatics on the Anconal aspect divide; some turn obliquely over the Radial Muscles, and run up in the course of the Radius; others turn over those of the Ulna and follow the Basilic Vein.

Q. Do these Lymphatics pass through glands anywhere?

A. Not in the fore-arm; but while they ascend in the inner and fore part of the Humerus, they pass through some small glands in the course of the Humeral Artery, and the rest go into the Axillary Glands.

Q. Do these Superficial Lymphatics anastomose with the deep-seated?

A. Yes; and very frequently with each other round the whole arm, till they terminate in the Axillary Glands.

Q. Where have the deep-seated Lymphatics of the Arm their course and termination?

A. They run on each side of the Arterial branches and trunks the whole way up the arm, and terminate in the Axillary Glands.

Q. What other Lymphatics terminate in the Axillary Glands?

A. Besides the Superficial and Deep-seated of the Arm, the Lymphatics of the Mamma and lateral part of the Thorax, after passing through some small glands at the edge of the large Pectoral Muscle, the Sub-cutaneous Lymphatics from the back part of the Thorax, from the integuments and muscles of the Scapula, terminate all in the Axillary Glands.

Q. Describe the *Axillary Glands*.

A. These Glands vary in size and number, but are considerable in both respects; they are situated in the hollow of the Axilla, between the Pectoralis Major and Latissimus Dorsi, embedded in adipose substance, and connected by it with the blood-vessels and nerves.

Q. What *Vasa Efferentia* go out from the Axillary Glands?

A. Several large vessels go out from them under the clavicle, and there unite into a trunk, which, in the right side, receives or joins the short trunk forming the general termination of the Lymphatic System on this side, and which, in the left side, generally terminates in the Thoracic Duct.

LYMPHATICS OF THE HEAD AND NECK.

Q. What Lymphatics do we find on the *Occiput?*

A. A great many accompanying the different branches of blood-vessels pass through small glands behind the ears, and over the Mastoid processes.

Q. What is the course of the Lymphatics on the *side of the Head?*

A. They accompany the branches of the Temporal Artery, pass down through glands either situated at the root of the Zygoma, or through others connected with the Parotid Gland.

Q. Describe the course of the Lymphatics of the *face.*

A. These Lymphatics also follow the general course of the blood-vessels; some of them passing through glands situated on the outside of the Buccinator, others through large glands at the outer and under part of the Inferior Maxilla.

Q. What course do the Lymphatics of the *nose* and *mouth* take?

A. Those of the inner parts of the Nose accompany the branches of the Internal Maxillary Artery; those of the Tongue, Muscles, and parts about the Os Hyoides, pass through glands situated behind the angle of the Lower Jaw.

Q. What course do all these Lymphatics take in the *Neck*?

A. Both the Superficial and Deep-seated follow the External and Internal Jugular Veins and Carotid Arteries, receiving many branches as they descend from the integuments and muscles of the Neck, and forming a remarkable plexus, which goes through numerous small glands, called Concatenatae, situated around these blood-vessels.

Q. Where do these *Lymphatics of the Neck* terminate?

A. After that plexus has passed through the Glandulae Concatenatae, the different Lymphatics unite into one trunk, which, in the right side, goes into the General Lymphatic trunk, and which, on the left, enters the Thoracic Duct near its termination.

Q. Describe the *General Lymphatic Trunk* in the right side?

A. It is large and scarcely half an inch long; it is formed by the Lymphatics of the right Lung, right side of the Heart, of the Diaphragm, and of the Liver; and also by the Lymphatics of the right arm, right side of the Neck, and of the Thyroid Gland, and of the Head.

Q. Do all the Lymphatics on the left side terminate in the Thoracic Duct?

A. Yes; almost all of them terminate in it, excepting one or two occasionally in the Internal Jugular, or Subclavian Vein.

Q. Are there no *Lymphatics in the Brain?*

A. Anatomists have not been able to trace them satisfactorily; but it is highly probable that they exist in the Brain, because they have been supposed to have been seen on its membranes; because they have been found occasionally in the passages of the blood-vessels: because the Lymphatic Glands of the occiput and neck have become enlarged from diseases of the Brain; because Lymphatics have been found in the Brain of Fish; and because effusion of serum in several cases of Hydrocephalus Internus has been removed by suitable remedies.

PHYSIOLOGY OF THE CHYLE.

Q. Is the *Chyle* completely formed in the Intestines before it is absorbed by the Lacteals?

A. It has been supposed that its passage through the Mesenteric Glands, along the Thoracic Duct, and through the Lungs, is necessary for proper Chylification. But although it may be purified in passing through the Mesenteric Glands, yet it seems perfectly formed by the chemical changes in the Alimentary Mass previous to its absorption.

Q. What is the rapidity of the course of the Chyle?

A. It varies with the quantity formed in the small intestines; it is slow when small in quantity; rapid when large.

Q. Do the qualities of the Chyle differ with the aliments taken in?

A. Dr. Marcet has found that Chyle produced from vegetable food contains more Carbon than that from animal.

Q. Is the Thoracic Duct the only passage for the Chyle into the blood?

A. It would appear so; Liquids, as, alcohol, solutions of camphor, gain admittance into the blood by the Lymphatic vessels uniting with the Veins, as is proved by distillation of the blood, which demonstrates them in that fluid; though none can be found in the Chyle or in the Thoracic Duct.

Q. By what outlets are the Lymph and its vitiated particles, taken up from decayed parts, cast out of the system?

A. By the four *Emunctories*, viz. the faeces, urine, perspiration, and exhalation from the Lungs.

Q. Can the discharge of noxious particles from the blood be accelerated?

A. Yes; by means of medicines which stimulate the Intestines, the Kidneys, Skin, and Lungs, to increase their peculiar discharges, together with which the vitiated Lymph is carried off.

OF THE NERVOUS SYSTEM.

Q. What membranes form the theca of the *Spinal Marrow*?

A. The same membranes, which surround the Brain, are continued down the spinal canal, and form the sheath of the Medulla Spinales, and it receives a partial ligamentous covering also from the ligament lining the vertebral canal.

Q. Do these membranes embrace the *Spinal Cord* closely?

A. No; the involucra envelope the spinal marrow loosely, so as to admit of the flexions of the spine without inconvenience.

Q. Does the Spinal Marrow consist of a *Cineritious* and *Medullary* substance, as the Brain does?

A. Yes; but they are placed the reverse of the Brain; the Medullary matter being exterior, and the Cineritious interior.

Q. Is the *Spinal Cord* of the same size during its whole length?

A. No; it is much larger near the lower part of the cervical and lumbar vertebrae, than in the dorsal.

Q. Why is it larger in these places?

A. Because the large nerves which are sent to the Superior Extremities, pass out from the Spinal Marrow through the four lowest cervical holes; and the large nerves, also, which send off those of the Inferior Extremities, come out from the Spinal Marrow through the holes between the Lumbar Vertebrae; whereas the dorsal spinal cord only gives off the Intercostal Nerves, which are comparatively small.

Q. Is the *Spinal Cord* made up of different portions corresponding to the crura of the Cerebrum and Cerebellum?

A. Yes; there are an anterior and a posterior fissure on its surface, which form two lateral portions; and these again are subdivided by a lateral fissure into a large anterior, and a small posterior portion.

Q. Are *these four portions* firmly united?

A. They seem united only by fine cellular substance to near their middle, where cineritious substance, passing from one to another, connects them intimately.

Q. In what manner are the Nerves, sent out from the Spinal Cord, formed from these portions?

A. A flat fasciculus of nervous filaments is sent off from the anterior, and another from the posterior surface of the lateral portions; each is furnished with a sheath proper to itself, and the two sheaths are connected by cellular substance till they get into the hole between the vertebrae.

Q. When they get there what happens?

A. Between the vertebrae, each posterior fasciculus forms a Ganglion, from the opposite part of which a nerve issues, which is immediately joined by the anterior fasciculus to constitute the origin of a spinal nerve.

Q. Is any provision made for preventing the spinal marrow and the delicate filaments of the fasciculi from being overstretched and ruptured?

A. Yes; the Ligamentum Denticulatum seems of that description; it is attached to the Dura-Mater, where it comes out of the cranium, accompanies the spinal cord to its lowest extremity, and from its opposite side, sends off Denticuli, which run transversely among the nervous filaments, and support them.

Q. What happens when the *Spinal Nerves* come out from the holes between the vertebrae?

A. Each sends branches backwards to the muscles, and others forwards, to join the Great Sympathetic Nerve; while the trunk itself passes on to its place of distribution.

Q. How many pairs of *Spinal Nerves* go out from the Cord?

A. Thirty pairs; *one* sub-occipital; *seven* cervical; *twelve* dorsal; *five* lumbar; and *five* sacral.

Q. Describe the origin and course of the SUB-OCCIPITAL NERVES?

A. The sub-occipital nerve on each side arises from the beginning of the spinal marrow by an anterior and a posterior fasciculus, which fasciculi form a ganglion in passing out between the bones, from which one nerve goes out under the Vertebral Artery, and over the transverse process of the Atlas to the neck, where it is connected above to the ninth pair by an arch, and below, to the first cervical also by an arch; anteriorly to the upper ganglion of the Great Sympathetic by small branches, while the trunk of the Sub-occipital itself divides, and is dispersed among the muscles.

Q. Describe the origin and course of the first CERVICAL NERVE?

A. It passes out from the Spinal Cord between the Atlas and Vertebra Dentata, and immediately divides into an anterior, and a posterior branch.

Q. Describe the *anterior branch* of the first Cervical Nerve?

A. It passes under the transverse process of the Atlas, and is joined by an arch to the Accessorius, and by branches to the ninth pair, and by a ganglion to the uppermost ganglion of the Great Sympathetic, from which a branch is sent down to the second cervical nerve; filaments also go to the muscles.

Q. Describe its *Posterior branch.*

A. It is the larger of the two, perforates the muscles, giving off branches to them, ascends upon the *occiput*, dividing into many branches, which are dispersed among the muscles and integuments, and communicate with branches of the Frontal, and Portio Dura.

Q. Describe the *Second Cervical Nerve?*

A. After being formed by two fasciculi in the ordinary way, and passing out between the vertebrae, it sends off a branch to the middle ganglion of the Great Sympathetic, another downwards to join the third cervical, sends branches to the Sterno-Mastoideus, communicates with the Accessorius behind it, and more forwards with the Descendens Noni; it also sends off a small branch to assist in the formation of the *Phrenic Nerve;* it is ultimately divided into branches, some of which form the cutaneous nerves, and others are spent among the muscles of the neck.

Q. Describe the *Third Cervical Nerve?*

A. It is formed and passes out as the others, and then sends a branch to the middle ganglion of the Sympathetic, another to the fourth Cervical, another towards the formation of the *Phrenic* or *Diaphragmatic Nerve*, and a filament to the Descendens Noni; it afterwards divides into posterior and anterior branches, which are dispersed among the muscles.

Q. Describe the connexions of the *Fourth Cervical Nerve?*

A. It communicates with the middle ganglion of the Sympathetic, it sends one or two filaments to the formation of the *Diaphragmatic Nerve*, and then it joins the fifth Cervical.

Q. Describe the *other Cervical Nerves?*

A. The fourth runs downwards, joins the fifth, their trunk running down joins the sixth, and then the seventh behind the clavicle, and lastly to this is added the First Dorsal Nerve over the first rib. These four Cervicals and the first Dorsal are of large size, and pass between the anterior and middle Scaleni Muscles, and then between the Subclavius and first rib, at the lateral side of the Subclavian Artery into the Axilla, where they separate, unite, and separate repeatedly, forming a plexus which surrounds the artery.

Q. What nerves are sent out from the *Axillary Plexus?*

A. Nerves sent to the muscles behind, and the Thoracics accompanying the blood-vessels to the Pectoralis, Mamma, and Integuments. The nerves of the Superior extremity, viz. the Scapularis, Articularis, Cutaneus, Musculo-Cutaneus or Perforans, the Spiral-Muscular, the Median or Radial, and the Ulnar.

PATHOLOGY OF THE SPINAL MARROW.

ARACHNITIS SPINALIS.

Q. What are its symptoms?

A. In this affection the head is drawn backwards, the muscles on the posterior part of the trunk are in a state of permanent contraction, pain more or less violent is felt along the vertebral column, more acutely however in some particular parts of it; the intellectual faculties are not engaged; the head moves from one side to the other, when inflammation attacks the upper part of the medulla oblongata. We shall have additional reason to conclude that the disease is arachnitis, if the patient has received a fall, or suffered any injury of the vertebral column; or if there exists at the same time symptoms of arachnitis of the brain, in which case the symptoms of both affections will be blended.

Q. What are the diseases with which it may be confounded?

A. Arachnitis of the spine may be confounded with tetanus, and with different acute affections of the medulla spinalis.

Q. What are its anatomical characters?

A. They are the same as those enumerated when treating of arachnitis of the brain.

HYDRO-RACHIS.

Q. What are its symptoms?

A. Hydro-rachis, or spina-bifida, though generally congenital, may sometimes be observed at more advanced periods of life; one or more tumours, broad at the base, or attached by a pedicle, are found in the lumbar region, or more rarely in the superior parts of the spine; their size is variable, their surface in general transparent, without any change of colour of the skin. Pressure exerted on one of them increases the size of the others, if there be several, and at the same time causes symptoms of compression of the brain; the same effect takes place when the brain is pressed, if there should happen to be hydrocephalus. The limbs of these patients are feeble and ill-developed; the rectum and bladder are paralysed.

Q. What are its anatomical characters?

A. When the skin forms a covering for the tumour it is thickened, or, on the contrary, is thin and transparent; in some cases it is wanting altogether, and then the coverings of the tumour consist of the dura mater, pia mater, and arachnoid membrane; the pia mater is in general much injected and red. In some instances, the lateral arches of the corresponding vertebræ are wanting; in others they present but a slight separation; and finally, in some rather rare cases, the vertebra is divided altogether. The cavity of the arachnoid membrane contains a fluid, serous and limpid, sanguinolent or purulent, which may communicate with the brain itself, or be merely enclosed in the pia mater. We sometimes find a division to a greater or less extent of the substance of the medulla, in other cases very few traces of its structure can be found where the tumour had been situated.

INFLAMMATION AND "RAMOLLISSEMENT," OF THE MEDULLA SPINALIS.

Q. What are its symptoms?

A. This disease usually supervenes after contusions of the vertebral column, and is distinguishable by pain referred to some point of the spine, and by a sensation of pricking, and darting in the extremities; there is no derangement of the intellectual faculties, or of the senses, unless the inflammation be near the pons Varolii; in which case there may be total loss of sense, with aphony, trismus, paralysis of the whole body, retroversion of the head, and embarrassed respiration. When the cervical portion is affected, we usually observe a rigidity of the neck, permanent contractions or convulsions of the upper extremities, which are succeeded by paralysis and considerable disturbance of the respiration. When the dorsal portion is the seat of the disease, the trunk is sometimes agitated by continued convulsive motions; there are at the same time palpitations, high fever, and greater or less difficulty of respiration. Finally, when the lumbar portion becomes inflamed, we find paralysis of the lower extremities, constipation and retention of urine, or involuntary evacuations. When the disease is chronic, there sometimes is no pain, and then the paralysis of the lower limbs, of the bladder and rectum, come on gradually.

Q. What are the diseases with which it may be confounded?

A. They are certain forms of rheumatism, or neuralgia of the limbs.

Q. What are its anatomical characters?

A. They are the same as those of inflammation, and ramollissement of the brain.

TUMOURS OF THE MEDULLA SPINALIS AND ITS MEMBRANES.

Q. What are their symptoms?

A. The present state of knowledge does not furnish any signs by which we can distinguish the existence of the different tumours that are developed in the medulla spinalis and its membranes; we can only say that they sometimes induce paraplegia and various epileptic symptoms.

Q. What are their anatomical characters?

A. These tumours may in general be referred to the heads, tubercle, scirrhus, and hydatid.

Q. With what diseases may they be confounded?

A. With tumours external to the vertebral column, compressing the nerves or their origins.

NOTES.

1. Though authors so constantly speak of inflammation of the arachnoid membrane, still anatomy has not yet been able to discover any vessels in its tissue. Ribes and Ollivier are of opinion that the seat of the inflammation is not in the arachnoid of the spine, but in the dura mater, which receives a great number of vessels in the pia mater, and in the vessels of this latter membrane, which penetrate into the substance of the medulla. Hence they account for the red tinge and thickening (which are reported by different persons as having been observed in the arachnoid) by attributing them to injection of the vessels of the other membranes, and infiltration or thickening of the sub-serous cellular tissue. Inflammation of the membranes of the medulla spinalis, very frequently extends to those of the brain. The symptoms of both affections are therefore usually found united; however there are two which may be considered pathognomic of arachnitis of the spine—the first is a general contraction of the posterior muscles of the trunk, producing a complete opisthotonos. As this has been observed in cases where examination has demonstrated an inflammation of the arachnoid of the spine, that of the brain being free from any such affection, it may be regarded as diagnostic of arachnitis spinalis.—The other symptom is pain

extending along the spine, but more particularly referred to some parts of it.

Tetanus has been attributed to inflammation of the membranes of the spinal marrow. This, it is true, has been observed in many subjects that had died of tetanus; but as in several others no trace of such inflammation could be found to exist, we cannot admit the conclusion that it is the essential cause of the disease. Some pathologists are of opinion that this inflammation is connected chiefly with traumatic tetanus. When we consult the writings of those who have treated of this subject, we find that they speak of inflammation of the medulla spinalis, in such a way as to leave it a matter of doubt, whether they mean inflammation of the medulla itself, or of it, together with its membranes; so that we find it difficult to ascertain whether there had been inflammation of all these parts, or whether it had been confined to one or other of them. Dupuytren, however, found the investments alone inflamed in an individual who had died of tetanus, caused by a punctured wound of the foot; and Brera says, that he has seen the substance of the medulla altered in similar cases.

The progress of arachnitis spinalis is, in general, rapid, and its termination fatal. Ollivier reports one case that lasted thirty days, but death usually occurs from the tenth to the fourteenth.—See Ollivier, p. 319.

2. Several writers consider "ramollissement" of the substance of the brain and medulla spinalis, as a peculiar alteration of the nervous system altogether dependent of inflammation. It is true that this morbid alteration has been observed in cases in which no trace of local congestion could be found; but in general the membranes in the neighbourhood of it are red and thickened, and their vessels injected with blood; and sometimes those which penetrate into the substance of the medulla, though not visible in the healthy state, become so by being injected, and

give to the part a more or less deep tinge of red. These circumstances tend to show that "ramollissement" is produced by inflammation, which is further confirmed by the fact that it most constantly is seated in those parts of the brain and medulla, which are most vascular in their structure—such as the corpora striata, optic thalami and convolutions of the brain—and those swellings or enlargements which the medulla presents in its lumbar, cervical, and dorsal regions. These are the most vascular parts, as they contain the greatest quantity of gray substance. The "ramollissement" may extend to the whole thickness of the medulla, may occupy but one of its lateral halves to a variable extent, or be found only in either its anterior or posterior lateral facette—it may exist in the medulla oblongata solely, or in the cervical, dorsal, or lumbar region. Sometimes an increase of volume is observable in the affected portion—in some cases the limbs, even at the commencement, are attacked with convulsive movements of variable duration, which after some time are succeeded by paralysis: in others they are in a state of permanent and painful contraction—and lastly, they are sometimes altogether relaxed and flaccid. On what do these remarkable differences depend? According to Janson, as quoted by Ollivier, paralysis of the limbs without contraction, is owing to inflammation of the nervous structure alone, whilst the contraction depends on its complication with inflammation of the membranes.

3. We can, as is pointed out in the text, indicate almost the very spot in which the inflammation is seated; and those distinct groups of symptoms enumerated as characteristic of the lesions of the different regions of the medulla spinalis, are readily explicable by considering the destinations of these nerves that arise respectively from them. But it is not sufficient to consider merely their destination, we must take into account their function also. And here we find how the improved physiology and pa-

thology of the present day can mutually assist and enlighten each other. When the researches of that distinguished inquirer, Mr. Charles Bell, had demonstrated that the anterior roots of the spinal nerves preside over motion, and the posterior over sensibility, it became evident that the loss or derangement of these functions must be determined by the lesion of those roots, or of the part of the medulla from which they arise. Ollivier reports a very remarkable case, that clearly proves the correctness of this inference. This individual, an old soldier, had been for some years taciturn and indolent, wished to remain constantly in bed from finding an inability to get out of it. His gait was tottering, his lower extremities weak, both being equally affected. These symptoms increased until he ultimately became confined altogether to his bed, in which he lay with his thighs flexed towards the pelvis, his legs on his thighs, without being able to extend or move them in the least degree. Still these parts retained *their natural sensibility, as was evident on pricking or pinching* them.—The excretions were passed involuntarily, the voice and intellectual faculties were lost—after death the corpora pyramidalia and olivaria were found softened, and converted into a greyish diffluent pulp, which alteration extended along the whole of the anterior part of the medulla—almost to the lumbar region. The "ramollissement" could also be traced upwards into the brain, through the commissure of the cerebellum, the crura cerebri, the thalami, and corpora striata, even to some of the convolutions, particularly towards the middle of the anterior lobe. None of the other parts of the brain or cerebellum presented any sensible change, and the posterior part of the medulla, as well as the other membranes investing it, were perfectly healthy.

NERVES OF THE SUPERIOR EXTREMITY.

Q. Describe the *Scapular Nerve?*

A. It generally arises from the fourth and fifth

Cervicals, passes through the semilunar notch of the Scapula, and is dispersed upon the Supra and Infra-Spinatus muscles.

Q. Describe the *Articular Nerve?*

A. It arises from the common trunk of the fourth and fifth Cervicals, sinks deep in the axilla, then follows the course of the Posterior Circumflex Artery, and is spent upon the Teres Minor, Capsular ligament, and Deltoid.

Q. Describe the *Cutaneous Nerve.*

A. It comes off from the trunk common to the last Cervical and first Dorsal, and is much increased by fibrillae from the latter, runs down the inner and fore part of the arm, giving off small branches to the muscles, integuments, and coats of the blood-vessels; and near the bend of the fore-arm it divides into an *external and internal,* which are dispersed over the elbow joint and fore-arm.

Q. Is there not another *Cutaneous Nerve?*

A. Yes; the *Cutaneus Internus* of Wrisberg, which arises from the Axillary Plexus, descends a little and divides into two branches; the larger runs down the inner edge of the Triceps, and is dispersed upon it and the integuments near the elbow; the smaller, turning to the *anconal* aspect of the arm, is dispersed upon the Triceps and skin.

Q. Describe the *Musculo-Cutaneus,* or *Perforans* Casserii?

A. It arises by filaments from almost all the nerves forming the Axillary Plexus, perforates the upper end of the Coraco-Brachialis, to which it gives twigs, passes down between the Biceps, and Brachialis Internus, giving filaments to both; at the elbow-joint it passes on the out or radial side of the tendon of the Biceps, down the fore-arm between the Supinator Longus and Integuments, giving twigs to them in its course, as far as the thumb and back of the hand.

Q. Describe the *Spiral* or *Spiral Muscular Nerve?*

A. It is formed by fibrillae, from the Cervical Nerves entering the Axillary Plexus, it is larger than the rest of this extremity, and is distinguished by its spiral course. It is situated in the Axilla between the great artery and the ulnar nerve, turns obliquely downwards between the two heads of the Triceps, and then behind the Os Humeri to the radial side of the elbow, where it descends as far as the hand among the muscles of the fore-arm. In its whole course it gives twigs to the muscles and integuments.

Q. Describe the *Median* or *Radial Nerve.*

A. It is composed of fasciculi from all the nerves forming the Axillary Plexus, descends along the anterior surface of the Humeral Artery, to which, and the deep Veins, it is firmly connected by cellular substance; at the elbow it passes over the tendon of the Brachialis Internus, and perforates the back part of the Pronator Teres, and passes along between the Flexor Carpi Radialis, and Flexor Sublimis, in its way to the hand.

Q. Mention particularly the branches and termination of the *Radial Nerve.*

A. This nerve at the elbow-joint gives branches to the integuments, the Pronator and Flexor muscles, and sends off the Interosseous Nerve, which is spent on the Flexors of the thumb and fingers; at the wrist it passes under the annular ligament, and below the Aponeurosis Palmaris, and superficial arterial arch; it is divided into seven branches, two of which go to the opposite sides of the thumb, one to the side of the fore-finger next it, the others are divided, and run along the ulnar side of the fore, and back sides of the middle, and the radial side of the ring finger; these unite at the point of the fingers: other small filaments are sent to the Lumbricales, integuments of the palm, and contiguous parts.

Q. Describe the origin and course of the *Ulnar Nerve.*

A. It is of considerable size, arises chiefly from the last cervical and first dorsal nerves, runs along the inside of the Triceps, and at the elbow gets into the groove between the Olecranon, and inner Condyle, perforates the heads of the flexors of the fore-arm, and follows the course of the ulnar artery to the wrist, where it sends off the *Dorsal* Nerves, and, together with the artery, passes over the Annular Ligament into the Palm, where it is covered by the Aponeurosis Palmaris.

Q. Describe the course and termination of the *Dorsal Branches* of the Ulnar Nerve ?

A. They have their course between the Flexor Ulnaris and Ulna, to the back of the hand, and, in their course, they give twigs to the integuments of the wrist and metacarpus, and anastomose with others of the Spiral Nerve. One of them runs to the Ulnar side of the little finger, where it divides into two branches, one continues its course along the ulnar side of that finger ; the other is subdivided, one of its branches runs along the radial side of the little finger, and the other along the ulnar side of the ring finger.

Q. Describe the distribution of the Ulnar Nerve after it has passed into the Palm of the hand ?

A. In the palm the Ulnar Nerve is divided into *Superficial* and *Deep-seated* branches. The Superficial are sent to the Ulnar and Radial sides of the little, and to the Ulnar side of the ring finger, and to the muscles in their course. The Deep-seated form an arch, from which branches go to the muscles, as the Abductor Minimi Digiti, Flexor, Brevis Abductor Pollicis, Lumbricales and Interossei ; and also to the adjacent parts.

NERVES OF THE THORAX.

Q. What large trunks of Nerves are found within the Thorax ?

A. On each side of it we find the Phrenic or Diaphragmatic, the Par Vagum, and the Great Sympathetic, descending behind the Pleura to their different destinations : and, besides, we find the Intercostal Nerves running transversely.

Q. Describe the origin and course of the *Phrenic* or *Diaphragmatic Nerve.*

A. On each side it derives its origin partly from the *second*, but chiefly from the *third* and *fourth Cervical* Nerves, descends in the neck along the fore and lateral part of the Scalenus Anticus, enters the Thorax between the Subclavian Artery and Vein behind the anterior extremity of the first rib, passes over the root of the Lungs, then along the Pericardium, to which it adheres, in its course to the Diaphragm, upon the superior surface of which the Nerve divides into branches, and is dispersed in the form of radii towards the fleshy parts of that muscle.

Q. Describe the general course of the *Par Vagum* or *Pars Vaga?*

A. This eighth pair of Nerves arises from the Medulla Oblongata, passes out of the cranium by the Foramen Lacerum Posterius, descends behind the Carotid Artery, inclosed in the same sheath: enters the Thorax between the Subclavian Artery and Vein, passes behind the bronchia or root of the Lungs, descends with the Œsophagus through the Diaphragm into the Abdomen.

Q. What principal branches are sent off from the *Pars Vaga* in the Thorax?

A. The Recurrent Nerve; filaments to assist in forming the Anterior Pulmonary Plexus; six or seven branches to form the Posterior Pulmonary Plexus; lastly, it divides to form the Great Œsophageal Plexus.

Q. Describe the *Recurrent Nerves.*

A. The *right* Recurrent is reflected upwards behind the Subclavian Artery; and the *left* behind the Arch of the Aorta; each ascends in the neck at the posterior and lateral part of the Trachea, and sends filaments to the internal Membrane of the Trachea, Œsophagus, Pharynx, Thyroid Gland, Larynx, and its different muscles.

Q. What connexions does the *Recurrent Nerve* form in the Thorax?

A. The Recurrent near its origin, is connected with one or two branches of considerable size, from the middle and lowest ganglia of the Great Sympathetic ; it sends off branches to assist in forming the Anterior Pulmonary Plexus ; and, a little higher, it sends filaments to join the Superficial and deep Cardiac Nerves.

Q. Describe the formation and situation of the *Anterior Pulmonary Plexus?*

A. Filaments sent from the Par Vagum, the Recurrent, and the Cardiac branches of the Great Sympathetic, on each side meet, and by their varied connections form this Plexus, situated on the largest branches of the Pulmonary Artery at the root of the lungs. From this Anterior Pulmonary Plexus, filaments are sent to the Pericardium, and Cardiac Nerves; and many follow the Bronchial Tubes, and are dispersed through the substance of the Lungs.

Q. What Nerves form the *Posterior Pulmonary Plexus?*

A. The branches sent across from the one Par Vagum to the other, when running down behind the root of the Lungs, form the Posterior Pulmonary Plexus, from which several nerves arise, and following the Pulmonary Vessels, are distributed through the substance of the Lungs.

Q. How many *Plexuses* are formed on the *Œsophagus?*

A. Two; the *Small Œsophageal Plexus*, formed by twigs sent off from the Paria Vaga, and from the roots of the Recurrents, sends nerves to the fleshy parts of the Trachea, near to the Œsophagus, upon which this plexus lies, and gives many nerves to it: and the *Great Œsophageal Plexus*, embracing the tube and sending filaments to all its substance, is formed by the division of the two Paria Vaga into several Cords, between which funiculi run, and form a plexus.

NERVES OF THE HEART.

Q. From what sources do the Cardiacus Magnus Profundus arise ?

A. On the right side the *Cardiacus Magnus Profundus* arises from branches sent out from the second Cervical Ganglion of the Great Sympathetic, from the Cardiacus Supremus or Superficialis, and Par Vagum, descends between the Superior Cava and Ascending Aorta, joins the Cardiac Branches of the left side behind the Aorta, and forms the Plexus Cardiacus Magnus, from which is formed the Ganglion Cardiacum.

Q. Does the *Cardiacus Magnus Profundus* on the left side rise in a different manner?

A. It derives its origin from several filaments sent from the middle and lowest Ganglions of the Sympathetic, passes down across the arch of the Aorta, then receives the Cardiac branch of the Par Vagum, and shortly afterwards the Right Cardiacus Profundus to form the Plexus.

Q. Describe the *Nervus Cardiacus Minor.*

A. It is only found in the right side; it arises from the lowest cervical Ganglion of the Sympathetic, crosses over the Arteria Innominata and Aorta, and terminates in the Reticulum of nerves dispersed upon the left side of the Aorta Ascendens.

Q. Describe the origin and course of the *Cardiacus Supremus,* or *Superficialis.*

A. This Superficial Cardiac Nerve arises from the highest ganglion of the Sympathetic, and from the Superior Laryngeal, descends in the right side and joins the Superficial Cardiac branch of the eighth pair before the Subclavian Artery; in the left side it terminates in the Cardiac Plexus.

Q. Whence is the *Right Coronary Plexus* formed?

A. It proceeds from the Reticulum of nerves situated on the left part of the ascending Aorta, passes between the Pulmonary Artery and Aorta, and then follows the course of the right Coronary Artery to be dispersed upon the right side of the Heart.

Q. Describe the *Left Coronary Plexus.*

A. The Great Cardiac Plexus, having sent filaments to the Lungs, gives out branches, which unite and form the Great Cardiac Nerve of a gangliform appearance, situated on the left side of the Pulmonary Artery; from which nerve numerous branches arise, which form the Coronary Plexus of the left side, and communicate freely with the right.

OF THE GREAT SYMPATHETIC.

Q. Describe the origin and course of the Great Sympathetic nerve into the Thorax?

A. It arises by two or three filaments sent off from the *Sixth Pair* in the Cavernous Sinus, descends forming a Plexus around the Internal Carotid Artery, where it receives the *Retrograde Nerve* from the Second Branch of the Fifth Pair, descends through the Foramen Caroticum, is included in the same sheath with the Carotid Artery and Par Vagum, and, after forming three ganglia, and making numerous communications in the neck, it splits into two portions, one of which goes down before, and the other goes down behind the Subclavian Artery, they immediately unite into a trunk, which runs down the Thorax near the heads of the ribs.

Q. Describe the connexions of the *Sympathetic* in the Thorax.

A. The Sympathetic Nerve having got into the Thorax, forms a ganglion at the head of every rib, which receives two or three short branches from the commencement of each Intercostal Nerve. From many of the dorsal ganglia, small filaments are sent to the coats of the Aorta.

Q. Do any *particular Nerves* arise from these Dorsal Ganglions of the Sympathetic?

A. Yes; from the sixth, seventh, and eighth dorsal Ganglia branches are sent off, which pass obliquely down over the sides of the Vertebrae, and unite into a trunk called *Nervus Splanchnicus*, which goes into the Abdomen.

Q. Is another nerve not generally found of the same sort?

A. Yes; another Splanchnic Nerve, called *Secunda-*

rius, or *Accessorius*, arising from the ninth and tenth ganglia, descends into the Abdomen, and terminates with the former.

OF THE INTERCOSTAL NERVES.

Q. Describe the origin and course of the *Intercostal* or *Dorsal Nerves*.

A. They arise from the Spinal cord in the manner already described, pass out laterally between the Vertebrae, and run along the groove in the lower margin of the ribs to the anterior part of the Thorax, where they are dispersed.

Q. What branches do the *Intercostal Nerves* send off?

A. After they emerge from between the Vertebrae, they are connected by two or three short twigs to the ganglia of the Sympathetic, and opposite to which they send some principal branches backwards to the muscles situated near the Spine; in their course forward between the external and internal layers of Intercostal Muscles, they send off branches to these and other muscles, to the integuments of the Thorax, and other parts of the Abdomen.

Q. Do not some of the *Intercostal Nerves* contribute to the formation of the *Axillary Plexus?*

A. Yes; the first Intercostal Nerve sends a branch backwards, which enters into the Axillary Plexus. The branches reflected from the *Second* and *Third* Intercostals are also dispersed by numerous filaments upon the Axillary Glands and their integuments, and upon the back part of the arm and Latissimus Dorsi.

Q. Have these branches of the three or four upper Intercostal Nerves any particular names?

A. Yes; they are called from their origin and destination *Intercosto-Humeral*, which communicate with the Cutaneous Nerve of the arm, and with each other.

NERVES OF THE ABDOMEN.

Q. What nerves are dispersed upon the Chylopoietic and Assistant Chylopoietic Viscera?

A. The Paria Vaga, Rami Splanchnici, and the Sympathetic.

Q. Describe the course and termination of the *Left Par Vagum.*

A. It enters the abdomen at the anterior part of the Cardia, sends several filaments to the left Hepatic Plexus, and then ramifying, is spent on the anterior or upper and left portion of the stomach.

Q. Describe also the course and termination of the *Right Par Vagum.*

A. It descends upon the posterior part of the Cardia, soon divides into two fasciculi, of which the one proceeds to the root of the Hepatic Plexus, and to the Coeliac Ganglion ; the other, being the principal, is ramified on the posterior or under and left portion of the Stomach.

Q. Describe the termination of the *Rami Splanchnici.*

A. The Splanchnic Nerves arising from the dorsal ganglia of the Sympathetic, perforate the lateral and upper part of the smaller muscle of the Diaphragm, divide into a number of branches, which incorporate with the sides of the great *Semilunar Ganglion.*

Q. Describe the *Semilunar* or *Solar Ganglion.*

A. It is composed of the Splanchnic Nerves, and the branches of the Par Vagum on both sides; it is long and curved in figure, with its convexity downwards, and seems made up of a congeries of smaller ganglia, of different sizes and shapes, called the Coeliac Ganglia.

Q. What is the situation of these *Coeliac Ganglia?*

A. They are situated upon the Aorta at the roots of the Coeliac and Superior Mesenteric Arteries, and extend upon the fleshy crura of the Diaphragm.

Q. Do many *Nerves* issue from the *Coeliac Ganglia?*

A. Yes ; innumerable nerves issue from them in every direction, forming the *Solar Plexus* which lies along the Coeliac and Superior Mesenteric Arteries.

Q. What nerves arise from the *Solar Plexus?*

A. Various Plexuses of nerves arise from it, named after the arteries which they embrace, such as the Hepatic, the Splenic, Superior Mesenteric, Aortic, &c.

Q. Describe the *Hepatic Plexus ?*

A. It follows the course of the Hepatic Artery, gives filaments to the Renal Capsules, to the Diaphragm along its arteries; it divides into a right and left Hepatic Plexus, following the division of the Hepatic Artery: the right sends branches to the Pancreas, Pylorus, Duodenum, and gives origin to the Gastro-epiploic Plexus: the left sends branches to the Stomach, and is afterwards spent in the left lobe of the Liver.

Q. Describe the *Splenic Plexus?*

A. It embraces the Splenic Artery, and sends branches to the Pancreas in its vicinity.

Q. Describe the *Superior Mesenteric Plexus?*

A. It embraces the trunk of the Mesenteric Artery, and sends filaments along its different branches to the Glands of the Mesentery, to the Small Intestines, and right portion of the Colon.

Q. Describe the *Aortic Plexus.*

A. It closely embraces the Aorta, and is joined by nerves from the Sympathetic. From this plexus the *Inferior Mesenteric Plexus* is sent off, which is distributed to the left portion of the Colon and to the Rectum.

Q. Do any other Nerves arise from the *Aortic Plexus?*

A. Yes; the Aortic Plexus descends, receiving additions from the Sympathetics of both sides, under the name of the *Hypogastric Plexus*, which, at the lower end of the Aorta, divides into a right and left Plexus, which descend into the Pelvis, and are dispersed upon its different viscera.

Q. Describe the *Renal Plexus?*

A. It is sent off from the Coeliac Ganglia, and receives some filaments from the Ganglia of the Sympathetic; it soon divides into an anterior and a posterior plexus, which run along the corresponding surfaces of the Renal Artery, and are dispersed in the substance of the Kidney.

Q. Do any *Nerves go off* from the *Renal Plexus?*

A. Yes ; some twigs are sent off to the Renal Capsule, which receives other branches from the Coeliac Ganglia ; The Renal Plexus also gives filaments to the Ureter, and Spermatic Cord.

Q. Describe the *Hypogastric Plexus.*

A. It is a continuation of the Aortic Plexus, receiving filaments from the Sympathetics, and Sacral Nerves ; it gives off branches to the Rectum, Urinary Bladder, and Spermatic Cord, in the male, and to the Uterus and Vagina in the Female.

Q. Describe the *Spermatic Nerves?*

A. They are of small size, and given off from the Renal, and Hypogastric Plexuses; they accompany the Spermatic Arteries through the substance of the Testicles. They also receive a filament or two from the second Lumbar Nerve ; but they are spent upon the Substance of the Cord, Cremaster Muscle, and Scrotum, chiefly, and partly upon the Testicle, in the male, and upon the Round Ligament, Uterus, Vagina, Mons Veneris, and Labia Pudendi, in the Female.

Q. Describe the *Nerves of the Uterus* particularly ?

A. They are sent from the Hypogastric Plexuses chiefly, and partly from the Spermatics ; they enter the Uterus by the lateral broad Ligaments near its cervix, and are dispersed through its substance, communicating freely with one another.

Q. Describe the *Nervi Pudici.*

A. The Pudic Nerve, on each side, arises in two Fasciculi, formed by fibrillæ from the branches which compose the Sciatic Nerve; these fasciculi pass through the Notch of the Ilium, then between the Sacro-Sciatic Ligaments, following the course of the Pudic Arteries.

Q. To what parts are the *Pudic Nerves* distributed?

A. In their course they give many branches to the Muscles, Anus, Perineum, and Penis. On this last, the Superior fasciculus forms the Dorsalis Penis, situated between the Artery and Vein, sending branches to the upper part of the penis, and the Inferior fasciculus supplying its under part.

OF THE LUMBAR AND SACRAL NERVES.

Q. What situation do the *Sympathetic Nerves* occupy in the *Loins?*

A. After entering the Abdomen, the Sympathetics pass obliquely towards the Mesial line of the Lumbar Vertebrae, between the tendinous Crura of the Diaphragm, and the Psoas, forming Ganglia, from each of which two or three filaments are sent backward to join the root of the Lumbar Nerves ; and others forward to the Aortic Plexus.

Q. What course does the *Sympathetic* take in the *Pelvis?*

A. It descends at the inner or mesial side of the sacral foramina, becoming of smaller size it forms an arch with its fellow on the surface of the Os Coccygis, and thus terminates. In passing down, however, it forms] Sacral Ganglia, from which nerves are sent out to join the Sacral Nerves, and others to the parts lining the Pelvis, and to the Rectum.

Q. Describe the five *Lumbar Nerves.*

A. They emerge between the Vertebrae, form connexions with one another, upwards and downwards, with the Sympathetics, by branches running obliquely over the Vertebrae, and send large branches backwards to the large muscles and integuments of the Loins.

Q. What nerves form the *Lumbar Plexus?*

A. The different connections of the Lumbar Nerves with each other, form a sort of Plexus situated behind the Psoas, from which nerves are sent to the Quadratus Lumborum and Flexors of the Thigh.

Q. Describe the *first Lumbar Nerve* particularly ?

A. It is connected by a branch to the last Dorsal, and by its trunk to the second Lumbar Nerve. It sends filaments to the Muscles of the Loins, and a principal branch over the Quadratus Lumborum towards the spine of the Ilium, where it is ramified on the Integuments of the Pelvis, on the upper and outer part of the Thigh, on the lower part of the abdominal muscles, groin, pubes, and scrotum, or labia pudendi.

Q. Describe the *Second Lumbar Nerve*, also, particularly?

A. It perforates the Psoas, to which it gives several twigs, and then unites with the third Lumbar. It sends off the *External Spermatic*, which generally receives some twigs from the first Lumbar; this Spermatic perforates the upper part of the Psoas, near Poupart's Ligament it divides into two branches, one of which passes through the abdominal Ring, and is dispersed upon the Pubes, Spermatic Cord, Scrotum and Testis, and Round Ligament, Uterus, and Labia Pudendi.

Q. Are the other *three Lumbar Nerves* connected in like manner?

A. Yes; they unite also, and form a Plexus.

Q. Do any other Nerves arise from the *Lumbar Nerves*?

A. Yes; the Cutaneus Externus, the Obturator, and the Crural Nerve.

Q. Describe the *External Cutaneous*?

A. It arises from the second and third Lumbar, passes behind the Psoas, and across the Iliacus Internus to the Superior Anterior Spinous Process of the Ilium, goes over Poupart's Ligament, and is dispersed on the Vastus Externus, and Integuments of the Thigh.

Q. Describe the *Obturator Nerve*?

A. It is of very considerable size, and arises from the Second, Third, and Fourth Lumbar Nerves, passes between the External and Internal Iliac blood-vessels, along the side of the Pelvis; accompanies the artery of the same name through the upper part of the Obturator Muscles, and Ligament; and having sent branches to the Obturator and Pectineus, it divides into an anterior, and a posterior fasciculus, the former dispersed upon the two small Adductors and Gracilis, the latter upon the Adductor Magnus.

Q. Describe the *Crural Nerve*?

A. It arises chiefly from the Third and Fourth, and partly, also, from the First and Second Lumbar Nerves; its different origins unite, and form a trunk of great size. This Crural Nerve passes behind the Psoas, and descends at its lateral side, passes out under the Crural Arch at the outside of the Femoral Artery, where it is soon divided into branches.

Q. What are the *principal branches* of the *Crural Nerve?*

A. The Cutaneus Medius, Anterior, Internus, and the Saphaenus.

Q. Describe these *Cutaneous Nerves?*

A. They descend upon the fore and internal parts of the thigh, and are distributed to the integuments and cellular substance, as far as the knee.

Q. Describe the *Nervus Saphaenus?*

A. This nerve descends among the muscles, and gives branches to them; passes behind the tendon of the Sartorius to the inside of the Tibia, and is ramified upon the integuments and cellular substance of the leg, generally following the veins.

OF THE SACRAL NERVES.

Q. How many pairs of Sacral Nerves are there?

A. Five pairs; each of which is divided into a small posterior, and a large anterior trunk.

Q. Describe the course of the *Posterior Trunks* of the Sacral Nerves?

A. They pass out of the Vertebral Canal by the small holes in the posterior part of the Os Sacrum, and are dispersed upon the Muscles and integuments there.

Q. Describe the connexions of the *Anterior Sacral Nerves?*

A. They go out by the large anterior holes of the Os Sacrum. The *first, second,* and *third,* are the largest; they unite into a trunk which receives the trunk of the fourth and fifth Lumbar, they form a Plexus from which the *Sciatic Nerve* take its origin.

Q. Describe the destination of the *fourth* and *fifth* Sacral Nerves?

A. They send branches to the Hypogastric Plexus, to the Muscles and ligaments of the Os Coccygis: and then run outwards to be dispersed upon the parts about the Anus.

Q. Describe the course of the *Sciatic Nerve?*

A. The Sciatic Nerve issuing from the Plexus, formed by the three upper Sacral, fourth and fifth Lumbar, and branches from the Sympathetic Nerves, goes through the Notch of the Ilium, under the Pyriform muscle over the short Rotators, and gets between the Tuber Ischii and Trochanter Major; it then descends in the back part of the Thigh, between the Flexors and Adductor Magnus, twisting gradually into the ham, where it is called the Popliteal Nerve.

Q. What particular branches does the *Sciatic Nerve* give off in the Pelvis and Thigh?

A. In the Pelvis it gives rise to the fasciculi, which compose the Pudic, and also the Gluteal Nerve; in the thigh it gives rise to various irregular branches, ramified among the muscles, integuments, scrotum, labia externa, anus, perineum, and several of them descend, spreading on the back part of the thigh even to the ham.

Q. As we have already described the Pudic, describe now the *Gluteal Nerve?*

A. The Gluteal Nerve arises by a superior fasciculus sent off from the common trunk of the fourth and fifth Lumbar, and by an inferior fasciculus from the same Lumbar, and first Sacral Nerves; they both pass through the notch of the Ilium; the former is dispersed upon the Glutei medius and minimus, and the latter upon the Gluteus Maximus and Integuments.

Q. Describe the *Popliteal Nerve?*

A. It has the tendons forming the ham-strings on each side, the blood-vessels below and the integuments above; a short space above the bend of the knee it divides into a small external or Fibular, and a large internal or Tibial Nerve.

Q. Describe the *Fibular or Peroneal Nerve?*

A. It passes down over the head of the Fibula, and divides into superficial and deep branches.

Q. What *superficial branches* does the *Fibular Nerve* send off?

A. The *Cutaneus Externus* sent to the Biceps, Gastrocnemius, and integuments; the superficial Fibular perforates the Peroneus Longus, passes over the Peroneus Brevis, giving filaments to both, and becoming subcutaneous about the middle of the leg, sends branches to the Metatarsus, Extensor Digitorum Brevis, and other branches, which anastomose on the upper part of the foot, and send dorsal branches to the toes.

Q. Describe the *Deep Branches* of the *Fibular Nerve*?

A. It crosses over the Fibula higher than the Superficial, sends a reflected branch to the soft parts of the joint, a branch to the Peroneus Longus, another to the Tibialis Anticus, others to the Extensor Pollicis, and Extensor Digitorum Longus, filaments to the Periosteum of the Tibia. The part, which seems the trunk of the nerve, accompanies the Anterior Tibial Artery, divides into branches upon the foot, which are dispersed upon the Extensor Digitorum Brevis, Interossei, and toes; one passes with a branch of the Artery into the sole, and forms a connexion with the plantar Nerves.

Q. Describe the *Tibial Nerve*?

A. It passes down between the heads of the Gastrocnemius Externus, perforates the Internus, and follows the Posterior Tibial Artery between the Flexor Digitorum Longus, and the Gastrocnemius Internus, passes in the sinuosity of the Os Calcis into the sole, where it divides into the External and Internal Plantar Nerves.

Q. What branches does the *Tibial Nerve* give off in its course down the leg?

A. The communicans Tibiae, which is distributed to the back part of the leg, and external side of the foot, various other nameless branches to the muscles and integuments.

Q. Describe the *Internal Plantar Nerve?*

A. It runs on the tibial side of the sole, giving twigs to the muscles, divides into four nerves, which split into others that run along the plantar sides of the three first toes, and tibial side of the fourth, accompanying the arteries.

Q. Describe the *External Plantar Nerve?*

A. It gives twigs to the heel, and runs with the artery along the Fibular edge of the sole, and ultimately divides into three principal branches; two run along the contiguous sides of the fourth and fifth toes, and fibular side of the little toe; the third gives filaments to the muscles. These Plantar Digital Nerves furnish twigs to the integuments, and communicate freely with one another, and also with the Dorsal Digital branches.

OF DISEASES OF THE NERVES.

Q. What Diseases are Nerves subject to?

A. It is impossible to answer that question in the present state of our knowledge of the Nervous System; for various morbid affections of the Nerves take place without our being able by dissection to ascertain the cause.

Q. Is not the *Nervous Energy* of the whole system sometimes *preternaturally increased?*

A. Yes; in Mania the Nervous Energy given to the muscles increases their strength and powers sometimes to an amazing degree. In Epileptic and Hysterical fits too, the Nervous Energy thrown into particular muscles, especially Flexors, is for a time excessive and morbid.

Q. Is not the *Nervous Energy* of the body sometimes *morbidly diminished?*

A. Yes; from any inordinate pressure on the Brain, or on a part of it, or on some of the large nerves, the Brain or Nerves are impeded in the performance of their functions, and, in consequence, cannot give Nervous Energy to the muscles necessary for their healthy actions.

Q. Are *Nerves* subject to *tumefaction?*

A. Yes; when a nerve is punctured it swells considerably, to a greater or less extent according to the nature of the injury.

Q. Are *Tumours* not found in Nerves independent of puncture?

A. Yes; a tumour attended with the most excruciating pain, in a few rare instances has occurred; it has a cyst which contains blood; and when divided it seems composed of thick viscid jelly, in which are a few white fibres.

Q. When *Nerves* are divided across, *do they re-unite?*

A. Yes; when kept in contact the divided extremities of nerves re-unite by real nervous matter, as repeated experiments have demonstrated.

Q. Are *Nerves* subject to *inflammation?*

A. Yes; they are affected with local Inflammation, and this seems the reason why symptomatic Fever is excited, and a constant concomitant of acute local Inflammation.

PATHOLOGY OF CONSTITUTIONAL DISEASES.

SCURVY.

Q. What are its symptoms?

A. Lassitude, with a sense of weight in the muscles of the lower extremities; indolent and inelastic swelling of the legs, which are covered with blotches of greater or less size, not elevated; red, blue, violet, or yellow, very similar to those ecchymoses arising from contusions, changing colour as the former, becoming brown, and gradually disappearing; pain, swelling, and bleeding of the gums; fetid smell from the mouth, and the teeth get loose, and fall out, and hemorrhage occurs from the various mucous membranes.

Q. What are its anatomical characters?

A. The blood is generally found fluid, the muscles flaccid, the bones softened, yellow, and uneven. The viscera present various appearances, they are generally softened, pale, and gorged with watery blood. The brain something softened.

SYPHILIS.

Q. What are its symptoms?

A. These differ much in the various tissues which may be affected, but in all cases arising from a syphilitic taint, and attended with ulceration and discharge of matter, capable of re-producing the same disease by inoculation. When the mucous membrane is affected, we find gonorrhœa, ophthalmia, or ulcers; these ulcers commence in a pimple, and afterwards have the following characters:—a greyish base, the edges hard, thick, red, and conical; they generally occur on the glands, on the internal surface of the prepuce, in the vulva, the mouth, in the throat, or about the anus. When the skin is affected, we observe patches of a copper or reddish brown colour; dry furfuraceous crusts at the roots of the hairs; greyish ulcers, which proceed from prominent pimples, appearing like boils; round transparent pustules covered by crusts; dry or suppurating fissures; and, finally, we may have the epidermis very rough or uneven.

When syphilis attacks the glands, the inflammation has a great tendency to run to suppuration or induration; the inguinal glands are those most exposed. The periosteum and bones, especially of the cranium and face; the sternum and tibia are very frequently affected; the parts swell, and a hard, more or less prominent tumour is observed: the pain which is produced is much more violent during the night. A deep caries is often the consequence.

Q. What are its anatomical characters?

A. They are just described above.

SCROFULA.

Q. What are its symptoms?

A. Indolent swelling of the glands in various parts of the body, but occurring most commonly in the neck and abdomen of children: no change is observed in the skin at the commencement, but after some time it becomes red, gets thinner, and finally ulcerates; this is attended with very little pain. Scrofula often induces swelling and caries of the long bones; various affections of the joints, especially of the knee, hip, foot, and ankle. The affected glands remain for some time without change, at length they soften and ulcerations take place, discharging a serous fluid, sometimes mixed with albuminous flocculent matter. The cicatrices of these ulcers are pale, irregular, and wrinkled. When scrofula attacks the lungs it causes phthisis. Persons whose lymphatic system is much developed, seem particularly subject to this disease. It is remarked to be endemic in moist and cold valleys, where the rays of the sun cannot penetrate.

Q. What are its anatomical characters?

A. On dissection, the cervical maxillary or mesenteric glands are found variously affected: those of the axilla and groin are not so commonly diseased. Tubercles are often discovered in the lungs. In some instances we find swelling and softening, or destruction of the articular surfaces and caries of the ends of the bones.

PATHOLOGY OF FEVERS.

ERUPTIVE FEVERS.

SCARLATINA.

Q. What are its symptoms?

A. A contagious disease, commencing with the symptoms of inflammation of the different mucous membranes, especially of the throat, followed, on the second, third, or fourth day, by an eruption of small, isolated and little prominent pimples, at first of a palish red, then scarlet colour: these pimples enlarge and approach each other, becoming in this way confluent, and forming large patches, giving the skin the appearance of being covered by raspberry juice, or the sediment of wine. These patches appear on the face and neck, then on the chest, abdomen, and extremities: last from seven to nine days, and then disappear in the same order, and are followed by a furfuraceous desquamation of the epidermis.

Q. What are its anatomical characters?

A. The red spots disappear after death, but traces are found of inflammation of the digestive tube, and more frequently of the lungs and trachea.

Before the eruption has taken place, it may be confounded with arachnitis, or inflammation of the digestive or respiratory organs. After the eruption has taken place, with measles.

MEASLES.

Q. What are its symptoms?

A. This disease is contagious, occurs but once during life; appears in an eruption of semilunar spots of vermillion red, separated by colourless intervals of an angular form; the spots do not generally rise over the skin, sometimes, however, they are swollen in the middle like small pimples, and more easily felt than seen; do not contain any fluid, and disappear without suppurating, leaving, on going off, a slight degree of roughness. These spots are first seen on the face and neck, then on the chest, abdomen, and extremities, and form, by spreading and approaching each other, irregular, prominent, and vermilion coloured patches, more red and broad on the extremities than any other part; their duration from seven to nine days, and terminate by desquamation. The eruption is preceded and accompanied by a certain degree of irritation of the mucous membrane of the nose, eyes, and intestines, and still more particularly of that of the pulmonary organs. There is also some fever attending. The disease terminates by desquamation of the cuticle.

Q. What are the diseases with which it may be confounded?

A. They are arachnitis, inflammation of the mucous membranes of the digestive or pulmonary or-

That is not true for I have both

[illegible] having it

gans before the eruption appears; after this takes place, scarlatina.

Q. What are its anatomical characters?

A. All traces of the eruption disappear after death; the mucous surfaces of the digestive and pulmonary organs are often found more or less extensively inflamed.

VARICELLA (CHICKEN-POCK).

Q. What are its symptoms?

A. On the first or second day there appears an eruption of small pimples, which are at first red and slightly prominent, then spread, turn white, and the summit fills with a white, transparent, and inodorous fluid. This fluid does not possess the power of inducing the same disease by inoculation. The three stages of eruption, suppuration, and desiccation, are not well marked; it terminates from the sixth to the tenth day. Never fatal, nor does the skin retain any mark whatever.

It may be confounded with variola.

Q. What are its anatomical characters?

A. These are described above.

VARIOLA (SMALL POCK).

Q. What are its symptoms?

A. After a febrile attack for two or three days, or some symptoms of gastric irritation, an eruption of pimples appears successively on the neck, face, chest, and then on the rest of the body; their duration is from four to five days, and present the following characters: Their form is lenticular and depressed at the centre; at first they are very small and red, then enlarge, become white, but are surrounded by a red areola; at this period they are filled with a sero-purulent, nauseous fluid, which possesses the property of producing a similar disease by inoculation. The skin near those pustules is swollen and painful, especially on the face and hands, and still more remarkably so in the confluent species, in which form the pustules are quite flattened: and as they are deprived of the red areola, they become blended, and form large patches covered by phlyctenæ, or a whitish pellicle. From the ninth to the eleventh day the pustules exsiccate in the order of their appearance, are followed by incrustations, which are cast off from the fifteenth to the twentieth day, leaving cicatrices or pits, which are at first red, then colourless, variable in depth and extent, but in all are very permanent in their duration. This disease is remarkably contagious, often epidemic; occurs most commonly in infancy; usually but once during life.

The diseases with which it may be confounded are, inflammatory affections of the brain, or its dependencies, the lungs or intestines, the various exanthematic fevers, before the eruption. After this, varicella.

Q. What are its anatomical characters?

A. The characters and appearance of pustules differ in their different stages. In the first, or eruptive stage, it is formed in a solid red mass, like a phlegmon in the rete mucosum, and adhering to the true skin; during the second or inflammatory stage, it is found filled with a fluid of variable characters; in the third, or suppurative, it contains pus, and depresses the true skin; fourth, after desiccation has taken place, we find incrustations on the skin, which are red, and more or less deep. In many instances we find variolous pustules on the gastro-intestinal and pulmonary mucous surfaces, which appear like aphthæ.

VACCINA, OR COW-POCK.

Q. What are its symptoms?

A. This is always produced by the inoculation of matter either taken directly from the cow, or from vaccine pustules on the human subject. On the third or fourth day, a small, hard, and colourless eminence is observed where the matter was inserted, then a vesicle depressed in the centre, which gradually increases in size, and on the sixth or seventh day presents a tense prominent head, surrounded by an areola of a deep red colour; if at this period we open the vesicle, a limpid, transparent, and viscid fluid exudes, which has the power of reproducing the same affection; on the eighth and tenth days, the swelling and redness increase, the vesicle becomes broad, whitish, and less prominent; on the twelfth, desiccation commences, and spreads from the centre to the circumference; a hard, dry, reddish crustation is formed, which falls off about the twentieth day, leaving a well marked and indelible cicatrix.

Every eruption after vaccination not presenting these characters is spurious, and not to be relied on.

INFLAMMATORY FEVER.

Q. What are its symptoms?

A. This is ushered in by shivering fits; the face red and flushed, eyes bright and injected, pulsations of the temporal and carotid arteries; intolerance of light and sound; great sense of weight in the head; faintness; the pulse full, strong, and frequent; the beating of the heart increased; respiration deep and frequent; the tongue whitish; constipation; hemorrhagies often occur, giving temporary relief; secretion of urine diminished; it is first very red, but afterwards deposits a dirty sediment; dull pains in the limbs; an exacerbation generally takes place in the evening, and during the night. In the advanced stages of this disease, the skin, which was at first hot, becomes parched, and the tongue dry, or covered with a brownish crust; the intellectual functions destroyed; great debility, and the patient dies.

Q. What are its anatomical characters?

A. On dissection the signs of inflammation are found in some of the principal organs.

BILIOUS FEVER.

Q. What are its symptoms?

A. Bitter taste in the mouth, the tongue covered with a whitish or brownish coat; nausea, and desire of vomiting; thirst, particularly for acidulous drinks; complete disgust for animal food; bilious vomiting, constipation or diarrhœa, head-ache, principally complained of around the orbits; a yellow tinge observed in the lips and alæ nasi; skin hot, dry, and parched to the touch; tenderness of the epigastrium on pressure; dull pains of the extremities; pulse full, hard, and frequent; in some instances a complete jaundice occurs. Morning and evening exacerbations.

These symptoms should rather be considered as proceeding from some inflammation of the digestive organs, than as an idiopathic disease.

Q. What are its anatomical characters?

A. For these the reader is referred to the descriptions given when treating of the affections of the gastro-intestinal canal.

MUCOUS FEVER.

Q. What are its symptoms?

A. Irregular rigors; tongue moist and white, or coated with a thick mucus; the mouth clammy; increased secretion of saliva; the breath fetid; apthæ observed in the mouth; acid or fetid eructations; mucous diarrhœa, with expulsion of worms; pulse rather slow, small, and weak; heat of skin moderate; urine diminished in quantity, sometimes the secretion of it is very abundant, limpid, whitish, and depositing a greyish sediment; dull head-ache, general lassitude, pains in the joints, dullness of intellect, irregular exacerbations.

Q. What are its anatomical characters?

A. Inflammation of the digestive respiratory tubes.

ANDYNAMIC FEVER.

Q. What are its symptoms?

A. General languor, and great prostration of strength: great reluctance, and slowness in moving: the muscles quite flaccid, so that the limbs, when raised, fall like dead masses; the patient lies on his back: great tendency to gangrene in wounds, and those parts on which the body rests ; it is very difficult to redden the skin : appearance of petechiæ and ecchymosis : the skin dry, and the heat trifling ; cold, viscid, and partial sweats: great sinking of the countenance: the energy of the intellectual faculties much diminished: drowsiness: wild dreams: answers very slowly given : the eyes contorted : the tongue at first pale, then becomes parched, and is covered, as well as the lips and teeth, by a brown black coat of viscid matter ; the breath fetid : great difficulty of swallowing, often impossible : dark and fetid fæces passed involuntarily : meteorism of the abdomen; the urine either passed in bed, or completely retained : hemorrhagies occur often, and increase the debility : the pulse rather slow, soft, and easily compressed : pulsations of the heart weak : the blood is found very thin, and sometimes of a greenish colour.

Q. What are its anatomical characters ?

A. In the present state of the science, we cannot exactly describe these : the bodies run into putrefaction in a very short time : the parenchymatous viscera are found softened : the lungs and the lining mucous membrane of its numerous canals are gorged with a thin black blood.

NERVOUS FEVER.

Q. What are its symptoms ?

A. Great irregularity and confusion of the different functions, and of the phenomena which depend on them, accompanied with various nervous affections : no consistency between the symptoms, and the generally fatal termination of this disease : the sensibility and the various senses more acute than natural, or confused : the tone of the voice changed : delirium : dreaming : stupor : restlessness : general or partial convulsions : trembling fits, with subsultus tendinum : rigidity of the muscles, and temporary paralysis : swooning, fainting : finally, a comatose state comes on ; pulse very irregular : it is found sometimes quick, sometimes slow, intermitting, and changes instantaneously from one to the other: face pale, alternating with flushings: perspiration may be either suppressed, or very copious: the temperature varies in the same way from hot to cold, &c.; the diagnosis of this disease is often very difficult. Diseases with which it may be confounded: The different cerebral affections of the gastro-enteritic inflammations.

Q. What are its anatomical characters?

A. In the simple nervous fever no alteration is found on dissection.

TYPHUS.

Q. What are its symptoms?

A. This disease always arises from infection, is generally contagious, and confined to European countries; the symptoms are those observed in the inflammatory affections of the viscera of the three great cavities, or those of the five different fevers we have just described. Typhus, in its first stage, is characterized by the symptoms of the inflammatory, bilious, or mucous fevers, and in its second, by those of the adynamic or ataxic; it is very often epidemic, and the principal phenomena are stupor, vertigo, petechiæ, constant confusion of the nervous functions, and a great tendency to a fatal termination.

Q. What are its anatomical characters?

A. These vary very much; the viscera of the head, thorax, or abdomen, sometimes are seen with all the marks of most acute inflammation; in other cases it seems to have been very slight, or no traces of any disorganization may be observed, especially where death has occurred very rapidly; the bodies generally putrefy quickly.

YELLOW FEVER.

Q. What are its symptoms?

A. A most fatal disease, occurring in hot climates, and running its course in a very short time; the principal symptoms are, violent head-ache, often confined to the orbitar region, with redness or paleness of the face at its commencement, and soon followed by itchings, nausea, violent thirst, yellowness of the skin observed on the temples, the conjunctiva, the sides of the neck, and soon spreads over the whole body; violent pains in the epigastric region of the abdomen and loins now supervene; excessive internal burning heat, with coldness of the extremities; vomiting of yellow, then dark matter; urine diminishes, and finally is suppressed; passive hemorrhagies occur; local gangrene; syncope, hiccup, subsultus tendinum, and gradual sinking of the pulse.

Q. What are its anatomical characters?

A. General yellowness of the skin, interspersed with blue livid spots; the muscles soft or contracted; congestion of blood in the membranes of the brain, and occasionally an effusion of a sanguinolent serum is found at the base of the brain and along the spine; red, livid, or dark black spots on the mucous membrane of the stomach, which is filled by a dark fluid matter similar to what was vomited. The lining membrane of the intestines often brown coloured; the liver softened; the kidneys red, or covered with gangrenous spots; the bladder contracted, sometimes inflamed.

PLAGUE.

Q. What are its symptoms?

A. An essentially contagious disease confined to the eastern countries, inducing death very rapidly, always accompanied by carbuncles and buboes, which terminate in gangrene; petechiæ on different parts of the body; these are attended with general symptoms, the same as described in the ataxic and adynamic fevers.

Q. What are its anatomical characters?

A. Gangrene of different portions of the digestive tube; sanguineous congestions in the head or chest; suppuration more or less of the principal viscera, and invariably gangrene is found in the skin and glands of the groin and axilla.

INTERMITTENT AND REMITTENT FEVERS.

Q. What are their symptoms?

A. The returns of this fever are more or less regular, the fits being divisible into three stages, the cold, the hot, and the sweating; if during the fits there is a complete cessation of fever, it is called intermittent; if on the contrary, the fever does not cease altogether during the intervals, it is called remittent; these fevers in general present the symptoms peculiar to one or other of the five orders described above.

Q. What are their anatomical characters?

A. The appearances presented after death are very variable; we know of none that may be called pathognomic of the disease; the spleen is sometimes found increased in size and consistence, particularly when the disease has been of long standing.

CONTAGIOUS FEVERS.

Q. What are their symptoms?

A. The febrile attacks or paroxysms present various symptoms at their commencement, but still assume some special character marked by some phenomenon which threatens life directly, and increases at each attack. These fevers, which are endemic in certain countries, owe their origin usually to the influence of marsh miasmata.

Q. What are their anatomical characters?

A. The organs to which those symptoms are referrible, which characterized the disease, present various alterations in their appearance and texture, but in some cases there is no appreciable alteration, particularly when the patient dies in the early stages of the disease.

PATHOLOGY OF POISONS.

THE METALLIC CORROSIVE POISONS.

POISONING BY THE PREPARATIONS OF ARSENIC.

Q. What are its symptoms?

A. Taste acrid and metallic: constriction of the pharynx: nausea: vomiting: the ejected matter brown, sometimes bloody: salivation copious: precordial anxiety: heat and pain in the stomach: stools black, sometimes green, fetid: violent colic pains: tenesmus: pulse small, quick, and irregular: intense heat of skin: burning thirst, cold sweats: difficult respiration: urine scanty, red, or bloody: delirium: convulsions: total change in the expression of the countenance. When the poison has been taken in large quantity, the sufferer dies quickly, without presenting the symptoms characteristic of this mode of poisoning.

Q. What are its anatomical characters?

A. Traces of inflammation, more or less considerable, of the mucous membrane of the digestive canal, from slight redness to ulceration, and even to gangrene.

POISONING BY THE PREPARATIONS OF ANTIMONY.

Q. What are its symptoms?

A. The same as those of poisoning by the acids: they usually commence in very abundant and obstinate vomiting, with acute pain of the stomach: there are observed extreme prostration of strength, copious stools, violent colic pains, cramps, cold sweats, and delirium.

POISONING BY THE PREPARATIONS OF COPPER.

Q. What are its symptoms?

A. Coppery taste in the mouth: eructations of the odour of copper: nausea: vomiting, with difficulty and pain, a green matter: pain of the stomach, most painful griping: alvine evacuations frequent, black, and bloody, accompanied by tenesmus, tension of the belly: pulse small, hard, and quick: anxiety: cold sweats: head ache: vertigo: convulsions.

POISONING BY THE PREPARATIONS OF SILVER.

Q. What are its symptoms?

A. Same as those which characterize the other corrosive substances.

POISONING BY THE PREPARATIONS OF GOLD.

Q. What are its symptoms?

A. Same as those which result from the action of the greater number of other metallic salts.

POISONING BY THE PREPARATIONS OF MERCURY.

Q. What are its symptoms?

A. Of the same character with those produced by other corrosive substances: acrid and metallic taste: tumefaction and burning heat of the throat: pain of the stomach and abdomen increased in a short time to an intense degree: salivation quickly induced, with the characters peculiar to mercury, when the corrosive sublimate has caused the poisoning.

POISONING BY THE PREPARATIONS OF BISMUTH.

Q. What are its symptoms?

A. Same as those caused by the action of other very active corrosive poisons.

POISONING BY THE PREPARATIONS OF LEAD.

Q. What are its symptoms?

A. Taste sweet, metallic, and astringent: pain of stomach: constriction of the throat: vomiting obstinate, very painful, sometimes bloody: hiccup: convulsions. Sufferers, if they survive, are very generally afflicted with palsy, or various painful affections.—See the article Colica Pictonum.

POISONING BY THE PREPARATIONS OF TIN.

Q. What are its symptoms?

A. Those common to all the corrosive poisons: sometimes paralysis supervenes, but most frequently death is the result.

POISONING BY THE PREPARATIONS OF ZINC.

Q. What are its symptoms?

A. Taste sour, with a sense of strangulation: nausea: vomiting. The symptoms often cease quickly, in consequence of the poison being ejected by means of its emetic property. Should it, on the contrary, remain in the stomach, the symptoms produced by other corrosive poisons are observed.

POISONING BY THE ACIDS.

Q. What are its symptoms?

A. All the acids produce very nearly the same effects—viz: a taste sharp, burning, and disagreeable: heat and acute pain of the throat, then of the œsophagus, stomach, and intestines: fœtor of the breath: eructations: nausea: vomiting repeatedly a bloody liquid of a yellowish or brown colour, which produces an effervescence on the ground, and deeply reddens tincture of turnsole: stools copious, more or less tinged with blood: extreme sensibility of the abdomen: burning, incessant thirst: pain increased by drinking: pulse small and irregular: urine scanty, and evacuated with difficulty: respiration laboured: extreme paleness, with alteration of the face: cold sweats, and in some instances, convulsions: the intellectual faculties generally remain unimpaired. Very often the poison causes, by its contact with the lips, tongue, and pharynx, yellow or brown eschars, which drop off, and produce a loss of

POISONING BY ALKALIES AND THEIR SALTS.

The Prussic acid, when inoculated on the surface of the body, even in very small quantity, causes almost instant death.

POISONING BY THE ALKALIES AND THEIR COMPOUNDS.

Q. What are its symptoms?

A. Taste pungent, urinous, and caustic, accompanied generally by the symptoms of poisoning by concentrated acids; the liquid of the vomited matter and the stools render syrup of violets green.

Ammonia produces total derangement of the faculties, and sudden death.

POISONING BY PHOSPHORUS.

Q. What are its symptoms?

A. Taste of garlic in the mouth, with peculiar parched sensation, together with all the symptoms which result from poisoning by the acids.

POISONING BY IODINE AND ITS PREPARATIONS.

Q. What are its symptoms?

A. Same as those which are characteristic of poisoning by the acids, and, in addition, a strongly marked yellow colour of the tongue and fauces.

POISONING BY ALCOHOL AND ITS COMPOUNDS.

Q. What are its symptoms?

A. Intoxication, then complete insensibility: paralytic phenomena: stupor: the face swollen, and of a deep red hue: respiration stertorous: the breath smells strongly of the liquors which have produced the intoxication.

POISONING BY VEGETABLE SUBSTANCES.

ACRID POISONS.

Q. What are its symptoms?

A. All the poisons of this class produce very nearly the same effects, which generally consist in the following:—viz. taste acrid and pungent, or intensely bitter; heat in the throat; dryness of the mouth and pharynx, with constriction: vomiting continuing even after the ejection of the poison: acute pains in the stomach and intestines: alvine evacuations abundant: pulse strong and quick: sometimes dilatation of the pupil: general insensibility: smallness and irregularity of the pulse: death.

NARCOTIC POISONS.

Q. What are its symptoms?

A. Heaviness in the head: stupor: torpor: inclination to vomit: great tendency to somnolence: countenance dull: face swollen: eye-lids tumefied: pupils always much dilated, with little or no power of contraction: relaxation of the muscles of the limbs, particularly the inferior: sometimes convulsive movements of different parts of the body: the pulse at first generally strong and full, afterwards becomes feeble, slow, and irregular: finally, precordial anxiety, alvine dejections, and death.

Q. What are its anatomical characters?

A. After death there are not discovered any traces of inflammation in the parts with which the poison is found in contact, but there is congestion of the vessels of the brain and the lungs: these latter do not crepitate on pressure, and are of a deep red colour: the blood contained in them, as well as that of the heart, is sometimes liquid, sometimes coagulated.

POISONING BY ANIMAL SUBSTANCES.

POISONING BY THE FLESH OF FISHES.

Q. What are its symptoms?

A. In a time more or less considerable, after the fish has been swallowed, there are experienced a heaviness in the stomach, vomiting, griping pains, cephalagia, vertigo: the head and circumference of the eyes are intensely hot: the face is red and swollen: the patients feel burning thirst: a rash like that of urticaria frequently appears over the entire body: the pulse is accelerated, small, and hard: convulsions sometimes come on: the extremities are rarely cold.

POISONING BY THE STING OF VENOMOUS INSECTS.

Q. What are its symptoms?

A. Generally pain, swelling, and sometimes high inflammation of the part stung, in some cases terminating in gangrene, and accompanied by nausea, vomiting, fever, numbness: general shivering, and in some instances death.

POISONING BY CANTHARIDES TAKEN INTERNALLY.

Q. What are its symptoms ?

A. Breath fetid : taste acrid ; heat excessive : pain in the throat, stomach, and belly : vomiting frequent and bloody : alvine evacuations abundant : heat in the lumbar regions and the bladder : strangury or entire retention of urine, with frequent desire to make it : obstinate and very painful priapism : fever : convulsions : delirium : death.

POISONING BY THE BITE OF VENOMOUS SERPENTS.

Q. What are its symptoms ?

A. Acute and sharp pain in the part which has been bitten, and extending over the entire body : there immediately appears swelling, with hardness and paleness at first, then with livid redness, and a gangrenous appearance : the pulse small, frequent, and irregular : then supervene syncope, vomiting, anxiety, difficulty of respiration, with cold and abundant perspiration : the sight becomes weak, delirium is manifested, a yellow tinge is spread over the entire body : after a certain time the bitten part becomes insensible, discharges a serous fluid, is covered by gangrenous specks, and the sufferer sinks.

POISONING BY THE BITE OF RABID ANIMALS.

At a time more or less considerable, after the infliction of the wound (usually between the twentieth day and third or fourth month,) the bitten part becomes painful, opens afresh, emits a reddish serum; if it has not been cicatrized it becomes red, and affords a serous and reddish pus; restlessness, anxiety, spasms, troubled respiration succeed: the sufferer feels a trembling, which extends from the sore over the entire body, and appears to end in the throat : he is agonized by internal heat, and sometimes excessive thirst, but he dares not to drink : the sight of water or of polished or shining bodies irritates him, and aggravates the symptoms: deglutition is impossible. At the expiration of four or five days the symptoms are increased: violent convulsions pervade the entire body, produce a frightful expression of the countenance: the eyes are red and prominent: the tongue hangs outside the mouth, from which flows a viscous saliva: in a few cases there is an inclination to bite: the pulse becomes unequal and intermittent: a cold sweat extends over the entire body, and death speedily takes place.

METHOD OF MAKING POST MORTEM EXAMINATIONS.

Q. What is to be observed previous to making this examination, to render it most useful?

A. The physician should, whilst conducting it, be divested of every preconceived opinion, and be guided solely by the desire of discovering the truth.

Q. How is the head examined?

A. The shortest method of opening the head, and which is therefore the most convenient in the dissecting room, is, after supporting the back part of the head on a block, to make a circular incision through the scalp around the head, passing along the frontal sinus, the petrous portion of the temporal bone, and the occipital protuberance. Having made this down to the skull, the latter may be broken all around by the claw of a hammer, taking care not to tear the dura mater or brain: when the vault of the skull is detached, it may be torn off by introducing the end of the hammer between the divided portions of the frontal bone. In some cases the dura mater adheres so closely to the parietal bones, that it is impossible to detach it without using the scalpel. Whilst going through the first step of the examination, the quantity of blood which flows from the incision in the scalp should be observed, and also the state of congestion of the face.

After the skull has been removed, the dura mater should be examined, in order to ascertain whether there is any fungous production upon it, or depression in the corresponding part of the bony arch; when adhesions exist, when the sinuses are gorged with blood, the fact should be stated in the report. When pus or blood is effused between the membrane and bone, we should ascertain whence it comes; and should never omit to examine the scalp, to see whether it presents a wound, or the bone a fracture; finally, the dura mater should be washed, in order that we may be able to determine whether any change of colour which it presents is owing to a fluid effused on its surface, or is produced by inflammation.

After these preliminary steps, we should proceed to divide the dura mater circularly with a scalpel or pair of scissors, and when the falx is detached, the whole may be drawn back, gently separating it from the arachnoid, in order that we may see whether any slight adhesions exist between them. Before the contact of the air has reddened the vessels of the pia mater, we should see whether they present any appearance of injection. After having ascertained whether pus, blood, or serum is effused between the two layers of the arachnoid, or infiltrated between it and the pia mater, we should inspect the convolutions of the hemispheres, to see whether they are flattened; for when that exists to any considerable degree, it indicates an effusion of fluid into the lateral ventricles.

Whilst examining the arachnoid, we should recollect that in the healthy state this membrane is exceedingly thin and transparent, even at the summit of the hemispheres, and can scarcely be detached from any part without being torn, except opposite the *pons varolii*, where it presents some degree of firmness and thickness. Examination should then be directed to ascertain if it has lost its transparence, or presents on its surface any purulent exudation or false membrane. When viewed horizontally, it sometimes appears covered with minute granulations, giving it a velvety appearance ; we should carefully avoid mistaking for these, small bubbles of air effused beneath the pia mater. Whenever it appears opaque or studded with white points, it should be pressed on by the finger in order to ascertain its degree of consistence, as in some cases it approaches that of cartilage. When the arachnoid is white and thickened, so as to resemble a false membrane, it should be detached from the pia mater, to discover how far each of these membranes is concerned in the alteration. Though at first sight it occasionally appears red, we find the effect to depend on an alteration in the state of the vessels of the pia mater, which are found to be injected. When detaching the membranes from the surface of the brain, the finger may be insinuated between the convolutions, so as to draw them from within outwards, and then it will be easy to ascertain their degree of thickness, strength and tenacity ; and also whether there exist any adhesions between them. We should thus pass in review successively the different parts of the arachnoid which line the base of the brain, the decussation of the optic nerves, and the *pons varolii;* as from the loose connexions which exist in these parts, as well as the number and size of the vessels, effusions of lymph or of pus are more perceptible and more common than elsewhere, particularly in children.

Q. How is the substance of the brain to be examined ?

A. The appearance of the grey substance should be noted, it may be of a slightly rosy tinge, or may present a sort of dotted redness, particularly when the pia mater is much injected: in other cases the texture of the convolutions is altered, being rendered soft, or almost diffluent, by inflammation and suppuration. An incision may be made from above downwards, across the substance of each anterior lobe, so as to penetrate through the lateral ventricles, and then by compressing the brain from behind forwards, the fluid (if any be contained in them) may be made to flow forwards, and its quantity ascertained by receiving it in a graduated glass vessel.

The substance of the brain should, in the next place, be sliced off by several horizontal incisions, and any change, either of colour or consistence, carefully noted. In cases of "ramollissement," the existence of pus or serosity should be ascertained if possible: and whether the softening is connected with sanguineous injection. When infusion of blood has taken place into the brain, the change of appearance and colour of the affected part should be stated; it is also necessary to ascertain the size and consistence of the clot, and whether it is enclosed in a membranous sac, or mingled with a serous fluid; in a word, we should describe the physical character of the clot, as well as those of the cyst which surrounds it. When a tumour is found developed in the brain or its investments, its mode of connection with those parts should be examined, also the degree of compression which it exerts upon the substance of the brain, and the consistence of the parts of the latter which surround it. This can be ascertained by gently pouring water on the part; but when the membranes are affected, they may be washed in a vessel of water, and dissected according to convenience. The state of the corpus callosum, fornix, corpora striata, optic thalami, and pons varolii, should be fully stated, taking care, with regard to this last, to indicate the side of it which is particularly affected. When the ventricles are laid open, we should never omit examining with care the state of the serous membrane which lines them.

Q. What is the method of examining the cerebellum, medulla oblongata, and their membranes?

A. They should be dissected in the way just pointed out for the brain; in order to remove these parts from the occipital fossa, the tentorium cerebelli should be cut through, and after detaching the nerves, the medulla oblongata should be divided as far down as possible. If the patient has had a discharge from the ear, attention should be directed to the state of the bones which support the posterior lobe of the brain, particularly the petrous portion of the temporal bone; we should ascertain whether there is a caries of the bone, or any collection of pus, which may be recognized by its colour or smell; or finally, whether the dura mater is detached at any point from the skull. We should always endeavour to determine whether the disease commenced in the bone, membranes, or substance of the brain; and whenever any lesion of the cerebellum is discovered, the testicles in the male, the ovaries, uterus, and its connexions in the female, should be carefully examined.

Q. What is the method of opening the vertebral column?

A. The body being turned forwards on its face, the cervical vertebræ may be raised to a level with the dorsal, by placing a block under the neck. The great mass of muscle which fills up the depression at each side of the spinous processes of the vertebræ should be dissected away from the occipital hole to the sacrum (a large portion of the occipital bone having been previously removed by two cuts made by a saw from above downwards). The posterior or annular portion of the vertebræ being thus laid bare, it may be cut through with a chissel; or with a "rachisome," the cutting edge of which being placed on the transverse process of each vertebra, its division is easily effected by striking the instrument with a hammer or mallet; the same is to be done at the opposite side, and the portion thus insulated is then easily detached. A continuance of this operation will, in a short time, expose the entire of the medulla spinalis, as it lies enveloped in its membranes, which need not be in the slightest degree injured by it. The membranes, and substance of the spinal marrow should then be examined, with those precautions which have been already detailed in the previous section.

Q. What is the method of opening the thorax?

A. The shortest and simplest process consists in dividing the cartilages of the ribs, as near as possible to their bony arches, with a strong scalpel, proceeding from below upwards, after having previously divided the abdominal muscles which are attached to the zephoid cartilage. The sternum should then be raised up towards the face of the subject, which is facilitated by luxating the bone from its connexions with the clavicles, having previously divided the articular ligaments. By this process we avoid breaking the ribs, and leaving thereby projecting spiculæ of bone, which may wound the operator whilst engaged in examining the contained organs. When it becomes requisite to expose the cavity of the chest to a greater extent, we may proceed according to the process recommended by M. Chaussier.

With this intent a large elliptic incision is made in the integuments, commencing immediately below the clavicles, and extending downwards towards the crest of the ileum, and thence forwards towards the margin of the pubis. After having made a similar incision at the opposite side, all the ribs except the first and two last, are to be sawed through with a saw convex at its cutting edge; the sternum should, in the next place, be divided by a transverse cut. The upper part of this large flap should then be raised up, in order that its attachments to the mediastinum, lungs and diaphragm may be divided by a scalpel, so that being left attached to the pubes merely by a narrow band, it may be laid down upon the lower extremities. In this way a full view is got of the whole extent of the chest and abdomen, and the alterations presented by the different viscera may be examined as they lie in their natural situations.

When we want to examine the state of the large vessels at their origin, or the lower part of the trachea, it becomes necessary to saw across the first rib, and part of the clavicle at each side; after having turned back this flap, the blood should be wiped away so as to expose the parts more clearly.

In examining the lungs, we commence by ascertaining whether there are any adhesions between the two layers of the pleura. When such connexions exist, they should be detached from the serous membrane, which gives an opportunity of seeing what their colour and consistence is, whether they consist of a single band or of several, and whether vessels are developed in their substance. In order to determine whether the corresponding points of the pleura are thickened, opaque or injected, it should be removed from the lung or the wall of the thorax, and held up to the light, when any change of structure which it presents is at once perceptible. In doing this, care should be taken not to attribute to the pleura a change of colour which may exist only in the false membrane. The serous membrane should be examined in every part of its extent, on the internal surface of the ribs, the diaphragm, and fissures between the lobes of the lungs. When, after detaching the bands of adhesion, the pleura appears red and injected, we should ascertain whether the redness exists in the membrane itself, or has taken place only in the subjacent cellular texture; when any fluid is contained in its cavity, its quantity, colour, and other properties should be noted. In cases of interlobular pleurisy, care should be taken not to mistake an effusion enclosed amongst the adhesions for an abscess of the lung. When gangrene exists, its seat should be ascertained, as it may attack the false membranes, the pleura, or both. Where a communication exists between the pleura and bronchi, a probe should be passed along the fistulous canal, which then may be laid open, and the state of its walls examined; finally, if air be contained in the cavity of the serous membrane, it should be stated in the report.

When the lungs are removed from the thorax, incisions should be made through their substance, that we may be able to ascertain their colour, consistence, weight, degree of cohesion, and also whether they contain any fluid blood, serosity or pus, infiltrated into them. In cases of gangrene it is useful to determine whether it is circumscribed by a defined line, or is blended insensibly with the healthy structure, or whether this transition is effected by an inflamed portion of the lung. The bronchi are to be laid open in their whole extent, even to their final terminations, that we may ascertain the degree of consistence and colour of their lining membrane, and also whether it presents any effusion, false membrane on ulceration. In pursuing this examination, we sometimes find some accidental substance developed in the bronchi, or their trajet dilated, or that they are contracted in some particular part. In some cases also, we find air effused under the pleura, or contained in some of the pulmonary lobules distended or torn, as occurs in emphysema of the lung,

In cases of tubercular excavations, we should not omit ascertaining whether they are covered with a false membrane, also whether they communicate with the bronchi. For a full description of the different changes of structure presented by the lungs, we shall refer the reader to the pathological articles which follow those on the diagnosis of each disease, and particularly to the description of the accidental tissues which we shall give in page 369.

When the heart is removed from its situation it may be cut across, in order that we may discover the thickness and consistence of its walls, the colour of its lining membrane, and the dilatation of its cavities. The state of the different orifices, their contraction, obliteration, ossification of their valves, &c. may be ascertained by the introduction of the finger, after which the ventricles, auricles, and great vessels arising from them should be cut open to expose their cavities, and show whether there is any thickening or induration of their coats, or change of colour in their lining membrane. As the method of examining the pericardium is the same with that above pointed out when treating of the pleura, it is unnecessary to repeat it in this place ; we shall merely observe that in all diseases of the heart and lungs, the liver should be examined. In cases of aneurism of the aorta, it becomes necessary to inquire whether the dilatation extends all round the vessel, or occupies only one side of it; whether all the tunics are dilated, or only one of them. When rupture or ulceration exists, its seat should be noted, and also the manner in which the layers of blood are disposed in the sac.

EXAMINATION OF THE MOUTH, PHARYNX, LARYNX, AND TRACHEA.

Q. How is this effected ?

A. Having put the neck of the subject on the stretch, a longitudinal incision is made along the median line, from the lower lip to the top of the sternum, another may then be made in the course of the base of the lower jaw bone, the symphysis of the jaw is then sawed through, and its lateral halves separated after having removed all the soft parts which are attached to its base. The same should be done with regard to those muscles which are placed on the lateral parts of the neck, and interfere with the examination of the œsophagus and trachea.

To examine the air-tube, it is necessary to remove the thyroid gland, and then make an incision along the whole extent of the trachea and bronchi, having previously sawed through the clavicle and first rib at each side. To what has been already said when treating the mode of examining the bronchi, we shall here merely add that the state of the epiglottis and ventricles of the larynx should always be attended to.

Q. Describe the examination of the abdomen ?

A. This may be commenced by making a crucial incision through the parietes of the cavity, or a double elliptic one from the cartilages of the ribs at each side to the pubes, and having detached the flap from this latter point, it may be turned upon the thorax of the subject. When the cavity of the abdomen is thus exposed, we can readily see whether there are any adhesions between the intestines or between the two layers of the peritoneum, or whether there is any fluid effused within it. The digestive tube may be laid open in its whole extent with the "entéro-tome," and after having detached it from the mesentery, it should be washed and examined from the œsophagus to the rectum. We should attend particularly to the colour of the mucous membrane, and to the different appearances of congestion and inflammation which it presents, also to its degree of adhesion to the muscular coat, and to its thickness, consistence, and elasticity in different parts. When ulcerations, fungous excrescences or cicatrices exist, their extent and situation should be described on the report of the case.

As derangements of the gastro-intestinal mucous membrane are exceedingly frequent, and as disputes constantly arise on the subject of its inflammation, it may be useful to describe the physical characters which this membrane presents in its healthy state, as the first step towards distinguishing the changes induced by disease.

Q. Describe the appearance of the mucous membrane in the healthy state.

A. The thickness and tenacity of the membrane in general diminishes from the stomach to the anus, but its degree of adhesion to the subjacent parts diminishes in the opposite direction. 2d. It is soft and pulpy in infancy, increases in density as age advances, but in some cases in old persons it again becomes soft as in children. 3d. In the fœtus it is somewhat of a rosy colour, in infancy it is of a pale colour, in adult age it is greyish white; during digestion, the part of the membrane which lines the stomach, duodenum, and the commencement of the ileum, is of a slightly rosy tinge. 4th. The membrane of the stomach is never marbled or studded with black spots in the healthy state. 5th. The age of the individual, the sort of death, the last agonies of life, the vicinity of certain organs, the nature of the matter contained in the canal, the time which has elapsed since death took place, the position given to the body (particularly whilst it was warm), the contact of air, are all so many causes capable of altering the appearance of the mucous membrane. 6th. The prominences or villi perceptible on the surface of the membrane are most numerous in the stomach, (particularly at its pyloric extremity) and in the duodenum ; their number gradually diminishes from thence along the course of the intestine. 7th. Mucous glands are not very apparent, or rather appear in a very small number on the internal surface of the stomach and intestines.

After having examined the digestive canal, we should proceed to inspect the different organs contained in the cavity of the abdomen : the liver, gall-bladder, spleen, mesentery and its glands, kidneys, ureters, bladder, genital organs, aorta, vena cava, &c.

We shall conclude these remarks by recommending the examination of the lining membrane of the large arteries and veins in cases of eruptive fevers, particularly of small-pox. When giving the account of a *post mortem* examination, we should never omit to state how many hours have elapsed since death took place, and the position in which the body has been placed, for position exerts a material influence on the appearance of congestion presented by bodies after death.

These remarks on the subject of the knowledge necessary to enable an observer accurately to describe the different species of alterations which occur in the human body, may now be concluded by a brief statement of the anatomical characters of the non analogous accidental tissues: tubercle, scirrhus, encephaloid, melanosis, cyrrhosis, sclerosis, and scaly-scirrhus.

Q. What is Tubercle ?

A. It is the most common of all the productions of this sort; it is a morbid structure, common to all organs, and generally occurs in several at the same time. Tubercles are found either in the form of spherical tumours, or of masses infiltrated into the substance of the organ in which they are developed; their size varying from that of a millet seed, to a small egg. They sometimes adhere intimately to the surrounding substance, and appear as if formed at its expense (*non-encysted Tubercles*); at other times they are enclosed in a distinct membrane, whose character may be merely cellular or approach that of fibro-cartilage; as this completely separates them from the surrounding parts, they are termed *encysted tubercles*.

In their crude state tubercles consist of a grey, transparent, semi-cartilaginous substance, without any trace of vessels, and which in process of time becomes opaque and of a yellow colour.

Tubercles after some time become softened; the process begins at the centre and proceeds towards the circumference until the whole mass is converted into a cheesy pultaceous matter, and then into a curdy, puriform fluid, which, when expelled from its situation, leaves an ulcerated cavity; the latter may, though very rarely, be cicatrized by means of a fibro-cartilaginous structure.

Q. What is Scirrhus?

A. This is white, grey, or bluish, somewhat semi-transparent, colourless, or very slightly coloured. In the crude state its consistence varies from that of hog's skin, which it very much resembles, to that of the intervertebral cartilages; scirrhus is usually divided into irregular homogeneous masses, which are again subdivided into lobules united to each other by fibrous bands or dense cellular texture; it sometimes presents an alveolar or regularly radiated appearance, somewhat like that presented in the interior of a turnip; in such cases the scirrhus is so firm that a scalpel grates upon it as if it were cartilage.

When it becomes soft, its consistence and appearance resemble those of meat jelly, or a thick syrup whose transparence is disturbed by a dirty grey tinge or by some blood; at other times it resembles honey, gum, or a grey pultaceous mass.

Q. What is Encephaloid?

A. In its crude state encephaloid is somewhat more opaque and white, but not so firm as scirrhus. It consists of masses, sometimes lobulated, sometimes not so; these are usually disposed like the convolutions of the brain, and separated from one another by a very soft, delicate, or rather imperfect cellular texture, in which we find blood vessels of rather a large size, but whose coats are very thin and weak. The sub-divisions of the lobes, as in scirrhus, are marked by septa or lines which are whiter than the rest of the tumour, they assume no regular distribution and in some instances are but very slightly marked.

When encephaloid becomes soft it resembles very much the substance of the brain when inclining to decomposition; when an incision is made into it some drops of blood ooze out. If the softening has extended through the whole mass it presents the appearance of a reddish or violet coloured pulp, the consistence of which, however, is variable in different parts of its extent. We sometimes find in these masses effusions of blood, either in the liquid or solid form, not unlike those found in the brain after hæmorrhage has taken place into that organ; at other times the blood is diffused amongst the encephaloid structure in such a way as to resemble that in aneurismal tumours; and the resemblance in some cases is so complete that the distinction between them can only be established by finding some portion of the encephaloid, which at once marks the true nature of the tumour.

These masses are sometimes enclosed by a sort of membrane, or by a semi-cartilaginous cyst, whose internal surface is lined by a soft, vascular, cellular structure; in other cases the cyst is incomplete in some part of its extent, or it may be altogether wanting, the tumour being merely enclosed by some loose cellular substance; finally, we occasionally find serous effusions into the encephaloid itself or into the parts which surround it. When exposed to the air its surface becomes of a grey or somewhat greenish colour, and as it decomposes it exhales a very fetid smell.

Q. Describe Melanoïdes.

A. This accidental production may exist in the form of single masses, enveloped in a cyst, infiltrated into the substance of organs, or lastly, in layers diffused on the surface of membranes. In some cases the masses are extremely small, they are however occasionally found as large as a nut—they are sometimes lobulated or nipple-shaped, united by cellular texture, but never penetrated by vessels.

In the crude state it is opaque, brown or black, homogeneous, without smell or taste, somewhat moist, and of the consistence of a lymphatic gland.

When "ramollissement" or softening begins, a thin reddish fluid, mixed with small black clots, can be forced out by pressure. After the softening is complete the mass is converted into a thick dark pulp, which may be effused or infiltrated so as to stain the surrounding parts.

Its chemical analysis, according to Breschet, gives the following results—1st. coloured fibrine; 2d. a dark colouring matter soluble in diluted sulphuric acid, or in a solution of sub-carbonate of soda, which fluid it tinges of a red colour; 3d, a small quantity of albumen; 4th. sub-carbonate of soda, phosphate of lime, and oxide of iron.

Q. Describe Cyrrhosis.

A. In the crude state this is somewhat of a fawn colour, inclining sometimes to greenish, and presents some resemblance to the supra-renal capsules in an adult. To the touch it feels flaccid, like fungoid productions, and when cut into, it appears compact and humid; but though in some cases we find divisions which separate the mass into lamellæ, still there are no traces of fibres.

When cyrrhosis becomes softened, it assumes the appearance of a glutinous pulp, of a greenish brown colour, but without smell.

According to Laennec, who first described this accidental production, there are three species of it; 1st. Cyrrhosis in masses; 2d. in layers; 3d. in cysts. When it exists in the liver, (which is the organ most frequently attacked by it) it assumes the form of small masses, never exceeding the size of a cherry stone, and sometimes not larger than a grain of millet seed. In such cases, these granular bodies being exceedingly small and numerous, and diffused through the whole substance of the liver, give it a homogeneous appearance, and a yellowish colour, not unlike that of boot leather; on closer examination however, the liver is found to be studded with a multitude of small bodies not unlike those hard fatty granules, found in the sub-cutaneous cellular texture of the lower extremities in anasarcous subjects. The cysts which sometimes enclose these productions, consist of a thin layer of cellular membrane, which renders them capable of being easily detached from the substance of the liver, to which they form and adhere when there are no cysts. The substance of the organ, in these different cases, shrinks, becomes wrinkled and indurated.

Cyrrhosis has hitherto been discovered only in the liver, kidneys, prostate gland, epididymis, ovaria and thyroid gland.

Q. Describe Sclerosis.

A. This was found infiltrated beneath the peritoneum in a subject affected with cancer; it was of a dull white colour, and not unlike cyrrhosis. It appears disposed to extend itself; but has not as yet been discovered in the softened state.

Q. Describe Scaly Scirrhus.

A. M. Laennec found this accidental production enclosed in a cyst, in the case of a person who died of cancer; it was of a dull white colour, semi-transparent, and disposed in layers or flakes like those of fish.

NOTES.

1. The method pointed out in this section for the opening of bodies answers very well in the French hospitals, as the greater number of those who die are consigned to the dissecting rooms immediately after the examination is completed. It is, however, altogether inadmissible in private practice, and cannot be adopted even in hospitals in this country, where the bodies are almost invariably claimed by the friends for the purposes of burial. When opening the head, an incision may be made through the scalp, from ear to ear, transversely over the vertex; two flaps may then be made of the integuments, one of which should be reflected forwards over the face, the other backwards over the occiput; the bones can then be sawed through all round. After the brain has been examined, the roof of the skull may be restored to its place, and the flaps drawn over it, and united by suture. The thorax and abdomen may be laid open by a straight incision made along the central line; the integuments may then be dissected off the ribs, for some way at each side, so as to expose their attachments to the cartilages, which should be cut through with a strong scalpel; and the triangular flap thus formed, consisting of the sternum and the cartilages of the ribs, can be readily turned upwards on the neck and face of the subject. In addition to the straight incision from the sternum to the pubes, through the integuments of the abdomen, it is usually necessary to make another at each side at right angles with it, extending into the loins, in order to give greater room for continuing the examination of the contained viscera. When these incisions are properly united, there will be no appearance of unnecessary mutilation. It has been lately proposed to open the spinal column from the inner side, namely, by cutting out the bodies of the vertebræ, after having removed all the thoracic and abdominal viscera. The process, however, is very tedious and trou-

blesome; and as it can serve no other purpose than that of avoiding another external incision along the back, it cannot be recommended as being either useful or necessary.

2. It is very difficult to make a satisfactory classification of those accidental productions which are developed in the living body. Each species of them presents some modifications according to the organs in which they are found; in many cases several of them are found blended together in the same mass, so that it is difficult to ascertain which predominates; in other instances, the shades of difference between them are so slight that it is difficult, if not altogether impossible, to determine to which species some particular accidental growths belong. These productions have, however, been divided into two classes: the first consists of those which are *analogous to some of the textures existing naturally in the body:* in the second are placed those which have no analogy or similitude to any thing found in the body during health. Hence has arisen the use of the terms *analogous, and non-analogous accidental productions.* Under the former may be included those ossific deposits, fibrous textures, fibro-cartilage, cartilage, horn and hair, which are developed by disease, and deposited in situations different from those in which they naturally exist. To these may be added the serous membranes which Bichat first noticed at the inner side of some serous cysts, and the mucous membranes which, as Hunter pointed out, line the trajet of fistulæ. To this class may also be referred that production, like enamel, which covers the heads of bones after the termination of certain affections of the articulations, and also the synovial membranes which line false joints.

In the text, the reader will find an enumeration of the *non-analogous* accidental productions, and a short description of the appearances which they present. The nature and character of tubercle, the most fatal because the most common of them, have long engaged the attention of pathologists; on this subject a considerable difference of opinion still prevails. According to Laennec, tubercles go through three stages, each presenting a distinct set of characters. In the first they are small, transparent, colourless, about the size of a millet seed, and are thence termed *miliary* tubercles. In the second they become yellow, opaque, and firm—in which form they are said to be *crude*, their consistence being about that of cheese. In the third stage the mass becomes softened, a passage for it is made by ulceration into some of the neighbouring bronchi, through which it is evacuated, and so is formed a tubercular cavity. Bayle and Laennec agree in considering tubercle to be a production *sui generis;* but the former pathologist considered the transparent granules, above described as the first stage of tubercle, to be a distinct production. Other writers are of opinion that they are nothing more than the lymphatics of the lungs, slightly altered in their appearance. This idea was inculcated long since by Morton and Portal, and has lately been revived by Broussais.

Dupuy, professor at the Veterinary school at Alfort, after having investigated the production of tubercles in several of the ruminant animals, has come to the conclusion that the matter of tubercle is, in the first instance, *secreted*, in a semi-fluid state, which, after a while, becomes indurated. In several cases in which hydatids were developed in the lungs of animals, he found a pale liquid deposited between the external surface of the hydatid, and the cellular membranes which invested it. This, when dried perfectly, resembled tubercle. In some cases the hydatid is destroyed, and the cavity which it occupied became filled with *tubercular matter, secreted by the cyst.* These observations are confirmed by Andral. He found in the liver of a rabbit a mixture of tubercle and hydatids, the latter being in a great variety of conditions. Some were entire, and separated from the substance of the liver by a thin layer of condensed cellular membrane; others, also entire, were surrounded by a matter not unlike a mixture of chalk and water; finally, a third set were broken down, so that only a few portions of their gelatinous structure could be recognised, the place which they occupied being nearly filled up by the matter just described. These facts are important in many points of view, and particularly as they throw some light on the opinions of Dr. Barron on the nature of tubercle. He considers that a transparent vesicle, which he calls an hydatid, constitutes the first stage of tubercle; but though this opinion is inculcated in a very decided, I had almost said dogmatic tone, it is by no means so tenable as the Doctor seems to think. Tubercle and hydatid are constantly found together in the same part, and under every variety of form and size, and as we have just seen, the one is often supplanted as it were by the other; but this is quite a different process from the conversion of one into the other. If hydatids be living organised beings, according to the opinions of all those naturalists who have examined the *entozoa*, it is very difficult to conceive how they can be considered as identical with tubercle, which all agree in regarding merely as an accidental production, or texture developed in the substance of organs.

M. Andral, in his late work, contends, that tubercle is the product *of a morbid secretion*, and that this process is preceded by an active congestion in the part, similar to that which occurs in every case while secretion is going on, whether healthy or unhealthy. Meckel has long since advanced the same doctrine. He says, (vol. i. p. 531,) "accidental formations are sometimes produced by a peculiar fluid effused expressly in order to give them origin. This is the way in which all accidental textures are formed, whether they have or have not any resemblance with parts already existing in the economy." Mr. Wardrop seems to have come to the same conclusion, at least with regard to one of the productions of this class. When treating of fungus melanodes, he observes, that "it has no smell, and seems more to resemble a secretion than a decomposition." M. Andral, as has been observed, asserts the same of tubercle, whilst Meckel extends the position to them all. This is a remarkable coincidence of opinion between inquirers of such deserved celebrity in their respective countries.

3. The accidental production which the French pathologists describe as "encephaloid," is that to which most of those in this country apply the term fungus hæmatodes. Mr. Abernethy, however, in his classification of tumours, calls it medullary sarcoma. This appears to be a contradiction in terms, or rather (to use the precise and forcible language of Mr. Wardrop,) "it is inconsistent to speak of a tumour being a *medullary* species of a sarcomatous or fleshy genus." Meckel, in the following passage, has evidently confounded structures which are altogether different, or rather the descriptions given of them by the authors whom he quotes. "The *fungus hæmatodes* of Hey, the *spongy inflammation* of Burns, and the *melanosis* of Laennec, are really one and the same production, which differs from cancer by being less firm in its texture, and of a black colour; still it resembles cancer so much, that some persons have called it *soft cancer*." (vol. i. p. 540.) It is the encephaloid of Laennec, and not the melanosis, which agrees with the descriptions of fungus hæmatodes, given by Hey and Wardrop. It is rather remarkable, that though Breschet has commented on the passage, he has not noticed this oversight.

4. In extirpating cancer of the lip, Dupuytren, instead of removing a triangular portion, and then uniting the cut surfaces by suture, in some cases makes a semi-lunar incision, so as to remove all the hardened part, and then covers the surface with simple dressing; after a while, there is scarcely any perceptible loss of substance, as the margin of the lip rises up nearly to its natural level. This plan of proceeding is

particularly applicable to cases in which the breadth of the diseased part is greater than its depth; for instance, when it extends across the whole lip. This operation is practised on the principle that cancer being an accidental production, developed in the part, compresses and forces back the adjacent substance, in proportion as it grows; consequently, the substance of the lip can restore itself to its original position, when, by the removal of this new growth, the compressing power is taken away. The Editors of the new edition of the "Medecine Operatoire," have given this rationale of Dupuytren's practice; (vol. iii. p. 339,) where they say that the deficiency produced by the operation is filled up, not by a new growth, but by the extension of the substance of the part; "par l'extension de la substance de l'organ." This method of operating has as yet, so far as I recollect, been adopted but in one instance in this country. The case will be found reported in one of the Numbers of the Medical Repository for 1824 or 1825; it occurred in the practice of Dr. Bull, of Cork, and was attended with complete success.

5. When examining the different accidental textures here described, it is necessary to remember that they are very frequently blended together in the same organs. The following remarks by Mr. Wardrop, in his observations on diseased structures, place this subject in a very clear light:—

"Though it cannot be doubted that scirrhus, scrofula, and fungus hæmatodes have each a distinct character, yet it is of importance to be aware that several of these diseased structures may exist at the same time in the same organ, or either of them may appear along with diseased changes of structure of some other kind: this led Laennec to form a class of Compound Diseased Structures. Different diseases are also seen existing at the same time in the lungs, brain, liver, and in the different coats of the intestines.

"A tumour is sometimes met with, one portion of which is scirrhous, another portion is medullary, and another is osseous or cartilaginous. It also happens, that when a disease attacks an organ already changed in some part of its structure, the one disease produces a certain influence on the other. For example, an injury, as has been already noticed, often increases the growth of a scirrhous tumour, creating in it all the symptoms of simple inflammation; the common wart of the skin, from some accidental irritation, has often been known to become cancerous, one disease thus appearing either to be a complete conversion or transformation into another, or showing that two or more deviations from the natural structure may occur in the same part. So also it often happens that a syphilitic sore is accompanied by more or less common inflammation, a circumstance necessary to be attended to in the treatment of the disease; mercury increasing such an ulcer until the simple inflammation be previously subdued by antiphlogistic treatment.

"Sometimes compound tumours consist of a simple juxta-position of two or more different structures, and sometimes they are formed of an intimate and apparently confused mixture of the primitive tumours. Frequently some portions of each of the component primitive structures may be distinguished, but in other instances it is not easy precisely to define the primitive structure, and this is to be considered, as Laennec has justly observed, the conjectural part of pathological anatomy.

"In all tumours, it is not only difficult but impossible to describe the various modifications which result from the combination of scirrhus, fungus hæmatodes, and scrofula with one another, and with other morbid alterations of structure. The characters of different tumours are drawn from cases where one disease has alone existed; for, like colours, those that are primary are easily distinguished, yet language cannot describe their various and almost infinite combinations; therefore it is only in their unmixed state that we can learn to distinguish each morbid structure; their various complications must be afterwards discriminated.

"It is not impossible that when an organ is thus affected with more than one disease, each different affection may exist in a different texture of the organ."

DIAGNOSIS.

Q. What is Diagnosis?

A. Diagnosis is the most important part of Pathology, for it not only enables the physician to ascertain the nature of diseases, but also the treatment best adapted for their relief. Hitherto we have limited our attention to the study of symptoms, in order to distinguish the different phenomena which diseases present during their progress. We now proceed to assign a value to these phenomena, and appreciate them as signs, whereby an observer may be enabled, in a given affection, to ascertain what organ suffers, and the nature of its derangement.

If diseases presented themselves always and at every period under the same form; if the phenomena which characterize them were not subject to infinite modifications and varieties depending on unknown causes, and if they were not complicated with those sympathies which the diseased organ has with others more or less distant from it, our diagnosis would not be enveloped in so much obscurity; for the local symptoms which result from the derangement in the function of the affected organ would be sufficient, in most cases, to resolve our doubts. Frequently, however, the principal organ of a function is materially altered, and yet the function is but slightly deranged; at other times, on the contrary, a function is considerably disordered while the disease has its seat in an organ which is but indirectly subservient to it. Yet notwithstanding the numerous exceptions to this great physiological law, "that the disease of an organ manifests itself by a derangement of the function over which it presides," we still must take the state of the function into account, and consider it as the chief basis of our diagnosis. In doing so, however, we must remember to employ a greater degree of care and attention, according as the disease has been of long standing, its progress slow, and its symptoms indistinct.

As the following remarks are confined chiefly to diseases of frequent occurrence, they shall be directed to supply the means of distinguishing them by rational principles, rather than to attempt a degree of precision in this particular, which medicine cannot as yet lay claim to; with this view, we shall endeavour to determine this important problem: "*What is the organ which is affected, and what is the nature of its derangement in any particular disease?*"

Q. What is to be said on the diagnosis of the diseases of the brain?

A. When, together with headache more or less severe, we find a marked change in the state of the intellectual faculties—a derangement of the power of motion and sensibility, without any symptom of acute gastro-enteritis; and when these phenomena continue for any length of time, or set in suddenly, it is evident that the brain is the organ affected.

When the disturbance of the powers of sensation and motion occurs at one side of the body, the affection of the brain is at the opposite side.

When paralysis with relaxation of the muscles occurs, the substance of the brain is disorganized; or, what amounts to the same thing, an effusion has taken place in its substance or on its surface.

If the derangement consist of paralysis, with a slight degree of rigidity in the muscles, or with convulsive attacks, and if these symptoms have been preceded by headache and other marks of a cerebral affection, we may conclude that the brain is in a state of irritation or inflammation, which is not unfrequently produced by the contact of some extraneous substance, such as effused blood, or serum.

When, after a violent headache, without paralysis of either side of the body, the intellects become disturbed or deranged, or when a state of complete delirium sets in, without any symptom of gastro-intestinal inflammation, the pia mater, or arachnoid membrane covering the superior parts of the brain is inflamed.

When, more especially in children, a severe headache is succeeded by slight delirium, or coma coinciding or alternating with convulsions of both sides of the body, and spasmodic motions of the eye-balls, together with dilatation of the pupils, we may infer that the arachnoid membrane, or pia mater at the base of the middle lobe of the brain is inflamed.

Q. What is to be said of the diagnosis of the medulla spinalis?

A. If an acute pain occurs in some point of the vertebral column, together with a disturbance of the function of respiration, of the power of motion and sensation in the limbs, rectum, or bladder, and if at the same time the powers of the mind are unimpaired—the derangement is seated in the medulla spinalis or its membranes; and the affection of the medulla will be found after death at the side in which the paralysis had manifested itself.

When the paralysis takes place in the upper extremities and in the respiratory muscles, the derangement is seated in the cervical portion of the medulla spinalis.

When it occurs in the lower limbs, rectum and bladder, the alteration of structure exists in the lumbar portion.

When violent pain is referred to some point of the vertebral column, and when after the pain the spine is bent backwards, its membranes are inflamed.

Q. What is to be said on the diagnosis of the organs of respiration?

A. When none of the symptoms here mentioned present themselves (all of which are referable to a derangement of the functions of the brain,) and when pain is felt in some part of the chest, with difficulty of respiration, cough and expectoration, the respiratory organs are affected.

When the pain is referred to the larynx, and when there is an acute or hoarse cough, with a change in the character of the voice, we infer that the larynx is inflamed, particularly if by auscultation a "râle," is heard in that part.

If, besides these symptoms, there are fits of coughing, with extreme dyspnœa, and expectoration of pieces of false membrane, the complaint is croup.

We infer the existence of acute or chronic catarrh from the following symptoms:—the chest sounds clearly on percussion, the respiratory murmur is masked by a mucous "râle," the expectoration consists of sputa, which may be transparent or opaque, viscid or puriform, colourless or of a greenish yellow.

When, in addition to these symptoms, there is a considerable degree of dyspnœa, congestion of the face, and considerable quickness of the pulse, without any symptom of disease of the heart, the catarrh is seated in the last ramifications of the bronchi.

When the sputa are round and opaque, with white striæ, and when pectoriloquy is heard in some part of the chest, it indicates the existence of phthisis, with a cavity in the lung.

When the sound emitted by the chest is dull, when the sputa are viscid and streaked with blood, at the same time that the respiration is incomplete and accompanied by a "râle crepitant," the lung is inflamed, no matter whether pain is felt in the part or not.

If the pain is acute, and the respiration imperceptible by the stethoscope, at the same time that the voice determines an œgophony, the disease is pleuritis.

When the sound of the chest on percussion, is more loud than natural at one side, the respiration being completely suspended in that part, it indicates pneumo-thorax.

When the respiration is laborious, without any other symptom of an affection of the lungs, and when there is at the same time an irregularity in the action of the heart, we conclude that this latter is the organ which is affected.

Q. What is to be said on the diagnosis of the diseases of the heart?

A. When the stroke of the heart is weak, and gives a clear sound, which is audible in several parts of the chest, its cavity is dilated, and its walls thin. If these phenomena are perceptible at the base of the sternum, the dilatation is seated in the cavities of the right side; if at the cartilages of the ribs, it indicates that the left cavities are dilated.

When the stroke of the heart is strong and circumscribed, and when a dull sound is emitted by percussion at the region of the heart, there is an hypertrophy of that organ, the situation of which, (whether in the right or left cavities) will be determined according as the phenomena are most perceptible at the base of the sternum, or on the cartilages of the ribs.

When the "bruit de rape," or sound like that of a file is heard at the left side, simultaneously with the contraction of the ventricle, and the stroke of the pulse, it indicates that the mitral valves, and the sigmoid valves of the aorta are indurated; but if this sound is heard at the base of the sternum, the alteration of structure is situated in the tricuspid valves and the sigmoid, which are placed at the origin of the pulmonary artery.

Q. What is to be said on the diagnosis of the diseases of the abdomen?

A. When the abdomen is painful on pressure at some point, and when the functions of some of the viscera contained in this cavity are deranged, the disease must be looked for in one of its regions.

The digestive apparatus is deranged when there is vomiting or purging, or when the tongue is loaded and the digestion impaired.

If the tongue is red, and its point dry, if there is pain in the epigastrium with vomiting, loathing of food, and fever, the mucous membrane of the stomach is inflamed.

If to these symptoms there is added a diarrhœa with pain in the umbilical or iliac region, particularly of the right side, the inflammation extends to the intestines.

When, in addition to these phenomena, the tongue, lips, and teeth are covered with a dark coating, the intellects disturbed, and the patient lies in a state of stupor, the gastro-enteritis has reached an extreme degree.

When the tongue is white and broad, when there are colic pains with flatus, diarrhœa, and acute pain in either of the loins, extending along the course of the colon, the large intestines are inflamed.

If the abdomen is hard, and contracted with obstinate constipation, and occasionally vomiting, and if there be violent colic pains, particularly at the umbilicus, which so far from being increased by pressure are often relieved by it, and if the pulse be not increased in frequency, the disease is *colica pictonum*.

When the abdomen is tumid and excessively sensitive to pressure, either at some point or in its entire extent, and if the pulse is small, contracted, and febrile, the tongue white and humid, and the countenance anxious, the peritoneum is inflamed; in some cases there is vomiting, in others not.

When the digestion is painful and difficult, and is attended with flatus, and vomiting—and when a hard irregular tumour is felt in the epigastrium, there is a scirrhus or cancer in the stomach.

When a dull pain is felt in the right hypochondrium, and when pressure on that part produces pain, the stools being suppressed or of a grey colour, the skin and mucous surfaces presenting a yellow tinge, the urine turbid or saffron coloured, the liver is inflamed ; in such cases the patient usually rests on the affected side.

THE

RUYSCHIAN ART.

PREPARATIONS OF THE VISCERA.

Q. Describe the mode of preparing the viscera.

A. The various parts of the body may be preserved in a healthy state, either to exhibit their form or structure, or to compare them with morbid parts.

GENERAL OBSERVATIONS.

1. When removed from the body, and the useless parts dissected away, the part to be preserved is to be soaked in water, in order to get out the blood.

2. When it is necessary to give parts their natural form, which is lost by macerating, put them into a saturated solution of alum, retaining them by any means in the required form, until they become hardened. If it be a hollow part, as the stomach, bladder, &c. fill it with, and immerse it in the solution.

3. When an opening is to be exhibited, as that of the ureter, the bile-duct, the lacunæ of the urethra, Stenonian duct, Fallopian tube, &c. introduce a bristle. After this manner preserve the uterus and its appendages, cutting open the vagina and cavity of the uterus, the bladder, intestine, stomach, heart in the pericardium, liver, spleen, kidney, &c. &c.

4. All preparations of the brain are best hardened in a saturated solution of corrosive sublimate.

5. The parts are to be suspended in proof spirit by raw silk, in a tie-over bottle, and covered with bladder, taking care to exclude all air. When dry, varnish the bladder with mucilage of gum arabic several times; then put a sheet of thin lead over, and varnish

its edges with mucilage; and, lastly, tie another bladder over, and give it a coat of common spirit varnish, in which lamp-black, or other colouring matter, is mixed.

PREPARATIONS OF MORBID PARTS.

Q. What are the directions for the preparation of morbid parts?

A. All morbid parts should, immediately after their removal from the body, be put into rectified spirit of wine for a day or two, and then preserved in proof spirit. These preparations foul a great quantity of spirit, and should therefore be kept in stopper-glasses, from which the spirit can easily be removed, and fresh put in, until the preparation ceases to foul the spirit, when it may be put into a tie-over bottle.

PREPARATIONS MADE BY MACERATING.

Q. How are preparations made by maceration?

A. Preparations obtained by this process are very various.

GENERAL OBSERVATIONS.

1. Let the water be frequently changed, until it is no longer coloured with blood, but never after the blood is steeped away.

2. Let the macerating pan be placed in a warm place, to facilitate putrefaction.

3. The macerating pan should never be in a cold place, for the spermaceti-like conversion of the soft parts will be formed, and the bones spoiled.

4. The soft parts surrounding bones are a long time before they detach themselves from the bones.

5. Bones, when macerated, should be exposed to the sun's rays, and frequently wetted with clean water, or they may be bleached with the diluted oxygenated muriatic acid.

BONES.

Bones are macerated to be preserved whole, or they are sawed to expose their internal structure.

Bones of the Head.—Put the whole head, without disturbing the flesh or brains, into the pan. When sufficiently macerated, all the soft parts will come away with the periosteum; then detach the vertebrae, and wash out the brain. Bones are separated from each other by filling the cranium with peas, and putting it into water. The same method is to be adopted with other bones.

Bones in general, for structure.—Divide the femur into two halves; the os innominatum, the petrous portion of the temporal bone, the parietal bones, &c. these, when macerated, will exhibit the compact, the spongy, laminated, and reticular substance of bones.

A FOETUS.

Cut carefully away the fatty substance enveloping a foetus, but do not cut any of the cartilages. Steep out its blood, and macerate. It should be frequently looked at, and taken out when the flesh is all destroyed, before the cartilages are separated. The following preparations are obtained in this way:—

1. The superior extremity, to show its bones, the progress of ossification, and the cartilage to be formed into bone.

2. The lower extremity, to expose the same circumstance.

3. The spine, which forms a beautiful preparation.

4. The pelvis, not less elegant.

Preservation.—The above all to be preserved in proof spirit.

CUTICLE.

The cuticle of the head and foot may be separated by maceration; the former is called *chorotheca*, the latter *podatheca*. The arm and foot of a large foetus are to be preferred; they are first to be well washed with a soft sponge in soap and water.

Preservation.—Suspend them in proof spirit; first tie the part by which they are to be suspended, then put them into the bottle with the spirit, and gently pour some spirit into the cuticle, to distend it like a glove or stocking.

INJECTING INSTRUMENTS.

Q. Describe the instruments used for injection.

A. The celebrated Dutch anatomist, *Ruysch*, first invented the art of injecting animal bodies.

There are three kinds of apparatus used in making injected preparations. The one for the coarse and fine injections, and the minute injection; the other for injecting with quicksilver; and the third, called the oyster syringe, for injecting minute preparations with the minute injection only.

The first consists of a brass syringe made for the purpose, of various sizes, from one carrying six ounces to one sufficiently large to hold two pounds. The point of these syringes is adapted to the pipes into which it is to be affixed. To this syringe belong a stop-cock, and a great variety of pipes.

The instrument for injecting quicksilver consists of a long glass tube, at whose end is fixed, by screwing in, a steel pipe, the end of which is extremely fine.

The oyster syringe is similar to the large syringe, except in size. It is so small, that when the syringe is in the hand, and full, its piston may be commanded by the thumb of that hand to throw its contents into any preparation in the other hand. The pipe affixed by being screwed to the end of this syringe is nearly as small as that belonging to the quicksilver tube.

These instruments are always to be had at the surgical instrument makers.

INJECTIONS.

Q. What are the injections used for anatomical purposes?

A. The injections employed for anatomical purposes are of four different kinds: coarse, fine, minute, and mercurial.

COARSE INJECTIONS.

Red. Yellow beeswax, sixteen ounces—the palest resin, eight ounces—turpentine varnish, six ounces, by measure—finely levigated vermillion three ounces.

Yellow. Yellow beeswax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—king's yellow, two ounces and a half.

White. Fine virgin's wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—best flake white, five ounces and a half.

Pale blue. Fine virgin's wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—best flake white, three ounces and a half—fine blue smalt, three ounces and a half.

Dark blue. Fine virgin's wax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—blue verditer, ten ounces and a half.

Black. Yellow beeswax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—pure lampblack, one ounce.

Green. Yellow beeswax, sixteen ounces—pale resin, eight ounces—turpentine varnish, six ounces—levigated crystallized verdigris, four ounces and a half—best flake white, one ounce—levigated gamboge, one ounce.

Liquefy the wax, resin, and turpentine varnish over a slow fire, in an open pipkin; then add the colouring matter, having previously mixed it in another pipkin, with a very small quantity of the melted composition. Stir the whole well together with a wooden pestle, so that the colouring ingredients may be intimately and smoothly blended; place the whole again over the fire, and when they have acquired their due heat, the injection will be fit for use.

FINE INJECTIONS.

Brown spirit varnish, white spirit varnish, of each four ounces—turpentine varnish, one ounce.

These are to be put together in an earthen pipkin, over a slow fire, until they have acquired the necessary degree of heat. To make it of a red colour, put one ounce of finely levigated vermillion into another pipkin, and gradually add the heated materials, stirring the whole with a wooden pestle, that the colour may be equally diffused.

One ounce and a quarter of king's yellow—two ounces of best flake white—one ounce and a half of fine blue smalt, with one ounce and a quarter of best flake white—four ounces of blue verditer—half an ounce of pure lampblack—are the proportions for the various colours to the quantity of ingredients ordered above.

MINUTE INJECTIONS.

The size, which forms the vehicle to the colouring matter in these injections, is made in the following manner:—

Take of the finest and most transparent glue, one pound, break it into small pieces, put it into an earthen pot, and pour on it three pints of cold water, let it stand twenty-four hours, stirring it now and then with a stick; then set it over a slow fire for half an hour, or until all the pieces are perfectly dissolved; skim off the froth from the surface, and strain it through a flannel for use.

Isinglass and the cuttings of parchment make an elegant size for very particular injections; and those who are not very nice may use the best double size of the shops.

Red. Size, one pint—Chinese vermillion, two ounces.

Yellow. Size, one pint—king's yellow, two ounces and a half.

White. Size, one pint—best flake white, three ounces and a half.

Blue. Size, one pint—fine blue smalt, six ounces.

Green. Size, one pint—levigated crystallised verdigris, two ounces—best flake white, levigated gamboge, of each eight scruples.

Black. Size, one pint—lamp-black, one ounce.

GENERAL OBSERVATIONS.

1. All injections are to be heated to such a degree as not to destroy the texture of the vessels they are intended to fill; the best criterion of this degree of heat is dipping the finger into the injection. If the finger can bear the heat, the texture of the vessels will not be hurt.

2. All the coloured materials should be as finely levigated as possible, before they are mixed with the injection.

3. Great care should be taken lest the oily ones boil over, or bubble; and that the heat be gentle, otherwise the colour will be altered.

4. They should be constantly stirred, lest the colouring material, which is much heavier than the vehicle, fall to the bottom.

5. The instrument to stir them with should be a wooden pestle, and there should be one for each colour.

6. A large tin pan to contain water, with two or three lesser ones fixed in it for the injections, will be found very useful, and prevent all accidents, and the colour from spoiling, when on the fire.

PREPARATION MADE WITH COARSE INJECTION.

Q. How are preparations to be made with coarse injections?

A. The blood-vessels are mostly filled with coarse injection, and the parts dissected, to show their course; and when the anatomist wishes to exhibit the minuter branches, the fine injection is to be thrown in first, and followed by the coarse.

GENERAL OBSERVATIONS.

There are several circumstances to be observed in injecting with the fine and coarse injections, which are applicable to every part into which they are thrown; these are—

1. The part to be injected should be freed from its blood as much as possible, by steeping it for several hours in warm water, and repeatedly changing it.

2. Having emptied the part of its blood, the pipes are to be fixed in their proper vessels, and all other vessels to be tied with a ligature.

3. The heat of the water is then to be gradually increased to the same temperature with the injection to be thrown in.

4. The injecting syringe should be steeped in the water with the part to be injected until wanted.

5. The injection being finished, and the subject cold, remove the pipes, and tie up the parts they were in. Whenever a vessel is open, by accident or otherwise, be sure to secure it by a ligature, or cover it with a piece of thin and moist bladder, or the injection will always be oozing out.

6. The parts dissected and dried are to be varnished twice with copal or hard varnish, first washing them free from grease with some soap lees, and well drying them again.

BLOOD-VESSEL SUBJECT.

Q. Describe the mode of injecting a blood-vessel subject.

A. Select an emaciated subject, between the age of two and fourteen years.

Preparation. Make an incision through the integuments the whole length of the sternum; then, with a saw, divide the sternum longitudinally into two equal parts; introduce a dissecting knife under the divided bone on each side, separate it from the mediastinum, and lay open the thorax, by bending back the two portions of the sternum and the cartilages of the ribs: an incision is then to be made into the pericardium, and the left ventricle of the heart, and a large pipe introduced into the aorta, and secured by a ligature. The subject is next to be put into warm water, and gradually heated. The time generally required to heat the whole subject is four hours in a large body of water.

If the veins are to be injected, three more pipes are required: one to be put into the angular vein at the corner of the orbit; another into a vein as near the fingers as possible; and the third into a vein as near the toes as possible.

Q. Describe the injection of a blood-vessel subject.

A. The subject and injection being properly heated, throw the coarse red injection into the heart-pipe, which will fill the arterial system; and then the coarse yellow injection into the head pipe first, and next into the pipes of the extremities. The subject, when injected, should be put into cold water, with its face downwards.

Q. How is the dissection to be conducted?

A. Open the abdomen by an incision from the sternum to the umbilicus, and from thence to each ilium. Cut away the abdominal viscera, the stomach, spleen, and intestines; leaving the mesenteric vessels as long as possible: dissect away the liver, leaving the vena portae and hepatic artery as long as possible. This done, dissect away the fat and cellular membrane from the vessels; secure the mesenteric vessels in an arborescent form on a piece of pasteboard. The kidnies, urinary bladder, uterus, and its appendages, are to be preserved and dried in their situations. From the thorax are to be removed, the lungs and heart, or the latter may remain. The integuments being carefully dissected from the sternum, it is to be bent back, and kept in that situation, to expose the internal mammary arteries. The dissecting away the skin is the next, in order to exhibit the muscles, and expose the arteries and veins. The skin should only be removed from time to time to carry on the dissection, and never more than that covering the part to be dissected; otherwise the parts from which the skin is removed will become dry, and the dissection be spoiled. In dissecting the arteries and veins, the dissector will find no difficulty, if he proceeds cautiously from the larger trunks towards their extremities. The brain is to be removed by sawing away a large portion of the bone on each side of the longitudinal sinus of the dura mater. The cheeks should be pushed out by introducing horse hair into the mouth.

Drying. When dissected, or before, the subject should be hung up by the head in a frame: one arm is to be placed at a little distance from the side, and the other turned up over the head, with the palm of the hand in front; the legs at a little distance from each other, and kept in these postures by packthread. Should any muscles obstruct the sight of the arteries, they are to be separated to a proper distance by pieces of wood. This done, expose it to a current of air, in a place where it cannot get wet; and if the weather be moist, remove, from time to time, all moisture, by a soft sponge.

Preservation. Varnish it several times, and keep it in a dry place, and in a proper case, with a glass front and back.

A HEAD, FOR ARTERIES AND VEINS.

Q. How is the head to be prepared?

A. Choose an emaciated head of an adult, separated from the body, by a transverse section, about the sixth or seventh vertebra.

Preparation. Put a pipe into each carotid, or, what is better, one pipe with a bifurcation; remove a portion of bone over the longitudinal sinus of the dura mater, about the middle of the parietal bones, and secure a pipe in the longitudinal sinus, pointed towards the occiput. Put the head into warm water to soak, pressing the blood occasionally out of the external and internal jugulars. Then tie up the jugular veins and vertebral arteries, and all the small vessels.

Injection. Into the carotids throw the red injection, and the yellow, or dark blue, into the pipe in the sinus of the dura mater. The former will fill the arteries, the latter the veins.

Dissection. Follow the course of the larger trunks, dissect out the globes of the eyes, and remove, with a fine saw, the portion of the jaw bone behind the last molaris, to show the course of the internal carotids. To prepare the whole head, a portion of the cranium must be removed, by sawing on one side of the longitudinal sinus of the dura mater, from the frontal sinus to the horizontal spine of the occipital bone, and then sawing horizontally above the ear, from one extremity of the former incision to the other. The dura mater should be removed with a pair of scissors, the brain carefully washed out, and the tentorium and falx preserved. It is better to make a perpendicular section of the head, a little to one side of the sagittal suture, through the nose, foramen magnum, and vertebræ; and thus prepare each side. The course of the cervical artery is to be shown by dissecting away the muscles, &c. from between the transverse processes.

Preservation. Varnish it several times, and keep it in a glass case, suspended; or fix it by the neck, and cover it with a glass bell.

AN ARM, FOR ARTERIES AND VEINS.

Q. Describe its preparation.

A. Remove the superior extremity from the trunk, by separating the clavicle from the sternum, raising it, and passing the knife under it to the articulation, including the greater part of the pectoral muscle. Then cut under the scapula, so as to remove with the arm the clavicle, scapula, and subscapularis muscle.

After soaking it in warm water, force out the blood from the veins, by pressing the extremity from the fingers toward the shoulder. Fix a pipe in the axillary artery, and another in the largest vein on the back of the hand; some warm water may be injected into the vein, so as to wash out the blood; and, when pressed out, the axillary vein should be tied. Tie any muscular branches that may be gaping.

Red injection may be thrown into the artery, and yellow, or dark blue, into the vein.

This is very simple; it requires only the removal of all the cellular and fatty membrane, and exposing the course of the vessels. Tie up the limb by the clavicle.

When varnished, keep it in a cool and dry place, to preserve it.

A LOWER EXTREMITY, FOR ARTERIES AND VEINS.

Q. Describe the preparation of the lower extremity for arteries and veins?

A. Having removed the contents of the abdomen, make a section through the symphisis of the pubis, and the ligaments connecting the ilium and sacrum, so as to remove one side of the pelvis.

Fix a pipe in a vein as near the toes as possible, and another in the iliac artery. When the limb has been well soaked in warm water, press out the blood from the veins, or throw in some warm water at the venal pipe; but carefully press it out again, and tie up the iliac vein. Secure all divided vessels.

Blue injection, or yellow, may be put into the vein, and red into the artery.

Expose the course of the artery and veins, particularly the profunda of the thigh.

THE GRAVID UTERUS, FOR ARTERIES AND VEINS.

Q. Describe the preparation of the gravid uterus, for arteries and veins?

A. The gravid uterus, or the uterus soon after it has expelled the foetus, may be injected, to show its large and tortuous vessels. It may be injected whilst in the body; but this is always attended with much difficulty, and never succeeds so well as when removed from the body. Therefore separate the spermatic and hypogastric vessels as far from the uterus as possible, and cut out the uterus with the bladder, vagina, and external parts of generation.

Put a pipe in each spermatic artery, and each hypogastric, and also one into each spermatic and hypogastric vein; so that, at least, there will be four pipes for arteries, and four for veins, necessary. Be very careful that all the divided vessels be secured by ligature, which only can ensure success.

Red and yellow are mostly preferred; the former for the arteries, the latter for the veins. Be careful that the red be thrown into all the arterial pipes, and the yellow into the venal; and, to prevent mistakes, it will be better to have the pipes of the veins different from those of the arteries.

Distend the vagina and uterus with horse hair, either by introducing it through the vagina, or, if the foetus be in it, by a perpendicular section through the anterior parietes, which is to be sewed up again. Then dissect away all loose cellular structure and fat, preserving the round and broad ligaments, and Fallopian tubes. Should the foetus be in the uterus, an incision should be made, as above directed, except the placenta be adhering there, which is known by the great number of vessels, and then on the opposite side, and through the membranes, to remove the child; cut the umbilical cord close to the foetus, and fix a pipe in one umbilical artery, and another in the umbilical vein; the latter carrying arterial blood, should be filled with red injection, and the artery with yellow; the cord is to be laid round the placenta.

Preservation. When well varnished, suspend it in a case, with a glass front and back.

A PLACENTA, FOR ARTERIES AND VEINS.

Q. How is a placenta for arteries and veins to be prepared?

A. This is perhaps the easiest preparation to make with coarse injection, and should, therefore, be the first attempt of the student.

Fix a large pipe in the vein, and a small one in one of the arteries. The difficulty usually attendant on getting the pipe into the artery is obviated in a great measure by introducing the point of the scissars into these vessels, and slitting them down for about half an inch, then spreading the artery open upon the fore-finger, and keeping it so by pressure with the thumb, by which the pipe may be carried in without difficulty. A ligature should be passed round each pipe with a needle, taking care not to puncture any of the vessels.

Injections. The usual colours are to be selected; but instead of throwing the yellow into the vein, it should be pushed into the artery, for the artery here performs the function of a vein, and *vice versa.* When there are two placentæ there should be different colours used.

Dissection. The spongy substance is to be carefully dissected away from the injected vessels, the placenta soaked in cold water, to get rid of its blood, and then dried, curling the cord around it; and should the membranes not be much torn, they may be distended with curled hair over it.

Preservation. Varnish it well; fix its bottom in a case with a glass top.

THE HEART, IN SITU; WITH THE HEAD AND ADJACENT VESSELS.

Q. How is it made?

A. For this purpose choose the head of a young subject, or an adult whose heart is free from fat. The liver, stomach, spleen, &c. are to be removed from the abdomen, and the aorta divided just as it gives off the coeliac artery. The incision into the chest should be carried through the integuments, from the trachea to the ensiform cartilage, the sternum sawed through, and bent one half on each side, from the extremity of the cartilages nearest the ribs; then divide one of the pulmonary veins as near as possible to the lungs, and remove a portion of bone over the longitudinal sinus of the dura mater.

Preparation. Having well soaked the parts in warm water, and squeezed the blood from the heart and vessels, by the inferior cava and pulmonary vein, put a pipe into the longitudinal sinus of the dura mater, pointed towards the occipital bone, another into the pulmonary vein, a third into the vena azygos, and one into the receptaculum chyli, or thoracic duct. Tie up carefully the aorta and the vena cava inferior, and put a strong ligature around the middle of each arm.

Injection. Three colours are required;—one for the arteries, which should be red; another for the veins, which may be yellow or blue; and the third for the thoracic duct, which should be white, to imitate chyle. Throw the red injection into the pipe in the pulmonary vein, which will fill the left auricle, ventricle, aorta, and all the arteries. The pipe in the head is for the yellow injection; by this will be filled the veins of the head, face, neck, and chest, the right auricle of the heart, the right ventricle, and the pulmonary arteries. Should the vena azygos not be injected, the yellow injection is to be thrown into it. A small quantity of white injection is sufficient for the thoracic duct.

Dissection. Remove the body by a transverse section at the last dorsal vertebra, then amputate the arms at their middle, saw away one side of the bones of the skull, and wash away the brain: then dissect away all the loose cellular membrane and fat, and expose the various parts in the best manner; dissect away the lungs, leaving the pulmonary arteries as long as possible.

Preservation. This is, when well done, a valuable preparation, and deserving of great care. Varnish it well, and preserve it in a square glass case.

A FOETUS, TO EXHIBIT THE PECULIARITIES OF ITS CIRCULATION.

Q. How is it prepared?

A. For this purpose select a still-born foetus; and, if possible, one that died from a flooding of the mother.

Dissect the umbilical vein from the arteries, about four inches from the umbilicus, and fix a pipe in it, taking care not to include the arteries. Throw warm water into this pipe, and wash out the blood, which will flow out by the umbilical arteries. Having drained away as much of the water as possible, tie a ligature very loose on the umbilical arteries.

Injection. The foetus being heated, throw in gently any coloured injection. The water will come away first through the umbilical arteries; and, when the injection appears, make the ligature firm, to prevent its further egress.

Dissection. The peculiarities in the foetal circulation are the umbilical cord, the ductus venosus, the ductus arteriosus, and foramen ovale. When the body is cold, proceed to the dissection; remove the head from the cervical vertebrae, the arms, with the scapulae, and pectoral muscles; the inferior extremity at the articulation with the pelvis, the whole of the parietes of the abdomen, leaving the arteries running to the cord by the sides of the bladder; the anterior part of the thorax, with the sternum, cartilages, and part of the ribs, the integuments and muscles of the back. Next cut away the lungs, and remove the pericardium; keep the diaphragm in its place, and turn up the liver, so as to expose the ductus venosus. Some dissection and care is here necessary. Dissect away the stomach and intestines, and lay out the mesenteric vessels, distend the bladder with air, and cut away any thing that may obstruct the view of the vessels. The foramen ovale cannot be exhibited.

Preservation. After having varnished it, hang it in a glass bell, with a hook at its top.

PENIS.

Q. How is this preparation made ?

A. The penis may be injected, to show the two corpora cavernosa, the corpus spongiosum, and glans, with the arteries and veins. For this purpose any healthy penis will do, but large ones are generally preferred. Having cut through the integuments and soft parts in the pelvis, in the direction the saw is to be passed, saw through the middle of each crista of the pubis, straight down and through the ascending ramus of each ischium, close to their commencement, and thus remove the pubis, with the bladder and external parts of generation.

Make an incision into either of the crura of the corpora cavernosa, and into the bulbous part of the urethra, as near to the prostate gland as possible ; soak it in hot water, and carefully press out the blood from every part. Introduce a probe along the vena magna ipsius penis, by an incision at its root, to break down its valves ; fix a pipe in each of these incisions, and another in each vas deferens, at its entrance into the vesiculae seminales, and secure all the divided vessels.

Injection. Four colours are necessary; those generally preferred are red, yellow, blue, and white. Throw the red into the corpus spongiosum, which will distend the glans ; the yellow into the corpus cavernosum pipe ; the blue into the vena magna ipsius penis ; and the white into the vasa deferentia.

Dissection. Inflate the bladder, dissect away all the soft parts, and keep the penis erect against the symphisis pubis.

Preservation. In a covered box.

TESTICLE.

Q. Describe its preparation ?

A. A testicle of an adult should be chosen free from disease, and great care is requisite in removing it from the body. First, enlarge the ring of the oblique muscle, push the testicle through from the scrotum, and separate its cellular connecting substance; then cut the spermatic artery and pampiniform plexus as high as possible, and then the vas deferens.

When well soaked, press out the blood from the veins; put a pipe into the spermatic artery, and another into a vein; and secure all other open mouths.

Injection. Red is to be sent into the artery, and yellow or blue into the vein, which is without valves. Then fix the quicksilver tube in the vas deferens, and suspend it in water; this done, fill it with mercury, and in twenty-four hours it may be removed to be dissected.

Dissection. Cut away the tunica vaginalis, and the tunica albuginea, which requires great care: then remove all the cellular and adipose membrane, and dry it on a board previously waxed.

Preservation. In a common preparation glass, on a blue or green paper ground.

THE SYSTEM OF THE VENA PORTÆ.

Q. Describe this preparation?

A. Remove the liver, spleen, stomach, and intestines all together, of a person whose mesentery is free from fat, cutting away at the root of the mesentery, behind the peritoneum.

Cut into a mesenteric vein, as near to the intestine as possible, and secure it with a ligature passed around it with a needle, taking care not to wound any other vein. Inject warm water, and let it again run out by the divided vessels. Drain its water off, and secure all the veins, the hæmorrhoidal especially.

Injection. Throw any colour into the pipe, which will pass into the splenic, mesenteric, and internal hæmorrhoidal vein, and into the vena portæ.

Dissection. Remove all the soft parts; the stomach, spleen, and intestines; cutting the vessels as long as possible, and dry them in the best manner, either attached to the liver, or dissect away the liver from the vena portæ, taking care to preserve some of its ramifications.

Preservation. In a covered box.

HEART.

Q. Describe the preparation of the heart?

A. The heart is mostly injected out of the body, to show its common and proper vessels. For this purpose, choose a lean heart. Cut through the thoracic viscera immediately at the top of the thorax; divide the intercostal arteries by drawing the knife down the pleura, over the ribs beyond their origin; separate the vena cava inferior and aorta, in the abdomen, with the cava hepatica; and remove the thoracic viscera, with the portion of the diaphragm surrounding the vessels.

Soak the blood and coagula out of the cavities of the heart, and press the blood from the coronaries. Put a pipe into the vena cava superior, and another into one of the pulmonary veins. Then tie the lungs at their root, and the vena cava inferior, the arteria innominata, the left carotid and subclavian; and pass a ligature, with a slip knot, round the sinus of the aorta, and secure all other open vessels.

Injection. The common coloured injections, red and yellow, only are wanted. Throw the former into the pulmonary vein, which will fill the left auricle, ventricle, aorta, and coronary arteries. The yellow, being sent into the superior cava, will distend the right auricle, coronary veins, right ventricle, and pulmonary artery. In order to fill the coronaries well, the injector must stop two or three times in the course of the process, to squeeze on the injection in them with his nail; then heat the whole again, and throw in more injection. The preparation having cooled, a pipe is to be fixed at the bottom of the aorta, and some red injection, just hot enough to run through the syringe, is to be pushed along the aorta, an assistant throwing cold water on the intercostals, if the injection runs through them.

Dissection. Cut away the lungs, pericardium, and all the soft parts.

Preservation. Either in a covered box, or under a glass bell.

STOMACH. INTESTINES. BLADDER.

Q. Describe these preparations?

A. These are best injected with the whole subject, but may be removed and injected separately.

GENERAL OBSERVATIONS.

1. The anatomist can only succeed by having the preparation constantly heated as he is throwing in the injection.
2. The injection should be thrown in very gradually.
3. When injected, the part should be immediately immersed in cold water.

PREPARATIONS WITH MINUTE INJECTION.

BONES.

Q. How are these made?

A. The vascularity of bones is to be demonstrated, by throwing fine injection into an extremity, cutting out the bone when cold, separating it from all the soft parts, immersing it in water for a few days, to soak out the blood, and then putting it into a mixture of muriatic acid and water in the proportion of one ounce to a quart, for three or four months, adding about every month, a drachm of acid. The limb of a ricketty child is to be chosen.

Injection. Put a pipe into the largest artery of the extremity, and throw gradually the red injection into it, fixing the stop-cock in the pipe.

A FOETUS.

Q. How is a foetus prepared?

A. Still-born children, when injected with minute injection, afford a number of beautiful preparations.

Preparation. No water should be thrown into the vessels. Fix a pipe with a stop-cock into the umbilical vein, and tie the arteries in the ligature.

Injection. Red injection is always chosen for this purpose; and throw it in with great care, until the abdomen and skin all over become very tumid. First mucus comes from the nose and mouth, then the meconium from the anus, and often pure size.

Dissection. Cut off the head from the shoulders, the arms below the shoulder joint, and the legs just below the acetabulum; then preserve a small quantity of the integuments around the navel, and remove all the anterior parietes of the abdomen and chest, so as to exhibit the thoracic and abdominal viscera. Cut away the integuments and posterior part of the theca vertebralis, to exhibit the medulla spinalis.

Preservation. Soak out the blood, and preserve it in proof spirit, to show the viscera and their vascularity.

From a well-injected foetus may be obtained the following preparations:

1. If the foetus be about seven months old, the *membrana pupillaris.*

2. If it be male of this age, the *testicle* in the abdomen, with the *gubernaculum.*

3. The *vascular* and radiated fibres of the *parietal bones.*

4. The *vascular membrane,* including the *teeth.*

5. The *viscera of the chest* separate, if better injected than those of the abdomen, showing the vascularity of the lungs, thymus gland, and heart.

6. The *stomach,* which is to be inverted, to show its vascular *villous coat.*

7. The *intestines,* which are to be separated from the mesentery, and inverted, to show their *villous coat.*

8. The *glandulae renales* and *kidnies* together, to exhibit their relative size, and the lobulated structure of the kidney.

9. The *uterus and its appendages,* to show the long ovaria and plicae of the neck of the uterus and vagina.

10. The external parts of the female organs of generation, to show the *hymen.*

11. A red portion of the *skin,* to exhibit its vascularity.

12. The *medulla spinalis*, to show its vessels, and the *cauda equina*.

13. The *membrana tympani*, to exhibit its vascularity.

14. The *cavity of the tympanum*, to show its vascularity, and that of the periosteum of its bones.

15. The *vestibulum and cochlea*, to show the membranous semicircular canals of the former, with their ampullæ injected, and the vascularity of the zona mollis.

16. The *head*, to show the natural appearance of the face, the papillae of the lips, tongue, &c.

17. The *hand*, to show its natural colour.

Preservation. The above preparations are all to be well soaked from their blood, and preserved in proof spirit of wine.

18. A portion of *skin*, freed of its adeps, to show its vascularity.

19. The *membrana tympani*, to show its vessels.

20. The *heart*, to show the foramen ovale, by distending the cavities with air; and, when dry, cutting away the outermost sides of the auricles, and introducing a bristle.

21. Any large muscle, freed from its cellular membrane and fat, and dried, to show the *vascularity of the muscle*.

Preservation. These are all to be dried, well varnished, and preserved in bottles. Some prefer putting them into spirit of turpentine; but this should be avoided as much as possible, for the turpentine is always oozing in warm weather, and dirtying the glass.

UTERUS.

Q. Describe this preparation?

A. The object of injecting a uterus with fine injection is to exhibit the vascularity of its internal membrane, which furnishes the catamenia. For this purpose the uterus of a person whose menstruation has not been stopped by age or disease is to be selected.

Remove the uterus, by dividing the vessels as long as possible, the round and broad ligaments, and as much as possible of the vagina. Tie a pipe in each hypogastric artery, and secure all the divided vessels.

Injection. Any coloured injection may be chosen, but red looks best.

Dissection. Cut away all the loose cellular membrane, bladder, and rectum, if there be any, from around the vagina, and cut it open along the middle of its superior part; continue this incision on each side of the anterior part of the uterus, so as to exhibit the posterior surface of its cavity.

Preservation.—If the injection be successful, which it seldom is more than one time in ten, suspend it by the ligaments, and preserve it in the proof spirit.

AN ADULT HEAD.

Q. How is the preparation made?

A. Separate the head as low as the last cervical vertebrae from the shoulders. Put a bifurcated pipe into the carotids. Secure the vertebral arteries and jugular veins, and all the divided parts.

Injection.—The red injection is always preferred.

From an adult head injected in this way may be made the following preparations:

1. The upper eyelid to show the vascularity of *Meibomius's glands.*
2. The *choroid membrane,* exhibiting its vascularity.
3. The *retina,* suspended by the optic nerve, exhibiting its vascularity.
4. A section of the optic nerve, to exhibit the *central artery.*
5. The whole of the *cerebrum, cerebellum,* and *medulla oblongata,* with the pia mater; or,
6. The pia mater, separated from the convolutions of the brain, to exhibit the *intergyral processes* and the *tomentum cerebri.*

7. One half of the nostrils, to exhibit the vascularity of *Schneider's membrane*, and that of the membrane lining the antrum of Highmore.

8. The *tongue*, lying in the jaw, and suspended by the *palatum molle*, with the posterior fauces cut away, to show the *epiglottis* and *glottis*, the *uvula* and *velum pendulum palati*, the tongue, its papillæ and excretory ducts, and the vascularity of the gums and *sublingual glands*.

Preservation.—The above preparations are to be soaked well in cold water, to get out all the blood, and then preserved in proof spirit.

PREPARATIONS WITH QUICKSILVER.

Q. Describe these preparations.

A. Mercury cannot be coloured by any substance; it must, therefore, always present the same silver colour.

GENERAL OBSERVATIONS.

1. The parts should always be injected in a proper tray, that the mercury may be easily collected.

2. A lancet, with a curved needle ready threaded, should be always at hand.

3. A bottle, whose neck is not so wide as to permit the quicksilver tube going to the bottom, when put into it.

4. When injecting, if any circumstance render it necessary for the injector to put aside the tube with the mercury, it should be placed in the bottle, the mercury remaining in it, to be handy and prevent delay.

5. Injecting with mercury is always tedious, and frequently unsuccessful. The parts exposed must be kept moist, by sprinkling them with cold water.

A SUPERIOR EXTREMITY.

To inject the lymphatics of an arm, choose one from a dropsical subject, without fat; make an incision into the skin around the wrist, and seek diligently, with a magnifying glass, for an absorbent, into which the pipe is to be put, when the quicksilver will immediately run. The shoulder should now be placed considerably lower than the hand; and, when the mercury runs out at the divided vessels in the axilla, tie them up, and also the lymphatic, into which the pipe was introduced. Then seek for another absorbent. When the mercury ceases to run in a lymphatic, tie the vessel, and seek for another.

Dissection.—Begin at the lymphatics, where the mercury entered, and trace them; removing every thing that obstructs their view, but preserve the glands.

AN INFERIOR EXTREMITY.

The limb for this purpose should also be taken from a dropsical person, and the same method adopted as with the superior extremity, seeking as near to the toes as possible for the lymphatics.

A PAROTID GLAND.

Cut down upon the masseter muscle, and seek for the Stenonian duct, which is the excretory duct of the parotid. Tie the quicksilver pipe in it, then fix the tube, and pour into it the quicksilver; and, when it ceases to run, remove the tube and pipe, and tie the duct. Be particularly careful, in dissecting away the gland, not to cut it.

Preservation. Dry it on a waxed board, and preserve it on a blue paper and pasteboard, in spirit of turpentine.

LIVER.

The lymphatics running on the peritoneal coat of the liver, and over the gall-bladder, make a beautiful preparation. The liver should be well soaked for several days, and the pipe put into the lymphatics of the suspensory and coronary ligaments, and the mercury forced along them, breaking down the valves with the nail, by pressing on the mercury. Secure the vessels at the portae of the liver, when the mercury gets there, and tie the lymphatics when filled. Should the anatomist's attempt to force the quicksilver beyond the valves be unsuccessful, he must fix upon the most minute obvious branch, and let it run its proper course.

Preservation. Throw some coarse injection into the cavæ hepaticæ and vena portae, without heating the liver thoroughly; inflate the gall-bladder, and dry the whole. Varnish it, and preserve it in the best manner under a glass bell, or preserve the injected part in proof spirit, without any wax injection.

LUNGS.

The superficial lymphatics of the lungs are to be filled from the part most remote from the root of the lungs.

Preservation. Cut away the part on which the lymphatics are filled. Dry it on a waxed board, varnish it, and preserve it in a bottle, on a green or blue piece of paper; or preserve it in proof spirit, without drying it.

HAND.

Select the hand of an aged female (separated from the arm by a transverse section, three inches above the wrist), that has died of a lingering disease. Soak out the blood in warm water; fix the pipe in the radial artery, then add the tube, and pour into it the mercury. As the mercury appears in the other arteries and veins, take them up and secure them with ligatures. Should the mercury still escape from small branches, put a cord round the arm, and with a piece of wood tighten it, by twisting the wood, taking care not to prevent the mercury passing into the hand. Then suspend the hand in a glass filled with water, and suspend also the tube and quicksilver in the manner represented in the annexed plate, for a day or two, that the mercury may get into the small vessels. When injected remove the pipe, and tie, by a strong string, the fore-arm; put the hand into water, until putrefaction separates the cuticle.

Preservation. Dry it carefully, and varnish it; then fix the fore-arm in a pedestal of plaister of paris, and keep this beautiful preparation under a glass bell.

LACTEALS.

Remove the mesentery and intestines, if the former be perfectly free from fat, and let them remain several days in water, which should be frequently changed. Search for an absorbent, on the intestine, into which introduce the quicksilver, which will run on to the glands in the mesentery, where it will stop. When the lacteals are filled, the preparation will be more elegant if red and yellow coarse injection be thrown into the mesenteric arteries and veins.

Preservation. Spread the mesentery on a waxed board, inflate a portion of the intestine, clear away all that is useless; dry and varnish, and preserve it in a glass frame.

CORRODED PREPARATIONS.

Q. How are these made?

A. These preparations are made by filling the vessels with coarse injection, and corroding the soft parts, so as to exhibit those vessels.

GENERAL OBSERVATIONS.

1. The liquor for corrosion is to consist of three parts of muriatic acid, and one of water.

2. The liquor should be kept in a well glazed earthen vessel, with a top to it, also well glazed.

3. The part to be corroded should be carefully moved in and out of this liquor, as the slightest force may break the vessels.

4. When corroded, the pulpy flesh is to be care-

fully washed away, by placing it under a cock of water, the water flowing very slowly; or, in some instances, by squirting it away.

5. When the preparation is freed of its flesh, it should be fixed in the situation it is to remain in, either in a plaister of Paris pedestal, or on a flat surface.

6. If the flesh be not perfectly destroyed, the preparation is to be returned to the corroding liquor for a fortnight or month longer, or until it becomes pulpy.

HEART AND LUNGS.

These viscera, occupying less space in children than adults, are to be preferred. It is of no consequence whether they are fat or lean. The integuments should be cut from the fore part of the neck; and the trachea, jugular veins, and carotid arteries removed, and, with them, the viscera of the thorax, carefully separating the subclavian vessels from the clavicle, without injuring them, and dividing the axillary vessels and the cava inferior and aorta, just below the diaphragm.

Preparation. Soak the whole well, to free it of its blood, and press out all the fluids: fix a pipe in the inferior cava, and another in one of the pulmonary veins, taking care not to injure the others, by tying it. Then secure the carotids, the jugulars, the axillary vessels, the vertebral artery, the intercostals, the aorta after it has formed its arch, the internal mammaries, and every vessel that can be found.

Injection. Red and yellow are generally preferred, but red and blue are more proper, and more elegant. Throw the blue into the vena cava inferior, which will distend the right auricle, the superior cava, the jugular veins, and great coronary vein, the right ventricle, and pulmonary arteries. The red injection will fill the left auricle and pulmonary veins, the aorta, subclavians, carotids, &c.

Preservation. Great care is requisite in freeing the injection from the pulpy flesh. When done, let the apex of the heart be placed immediately in a plaister of Paris pedestal, and cover it with a glass. If the pulmonary vessels are well preserved, it forms a valuable preparation. If one good preparation be obtained in ten trials, it will amply repay the anatomist.

HEART.

A fat heart will do for this purpose. Inject it as directed in page 405, and put it into the corroding liquor.

Preservation. Lay it on some cotton, on a pedestal, and cover it with a glass.

LIVER.

The liver of a child is to be preferred to that of an adult, it occupying much less room: its vessels should be cut long, and with it the portion of the duodenum, perforated by the bile duct.

Preparation. Fix a pipe into the hepatic artery, another into the vena portæ, a third into the ductus communis choledochus, and a fourth in the vena cava hepatica.

Injection. The four injections are to be the red, yellow, dark blue, and light blue. First, throw the red injection into the hepatic artery, next the dark blue into the vena portæ, then the light blue into the cavæ hepaticæ, and lastly, the yellow into the ductus communis choledochus.

Preservation. Remove the pipes as soon as the injection will permit; and, when corroded, fix the trunks in the best manner possible, upon a proper pedestal: then wash away the flesh, dry it, and cover it with a glass.

KIDNEY.

Choose the kidney of an old drunkard. Cut the emulgent vessels close to the aorta and cava, and the ureter, very low; then remove the kidney, with all its surrounding adeps.

Preparation. Soak out the blood, and press out all the fluid. Fix a pipe in the emulgent artery, another in the vein, and a third in the ureter; and tie up all the open-mouthed vessels.

Injection. Red, blue, and yellow. First throw the yellow into the vein, then the red into the artery, and lastly, the blue into the ureter.

Preservation. Under a glass bell. The kidneys of different animals form a beautiful exhibition.

OF

INCISIONS.

Though it may appear superfluous to lay down rules for performing the first and most simple of all surgical operations, yet, it is universally allowed, that, if strict attention be not paid by the learner to the principles of any science, little hope can be entertained of his ultimate success. It is not sufficient, however, that the student be able to perform these primary operations, by any fixed rules, unless he acquire also, that ease and facility, which so strikingly distinguish the dexterous from the clumsy operator. Hence, the necessity is manifest, of careful and minute attention to a proper method of holding the bistoury, or scalpel, while making the various incisions about to be described. Quickness, and flexibility of hand, are, indeed, generally obtained, by long and frequent practice; yet a proper method of holding an instrument, tends, in no small degree, to facilitate these desirable attainments: and, to show that this point is not too trifling to be insisted on, the words of a distinguished Professor are here introduced. "When that which is simple is fully attained, that which is more complex will be easier understood, and better performed; and it will often be found, that the final success of that which is great, very much depends on the accurate execution of that which is little."

TO MAKE A STRAIGHT INCISION.

Q. How is a straight incision to be made?

A. With the fingers and thumb of the left hand, put the integuments on the stretch, and in the right, take the scalpel or bistoury, holding it between the thumb and middle finger, at that part where the blade and handle unite, resting the fore-finger on the back of the blade, and applying the ring and little fingers closely round the handle, the extremity of which will rest against the side of the metacarpal bone of the little finger. In this form, pass the instrument perpendicularly through the integuments, and when it has penetrated to the necessary depth, lower the handle gradually, till the blade be almost horizontal, continuing the cut from left to right. When near the point at which it is intended to terminate the incision, raise the handle, so as to bring the instrument perpendicular, in order that the incision may be of equal depth from one extremity to the other.

In making this incision, care should be taken not to introduce the instrument so deep, as to wound any important part, which may be situated beneath; particular attention should also be paid to the state of the integuments, which, if not kept tense, roll before the instrument, prolonging the operation, and causing unnecessary pain to the patient.

These precautions being attended to, nothing more will, in general, be required to make the first incisions in the operation for hernia, in cutting upon arteries, for the removal of small subcutaneous tumours, &c. &c.

TO MAKE A CRUCIAL INCISION.

Q. How is this to be done ?

A. This is formed of two straight incisions, the first of which is made from left to right, as directed; the second consists of two cuts, each of which (supposing a circle drawn round the first) is made from the circumference to the centre, or middle of the first incision, and at right angles to it. By making the second incision in two opposite directions, the integuments are kept tense during the operation, and the cut is made with less pain to the patient, than if performed at once.

The second incision may also be made thus. The bistoury is to be held flat in the hand, with its cutting edge turned towards the operator's right ; it is then to be pushed under the integuments, from the middle of the farther border of the first incision, till its point arrives at the spot where it is intended to commence the second. The cutting edge, being now turned towards the surface, is to be protruded through the integuments from the point to the heel, and half of the incision finished, by drawing the bistoury from heel to point. In the same manner the opposite half is to be made, the operator thrusting the bistoury beneath the integuments towards himself. This method is more tedious and painful than the former, which, if cautiously performed, is always preferable.

In dissecting back the flaps, as in the operation of Trephining, the bistoury is to be held like a writing pen, the point of the nearest angle is to be raised between the thumb and fore-finger of the left hand, and dissected back with the point of the bistoury ; then the cutting edge of the knife is to be turned in a contrary direction, and the opposite angle dissected back; again the direction of the cutting edge is to be changed, and so on alternately, for either of the remaining angles.

TO MAKE ELLIPTICAL INCISIONS.

Q. How is this to be done ?

A. These are frequently employed in surgical operations, as in the removal of scirrhous breasts, tumours of considerable size, and in all cases in which a portion of integument is to be taken away with the diseased part.

The operator with his left hand draws the integuments towards him away from the line which the incision is to take ; whilst an assistant keeps them tense by pulling them in an opposite direction. The inferior half of the ellipsis is to be first formed, the course and extent of which being fixed, the cut is to be made from left to right. The superior is then to be finished in the same manner, taking care that it correspond at every point with its fellow. The part may now be dissected out, and the lips of the wound brought in contact, to ascertain whether they exactly coincide.

The parietes of the abdomen, and the gluteal region, are the parts best adapted for practising these incisions, there being generally more fat between the integuments and muscles in those situations, than in any other parts of the body.

TO PUNCTURE AN ABSCESS.

Q. Describe this operation?

A. A collection of matter, when superficially seated, is generally evacuated by a puncture made with a lancet; but when the abscess is a considerable distance from the surface, a straight bladed bistoury is the best instrument for performing the operation, which should be done thus.

The bistoury is to be held nearly perpendicular, with its point downwards, grasping the heel between the thumb and fore-finger of the right hand, the middle finger being placed on the side of the blade, at the same distance from its point, as the matter is supposed to be from the surface. The hand being supported by the ring and little fingers, the bistoury is to be passed through the integuments into the abscess: the situation of the middle finger thus prevents the instrument from puncturing too deep.

TO DILATE A SINUS ON A GROOVED DIRECTOR.

Q. How is this to be done?

A. The handle of the director is to be held between the index, the middle fingers, and the thumb of the right hand, and its point introduced into the sinuous opening: then the handle is to be taken in the same manner in the left hand, and a Phymosis knife, or a straight narrow bladed bistoury, is to be held in the right, with its cutting edge directed upwards; and in this way passed along the groove, lowering the handle of the director as the knife is pushed forwards, till it reaches the extremity of the sinus; then it is to be forced upwards through the integuments, and the operation finished by cutting towards the left hand; withdrawing the director as the incision is terminated.

LIGATURES ON ARTERIES.

Q. What cautions are to be observed in applying ligatures in surgical operations?

A. That the fingers of the left hand be applied parallel to the direction of the incision, so as not only to mark its course and extent, but also to keep the integuments tense. The ligatures should be round and compact; those composed of a single waxed thread, are generally strong enough for securing any artery. The eyed probe slightly curved, and the aneurismal needle, are the instruments best adapted for passing the ligature beneath the vessel, which should be separated from its lateral connections as little as possible, yet dissected clean at that part where it is about to be secured. The ligature should be applied horizontally, and drawn with an even force, so as to divide the internal and middle coats of the artery; taking care that no accompanying nerve or vein be included within it. As it is an extraneous body, it should be rendered as small as possible; one of its ends should therefore be removed, unless Mr. Lawrence's method be preferred, of cutting off both extremities close to the knot. If the patient faint during the operation, the wound should not be closed till he recover, in order to see if hæmorrhage takes place from any other vessel.

TO TIE THE RADIAL ARTERY AT THE WRIST.

Q. Describe this operation?

A. Feel for the styloid process of the radius, at which point begin your incision; continue it through the integuments for two inches, in the direction of a line, which, if continued, would pass between the condyles of the os humeri; the artery will be found superficially situated, having the tendon of the supinator radii longus muscle on its outer side.

ULNAR ARTERY AT THE WRIST.

Q. Describe this operation?

A. Feel for the Pisiform bone, half an inch above which, and on the outer side of the flexor carpi ulnaris muscle, make a straight incision of two inches in extent through the integuments; cut through the fascia, an assistant drawing the internal edge of the wound to the inner side; dissect carefully by the side of the tendon, and you find the artery situated on the outer side of the nerve. The colour of these smaller arteries remote from the heart, may occasionally lead the student to mistake them for veins, as the blood frequently remains in them after death, especially in old subjects.

ULNAR ARTERY IN THE MIDDLE OF THE FOREARM.

Q. Describe this operation.

A. About three fingers breadth from the internal condyle of the os humeri, on the anterior surface of the ulna, but near its inner edge, begin the incision; continue it in the direction of that bone for three inches; divide the fascia to the same extent, separate the presenting muscles, which are, on the outer side, the palmaris longus lying more superficial, and the flexor sublimis deeper; and on the inner, the flexor carpi ulnaris. The nerve will be found situated deeply in the inter-space, on the outer side of which the artery is placed.

RADIAL ARTERY NEAR THE ELBOW JOINT.

Q. Describe this operation?

A. In the axis of the angle formed by the two condyles of the os humeri, and the extensors and flexors of the hand, an incision is to be made through the integuments, commencing a little below the joint, and continued downwards for three inches. This exposes the fascia of the forearm, which is to be divided to the same extent; when the artery will be laid bare.

In wounds of these small arteries, which have free anastomosing branches, two ligatures are required to suppress the hæmorrhage; one above, the other below the wounded part; these are most readily applied by enlarging the incision, and thus exposing the bleeding vessel. But if the artery be completely divided, its cut extremities retract to a considerable distance, the blood continues to flow into the neighbouring cellular membrane, and it becomes extremely difficult to find the bleeding orifice. In such a case, it is better first to cut down on the vessel at one of the before mentioned points, between the wound and the heart, and apply the first ligature; the lower bleeding extremity will then be more readily discovered.

BRACHIAL ARTERY, NEAR THE ELBOW.

Q. Describe this operation.

A. This artery is occasionally punctured in the operation of venesection; producing an aneurism at the bend of the arm, which requires for its cure the obliteration of the vessel. Philagrius is said to be the first who tied this artery for an aneurismal swelling; he secured it above and below the tumour, which he extirpated, and filled the wound with such dressings as tended to promote suppuration. Dominique Anel, a French military surgeon, first tied the artery without opening the sac. The operation may be performed as follows:

Begin the incision half an inch above the inner condyle of the os humeri; continue it upwards along the inner edge of the biceps muscle for at least two inches; when, having cut through the integuments, and generally, a little fat, you find the median nerve rising before the artery, which has an accompanying vein on each side. Pass the ligature beneath the vessel from its inner side, by which means the nerve is readily excluded.

BRACHIAL ARTERY IN THE MIDDLE OF THE ARM.

Q. Describe this operation.

A. Make an incision through the integuments two inches long on the inner edge of the biceps muscle; this first exposes the median nerve, which has the artery on the inner side between its two accompanying veins; the internal cutaneous nerve is situated on the inner side of the artery, diverging from it, as it descends in the arm.

The operator may be occasionally confused by this artery dividing unusually high in the arm; in the last extremity that I dissected, the separation took place in the axilla; the two trunks ran down the arm parallel to each other, till they reached the tendon of the biceps, where they diverged into radial and ulnar.

AXILLARY ARTERY.

Q. Describe this operation.

A. A wound or aneurismal tumour of the upper part of the brachial artery would require the application of a ligature on the axillary, which may be applied as follows:

The part being shaved, or the hairs cut closely off with a pair of scissors, place the patient on his side, and let the arm be raised up by an assistant; then feel in the axilla for the head of the bone, which is thus lowered by the position of the arm; over it make an incision, in the direction of the limb, three inches long, the middle part of which should be exactly over the head of the bone; this will expose a part of the axillary plexus, behind the largest nerve of which, the median, the artery will be found: the vein passes rather below the artery at this part. After the first incision through the integuments, use the blade of the knife as little as possible, to avoid wounding any of the branches of the vessel.

SUBCLAVIAN ARTERY BELOW THE CLAVICLE.

Q. Describe this operation.

A. The following on the dead subject, I have found the most ready method of securing this vessel. Put the pectoral muscle on the stretch by raising the arm, and extending it backwards; then observe the depression formed by the junction of its clavicular with its sternal portion, the direction of which must be the course of the incision. Begin it half an inch from the sternal extremity of the clavicle, and continue it through the integuments for three inches in the above direction; separate the two portions of muscle from each other exactly in the course of its fibres, then bring the arm to the side, which, by allowing of a wider separation, exposes more readily the parts beneath: at exactly one-third of the length of the clavicle from its sternal extremity, you find the vein which is situated directly anterior to the artery, often concealed by fat and cellular membrane. To avoid wounding the vein, the greatest care is requisite. For this purpose the dissection had better be carried on with the handle of the scalpel, after having divided the muscle.

SUBCLAVIAN ARTERY ABOVE THE CLAVICLE.

Q. Describe this operation.

A. Make an incision three inches long just above the upper border of the clavicle, beginning half an inch from its sternal extremity, or immediately on the outer edge of the origin of the sterno mastoid muscle; continue it through the integuments and platysma myoides, taking care not to wound the vein, which is situated before the artery, crossing it nearly at right angles; having separated it from the artery, it should be held on one side by an assistant; then feel for the eminence formed by the junction of the bony, with the cartilaginous portion of the first rib, on the outer side of which you find the artery; the nerves forming the axillary plexus are situated rather behind and to its outer side. Owing to the depth of the vessel considerable difficulty will be found in passing the ligature.

CAROTID ARTERY.

Q. Describe this operation.

A. Begin the incision at the lower edge of the Thyroid cartilage; continue it upwards and outwards through the integuments and platysma myoides for two inches and a half, immediately on the inner side of the sterno mastoid muscle, so as to form an angle with the Thyroid cartilage: dissect very carefully by the edge of the muscle, drawing it a little outwards, and the artery is found where it emerges from beneath that muscle and the Omo-hyoideus. Be careful not to wound the internal jugular vein, which is situated on the outer side of the artery, and rather anteriorly; the nervus vagus is behind and to its outer side, and the descendens noni runs down the front of the artery: the whole is surrounded by condensed cellular membrane forming a kind of sheath.

POSTERIOR TIBIAL AT THE ANKLE.

Q. Describe this operation.

A. The patient being placed with his face downwards, make an incision two inches long between the inner malleolus and tendo Achillis, but nearer the former; cut through the aponeurosis, and you find the artery nearly under the malleolus, having the tibial nerve rather behind and to its outside, and an accompanying vein on each side.

POSTERIOR TIBIAL RATHER BELOW THE MIDDLE OF THE LEG.

Q. Describe this operation.

A. A little below the middle of the leg, begin an incision on the inner edge of the gastrocnemius; continue it obliquely for three inches in the direction of that muscle, so as to separate it from those beneath; elevate it with the upper part of the tendo Achillis, and on the first division of the muscle beneath, you find the artery with the nerve rather behind and to its outer side, and an accompanying vein on each side.

POSTERIOR TIBIAL HIGH UP IN THE LEG.

Q. Describe this operation.

A. Begin the incision below and between the condyles of the femur; continue it through the integuments four inches down the middle of the calf of the leg; cut through the aponeurosis and gastrocnemius externus nearly to the same extent till you come to the internus, on the inner side of the outer head of which you find the artery, with the nerve situated anteriorly and to its outer side, and the vein rather before it.

POPLITEAL ARTERY.

Q. Describe this operation.

A. Begin an incision between the condyles of the femur, and continue it upwards for three inches; the artery will be found deeply imbedded in fat, with the tibial nerve and popliteal vein situated more superficially.

PERONEAL ARTERY RATHER BELOW THE MIDDLE OF THE LEG.

Q. Describe this operation.

A. Let the incision be three inches long, parallel with the fibula, but behind its outer edge; a few muscular fibres will require to be divided; the artery may then be felt by passing the finger across the bone to its posterior and inner border, where it is situated; as it is small and deeply seated, there will be some difficulty in passing the ligature.

Mr. Guthrie, in the seventh volume of the Medico-Chirurgical Transactions, has related a case in which he secured this artery higher up the leg, to suppress the hæmorrhage caused by a gun-shot wound.

ANTERIOR TIBIAL IN THE MIDDLE OF THE LEG.

Q. Describe this operation.

A. Begin an incision rather below the middle of the tibia on its outer edge; continue it upwards and outwards, for three inches, in the direction of the interspace of the tibialis anticus, and extensor longus digitorum muscles; cut through the fascia to the same extent, then separate the muscles, between which on the interosseous ligament, you find the artery, having before it a branch of the peroneal nerve, and an accompanying vein on each side. These arteries, like the smaller of the upper extremity, require when wounded, to be secured by two ligatures.

FEMORAL ARTERY IN THE MIDDLE OF THE THIGH.

Q. Describe this operation?

A. The operation of tying the femoral artery where it is situated in the middle third of the thigh, for the cure of popliteal aneurism, was first performed by Mr. Hunter, and it is the operation now generally practised.

Put the Sartorius in action by placing the leg in the tailor's position; then make an incision, three inches in length, rather above the middle of the thigh, in the oblique direction of the muscle, and on its inner edge; continue it through the integuments and fat, till the border of the muscle is exposed. Observe the direction of the fibres to ascertain that you have not come upon the Vastus, then elevate the Sartorius, drawing it a little outwards, which brings the femoral sheath into view; open this with care, by a small incision, and then dilate it by cutting from within outwards; this exposes the artery, which has the vein rather behind and to its outer side.

FEMORAL ARTERY IN THE GROIN.

Q. Describe this operation?

A. The patient being placed on his back, separate the thigh to be operated on from the other, and let the leg hang over the edge of the table; this renders the artery more superficial, by putting the integuments and sartorius muscle on the stretch. Begin the incision half an inch below the middle of Poupart's ligament; continue it downwards for three inches, inclining it slightly to the inner side of the thigh, to avoid the saphena vein which is rather superficially seated, and nearly over the artery. Having cut through the integuments, fat, aponeurosis, and fascia lata, you come to the sheath of the vessels. This being cautiously opened, as in the last operation, exposes the artery, which has the vein on its inner side, but separated from it by a process of the sheath: the anterior crural nerve, not included in the sheath, is a little to its outer side. An interesting case of ligature on this artery, for a wound of the vessel caused by a hay-fork, is related by Mr. Norman of Bath, in the tenth volume of the Medico-Chirurgical Transactions.

EXTERNAL ILIAC.

Q. How is this operation performed?

A. The hairs being previously shaved from the part, begin the incision about an inch within, and rather below, the anterior and superior spinous process of the ilium; continue it, in a semilunar form, in the direction of Poupart's ligament, for a little more than three inches, so as to make it terminate just above the external abdominal ring: this exposes the tendon of the external oblique muscle, which being divided to the same extent, and turned aside, lays bare the internal oblique where it arises with the transversalis from the outer half of Poupart's ligament. With your finger, or the handle of the scalpel, turn up the borders of these muscles, and the spermatic cord becomes exposed; pass your finger behind it, push the peritoneum upwards, and you feel the artery with the vein on its inner side; they are closely connected by cellular membrane, and must be carefully separated with the handle of the scalpel, or a blunt probe. After having cut through the tendon of the external oblique, be careful to use the knife as little as possible, lest you wound the epigastric artery, which is generally situated near the inner extremity of your incision, crossing behind the spermatic cord. This accident happened to the celebrated surgeon Mons. Dupuytren, when performing the operation at the Hotel Dieu in Paris, in the autumn of 1821: the hæmorrhage was so copious, that two ligatures were required on the wounded vessel: the patient afterwards died of peritonitis.

INTERNAL ILIAC.

Q. How is this operation to be performed ?

A. "An incision about five inches in length, was made on the left side, in the lower and lateral part of the abdomen, parallel with the epigastric artery, and nearly half an inch on the outer side of it. The skin, the superficial fascia, and the three thin abdominal muscles were successively divided ; the peritoneum was separated from its loose connection with the iliacus internus and psoas magnus, it was then turned almost directly inwards, in a direction from the anterior superior spinous process of the ileum, to the division of the common iliac artery. In the cavity which I had now made I felt for the internal iliac, insinuated the point of my forefinger behind it, and then pressed the artery between my finger and thumb. I then passed a ligature behind the vessel and tied it about half an inch from its origin. I found no difficulty in avoiding the ureter : when I turned the peritoneum inwards the ureter followed it. Had it remained over the artery I could easily have turned it aside with my finger. The woman did not complain of much pain, and I am certain she did not lose one ounce of blood."

This artery is also said to have been successfully tied in Russia, by an army surgeon, upon whom the Emperor Alexander has since settled a pension, as a reward for the dexterity and skill, displayed in the treatment of the case.

THE AORTA.

Q. How is this operation to be performed ?

A. "The patient's shoulders were slightly elevated by pillows, in order to relax as much as possible, the abdominal muscles; for I expected that a protrusion of the intestines would produce embarrassment in the operation, and was greatly gratified to find that this was prevented by their empty state, in consequence of the involuntary evacuation of the fæces ; and here let me remark that I should, in a similar operation, consider it absolutely necessary, previously to empty the bowels by active aperient medicines.

I then made an incision three inches long into the linea alba, giving it a slight curve to avoid the umbilicus : one inch and a half was above, and the remainder below the navel, and the inclination of the incision was to the left side of the umbilicus in this form (⟩). Having divided the linea alba, I made a small aperture into the peritoneum, and introduced my finger into the abdomen ; and then with a probe-pointed bistoury, enlarged the opening into the peritoneum to nearly the same extent as that of the external wound. Neither the omentum nor intestines protruded; and during the progress of the operation, only one small convolution projected beyond the wound.

Having made a sufficient opening to admit my finger into the abdomen, I then passed it between the intestines to the spine, and felt the aorta greatly enlarged, and beating with excessive force. By means of my finger nail, I scratched through the peritoneum on the left side of the aorta, and gently moving my finger from side to side, gradually passed it between the aorta and spine, and again penetrated the peritoneum on the right side of the aorta.

I had now my finger under the artery, and by its side, I conveyed the blunt aneurismal needle armed with a single ligature behind it ; and my apprentice Mr. Key, drew the ligature from the eye of the needle to the external wound ; after which the needle was immediately withdrawn.

The next circumstance which required considerable care, was the exclusion of the intestine from the ligature, the ends of which were brought together at the wound, and the finger was carried down between them, so as to remove every portion of the intestine from between the threads: the ligature was then tied, and its ends were left hanging from the wound. The omentum was drawn behind the opening as far as the ligature would admit, so as to facilitate adhesion, and the edges of the wound were brought together by means of a quilled suture and adhesive plaster."

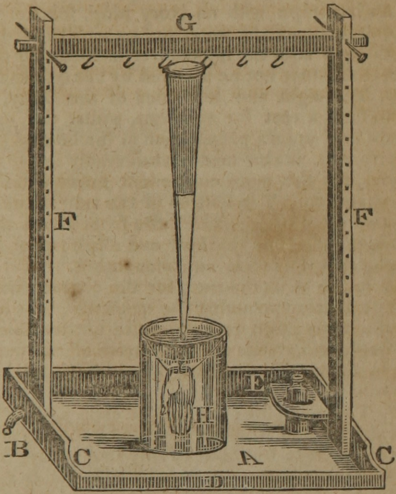
N. B. It may here be remarked that the additions have been selected for their usefulness to the student and practitioner; and though they do not pretend to the merit of originality in any respect, it is believed that they form an invaluable body of knowledge, drawn from the best sources,* which will instruct the teacher whilst examining his pupils, and by entering fully into the subject, give the student every thing necessary to a complete elementary acquaintance with physiology, pathology, and anatomy.

* Martinet, Magendie, Fyfe and Averill.

THE INJECTING TRAY

AND ITS APPENDAGES,

For the purpose of facilitating the process of Quicksilver Injections, and preventing the loss of Quicksilver, which is constantly occasioned by the old method.



EXPLANATION OF THE PLATE.

A. The Tray; this should be made of mahogany, about three quarters of an inch in thickness, and the several parts should be joined together with screws; every joint should be made perfectly water-tight, and the inside painted black; as this is much more favourable for seeing the fine parts of white membranes lying upon it, and the quicksilver flowing through the minute ramifications of their vessels. The machine being made in this form, is intended to be occasionally filled with water, for the purpose of injecting broad and flat parts, which require to be so managed as to prevent their drying, and to which the common jar, represented in the plate, is not adapted, as placentæ, large portions of mesentery and intestine, female breasts, &c.

B. An iron pipe with an ivory plug, for the purpose of drawing off the water and quicksilver remaining in the tray after the injection is finished: it is made of iron, that it may not be affected by the quicksilver.

C. C. The right and left sides of the Tray, cut down to form a rest for the arms, whilst the hands are employed upon a preparation at the bottom of it.

The front D. is also made considerably lower than the sides, for the more convenient management of the preparation. The bottom of the tray should be about twenty inches square ; the front about three inches high, and the sides four and a half; the clear dimensions on the inside, are here meant.

E. A ledge in one corner, for the convenience of fixing the bottle containing the quicksilver; it has a hole sufficiently large to receive the bottle which is let through, and stands on the bottom of the tray to preserve it from any accident, which it is very liable to from its weight.

F. F. Two uprights; the foot of each fixes in two square staples, and with the right and left sides of the tray, and ought to be about twenty-four inches high.

G. The cross piece, the ends of which slide up or down in the mortise of the uprights, and are fixed to any height, by means of pins passing through them and the ends of the cross-piece to keep them steadily fixed to each other. In the lower edge of this cross-piece is fixed several small hooks, from which may be suspended one or more injecting tubes.

H. Is a glass jar containing water, in which is immersed a hand, with the quicksilver injecting pipe fixed in the artery, as in the process of filling the vessels. The hand is suspended by a string from the edge of the jar.

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