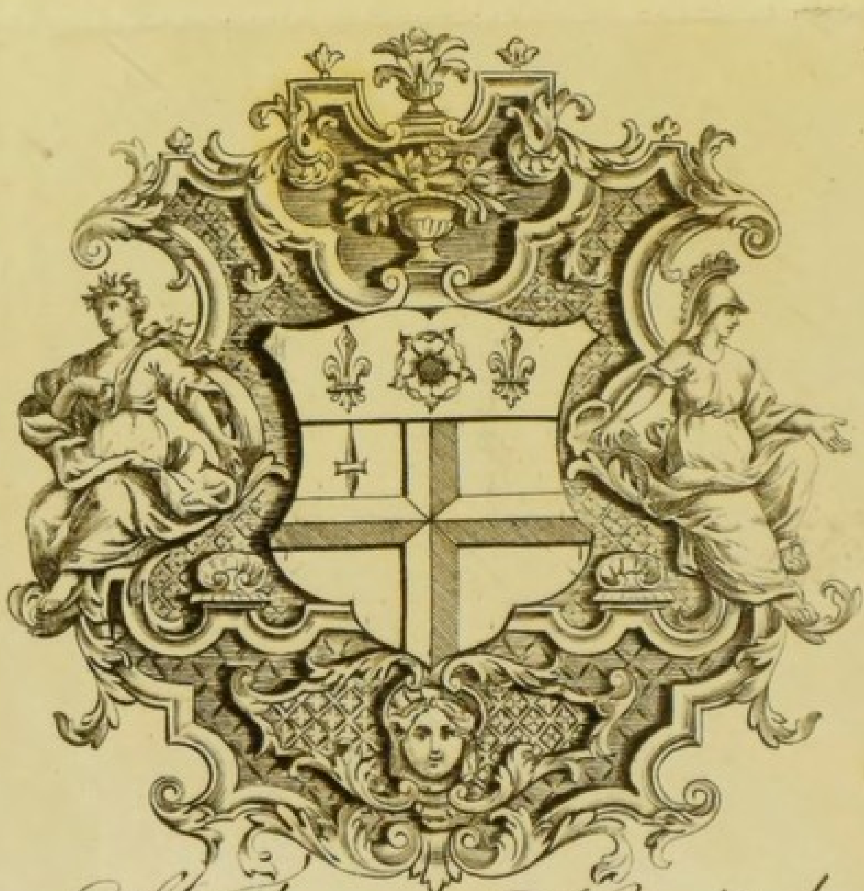

J H Green Esq

With the Authors' Respects

A

MANUAL

OF

PRACTICAL ANATOMY.

A

MANUAL

OF

PRACTICAL ANATOMY,

FOR THE

USE OF STUDENTS

ENGAGED IN

DISSECTIONS.

BY EDWARD STANLEY,
Assistant Surgeon and Demonstrator of Anatomy
at St. Bartholomew's Hospital.

Nihil dictum quod non dictum prius, methodus sola artificem ostendit.
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1818.

TO

JOHN ABERNETHY, F.R.S.,

Surgeon to St. Bartholomew's Hospital, &c. &c. &c.,

AS A

TESTIMONY OF PERSONAL RESPECT,

AND

AS AN ACKNOWLEDGMENT

OF

MANY OBLIGATIONS,

THIS MANUAL IS DEDICATED

BY HIS PUPIL AND FRIEND,

EDWARD STANLEY.

Charlotte-street, Bedford-square,
Oct. 20th, 1818.

PREFACE.

This Work is strictly for the Dissecting Room. Its Objects are, to describe accurately the several parts of the Human Body, and to give practical directions for the most convenient method of dissecting them.

It is [illegible] to pursue the several Regions of the Body in the order most convenient for their examination, and to describe each part successively according to its natural situation.

Let the Reader, who turns from the perusal of Systematic Works to this Manual, recollect, that it is intended only for Practical Beginners in the Science, to facilitate their first [illegible], and to furnish them with the sort of instruction which they especially require.

The Uses of the Muscles are omitted, inasmuch as being a part of Physiology, their explanation would exceed the objects of the work.

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MANUAL

OF

PRACTICAL ANATOMY.

CHAP. I.

DISSECTION OF THE ABDOMEN.

SECT. I.

OF THE ABDOMINAL MUSCLES AND PARTS CONNECTED WITH THEM.

THE muscles of the abdomen consist of five on each side, arranged in layers, which together form the front and lateral parieties of the cavity containing the viscera.

Two incisions are to be made cautiously through the integuments of the abdomen, one from the ensiform cartilage to the os pubis, the other from the umbilicus in a direction obliquely upwards and outwards over the cartilages of the ribs. The two flaps of skin thus formed, are to be reflected, one from above downwards, and the other from below upwards. In raising the skin from the front of the abdomen, the student must be careful to avoid injuring the tendinous fibres which are immediately beneath it, and in continuing the dissection from the middle of the abdomen outwards, he must look for the line where the tendinous fibres terminate, and the fleshy fibres begin. The fleshy fibres are then to be cleanly dissected in their whole course over the side of the abdomen and upon the cartilages of the ribs.

The first muscle exposed is

The Obliquus Externus or Descendens, which is a broad and thin muscle, extending from the thorax to the pelvis, and from the back part to the front and middle of the abdomen. It is fleshy above, and at the side, and tendinous in its anterior and lower part. It arises by seven or eight distinct fleshy portions, denominated digitations, from the external surfaces and lower edges of the seven or eight inferior ribs near their cartilages. The four or five upper digitations of the external oblique are received between corresponding portions of the serratus magnus muscle, and the two or three lower digitations are connected with the portions of the latissimus dorsi muscle, which are attached to the lower ribs. A distinct fleshy slip is sometimes seen connecting the upper part of the external oblique to the pectoralis major muscle. The fibres of the external oblique proceed from their origins obliquely downwards, and terminate in the following manner. From the three lower ribs, the fasciculi run almost directly downwards to be attached to the external margin of the crista ilii, along its two anterior thirds. In some subjects, the posterior border of the external oblique between the last rib and crista ilii is overlapped a little by the latissimus dorsi, which must be raised before it can be brought into view, while in other instances, the latissimus dorsi and external oblique do not meet, but there is left between them a triangular space wherein the fibres of the internal oblique are seen. From the upper ribs, the fibres of the external oblique running obliquely downwards and inwards, end in an aponeurosis, which is extended over the front of the abdomen to its middle, where it meets, and is united with the aponeurosis belonging to the opposite muscle.

From the anterior superior spine of the ilium, the aponeurosis of the external oblique is extended obliquely downwards and inwards, and is fixed to the upper part of the os pubis. Its lower margin thus stretched between the two points of bone is rather thickened, and forms POUPART'S LIGAMENT, or, as it is now frequently denominated, the CRURAL ARCH.

At a short distance before the aponeurosis of the external oblique reaches the os pubis, its fibres separate into two portions, between which an opening is left of a triangular form. This is the ABDOMINAL RING, or ring of the external oblique, through which the spermatic cord passes in the male and the round ligament of the uterus in the female. The direction of the opening is obliquely upwards and outwards. Its figure is triangular, having its base formed by the os pubis, its sides by the two portions of the aponeurosis which are called the columns or pillars of the ring, and its apex by the upper and outer extremity. This, however, which is called its apex, will be found somewhat rounded off by tendinous fibres, which run from one column to the other, and are variously distinct in different subjects. Of the two portions of tendon which constitute the columns of the ring, the upper is fixed to the symphysis pubis, where it meets, and is connected with the tendon of the opposite side, and the lower, representing a roundish cord, which, in fact, constitutes Poupart's ligament, is fixed to the eminence of the os pubis denominated its spine or tuberosity.

In the female, the crural arch is in a trifling degree longer, and the ring of the external oblique is considerably smaller, than in the male.

In various parts of the aponeurosis of the external oblique, small apertures are left for the passage of vessels to the muscles beneath.

The integuments of the abdomen are connected to the aponeurosis of the external oblique by common cellular and adipose tissue, but it is to be remarked, that, in some subjects, this tissue is so abundant, and so dense in texture, that it may, without difficulty, be raised in a continuous layer. Hence it has been denominated the Fascia Superficialis of the abdomen. The student must remember that when the integuments are reflected from the lower part of the abdomen, the ring of the external oblique is not immediately brought into view, as it is concealed by the cellular tissue just mentioned, which descends from the sides of the opening down the front of the spermatic cord.

Of the Inguinal Absorbent Glands.—Three or four absorbent glands are found imbedded in the cellular tissue upon the aponeurosis of the external oblique, and just above Poupart's ligament. They are connected with the chain of glands which are placed at the upper part of the thigh upon the fascia lata. The superficial absorbents of the external organs of generation, terminate in part, in these glands above Poupart's ligament.

There are other points connected with this stage of the dissection which yet remain to be mentioned.

The Linea Alba is a white line extending from the ensiform cartilage down the middle of the abdomen to the os pubis, and is formed by the interlacement of the tendinous fasciculi belonging to the aponeuroses on each side. The linea alba is broadest at its upper part, and just below its middle, is the umbilicus, which in the fœtus is an opening for the passage of the navel string, but in the adult it appears as a cicatrix, to which the skin is very firmly united. Previously to the removal of the integuments, the umbilicus forms a depression deeper in proportion to the fatness of the subject.

The Linea Semilunaris is another white line of a semi-circular figure, more towards the side of the abdomen, and extending along the outer edge of the rectus muscle. This line will be hereafter shewn to be formed by the union of the aponeurosis of the external oblique with the aponeuroses of other muscles beneath.

The LINEÆ TRANSVERSÆ consist of three or four white lines, sometimes but indistinctly seen, which extend across from the linea semilunaris to the linea alba, and are formed by tendinous intersections in the rectus muscle.

The external oblique is now to be detached from the ribs and from the crista ilii, and its aponeurosis carefully divided just above the line of the crural arch from the spine of the ilium downwards to within half an inch of the abdominal ring which is thus left entire. The muscle is then to be separated from the internal oblique immediately beneath it, and reflected forwards to a little distance beyond the linea semilunaris, where its aponeurosis is so firmly attached to the aponeuroses beneath as to prevent its further reflection.

The OBLIQUUS INTERNUS ASCENDENS, by the foregoing dissection thus brought into view, is a broad and thin muscle like the external oblique, but differs from it in being more fleshy at its lower, than at its upper part, and in its fibres having an opposite direction. At the back part of the abdomen, the internal oblique has a considerable breadth of connexion with the aponeurosis of the latissimus dorsi muscle *. Moreover it arises from the whole length of the crista ilii along the middle surface of the bone between its external and internal margins, and lastly, by fleshy fibres, from about the outer half of Poupart's ligament. From these origins, the fibres of the internal oblique proceed in different directions. The superior fibres run obliquely upwards to the ribs, the middle fibres proceed almost transversely across the abdomen, and the lower fibres descend obliquely towards the os pubis. The fibres have a fleshy insertion above, into the three lower ribs, and by a thin aponeurotic expansion into the cartilages of the four next ribs in succession. In front they end in an aponeurosis which proceeds beneath the aponeurosis of the external oblique to the outer edge of the rectus muscle. Here the aponeurosis of the internal oblique splits into an anterior and posterior layer. The anterior layer passes in front of the rectus beneath the aponeurosis of the external oblique and is united with it to the linea alba in its whole length. The posterior layer splits into a superior and inferior portion. The superior passes behind the upper three-fourths of the rectus, that is, from the

* The aponeurosis of the latissimus dorsi, which will be seen in the dissection of the muscles of the back, being connected with the internal oblique, and with another muscle, the serratus posticus inferior, is sometimes described as a tendon common to the three muscles by the name of fascia lumborum.

cartilages of the ribs as low as the mid-distance between the umbilicus and the os pubis. The inferior passes together with the anterior layer in front of the remaining fourth of the rectus to the linea alba.

The internal oblique is now to be detached from the cartilages of the ribs, from the fascia lumborum, and from the crista ilii, and is to be reflected forwards from the transversalis, beneath it, after the same manner as the external oblique. In detaching the fibres of the internal oblique from the crista ilii, the student must look for a branch of the circumflexa ilii artery and its accompanying vein, which ramifying between the internal oblique and transversalis muscles, point out the separation between them. It should be remarked that the fibres of the internal oblique, where they arise from the outer half of Poupart's ligament, are so closely united with the fibres of the transversalis beneath, that a distinct separation cannot easily be discovered. Hence the student need not attempt the reflection of the internal oblique at its lower part beyond the anterior superior spine of the ilium.

The TRANSVERSALIS, or, TRANSVERSUS ABDOMINIS, has its origin above from the internal surfaces of the cartilages of the seven lower ribs by distinct digitations, which intermix with similar portions of the diaphragm; behind, by a broad and thick tendon, which is fixed to the lower edges of the eleventh and twelfth ribs, to the transverse processes of the lumbar vertebræ, and to the back part of the crista ilii*; lastly, from the outer half of Poupart's ligament by fleshy fibres, which, as already mentioned, are intimately united with the fibres of the internal oblique. From this extent of origin, the fibres of the transversalis proceed transversely across the abdomen to the outer edge of the rectus. Here they end in an aponeurosis, which soon divides itself into two portions, a superior and inferior. The superior portion being united with the posterior layer of the aponeurosis of the internal oblique, passes behind the upper three-fourths of the rectus. The inferior portion passes in front of the lower fourth of the rectus, in company with the aponeuroses both of the internal and external oblique to the linea alba, where the aponeuroses of all the abdominal muscles are intermixed with each other.

The sheath of the rectus, hereafter to be described, is formed by the divisions of these several aponeuroses.

It must be here observed, that from the origin of the internal oblique and transversalis muscles, which occupies the outer half of Poupart's ligament, their lower margins proceed in a single mass inwards to the

* The attachments of this tendon cannot be brought into view until the muscles of the back are dissected. It will then be seen passing backwards between the quadratus lumborum muscle and the mass of flesh forming the sacro lumbalis and longissimus dorsi muscles to the transverse processes of the lumbar vertebræ.

edge of the rectus, where they become tendinous. By tracing the tendons of the two muscles over the rectus, we find them united in their lower part, and attached to the os pubis behind the ring of the external oblique.

From the lower margin of the internal oblique and transversalis muscles, and from the adjacent part of Poupart's ligament, a few thinly scattered fibres are detached, which constitute

The CREMASTER MUSCLE. This proceeds from its origin obliquely downwards, and inwards to the ring of the external oblique. Passing through the ring, the cremaster continues its course directly downwards in front of the spermatic vessels into the scrotum, where its fibres terminate by being scattered upon the upper part of the tunica vaginalis testis.

The muscle next to be dissected is

The RECTUS, which extends down the middle of the abdomen, occupying the space between the linea alba and linea semilunaris, and is contained, as before mentioned, within a sheath formed by the divisions of the aponeuroses of the two oblique, and of the transversalis muscles. The front of the sheath must be divided down its middle, and its internal surface is to be separated from the fibres of the rectus beneath, in order that the muscle may be brought completely into view. It will then be seen arising by a flattened tendon from the upper part of the os pubis, near the symphysis, thence ascending in the sheath, and becoming gradually broader as it proceeds upwards to the base of the chest, where it divides into three portions, which are inserted into the cartilages of the fifth, sixth, and seventh ribs, and into the ensiform cartilage. The lineæ transversæ have been already described as consisting of tendinous intersections, extending across the rectus. Their number varies in different subjects from three to five, and the majority of them are generally found above the umbilicus. They sometimes occupy only half the thickness of the muscle, and sometimes they extend completely through it. Some of them generally run across its whole breadth, while others reach only to its middle. It is further to be remarked, that in the situation of the lineæ transversæ, the sheath is much more firmly adherent to the muscle than elsewhere.

In front of the rectus, at its lower part, and lodged within its sheath, there is a small triangular muscle, denominated

The PYRAMIDALIS, which arising broad from the upper part of the os pubis, close to its symphysis, ascends, gradually contracting its breadth, and, after a course of about an inch and a half, ends in a thin tendon, which terminates in the linea alba.

Sometimes the pyramidalis is found on one side only, and, occasionally, the muscle is wanting on both sides.

The SHEATH of the RECTUS is already understood to be formed by the aponeuroses of the two oblique and of the transversalis muscles, which separating in the manner described at the linea semilunaris, thence extend in front, and behind the rectus, to the linea alba, where they are intermixed with the aponeuroses of the muscles from the opposite side. The rectus is thus inclosed within a sheath formed in front, by the aponeurosis of the external oblique, by the whole anterior layer, and a part of the posterior layer of the aponeurosis belonging to the internal oblique, and by the inferior portion of the aponeurosis belonging to the transversalis. It is formed behind by the remaining part of the posterior layer of the aponeurosis belonging to the internal oblique, and by the superior portion of the aponeurosis belonging to the transversalis. Consequently it happens, that behind, the sheath of the rectus is incomplete, since in its upper three-fourths only, it is covered on both sides by the aponeuroses, and, in its lower fourth, the aponeuroses passing entirely in front of the muscle, would here leave it in contact with the peritoneum but for the intervention of the common cellular tissue. If the rectus is cut across in its middle, and its lower half turned downwards, the deficiency in the posterior part of its sheath will be evident. It must be remarked that the posterior part of the sheath does not terminate abruptly by a well defined edge, but that the tendinous fibres of which it is formed, become gradually thinner below the umbilicus, until they are lost in the cellular tissue between the rectus and peritoneum.

In the dissection of the rectus the epigastric artery, with its accompanying vein, is seen ascending obliquely inwards beneath the posterior surface of the muscle. The vessels are first placed between the rectus and the peritoneum, and next between the muscle and the posterior part of its sheath.

Many branches of the lumbar nerves are met with ramifying between the abdominal muscles.

The next stage of the dissection consists in the reflection of the transversalis muscle from the peritoneum, which is immediately beneath it, and in doing this, there are certain parts situated just above Poupart's ligament, requiring a careful examination, on account of their importance as connected with the subject of hernia.

The lower margins of the internal oblique and transversalis muscles having been left attached to Poupart's ligament, the student must now detach them in one mass, and very carefully reflect them upwards, in order to bring into view a thin fascia, which is found just above Poupart's ligament, immediately behind the transversalis muscle, and between it and the peritoneum. This fascia is denominated

The Fascia Transversalis. Its general appearance is merely that of a thin expansion, formed by condensed cellular tissue, but possessing considerable firmness and power of resistance. It is at tached below, to the whole length of Poupart's ligament, and being traced upwards, is found to divide immediately above the middle of the ligament into two portions, between which a considerable interval is left for the passage of the spermatic vessels and vas deferens out of the abdomen. Both portions of the fascia become gradually thinner as they ascend, until they are lost in the cellular tissue between the transversalis muscle and peritoneum. On its inner margin the fascia is connected to the outer edge of the rectus, and to the lower part of the conjoined tendon, belonging to the internal oblique and transversalis muscles.

The course of the spermatic cord must, in the next place, be examined. It has been already mentioned that the spermatic vessels and vas deferens, which are the principal parts of the cord, pass through the interval left between the two portions of the fascia transversalis. The lower and lateral boundaries of the opening through which the cord leaves the abdomen, are formed by the margins of the fascia, while the upper boundary is formed by the lower margin of the internal oblique and transversalis muscles, which here cross over the spermatic cord, as will be seen by replacing them in their natural situation.

From the interval in the fascia transversalis, the spermatic cord proceeds obliquely downwards, and inwards beneath the aponeurosis of the external oblique to the ring, receiving in this part of its course the cremaster muscle, which is expanded upon it. Passing through the ring, the cord turns directly downwards over its lower column, to be continued into the scrotum.

It has been seen that the spermatic cord, in its course from the abdomen to the ring in the tendon of the obliquus externus, is lodged in an oblique canal. This is denominated the INGUINAL CANAL. It has two openings, of which, the upper, formed by the interval in the fascia, is called the internal ring, the lower, formed in the aponeurosis of the external oblique, is called the external ring. The situation of the internal ring is immediately above the crural arch, and about mid-distance between the anterior superior spine of the ilium and the angle of the os pubis.

The epigastric artery, as it will be hereafter seen, arises from the external iliac near to the crural arch. It passes across and underneath the spermatic cord, just as the cord enters the inguinal canal, and continues its course obliquely upwards and inwards, along the inner margin of the upper opening of the canal, to the posterior surface of the rectus muscle.

In the female, the round ligament of the uterus pursues the same course from the abdomen as the spermatic cord in the male, as far as the ring in the tendon of the external oblique. Having passed through the ring, the round ligament terminates by dividing into a number of slender threads, which are lost in the cellular tissue of the mons veneris. In the female, the epigastric artery holds the same relation to the round ligament as it does to the spermatic cord in the male.

For a more detailed account of these parts, the student is referred to Mr. Lawrence's Treatise on Ruptures.

The abdominal muscles are now to be dissected from the peritoneum, which lines their posterior surface. It will be observed that on each side, and towards the back part of the abdomen, the muscles and peritoneum are connected by loose cellular tissue, especially in the latter situation, while, in front, the posterior part of the sheaths of the recti is so firmly united with the peritoneum, that considerable care is required to effect their complete separation.

Between the peritoneum and the abdominal muscles in the front of the abdomen, there are found three fibrous and solid cords, which are sometimes but indistinctly seen in the adult. Two of these cords arising from the cavity of the pelvis, one on each side, ascend obliquely between the peritoneum and muscles, and approach gradually to each other until they meet at the umbilicus. The third cord arising from the superior part of the bladder proceeds directly upwards between the two lateral cords to the umbilicus, where they all terminate by being intermixed with the tendinous fibres of the linea alba. The two lateral cords are the remains of the umbilical arteries, and the middle cord is denominated the urachus.

SECT. II.

OF THE CAVITY OF THE ABDOMEN.

The boundaries of the abdomen in front and on each side, are formed by the muscles which have been described; behind, by the lumbar muscles and vertebral column; above, by the diaphragm which separates the abdomen from the thorax; and below, by the ossa ilii and ossa pubis. The lower part of the cavity of the abdomen is continued into the cavity of the pelvis.

The student must remember that the diaphragm and abdominal muscles, which are the principal agents in respiration, maintain by their alternate contractions, a constant and uniform pressure upon the whole contents of the abdomen, and that in consequence, there must be a close adaptation of the containing to the contained parts, and of the viscera, one to the other. When therefore we speak of the cavity of the abdomen, we do not imply that which the term denotes in its common acceptation, namely, a void or empty space, but only intend to mark the extent of the boundary within which the viscera are inclosed.

The whole extent of the abdomen is arbitrarily divided into certain parts or regions in the following manner:

Two imaginary lines are extended across the abdomen, one from the cartilage of the seventh rib on one side, to the same point on the opposite; the second from the anterior superior spine of the ilium on one side, to the same projection on the other. That part of the abdomen above the upper line is the Epigastric Region. That part below the lower line is the Hypogastric Region. The middle space between the two lines is the Umbilical Region.

Two vertical lines are next extended between the cartilage of the seventh rib, and the anterior superior spine of the ilium on each side. By these lines, the three first regions of the abdomen are further divided in the following manner: The right and left parts of the epigastric region, extending beneath the cartilages of the ribs, are the Hypochondriac Regions, while its central part either retains the name of epigastric, or is denominated the Scrobiculus Cordis. The right and left parts of the umbilical region are the Lumbar Regions, while the central part, in which the umbilicus is placed, retains the name of umbilical. The right and left parts of the hypogastric regions are each divided into the Iliac and Inguinal Regions, and the front part is designated the Region of the Pubes.

Two incisions are next to be made through the peritoneum, one extending down the middle and front of the abdomen, the other extending completely across from one side to the other, and intersecting the former at the umbilicus.

The PERITONEUM is a serous membrane, and like the other membranes of the same class, it forms a sac which is without opening, and contains only the secretion from its internal surface. The membrane lines the walls of the abdomen and pelvis, and is reflected upon the viscera of both these cavities in such a manner, that they receive from it a smooth covering, and are still completely on the outside of the sac.

Various processes of the peritoneum are extended inwards between the viscera, connecting them, and forming duplicatures, between which the vessels and nerves lie imbedded in their passage to each organ.

The viscera are attached to the back part of the abdomen, while in front, they are loose and unconnected, their smooth surfaces being here simply in contact with the peritoneum lining the walls of the cavity.

The student must, in the first place, examine the situation of those organs which can be seen without the assistance of dissection, beginning with

The LIVER. This organ is placed in the upper part of the abdomen, where it occupies the whole of the right hypochondrium, and extends obliquely across the epigastric region into the left hypochondrium, which it fills to a greater or less extent, according to its varying size in different subjects. The form of the liver is irregular. Above, it has an arched or convex surface, adapted to the under surface of the diaphragm. Below, it is unequally concave. On the right side, and towards the back part, the organ has a very considerable thickness; while towards the left, it becomes thinner, and in front, it terminates by a thin edge, which is situated immediately beneath the cartilaginous margins of the ribs. A fissure is seen in the front edge of the liver, marking the division between the right and left lateral parts, which are denominated its lobes. By lifting the liver a little upwards, and looking towards the back part of its under surface, we observe a distinct and projecting portion of a triangular figure. This is the Lobulus Spigelii, which cannot, however, be clearly seen until the liver is removed from the body.

The liver is retained in its situation by certain folds of peritoneum connecting it to the under surface of the diaphragm, which are denominated its ligaments. Four of these are generally described, but they are merely distinct parts of one process of peritoneum.

Two layers of peritoneum, connected by cellular tissue, descend from the under surface of the diaphragm to the convex surface of the liver. These form the Ligamentum Latum or Suspensorium Hepatis. The ligamentum latum is broad in front, where it is continued into the fissure dividing the liver into its right and left lobes, and is thence continued backwards, gradually contracting its breadth as it approaches to the back part of the organ. Between the two peritoneal layers of the ligamentum latum, we feel in front a round cord, denominated the Ligamentum Teres, and formed by the remains of the umbilical vein, which belongs to the fœtal circulation. When the ligamentum latum reaches the convex surface of the liver, its two layers separate, and are continued over the liver, one upon its right, the other upon its left lobe. The membrane is then continued around the edges, and upon the whole under surface of the organ. In this way the liver possesses a complete covering of peritoneum, which adheres very closely to its substance.

Between the right and left lobes of the liver and the diaphragm, there are two small folds of peritoneum, denominated the Right and Left Lateral Ligaments of the liver. The left is generally more distinct than the right.

The posterior part of the liver adheres closely to the diaphragm by cellular tissue over a surface of considerable extent. The peritoneum forming the boundaries of this adhesion is denominated the Coronary Ligament of the liver.

In the under part of the right lobe of the liver, there is an excavation in which the gall bladder is lodged.

The Gall bladder is a small bag of a pyriform shape, placed obliquely beneath the liver, its great end, denominated the fundus, is turned forwards and towards the right side, where it sometimes projects beyond the front edge of the liver; its small end, denominated the neck, is turned backwards and to the left. The gall bladder is closely united on one side, by cellular tissue, to the excavation in the liver, in which it is lodged; and on the other side, the peritoneum covering the under surface of the liver, is extended over the bag. The gall bladder thus receives only a partial peritoneal covering. Occasionally, however, it is completely surrounded by peritoneum, and connected to the under surface of the liver by a small fold of the membrane.

The STOMACH is a bag large and capacious at one end, and gradually decreasing, is small at the other. Its two extremities are simply denominated large and small. Of its surfaces, that which is presented to view is denominated superior or anterior; and the opposite surface, which is at present concealed, inferior or posterior. It has two arches, one extending along the lower convex edge of the organ, denominated the great arch or curvature, the other extending along the upper concave edge, denominated the small arch or curvature. Of the two openings of the stomach, one is situated between the great extremity and lesser arch, and is called the superior cardiac or œsophageal orifice, as the œsophagus here opens into the stomach, immediately after it has passed from the chest into the abdomen.

The other opening of the stomach is formed by the termination of its small extremity, and is denominated the inferior or pyloric orifice, which is placed about two inches lower than the œsophageal. The great extremity of the stomach is lodged in the left hypochondrium, whence the organ extends across the epigastric region, rather obliquely downwards, into the right hypochondrium. Near its lower end, the stomach begins to bend backwards and upwards, and approaches to the neck of the gall bladder, where it terminates by a circular contraction denominated the Pylorus. When the stomach is empty and contracted, it is lodged almost entirely beneath the cartilages of the ribs; but when distended, it will descend below the base of the chest behind the muscles of the abdomen.

The small arch of the stomach is connected to the liver by a thin and transparent membrane, which is the LESSER OMENTUM, or the OMENTUM HEPATICO GASTRICUM. It consists of two layers of peritoneum closely united, and proceeding from the under surface of the liver across to the small arch of the stomach. A few absorbent glands are found irregularly scattered between these layers of the lesser omentum. The vessels passing to and from the liver are lodged between the layers in front, and near their right edge. This edge of the lesser omentum, containing the hepatic vessels and biliary ducts, is called CAPSULA GLISSONI.

When the lesser omentum reaches the small arch of the stomach, its two layers separate and are continued, one over the anterior, the other beneath the posterior surface of the stomach, to the line of its great arch, where they are again connected by cellular tissue. The stomach thus receives a complete peritoneal covering. The continuation of the peritoneum beneath the posterior surface of the stomach, cannot, however, be seen, until by dissection the organ is separated from the adjacent viscera.

From the great arch of the stomach, a broad portion of peritoneum, consisting of several layers of the membrane, connected by adipose and cellular tissue, is extended downwards loosely in the abdomen, in front of the small intestines. This is the GREAT OMENTUM, which will be hereafter more particularly described.

The SPLEEN is placed in the back part of the left hypochondrium, between the great end of the stomach, and that part of the diaphragm attached to the insides of the tenth and eleventh ribs. The stomach must be drawn a little aside, in order to bring the spleen into view. The figure of the spleen is very irregular. Generally it is of an oval, or elliptical shape. Its external surface, which is opposite to the inside of the ribs, is convex; and its internal surface, which is opposite to the great end of the stomach, is concave.

Two or three small bodies, of the same structure with the spleen itself, are frequently found distinct, and at some distance from it, but connected with it by vessels, and by the peritoneum.

The peritoneum is continued from the diaphragm and stomach to the spleen. A distinct fold of the membrane intervenes between the diaphragm and the upper end of the spleen; and the two layers of peritoneum, covering the anterior and posterior surfaces of the stomach, are continued from its great end across to the inner concave side of the spleen. Between the two peritoneal layers, which thus extend across from the stomach to the spleen, the vessels and nerves of the latter are contained. The peritoneum, reaching the spleen from these sources, is continued round the organ, so as to give it a complete covering.

The INTESTINES are the continuation of the alimentary canal from the pylorus, to its termination at the anus, and are altogether, about six times the length of the body. From the differences in the relative size of the intestines at their upper and lower parts, they are divided into the small, which comprehend the upper and by far the greater part of the canal; and into the large, which form the lower and less considerable portion. The small intestines are divided into the Duodenum, Jejunum, and Ilium, and the large, into the Cœcum, Colon, and Rectum.

The DUODENUM is placed at the back part of the abdomen, close upon the spine, and is so concealed by its connexions with the surrounding viscera, that its situation cannot now be seen.

The JEJUNUM and ILIUM are the convoluted heap of intestines occupying the middle of the abdomen, principally in the umbilical and hypogastric regions.

The CŒCUM and COLON are so placed in the abdomen, as almost to surround the jejunum and ilium.

The RECTUM occupies the posterior part of the cavity of the pelvis. Hence its particular description will be given with the other pelvic viscera.

The Jejunum and Ilium are so loosely attached to the back part of the abdomen, that their convolutions have no fixed situation, but can readily accommodate themselves to the changes occurring in the adjacent organs. In order to discover the commencement of the jejunum, it will be necessary to lift upwards upon the chest that portion of the colon denominated its transverse arch, which extends across the upper part of the abdomen, and is connected with the back part of the cavity by a broad portion of peritoneum, named the transverse mesocolon. It will be hereafter stated, that the duodenum passes at its termination under the transverse mesocolon, and immediately on the intestine appearing in front of the mesocolon, it acquires the name of jejunum. The upper two-fifths of the heap of small intestine are the jejunum, and the lower three-fifths the ilium: not that there is any part of the canal which visibly marks the termination of the one, and the commencement of the other, since there subsist only some general differences between them. Thus the coats of the jejunum usually have a red colour, and are thicker to the feel than the coats of the ilium, which are pale and usually so thin as to be almost transparent *. These differences become apparent only by a comparative examination of a portion of jejunum near its commencement, and a portion of ilium near its termination; for as the jejunum and ilium approach each other, their characters change insensibly, until the distinctions between them are altogether lost. The termination of the ilium will be found in the right iliac region, where it opens obliquely into the left side of the first portion of the large intestine which is the Cœcum.

The jejunum and ilium are connected with the back part of the abdomen by a broad fold of peritoneum, denominated the MESENTERY. It consists of two peritoneal layers which are extended from the left lumbar region obliquely downwards to the termination of the small intestine in the right iliac region. In its course downwards, the mesentery expands itself sufficiently in breadth to be attached to the whole length of the jejunum and ilium, and both portions of intestine are received between its layers so as to give them a complete peritoneal covering. Between the layers of the mesentery lie imbedded the

* These distinctions arise from the folds formed by the mucous membrane of the intestines, constituting the valvulæ conniventes, which are larger and more numerous in the jejunum than in the ilium.

arteries, veins, and nerves of the jejunum and ilium; the lacteal vessels and absorbent glands; all of which are connected by cellular tissue, with more or less fat.

The large intestine begins, as it has been mentioned, in the right iliac region, whence it rises directly upwards in front of the kidney, almost to the under surface of the liver, and then turns forwards, continuing its course transversely across the abdomen in front of the great arch of the stomach. Reaching the left side, the intestine turns downwards through the left lumbar region, and is continued through the left iliac fossa to the junction of the last lumbar vertebra with the sacrum, which is the point where the rectum commences.

The first portion of the large intestine, placed in the right iliac region, forms a capacious bag of a rounded figure, denominated the CŒCUM or CAPUT COLI. The ilium opens obliquely into its left side, as before stated, and towards the back part and right side of the cœcum, a cylindrical process of intestine, about the size of a quill, is extended from it, which is the APPENDIX VERMIFORMIS CŒCI. The appendix vermiformis is generally about two inches in length, but it differs much in this respect in different subjects. It terminates by a rounded and closed extremity, and is united on one side by a small fold of peritoneum to the opposite part of the cœcum.

The bag of the CŒCUM gradually contracts at its upper part into the COLON, which constitutes the whole tract of large intestine from the cœcum to the rectum. That portion of the colon, which ascends on the right side, is denominated the ASCENDING or RIGHT LUMBAR COLON; that portion extended across the abdomen, the TRANSVERSE ARCH; and the descending portion, on the left side, the DESCENDING or LEFT LUMBAR COLON. In the left iliac fossa, the colon has turns resembling the letter S, hence this portion is denominated the SIGMOID FLEXURE.

The peritoneal connexions of the large intestines fix them in their situation, but not with equal firmness in every part of their course. Some portions of the gut receive a complete covering of peritoneum, while others are only partially invested by the membrane.

The cœcum and ascending portion of the colon generally receive a covering of peritoneum only on that side which is anterior and exposed to view in the cavity of the abdomen. On the posterior side, they are firmly united by cellular tissue to the iliac and lumbar muscles. In some subjects, however, the cœcum and ascending colon are completely surrounded by the peritoneum so as to be confined more loosely to the parts behind, and a small fold of peritoneum is sometimes left behind the ascending colon, which is denominated the RIGHT LUMBAR MESOCOLON or RIGHT LIGAMENT of the COLON.

The descending colon is covered by the peritoneum in the same manner as the ascending portion of the intestine.

The sigmoid flexure is surrounded by the peritoneum, which leaves a loose fold behind the intestine, denominated the LEFT ILIAC MESOCOLON or LEFT LIGAMENT of the COLON.

Lastly, we have to describe the peritoneal connexions of the transverse arch of the colon. It will be recollected that the two layers of peritoneum, investing the anterior and posterior surfaces of the stomach, meet and become connected along the line of its great arch. From the great arch of the stomach, they are continued downwards in front of the heap of small intestines towards the pelvis, and are then reflected back again until they meet the transverse arch of the colon. By the course of these two peritoneal layers from the stomach downwards, and by the reflection of the same two layers back again to the colon, the GREAT OMENTUM is formed, which thus consists of four layers of peritoneum connected by adipose and cellular tissue. The great omentum is also denominated the OMENTUM GASTRO-COLICUM, in consequence of its extending from the stomach to the colon. The membranous layers, of which the omentum is composed, are so closely united, and so thin and delicate in texture that their distinct separation cannot be effected. Frequently, however, when the omentum is not much loaded with fat, if its two anterior layers are gently lacerated, the hand may, without much difficulty, be passed into the centre of the four layers, and insinuated to some distance between them. The length of the omentum varies much in different subjects, according to the extent to which the two peritoneal layers are continued downwards from the stomach before they are reflected to the colon. Thus, in some subjects, the omentum reaches only to a short distance below the umbilicus, while in others, it extends to the pelvis.

The two reflected layers of the great omentum, reaching the transverse arch of the colon, separate and encircle the gut, and then meet again on its opposite side so as to give to it a complete peritoneal covering. By their union in this situation, they form a broad and loose fold which extends from the transverse arch of the colon to the back part of the abdomen, and is denominated the TRANSVERSE MESOCOLON. Between the layers of the transverse mesocolon lie imbedded the blood vessels and nerves of the intestine, the absorbents with their glands and connecting cellular tissue.

When the transverse mesocolon reaches the back part of the abdomen, its two layers are disposed in the following manner. The superior layer turns upwards in front of the duodenum and pancreas, and is then continued into the peritoneum investing the under surface of the liver. The inferior layer turns downwards, and is continued into the upper or anterior layer of the mesentery. The reflection of the superior layer of the mesocolon upwards, in front of the duodenum and pancreas, cannot at present be brought into view.

Below the neck of the gall-bladder, and just under the edge of the lesser omentum containing the hepatic vessels and biliary ducts, an opening is found large enough to admit one or two fingers. This is the FORAMEN of WINSLOW or FORAMEN EPIPLOICUM. If air is blown into this opening, it will pass between that part of the peritoneum covering the under surface of the stomach and the superior layer of the mesocolon, and will then continue its course into the centre of the four layers composing the great omentum. The omentum may by this means be inflated into the form of a bag, provided the cellular adhesions are not sufficiently strong to resist the impulse of the air blown against them. The foramen of Winslow is not infrequently obliterated by adhesions between its opposite sides.

Small pendulous processes, which consist of peritoneum containing a deposit of fat, are found irregularly attached to various parts of the large intestine. These are the APPENDICES EPIPLOICÆ.

The student should now dissect the vessels contained in the edge of the lesser omentum, denominated capsula glissoni; for which purpose, the liver must be lifted upwards, and its front edge fastened to the cartilaginous margins of the ribs.

By dissecting carefully through the layers of the lesser omentum, there will be brought into view the Biliary Duct, or Ductus Communis Choledochus, placed to the right, the Hepatic Artery to the left, and the Vena Portæ between, and rather behind the duct and the artery.

The Ductus Communis Choledochus commences at the union of the ductus hepaticus, which arises from the liver, with the ductus cysticus, which is continued from the neck of the gall-bladder.

The Ductus Hepaticus is about the size of a writing quill. It proceeds from beneath the liver obliquely downwards and forwards to the extent of an inch, or inch and a half, and is then joined by the ductus cysticus.

The Ductus Cysticus is about equal in size to a large crow quill, and is continued from the neck of the gall-bladder in the following manner. The neck of the gall-bladder, bending obliquely upwards, gradually contracts itself into the cystic duct, which turns downwards, so as to form a convexity towards the liver, and after a course of about an inch and a half it joins the hepatic duct at an acute angle. The ductus choledochus, thus beginning at the union of the cystic and hepatic ducts, continues its course downwards, to terminate in the duodenum in a manner which will be hereafter mentioned.

The Hepatic Artery is a branch of the cœliac, which will be brought into view by dissecting through the back part, and towards the left side of the lesser omentum.

The Cœliac Artery arises from the fore

part of the aorta. From its origin, it advances forwards, and rather to the right between the layers of the lesser omentum, to the extent of about half an inch, and terminates by dividing into three branches, the Coronaria ventriculi, the Splenic, and the Hepatic.

The Coronaria Ventriculi is the smallest of the three branches of the cœliac. It first bends upwards towards the left, to the cardiac orifice of the stomach, and then turns towards the right, along the small arch to the pyloric extremity of the organ. In this course the coronaria ventriculi gives off,

1. Branches, which ramify upon the great end of the stomach, and communicate with the œsophageal arteries, which are branches of the thoracic portion of the aorta.

2. Branches, which ramify upon both surfaces of the stomach, and have free communications with the other arteries of the organ.

Near the pylorus, the coronaria ventriculi ends by inosculating with the pyloric branch of the hepatic artery.

The coronaria ventriculi frequently gives off a large branch to the liver, in which case it is of equal size to the splenic artery.

The Splenic Artery is usually the largest branch of the cœliac. It proceeds from its origin across the abdomen, in a tortuous course, along the upper border of the pancreas, and beneath the stomach to the inner concave side of the spleen. The branches of the splenic artery are,

1. Pancreaticæ Parvæ, which consist of many small arteries distributed to the pancreas.

2. Gastro-epiploica Sinistra, which arising from the splenic as it passes beneath the stomach, is reflected to the great extremity, and continues its course around the great arch towards the pyloric end of the organ. The Gastro-Epiploica Sinistra gives off,

(*a*) Numerous branches to both surfaces of the stomach.

(*b*) Branches, which pass downwards, and are distributed between the layers of the omentum.

The Gastro-Epiploïca Sinistra, having given off these branches, terminates by inosculating with the gastro-epiploica dextra, which is a branch of the hepatic artery.

3. Vasa Brevia, which consist of three or four small branches, distributed upon the great end of the stomach.

As the splenic artery approaches to the spleen, it div des înto several branches, which entering the concave side of the organ, ramify through it, and some of them perforating its opposite side terminate in the diaphragm.

The Hepatic Artery is usually of a middle size between the coronaria ventriculi and the splenic. Arising from the right side of the cœliac, it ascends towards the under surface of the liver, and after a course of about two inches, it divides into the Hepatica Dextra and Hepatica Sinistra. Before its division, the hepatic artery gives off

1. Gastro-Epiploica Dextra or Gastro-Duodenalis, which is a branch of a large size. From its origin, this branch proceeds downwards behind the commencement of the duodenum, to the great arch of the stomach, along which it is continued from the pyloric towards the great end of the organ. The gastro-epiploica dextra gives off in this course,

(*a*) Duodenal Arteries, consisting of branches, varying in size and number, distributed upon the duodenum.

(*b*) Pancreatic Arteries, consisting of several branches distributed to the pancreas.

(*c*) Branches which arise from the horizontal portion of the gastro-epiploica dextra, and are distributed partly upon both surfaces of the stomach, and partly between the layers of the omentum.

The gastro-epiploica dextra terminates by inosculating with the gastro-epiploica sinistra.

2. Pylorica, which is a smaller branch than the last. It descends to the pylorus, and is then reflected along the small arch of the stomach, distributing branches to the pyloric end of the organ and ending by inosculation with the coronaria ventriculi.

The Hepatica Dextra and Sinistra proceed together to the under surface of the liver, which they penetrate and then ramify through the organ. The hepatica dextra gives off as it approaches the liver.

3. The Cystic Artery, which is a branch of a small size, ramifying between the coats of the gall-bladder and upon the biliary ducts. Some of the ramifications of the cystic artery penetrate the gall-bladder, and terminate in the liver.

The hepatica sinistra is sometimes supplied by the coronaria ventriculi, as before mentioned.

The hepatica dextra sometimes has its origin from the superior mesenteric artery.

The veins of the stomach accompany the arteries in their distribution. They terminate in the vena portæ.

The splenic vein accompanies the splenic artery in its course along the upper border of the pancreas. It also opens into the vena portæ.

The Vena Portæ is formed by the union of those veins which return the blood from the spleen, pancreas, gall-bladder, stomach, and intestines. There are two principal trunks in which the veins from these organs terminate; namely, the Splenic and Superior Mesenteric Veins, which, as it will be hereafter seen, are joined behind the pancreas. The vena portæ, thus formed, proceeds from behind the pancreas obliquely upwards, between the layers of the lesser omentum, between and rather behind the ductus choledochus and the hepatic artery, to the liver. Reaching the liver, the vena portæ divides into two branches, which ramify through its substance.

The omentum and transverse arch of the colon are now to be turned upwards upon the chest, and the inferior layer of the transverse mesocolon is to be carefully divided at its back part, close upon the spine, in order to expose the superior mesenteric artery at the part where it enters between the layers of the mesentery. Its origin and the first part of its course must be left for the next stage of the dissection.

The Superior Mesenteric Artery arises from the aorta at a short distance below the cœliac. From its origin it passes downwards first behind the pancreas, then over the duodenum and under the mesocolon. From beneath the mesocolon it enters between the layers of the mesentery, where it proceeds downwards and forwards, gradually bending towards the right iliac region. In the latter part of its course, the superior mesenteric artery forms an arch with its convexity turned downwards and forwards, and inclining to the left side. From the concavity of the arch there arise the following arteries :

1. Colica Media, which proceeds between the layers of the mesocolon towards the transverse arch, and divides sooner or later into two branches, one passing across the mesocolon to the right side, ends by inosculating with an ascending branch of the colica dextra, which is next to be described ; the other, passing across the mesocolon to the left side, ends by

inosculating with a branch of the colica sinistra, which is derived from the inferior mesenteric.

2. Colica Dextra, which passes across between the layers of the mesocolon to the ascending colon, and divides sooner or later into two branches. One of these joins a branch of the ilio-colica, which is next to be described, and the other joins the branch of the colica media just mentioned.

3. Ilio-Colica, which proceeds across the mesocolon towards the cœcum, giving off a branch which communicates with the colica dextra, and other branches which are distributed to the cœcum and last portion of the ilium.

From the convexities of the arches formed by the communications between the three arteriæ colicæ, there proceed numerous parallel branches which divide and surround the large intestine.

Sometimes there are only two arteriæ colicæ, in which case one of them divides to supply the branch which is wanting.

From the convex side of the superior mesenteric arch, there proceed from twelve to twenty branches for the supply of the jejunum and ilium. Each branch soon divides into two, which form arches by their communications with the adjacent branches. From the convexities of these arches, other branches arise, which divide and re-communicate in a similar manner. The arteries at length reaching the intestines, ramify round them so as to form a vascular net-work between their coats.

The SUPERIOR MESENTERIC VEIN forms an arch, and receives branches corresponding to those of the artery. The trunk of the vein ascends on the right side of the artery between the layers of the mesentery, and then passing under the meso-colon, continues its course upwards behind the pancreas, where it terminates by joining the splenic vein to form the vena portæ.

The mesentery, and the heap of small intestines, are now to be raised upwards and fixed in that situation, in order to facilitate the dissection of the inferior mesenteric artery, which will be readily exposed by dividing the peritoneum covering the lumbar vertebræ towards their left sides.

The INFERIOR MESENTERIC ARTERY, arising from the lower part of the aorta, descends on the left sides of the lumbar vertebræ to the pelvis. Then acquiring the name of Internal Hæmorrhoidal artery, it continues its course down the back part of the pelvis and behind the rectum. The inferior mesenteric artery gives off,

The COLICA SINISTRA, which passing across to the left side of the abdomen, divides into three branches. Two of these are distributed to the descending colon and sigmoid flexure, and the third ascends to join the branch of the colica media, as it has been mentioned, thus forming the great arch of communication between the two mesenteric arteries.

The internal hæmorrhoidal artery will be described with the other arteries of the pelvis.

The INFERIOR MESENTERIC VEIN begins in the pelvis by branches which returning the blood from the rectum, accompany the ramifications of the internal hæmorrhoidal artery. It ascends from the back part of the pelvis into the abdomen, and proceeds strait upwards along the left side of the spine, receiving branches from the descending colon and sigmoid flexure. The inferior mesenteric vein then continues its course under the mesocolon, and behind the pancreas, where it terminates by opening into the splenic vein.

The stomach must now be removed, by separating it from the surrounding connexions at its cardiac extremity, and by dividing its small end immediately above the pylorus, in order that the duodenum may be left entire. The spleen, cœcum, and colon, jejunum and ilium, are also to be taken away to facilitate the examination of the deeper-seated viscera.

The DUODENUM is already known to be the first portion of the small intestines. It is so named on account of its length, which is about equal to the breadth of twelve fingers. In order to see the course of the duodenum advantageously, the intestine must be moderately distended with air, and retained so by a ligature tied round each of its extremities. The duodenum proceeds from the pylorus a little upwards and backwards and to the right towards the neck of the gall-bladder. It then proceeds downwards almost in a strait direction in front of the right kidney. At the lower part of the kidney, and opposite to the third lumbar vertebra, it bends from the right across the abdomen to the left side of the spine, where it terminates in passing under the transverse mesocolon. The intestine then takes the name of jejunum. Three distinct portions or curvatures of the duodenum are usually described; the first constituting that part of the gut which intervenes between the pylorus and the point where it begins to turn downwards; the second, that part which descends in front of the kidney, and the third, that part which extends across the abdomen. Between the first and second portions a distinct angle is formed. By the second and third portions a kind of semi-circle is formed, with its convexity turned towards the right.

The PANCREAS is placed at the back part of the abdomen in the epigastric region. It is of a narrow elongated figure, its length is from eight to ten inches, and its breadth about two inches. One end of the pancreas, being in some degree the largest, is denominated its head, and the other smaller end its tail. The great end of the pancreas is turned towards the right, lying on the inside of the second portion of the duodenum, to which it is firmly united by cellular tissue over a considerable extent of the gut. The pancreas is thence extended across the vertebral column, above and in front of the transverse portion of the duodenum into the left hypochondrium, where its small end is almost in contact with the spleen.

The duodenum and pancreas receive only a partial covering of peritoneum. It is already known, that the superior layer of the transverse mesocolon is reflected upwards in front of the duodenum and pancreas. The peritoneum, thus passing over both these organs, adheres to them, and affords them an investment on their anterior surfaces. On their posterior surfaces, the duodenum and pancreas are connected with the surrounding parts by loose cellular tissue.

The course and termination of the Pancreatic and Biliary Ducts are now to be examined.

If an incision be carefully made horizontally along the middle of the anterior surface of the pancreas, its excretory duct will be discovered lying nearly in the centre of its substance. It runs from one end of the pancreas to the other. Beginning narrow at the small end of the gland, it gradually increases in size by numerous branches which it receives in its course, so that near its termination, the duct has attained the size of a crow quill. From the large end of the pancreas, the pancreatic duct turns a little downwards to join the ductus choledochus at an acute angle, thus forming a common tube which terminates in the duodenum, at the part which will be presently mentioned.

The Ductus Communis Choledochus proceeding downwards from between the layers of the lesser omentum, passes behind the right extremity of the pancreas, to which it is closely united. Then receiving the Pancreatic Duct, it terminates in the posterior side of the second portion of the duodenum at its lower part, near the union of the second with the third portions of the gut. The ductus choledochus passes obliquely for some way between the muscular and mucous coats of the intestine, before it enters into its cavity.

The ductus choledochus and pancreatic duct sometimes terminate separately in the duodenum by distinct openings near to each other.

The KIDNEYS are placed deeply at the back part of the abdomen by the sides of the lumbar vertebræ, and behind the peritoneum. The right kidney is generally placed a little lower in the abdomen than the left, in consequence of the liver reaching lower down on the one side, than the spleen on the other. In figure the kidney resembles a bean. It is elongated from above downwards, and convex in the greater part of its circumference; where it is turned towards the parietes of the abdomen, and on the opposite side, it presents a deep excavation, called the notch of the kidney, which is turned towards the spine. The kidneys do not receive any covering from the peritoneum. They are usually surrounded by fat contained within a loose cellular tissue. In some subjects, this fat exists in such large quantity as completely to enclose the kidneys, and to isolate them from the surrounding parts.

The RENAL CAPSULES are two small bodies of a yellowish-brown colour, situated at the back part of the abdomen behind the peritoneum, and immediately above the upper ends of the kidneys. They are of a flattened and triangular figure, their broadest edge is turned downwards, and presents an excavation, in which is received the upper extremity of the corresponding kidney. The renal capsules are connected with the surrounding parts by vessels and by loose adipose tissue, continuous with that in which the kidneys are imbedded.

SECT. III.

OF THE DIAPHRAGM, DEEP-SEATED MUSCLES, AND VESSELS OF THE ABDOMEN.

The student, having now made himself acquainted with the situations occupied by the several viscera of the abdomen, must, in the next place, dissect the diaphragm and the deep-seated muscles, which form the posterior boundary of the cavity. The liver is to be removed by dividing, in the first place, its connexions with the diaphragm above, and then by carefully detaching it from the vena cava inferior beneath, which passes through a groove in the back part of the under surface of the liver, between its right lobe and the Lobulus Spigelii.

Of the Diaphragm. The dissection of the diaphragm consists in stripping off the peritoneum which lines its inferior or abdominal surface in common with the rest of the walls of the abdomen. The diaphragm constitutes a muscular and tendinous partition, dividing the cavities of the thorax and abdomen. Its inferior surface is more or less concave, so that when viewed from the abdomen, it presents an arched or vaulted form. It is divided into two portions, one superior and broader, denominated the greater muscle of the diaphragm, which forms the partition between the chest and the abdomen, the other inferior and smaller, denominated the lesser muscle, which is connected with the back part of the former, and is extended along the bodies of the lumbar vertebræ. A broad and thin aponeurosis, denominated the CENTRAL TENDON, intervenes between the two portions. The fleshy fibres belonging to the greater muscle of the diaphragm arise in front from the posterior surface of the ensiform cartilage, and frequently from the bones of the six lower ribs by digitations which intermix with similar portions of the transversalis muscle. From these origins, the fibres converge towards the central tendon, in which they terminate. The lowermost of the posterior fibres are also attached to a tendinous expansion, denominated the LIGAMENTUM ARCUATUM, which extends across from the extremity of the last rib to the transverse process of the first lumbar vertebra. The CENTRAL TENDON consists of a middle and two lateral portions, which together have been considered to resemble the leaf of trefoil in shape. In the right side of the central tendon, and near its back part, there is a large opening somewhat of a triangular figure, through which the vena cava inferior passes from the abdomen into the chest. The tendinous fibres immediately around the opening have a decussated arrangement. The lesser muscle arises by two flattened tendons from the fronts and sides of the bodies of the lumbar vertebræ, the tendon on the right side from the three superior, and that on the left from the two superior. The fleshy fibres continued from these tendons, form two fasciculi, denominated the crura, which ascend nearly in a vertical direction upon the bodies of the vertebræ, and terminate in the back part of the central tendon.

Just below the attachment of the two crura to the central tendon, and towards the left side of the body, an oval opening is seen between them, through which the œsophagus and two nerves of the eighth pair pass from the chest into the abdomen. This is the cardiac, or superior, or œsophageal opening of the diaphragm. The lower boundary of this opening is formed by the decussation of two fasciculi of fleshy fibres which connect the crura, and extend obliquely across between them. Below these decussating fibres, the two crura separate, so as to leave between them a considerable interval towards the front of the spine for the passage of the aorta and thoracic duct. This is the inferior or aortic opening of the diaphragm. Tendinous fibres, uniting the two crura, are stretched across in an arched form over the aorta as it passes through the interval left between them.

The deep-seated muscles of the abdomen are the Psoas Magnus, Psoas Parvus, Iliacus Internus, and Quadratus Lumborum.

The Psoas Magnus is the thick fleshy mass placed close to the sides of the lumbar vertebræ. It arises by distinct tendinous and fleshy portions from the transverse processes, and from the sides of the bodies of the last dorsal, and of the four first lumbar vertebræ, and descends on the outside of the superior aperture of the pelvis. Then passing beneath Poupart's ligament into the thigh, it becomes tendinous, and is united to the iliacus internus, with which it is inserted into the trochanter minor of the os femoris.

The PSOAS PARVUS is a thin muscle placed in front, and on the inside of the psoas magnus. It arises from the body of the last dorsal vertebra, descends obliquely outwards, and terminates in a thin tendon, which is continued downwards on the inside of the psoas magnus to the front of the brim of the pelvis, where it is fixed into the linea ilio-pectinea. This muscle is frequently wanting.

The ILIACUS INTERNUS occupies the whole of the concavity of the ilium. It arises from the inner margin of the crista ilii, nearly in its whole length, from the anterior superior spine, and from the concave surface of the bone, and descending beneath Poupart's ligament, becomes united with the tendon common to this muscle, and to the psoas magnus. From beneath Poupart's ligament, the tendon descends into the thigh upon the capsule of the hip joint, and is attached to the trochanter minor of the os femoris.

The psoas magnus and iliacus internus are not at present to be followed below Poupart's ligament. The course of their tendon in the thigh to its insertion cannot be seen until the muscles of the thigh have been dissected.

A thin aponeurotic expansion, denominated the fascia iliaca, covers the iliacus internus and the adjacent part of the psoas magnus muscles. The connexions of this fascia will be presently described.

The QUADRATUS LUMBORUM is a thick and flattened muscle of an irregularly square form, placed by the sides of the lumbar vertebræ, between the last rib and the ilium. Arising from the posterior margin of the crista ilii, it ascends between the psoas magnus in front, and the fleshy mass of the sacro-lumbalis and longissimus dorsi behind, to be inserted into the last rib, and into the transverse processes of the four upper lumbar vertebræ.

At this stage of the dissection, the student is advised to observe the manner in which Poupart's ligament is firmly bound down to the subjacent parts by the attachments of certain fasciæ, and further to notice the relative situation of the parts which occupy the wide space between Poupart's ligament and the bone beneath.

The FASCIA ILIACA has been already mentioned as consisting of a thin aponeurotic expansion covering the iliacus internus and the adjacent part of the psoas magnus muscles. On its outer edge, the fascia is attached to the internal border of the crista ilii, on its inner edge, to the line in the ilium denominated linea innominata, or linea ilio-pectinea, which bounds the superior aperture of the pelvis ; and below, it is attached to Poupart's ligament from the anterior superior spine of the ilium, downwards to within a short distance of the insertion of the ligament into the pubes. The fascia here terminates in a pointed form over the external iliac vein, just in the situation where it is continued into the femoral vein. A portion of the same fascia is extended downwards, beneath Poupart's ligament, between the external iliac vessels and the os pubis into the thigh, where it terminates by becoming continuous with the fascia lata. The extension of this portion of the fascia iliaca behind the femoral vessels, and its continuity with the fascia lata cannot, however, be seen until the thigh is dissected.

It will be recollected that the insertion of Poupart's ligament into the spine of the os pubis forms a roundish tendinous cord, which is the lower column of the abdominal ring. It is now to be further observed, that a thinner portion of tendon is continued inwards from the spine for some way along the crista of the os pubis, and here terminates by a sharp crescent-shaped edge inclined backwards, or towards the cavity of the abdomen. This edge is known by the appellation of the crescent-shaped edge of the crural arch, and the thin portion of tendon which forms it, is usually denominated GIMBERNAT'S LIGAMENT. It may be distinctly seen from the cavity of the abdomen, merely by removing the cellular tissue from the posterior surface and upper part of the os pubis.

The wide space between Poupart's ligament and the bone beneath is almost completely filled by the muscles, vessels, and nerves passing between the abdomen and thigh. The iliacus internus and psoas magnus occupy the outer part and greater share of this space. The external iliac vessels descend over the smooth excavated surface in the upper and front part of the os pubis. The vein is found more internally, and the artery close to the outer side of the vein, a thin stratum of condensed cellular tissue intervening. The anterior crural nerve, in passing beneath Poupart's ligament, is about half an inch from the artery on its outer side, some fibres of the psoas magnus projecting between them. Besides the parts here mentioned, small branches of the lumbar nerves descend upon the iliacus internus and psoas magnus muscles, and the principal absorbent vessels of the lower extremity pass beneath Poupart's ligament in their course from the thigh into the abdomen.

As the attachment of the fascia iliaca to Poupart's ligament terminates just over the passage of the external iliac vein, there remains in consequence a small space between the inner side of the vein and the crescent-shaped edge of the tendon, where Poupart's ligament is not bound down to the parts beneath. This space is filled by an absorbent gland, or only by loose cellular tissue. It is denominated either the crural or femoral ring, and it is through this space the viscera are protruded in the femoral hernia.

For a more detailed account of these parts the student is referred to Mr. Lawrence's Treatise on Ruptures.

It now only remains for the student to examine the trunks of the principal vessels and nerves of the abdomen, which are found at the back part of the cavity behind the peritoneum.

The AORTA having passed from the chest into the abdomen through the interval left between the crura of the diaphragm, descends along the spine in a straight direction to the fourth lumbar vertebra, where it divides into two branches of equal size, denominated the common iliac arteries. In the upper part of the abdomen, the aorta is separated from the vena cava inferior by the right crus of the diaphragm. Lower down, the aorta and vena cava approach each other so nearly, that the vein, when distended, covers the right side of the artery.

The following are the branches which the aorta gives off in the abdomen, arranged in the order of their origin.

1. The PHRENIC ARTERIES, which consist of two small branches arising from the aorta immediately after its entrance into the abdomen. They ascend in front of the crura to the great muscle of the diaphragm, where their ramifications are principally distributed. Around the external margin of the

diaphragm, where it is attached to the ribs, the ramifications of the phrenic arteries communicate with the thoracic branches of the subclavian artery.

The phrenic arteries are subject to many varieties. They may arise by a common trunk from the aorta or from the cœliac artery. The two branches may have separate origins, one from the aorta, and the other from the cœliac artery. Occasionally there are three or four phrenic arteries.

2. The Cœliac Artery, which is large, arises at a short distance below the phrenics, from the front of the aorta, while it is still lodged between the crura of the diaphragm. The distribution of the cœliac artery has been already described, page 33.

3. The Superior Mesenteric Artery, which is the largest branch of the aorta, arises from its front part at the distance only of a few lines below the cœliac. Sometimes the cœliac and superior mesenteric arteries arise so nearly together, that they appear to have a common trunk. The distribution of the superior mesenteric artery has been already described, page 38.

4. The Capsular Arteries, which are small branches of variable number, arise from each side of the aorta near the superior mesenteric. They proceed transversely to the renal capsules, and distribute many ramifications to the surrounding parts.

5. The Renal Arteries, which are usually

two in number, arise from the sides of the aorta, at a short distance below the superior mesenteric, and proceed transversely across the abdomen to the kidneys. The artery on the right side is rather the longest, in consequence of the greater distance between the aorta and right kidney. The right renal artery is placed altogether behind the corresponding vein in its course to the kidney, while the left renal artery is placed partly in front, and partly behind its vein. The right renal artery passes across the abdomen behind the vena cava. Each renal artery divides as it approaches the kidney into three or four branches, which penetrate the organ in various situations in front and behind the notch on its inner side. The renal artery gives off in its course to the kidney.

(*a*) Capsulares, consisting of small twigs to the renal capsules.

(*b*) Adiposæ, distributed to the fat of the kidney.

Frequently there are four renal arteries, two arising from each side of the aorta, and sometimes three, two on one side, and one on the other.

6. The Spermatic Arteries, which are two small branches, arise from the fore part of the aorta, a little below the renal arteries, one of them frequently having its origin rather higher than the other. Each spermatic artery descends obliquely upon the psoas magnus muscle, in company with the spermatic vein; that on the right side being placed in front of the vena cava. The spermatic artery reaching the lower part and inside of the psoas, continues

its course differently in the male and in the female. In the male it proceeds forwards from the inside of the psoas, and joining the vas deferens, is continued through the inguinal canal with the other parts composing the spermatic cord, and descends from the ring in the tendon of the external oblique muscle to the testicle. The spermatic artery gives off many branches to the cremaster muscle, and other parts of the cord; and as it approaches the testicle, divides into several branches, which partly distribute themselves upon the epididymis, and partly penetrate the tunica albuginea, to reach the substance of the testicle. In the female, the spermatic artery descends from the inside of the psoas into the cavity of the pelvis, where it is placed between the layers of the broad ligament of the uterus, and is distributed principally to the ovary; some of its ramifications extending to the fallopian tubes and to the uterus, where they communicate with the uterine arteries. One or both of the spermatic arteries sometimes arise from the renal arteries.

7. Adiposæ, which are small branches distributed to the fat enclosing the kidney. Adipose arteries are also derived from other sources, as from the capsular, renal, and spermatic arteries.

8. Uretericæ, which are small branches distributed upon the ureter. Branches are also supplied to the ureter, from the renal, capsular, and spermatic arteries.

9. The Inferior Mesenteric Artery, which

is much smaller than the superior mesenteric, arises rather from the left side of the front of the aorta, about an inch above its bifurcation. Its distribution has been already described, page 40.

10. The Lumbar Arteries, which are five in number, arise from each side of the aorta, at right angles. They proceed transversely across the sides of the vertebræ to the transverse processes, where they divide into anterior branches, which are distributed to the psoas, quadratus, and abdominal muscles; and into posterior branches, which pass backwards, and are distributed upon the muscles of the spine. Branches of the lumbar arteries enter the spaces between the vertebræ on each side, through which the nerves pass out of the spine, and thus reach the membranes of the medulla spinalis, upon which they are distributed.

Of the Common Iliac Arteries.

Each common iliac artery beginning opposite to the fourth lumbar vertebra, proceeds obliquely outwards and downwards on the inside of the psoas magnus, to the junction of the ilium with the sacrum, where it terminates by dividing into two branches, which, in the adult, are of about equal size, and are named the external and internal iliac. The internal iliac is also named the hypogastric. Between the common iliac artery and the psoas magnus muscle on each side, there is a small interspace, occupied by cellular tissue. On the right side, the common iliac artery crosses obliquely over the two common iliac veins, just where they unite to form the vena cava; and on the left side, the common iliac artery is placed immediately in front of the corresponding vein.

At the point where the aorta divides into the common iliac arteries, a small branch arises, which is denominated the SACRA MEDIA. It descends along the middle of the sacrum to the os coccygis, distributing its ramifications to the surrounding parts, and communicating with the arteriæ sacræ laterales, which are branches of the internal iliac.

The EXTERNAL ILIAC artery descends from its origin obliquely outwards, along the inner edge of the psoas magnus to Poupart's ligament, beneath which it passes into the thigh, and immediately acquires the name of femoral. The external iliac artery has the corresponding vein close to its inner side, and rather behind it. Numerous absorbent glands, with plexuses of absorbent vessels, are placed closely around the external iliac artery in its whole course. These glands are connected below with the deep seated glands in the thigh, and above, with the lumbar absorbent glands.

The branches which the external iliac artery gives off, are—

1. Small twigs to the psoas magnus, to the absorbent glands, and other parts adjacent.

2. The EPIGASTRIC ARTERY, which usually arises from the inner side of the external iliac, just before its passage beneath Poupart's ligament. From its origin, it sometimes descends a little, and then

proceeds upwards and inwards to the under surface of the rectus, behind which it ascends obliquely from the lower and outer edge of the muscle, towards its upper and inner part. The epigastric gives off near its commencement,

(*a*) A branch which accompanies the spermatic cord through the abdominal ring, and communicates with the spermatic artery. In females, this branch accompanies the round ligament of the uterus.

(*b*) Branches which, arising from each side of the trunk as it ascends beneath the rectus, are distributed to the surrounding muscles, and communicate with the branches of the circumflexa ilii, lumbar and intercostal arteries.

The epigastric terminates near the umbilicus, in branches communicating with the branches of the internal mammary artery, which is derived from the subclavian.

The epigastric does not always arise from the same point of the external iliac. In some instances it has its origin higher than in others, and sometimes the epigastric arises by a common trunk with the obturator artery, which is usually derived from the internal iliac.

3. The Circumflexa Ilii, which arises from the outer side of the external iliac, sometimes opposite to the epigastric, and sometimes a little below it. From its origin it proceeds obliquely upwards and outwards to the crista ilii, round which it turns upon the iliacus internus muscle. Its branches partly distribute themselves to the iliacus and psoas muscles, and partly

ascend between the abdominal muscles, where they communicate with the lumbar, intercostal, and mammary arteries. At the back part of the ilium the circumflexa ilii communicates with the ilio-lumbalis artery, which is a branch of the internal iliac.

The distribution of the internal iliac artery will be described with the dissection of the viscera of the pelvis.

The VENA CAVA INFERIOR is formed by the union of the two common iliac veins, each of which consists of the united external and internal iliac veins.

The EXTERNAL ILIAC VEIN is the continuation of the trunk of the femoral vein passing beneath Poupart's ligament into the abdomen. It proceeds obliquely upwards and inwards to the sacro-iliac symphysis, exactly in the same direction with the corresponding artery. The external iliac vein receives in this course the circumflexa ilii and epigastric veins corresponding to the arteries of the same name.

The INTERNAL ILIAC VEIN ascending from the cavity of the pelvis, joins the external iliac vein at the sacro-iliac symphysis, and thus forms the common iliac vein.

The COMMON ILIAC VEINS proceed obliquely upwards and inwards, and unite to form the vena cava between the fourth and fifth lumbar vertebræ. The vein on the right side is placed immediately behind the corresponding artery, while the left vein is placed rather below and on the inside of the artery.

The VENA CAVA ascends in a straight direction through the abdomen on the right side of the vertebral column. Reaching the back part of the under surface of the liver, the vena cava passes through a groove in its substance between the right lobe and the lobulus Spigelii. From the back part of the liver the vena cava passes through the aperture in the central tendon of the diaphragm into the chest, where it is immediately invested by the pericardium and terminates in the right auricle of the heart. The principal branches which the vena cava inferior receives are,

1. The Lumbar Veins, which are usually four on each side. They proceed transversely across the bodies of the vertebræ with the corresponding arteries.

2. The Spermatic Veins, which ascend upon the psoas magnus muscle in company with the spermatic arteries. Each spermatic vein, as it ascends upon the psoas, divides itself into branches which re-unite into a sort of plexus. The right spermatic vein usually terminates in the vena cava a little below the renal vein, and the left usually opens into the renal vein itself.

3. The Renal Veins, which are of very large size, and formed by the union of many branches arising from different parts of the kidneys. Each renal vein proceeds transversely across to the vena cava. The left renal vein passes in front of the aorta, and is the longest in consequence of the greater distance between the vena cava and the left kidney.

4. The Capsular Veins, which are two in num-

ber, and arise, one from each renal capsule. They sometimes terminate in the renal veins.

5. The Hepatic Veins, which return the blood from the liver. They consist of two or three large veins which open into the vena cava just before it penetrates the diaphragm, and of some smaller branches, irregular in their number, which open into the vena cava in different parts of its course beneath the liver.

6. Two Diaphragmatic Veins returning the blood from the diaphragm.

The Vena Azygos begins in the abdomen by some small veins which communicate with the renal and lumbar veins, and sometimes directly with the vena cava. They unite into a single trunk which generally passes through a perforation in the fibres of the lesser muscle of the diaphragm into the chest; but, in some subjects, it passes through the same opening with the aorta and the thoracic duct.

The Thoracic Duct begins in the abdomen upon the second or third lumbar vertebra by the junction of many absorbent trunks which are formed by the absorbents of the lower extremities, and of the pelvis, and by the absorbents of the mesentery, which are denominated the lacteals. At its commencement the thoracic duct is usually rather enlarged in size where the trunk of the lacteals opens into it, and this dilated part of the duct is called the Receptaculum Chyli. Frequently, however, the duct is here no larger than in other parts of its course. The thoracic duct is placed first behind the aorta, then ascending a little to the right, is placed between the aorta and the right crus of the diaphragm, and thus passes from the abdomen through the aortic opening of the diaphragm into the chest.

The SYMPATHETIC NERVE consists in the abdomen of four or five ganglia connected by slender filaments which are placed along the sides of the lumbar vertebræ in front of the origins of the psoas magnus. The uppermost of these lumbar or abdominal ganglia is connected with the last ganglion of the sympathetic in the chest by a filament which passes through a slit in the fibres of the lesser muscle of the diaphragm.

The GREATER and LESSER SPLANCHNIC NERVES enter the abdomen through a distinct opening between the fibres of the lesser muscle of the diaphragm.

The URETER arising from the lower and inner part of the kidney, descends obliquely inwards along the back part of the abdomen to the sacro-iliac symphysis. Then crossing over the common iliac artery and vein, it is continued into the cavity of the pelvis.

Of the LUMBAR ABSORBENT GLANDS. These are very numerous. Some of them are placed at the sides of the lumbar vertebræ, and others in front closely around the aorta and vena cava. They form altogether one connected chain of glands, extending from the pelvis upwards to the diaphragm.

By dissecting through the psoas magnus muscle near its origin from the spine, the LUMBAR PLEXUS of nerves will be brought into view. It is formed by branches of the five lumbar nerves, and is placed close to the sides of the vertebræ, in front of their transverse processes, and behind the psoas magnus muscle. It distributes many small branches, some of which pass outwards upon the iliacus internus to be distributed to the abdominal muscles; others descend beneath Poupart's ligament into the thigh, and penetrating the fascia lata, are distributed superficially, and lastly, others accompany the spermatic cord through the abdominal ring and terminate in the integuments of the groin, pubes, and scrotum. The plexus having given off these branches, terminates in three large nerves, the Anterior Crural, the Obturator, and a Nerve which descends into the pelvis to join the sacral plexus.

The ANTERIOR CRURAL NERVE, proceeding from the lumbar plexus, descends obliquely outwards, and covered by the outer edge of the psoas magnus to Poupart's ligament, beneath which it passes upon the conjoined mass of the psoas and iliacus muscles into the thigh.

The OBTURATOR NERVE, descending from the plexus, proceeds obliquely forwards along the outside of the superior aperture of the pelvis to the obturator foramen, through which it is continued with the obturator vessels into the thigh. Here it terminates by dividing into two branches which are distributed to the triceps and other muscles adjacent.

CHAP. II.

DISSECTION OF THE PERINEUM AND EXTERNAL ORGANS OF GENERATION IN THE MALE.

Before the student commences the dissection of the muscles, vessels, and nerves in the perineum, it will be necessary that he should possess a general knowledge of the structure of the penis.

The upper part and sides of the penis are formed by the union of the two corpora cavernosa; the under part of the penis, by the corpus spongiosum urethræ. The corpus spongiosum is placed beneath the middle of the united corpora cavernosa, and projects considerably below them.

The Corpora Cavernosa are two bodies of a ligamentous structure externally and cellular within; laterally they are united in their whole length, and at their external sides have a rounded form; behind, they terminate in two slender conical and pointed processes, denominated the crura penis. The crura penis, separating like the branches of the letter Y, are attached to the inner borders of the rami of the ischium and pubes on each side. These attachments begin a little above the tubera ischii, and are then extended upwards as far as the front and under part of the symphysis pubis. Thus the crura penis, arising from the rami of the ischia and pubes, advance forwards, and converging in front of the symphysis, unite and form the two corpora cavernosa.

The corpora cavernosa are connected above with the symphysis pubis by a fibrous substance of a flattened and triangular form, denominated the suspensory ligament of the penis, but the exact limits of this part cannot be easily shewn, so closely is it interwoven with the surrounding fat and cellular tissue.

The CORPUS SPONGIOSUM URETHRÆ consists of a thin layer of spongy substance, surrounding the canal of the urethra, and it commences from behind, by an oblong pendulous projection, denominated the bulb of the urethra. The bulb projects below the line of the urethra, and is situated exactly in the mid-space between the crura penis a little before their union. The corpus spongiosum is continued forwards beyond the corpora cavernosa to form the glans penis. The glans is of a conical form and excavated at its basis; the front extremities of the corpora cavernosa are received into the hollow of the glans, and united with it by firm cellular tissue.

The skin covering the penis is of a thin texture, and is united to the parts beneath by very loose cellular tissue containing no fat. At the front extremity of the penis, the skin forms a loose fold, denominated the PREPUCE, which is generally of sufficient length to cover the glans in its relaxed state. By drawing the prepuce backwards, we observe its inner layer to be continuous round the basis of the glans with the cuticular covering of the latter. The inner layer of the prepuce is further attached to the under part of the glans by a triangular fold of the skin, denominated the FRŒNUM PREPUTII.

It is necessary that the subject should now be fixed in the same position as for the lateral operation of lithotomy, and the pelvis so raised as to expose the perineum to the light.

Previously to the removal of the integuments, the student will notice the line, or, raphé, running down the middle of the perineum, and the projection of the tuber ischii on each side. He will thus be enabled to form a more correct notion concerning the relative position of the several parts to be dissected.

Beneath the integuments a considerable quantity of soft fat is brought into view, which extends deeply inwards under the arch of the pubes. This fat must be carefully removed, and in removing it, tendinous fibres will be remarked, which, however, are too irregular in their form and direction to allow of their being exhibited as a continuous aponeurotic expansion.

The muscles first brought into view are :—

The ERECTORES PENIS, covering the crura penis.

The ACCELERATORES URINÆ, covering the bulb and lower part of the corpus spongiosum urethræ.

The TRANSVERSI PERINEI running across from the tubera ischii to the centre of the perineum.

The TRANSVERSI PERINEI ALTERI also crossing the perineum, but more obliquely than the transversi.

The SPHINCTER ANI surrounding the anus.

The ERECTOR PENIS arises from the inside of the tuber ischii, and is a thin flat muscle which proceeds upwards upon the crus penis, and terminates above in a thin tendinous expansion which is lost in the corpus cavernosum *.

The ACCELERATOR URINÆ arises by a thin tendinous expansion from the ramus of the ischium and os pubis. Its fibres advance forwards on the inside of the crus penis, and proceed obliquely downwards, covering the bulb and lower part of the corpus spongiosum laterally, and terminating in their middle at a white line, where they meet the fibres of the opposite muscle. The superior fibres of the accelerator form a distinct digitation which extends obliquely upwards and outwards, and terminates in the corpus cavernosum. The lower fibres of the accelerator are connected with a tendinous point in the

* The terms of locality employed in the description of this and of other muscles of the perineum refer to the position of the parts, when the subject is tied up as for lithotomy.

centre of the perineum where they meet the terminations of the transversus from each side, and the fibres of the sphincter ani from below.

The Transversus Perinei is a thin and narrow muscle, which arising from the tuber ischii, and thence passing across the perineum, ends at the tendinous point in the centre just mentioned.

The Transversus Perinei Alter arises from the ramus of the ischium, close to the tuberosity, and proceeds obliquely upwards in the triangular space between the erector and accelerator, where it terminates by an attachment to the side of the corpus spongiosum, and adjacent part of the crus penis.

Many varieties occur in the arrangement of the Transversi muscles. The muscle here described as the transversus alter, is sometimes wanting. A second transversus perinei is occasionally seen, either as a distinct muscle, or as irregularly scattered fibres, extending directly across the perineum, and terminating either at the tendinous point in the centre, or more deeply at the bulb.

The Sphincter Ani is a broad band of muscular fibres surrounding the anus. It is united behind, to the point of the os coccygis by a ligamentous substance, whence the fleshy fibres take their origin and extending upwards on each side of the anus, encircle the extremity of the rectum. The fibres of the sphincter are for the most part connected above with the tendinous point in the centre of the perineum, while some of them are irregularly scattered in the surrounding cellular tissue.

Two other muscles are met with in this dissection, the LEVATOR ANI and COCCYGEUS.

When the fat is removed which fills the deep hollow between the edge of the glutæus maximus and the rectum, we bring into view a thin stratum of muscular fibres passing downwards from within the pelvis by the side of the gut. These constitute the LEVATOR ANI. A partial view, however, of this muscle, can only be gained at present, its further demonstration belongs to the dissection of the pelvic viscera. It has its origin high up within the pelvis from the posterior surface of the os pubis, and from the aponeurotic expansion covering the obturator internus muscle. The fibres thence proceed downwards by the side of the prostate gland, the neck of the bladder, and the rectum. At their termination, part of the fibres are received in front between the fibres of the sphincter and the longitudinal fibres of the rectum, and part are continued to the back of the gut, where they meet the fibres of the opposite muscle, and are connected with them by the intervention of a white line. There are yet other fibres of the levator ani which are connected with the side of the os coccygis.

The COCCYGEUS is a small muscle placed deeply inwards between the edge of the glutæus maximus and the levator ani. It arises from the spine of the ischium, and thence extends across to the side of the os coccygis and sacrum, to which it is attached.

The vessels and nerves met with in the dissection of the perineum are few in number, and of a small size.

The Arteria Perinea Superficialis is a small branch of the pudendal artery which advances forwards from the triangular space between the erector and accelerator muscles, and then passing upwards over the transversus, terminates above in ramifications distributed to the skin of the scrotum and penis. In this course, the perinea superficialis sends off

The Transversa Perinei, distributed to the transversus muscle.

A branch of the pudendal nerve is also seen extending its ramifications up the perineum in company with the perineal artery.

OF THE SCROTUM, TESTICLE, AND SPERMATIC CORD.

The skin of the scrotum is of a brownish colour, and so thin in its texture, that the veins ramifying in the subjacent cellular tissue are distinctly visible through it.

Beneath the skin of the scrotum is a very large quantity of cellular tissue in which fat is never deposited. This cellular tissue is very loose on each side, but in the middle, is more condensed so as to form the Septum Scroti which divides the bag into a right and left side, in which the testicles are suspended by the spermatic cords. Numerous vessels and nerves ramify in the cellular tissue of the scrotum. The arteries are principally derived from the spermatics and external pudics, and the nerves are branches of the lumbar nerves which have descended from the abdomen through the abdominal ring.

The TESTICLE and its SPERMATIC CORD are closely enveloped by a sheath of condensed cellular tissue, which is denominated the Tunica Vaginalis of the Cord, and is to be distinguished from the serous membrane of the testicle presently to be described, which is the Tunica Vaginalis Testis. The cellular sheath of the cord is connected externally with the fibres of the cremaster muscle, and with the general cellular tissue of the scrotum, and internally with the spermatic vessels and nerves, and at its lower part is spread upon the tunica vaginalis testis.

Besides the cremaster muscle and the cellular sheath just mentioned, the spermatic cord is composed of the following parts connected by cellular tissue, viz., the Spermatic Artery, which is very tortuous in its course; the Spermatic Veins, which form, by their ramifications, a plexus, denominated the CORPUS PAMPINIFORME; the Spermatic Nerves; and numerous Absorbent Vessels, which passing through the ring into the abdomen terminate in the lumbar glands; and lastly, the Vas Deferens, which in its ascent from the testicle to the abdominal ring is placed behind the other parts of the cord. The left spermatic cord is the longest; hence the testicle on this side is removed to a greater distance from the aperture in the tendon of the external oblique muscle.

The tunica vaginalis testis is an imperforate sac, and is connected with the testicle in the same manner as other serous membranes are connected with the organs to which they belong. Thus it forms a bag round the testicle, and is reflected upon the external surface of the gland, which thus receives a smooth covering from the membrane, and is still on the outside of the sac. If the tunica vaginalis is punctured, and air blown into it, it will be raised into a bag on the front and sides of the testicle. When the bag is completely laid open, the membrane is seen to connect itself with the testicle along its posterior edge, and here it is reflected, first over a part connected with the testicle denominated the epididymis, and then over the gland itself. The tunica vaginalis is very thin. The external surface of the baglike portion of the membrane is covered by the cellular sheath of the cord, and that part of the tunica vaginalis which is reflected upon the testicle, is united to the fibrous membrane, which, enclosing the substance of the gland, is termed the TUNICA ALBUGINEA. The reflected layer of the tunica vaginalis, and the fibrous capsule of the testicle, are so firmly united, that they are generally regarded as one membrane. They may, however, be separated sufficiently as to shew them distinct from each other.

The testicles are nearly of an oval form, and flattened on their outer and inner sides. Each gland is suspended obliquely in the scrotum, with one end upwards and forwards, and a little outwards, and the other end inclining to the opposite direction; one flat side of the gland is turned towards the thigh of the same side, and the other towards the septum scroti.

The EPIDIDYMIS is a thin and narrow body, situated along the posterior edge of the testicle, and towards the outer side of the gland. It is connected with the testicle by vessels, and by the tunica vaginalis, which, as already mentioned, is reflected over it. The upper end of the epididymis, which is its largest part, is denominated the GLOBUS MAJOR, or CAPUT EPIDIDYMIS, and its lower end forms a slight swelling, denominated the GLOBUS MINOR. The narrow part of the epididymis, between its extremities, is denominated its body.

The VAS DEFERENS arises from the lower end of the epididymis, and turns upwards along the back part of the spermatic cord.

CHAP. III.

DISSECTION OF THE PELVIS IN THE MALE.

The organs contained in the pelvis of the male are the Bladder, the Rectum, and the following parts connected with the former, namely the Ureters, the Vasa Deferentia, the Vesiculæ Seminales, and Prostate Gland.

The best mode of dissecting these organs is to prepare a lateral view of them in their natural situation, by taking away the bony walls of the pelvis on one side. To obtain a view of them on their left side, the left os innominatum must be removed with the lower extremity attached to it, which may be thus accomplished. The left crus penis is to be detached from the ramus of the ischium and pubes, and the symphysis pubis is to be carefully divided without injuring the urethra, which passes almost immediately beneath it. The viscera are to be separated from the left side of the pelvis, and the sacro-iliac symphysis is to be divided. The left os innominatum, and the lower extremity attached to it, may then be removed without further trouble, and the viscera will be left resting in the right os innominatum, and in the hollow of the sacrum. Afterwards, the bladder is to be moderately distended with air blown into it from the ureter, its escape being prevented by a ligature passed tightly round the penis. The rectum is also to be moderately distended with horse hair or tow. The course of the peritoneum through the cavity of the pelvis, and its inflections upon the bladder and rectum, are in the first place to be examined.

The peritoneum lining the abdominal muscles descends from them in front, and passes behind the ossa pubis into the pelvis, to the middle of the superior part of the bladder, named its fundus. The membrane is thence continued backwards upon the bladder, and down the whole of its posterior and lateral parts. From the lower and back part of the bladder the peritoneum is continued to the front of the rectum, and leaves, by the mode of its reflection, a pouch between the two organs. The hand will readily enter this pouch, when passed downwards between the bladder and rectum. From each side of the bladder the peritoneum is extended outwards upon the walls of the pelvis. According to the preceding account, we find that the bladder is covered by peritoneum over one half only of its fundus, and over the whole of its posterior part, while the anterior half of its fundus, and its whole front and lower parts, receive no such investment. In some subjects, however, the peritoneum is extended beneath the inferior part of the bladder, almost to the back of the prostate gland, before it is reflected to the rectum.

As the peritoneum is reflected from the bladder to the rectum, it forms two small folds, one on each side of the pouch just described. These are sometimes denominated the POSTERIOR LIGAMENTS of the bladder.

The peritoneum reaching the rectum is continued from below upwards upon the gut, covering at first only its anterior side, but afterwards gradually encircling it. From the upper and back part of the rectum, the peritoneum is continued to the sacrum in the form of two layers, which are named the MESO-RECTUM. The form of the meso-rectum is triangular, narrow below and broad above; and between its layers the vessels and nerves of the rectum lie imbedded. The meso-rectum is continuous above, with the peritoneum covering the lumbar vertebræ.

Some dissection will now be required before the several organs contained in the pelvis can be distinctly seen. The fat and cellular tissue are to be cautiously removed from the lower part of the rectum, when the greater part of the levator ani muscle will be seen in its course downwards by the side of the prostate gland, neck of the bladder, and rectum. The muscle is necessarily separated from its origin in the removal of the os innominatum. The levator ani is to be reflected downwards, by separating it from the fibres of the sphincter ani, with which it is connected, and is to be left attached to the back part of the rectum. The muscular fibres of the rectum, which are arranged longitudinally in respect to the intestine, and the muscular fibres of the bladder, which cross each other in various directions are then to be cleaned, the dissection of both organs being confined to that side which is exposed to view. The ureter, and vas deferens, will be seen at the side of the bladder, and one of the vesiculæ seminales will be brought into view by cautiously dissecting through the cellular tissue, between the lower part of the bladder and the rectum, and the prostate gland will be seen attached to the lower and front part of the bladder. The urethra is afterwards to be carefully exposed in its whole course from the prostate gland, beneath the arch of the pubes, and along the corpus spongiosum : the fibres of the acceleratores urinæ muscles having been previously reflected from the latter part.

The Bladder is placed in the hypogastric region, and immediately behind the ossa pubis, the extent of the space which it occupies necessarily varying with the quantity of its contents. In its contracted state, the bladder is found deep in the pelvis below the ossa pubis, and presenting a triangular and somewhat flattened figure, with its broadest part extended transversely across the cavity. In its distended state, the bladder rises into the abdomen, between the peritoneum and the posterior surface of the abdominal muscles, and becomes of an oval form, with its largest end downwards. The front of the bladder is united to the ossa pubis by loose cellular tissue; and in the space between the lower part of the bladder and the rectum are found the vesiculæ seminales, and vasa deferentia. The upper part of the bladder is named its FUNDUS, and the lower, its CERVIX, where the circumference of the organ contracts in a slight degree round the prostate gland. A fibrous cord, named the URACHUS, arises from the centre of the fundus of the bladder, and ascending between the peritoneum and the abdominal muscles to the umbilicus, there terminates by being intermixed with the fibres of the surrounding aponeuroses. The bladder is in some measure fixed in its situation by a fibrous substance of a flattened form, which extends across from its neck to the lower and back part of the symphysis pubis. It is denominated the ANTERIOR LIGAMENT of the bladder, and is more or less distinct in different subjects.

The URETERS descending from the back part of the abdomen to the sacro-iliac symphysis, proceed downwards and forwards in the cavity of the pelvis to the lower and back part of the bladder, where they terminate. They are placed exteriorly to the peritoneum, and in their approach to the bladder, they cross the outer sides of the vasa deferentia. Each ureter passes obliquely for some distance between the muscular and mucous coats, before it perforates the latter, and enters into the cavity of the bladder.

The Prostate Gland is placed in front of the neck of the bladder. It is a whitish body, chesnut shaped, and of a dense unyielding texture. Its broadest part is turned backwards, where it is firmly united to the neck of the bladder by cellular tissue. The prostate is separated above, from the symphysis pubis by a space of about half an inch, and below, it is united to the rectum by a dense cellular tissue. In the dissection of the prostate, many large veins are seen placed closely around the broad part of the gland and the neck of the bladder.

The Urethra is a canal about nine inches in length, extending from the neck of the bladder to the extremity of the penis. It is lined throughout by a continuous membrane, and exteriorly, its sides are formed by parts of a different structure in different situations. From the neck of the bladder, the urethra passes through the prostate gland, rather obliquely from above downwards, and nearer to its upper than to its under surface, hence a larger share of the prostate is below and at the sides of the canal than above it. The urethra leaves the prostate at its upper and front part, and continues its course forwards beneath the arch of the pubes, in a direction slightly curved upwards. From beneath the arch, the urethra ascends in front of the ossa pubis, and between the crura penis to the commencement of the corpus spongiosum, or bulb. Between the upper side of the canal and the under part of the symphysis pubis, there is an interspace of about three quarters of an inch, and below, the canal is separated from the rectum by a considerable quantity of loose cellular tissue. The sides of this portion of the urethra are formed by a dense fleshy substance placed closely round the internal membrane. This substance is generally believed to consist of muscular fibres, arranged for the most part in a circular direction.

A thin aponeurotic expansion is stretched across between the rami of the pubes, and is consequently of a triangular form, with its broadest part turned downwards. It is called the TRIANGULAR LIGAMENT of the urethra, or the interosseous ligament of the pubes. The urethra perforates the centre of this expansion, and the bulb is firmly united with it in front.

Two small fasciculi of muscular fibres descend from the arch of the pubes, on each side of the urethra, to its lower part, where they meet. They have been denominated the COMPRESSORES, or LEVATORES URETHRÆ.

The urethra having reached the bulb, becomes surrounded by the substance of the corpus spongiosum, and is continued along the groove beneath the middle of the united corpora cavernosa to their anterior extremities. It then passes through the glans penis, at the extremity of which it terminates by a vertical opening.

The different parts of the urethra are named in the following manner:—That portion which is within the prostate, forming about an inch of the canal, is termed the prostatic part. That portion which is included between the prostate and bulb, being also about an inch in extent, the membranous part; and the rest of the canal, from the membranous part to its termination, forming the other seven inches, the spongy portion. There are slight variations in the diameter of the urethra at different parts. The canal is wide in the middle of the prostate, within the bulb, and at the base of the glans. The dilatation in the glans is named the fossa navicularis. The narrowest part of the canal is usually at the point of union between the bulb and the membranous portion.

In the dissection of the urethra we meet with

Cowper's Glands, which are two small bodies about the size of peas, but more or less distinct in different subjects. They are placed immediately behind the bulb, close to the under side of the urethra, and are partly concealed by the fibres of the acceleratores urinæ muscles.

The Vasa Deferentia enter the abdomen through the internal opening of the inguinal canal, formed in the fascia transversalis. Each vas deferens, immediately separating itself from the spermatic vessels, proceeds downwards and backwards on the inside of the psoas magnus muscle into the pelvis to the lateral and back part of the bladder. Becoming connected with the bladder by cellular tissue, the tube turns downwards round the side of the organ, just in the situation where the peritoneum is reflected from it outwards to the walls of the pelvis. The vas deferens then proceeds forwards beneath the inferior part of the bladder, where it gradually approaches the tube of the opposite side. The two tubes are here placed on the inside of the vesiculæ seminales, and gradually approaching, they meet at the back part of the prostate gland. Each vas deferens here unites with the vesicula seminalis, which is next to it, and by their junction the common, or ejaculatory duct, is formed, which proceeds forwards, between the neck of the bladder and the prostate, and terminates in the under side of the urethra, where it passes through the gland.

The Vesiculæ Seminales are two bodies of a pyriform shape, and convoluted appearance, and are placed between the lower part of the bladder and the rectum. They are imbedded in a considerable quantity of loose cellular tissue. The narrow end of each vesicula is connected with the back of the prostate, and is joined to the vas deferens in the manner just stated. From the prostate, the two vesiculæ are extended outwards and backwards on the outside of the vasa deferentia, and terminate behind by rounded extremities.

The Rectum, forming the last portion of the alimentary canal, occupies the posterior part of the cavity of the pelvis. Beginning above at the superior aperture of the pelvis, where it inclines rather to the left side, it extends downwards in the hollow of the sacrum, and gradually approaching to the middle line of the body terminates below at the opening of the anus, which is situated about an inch in front of the point of the coccyx. In front, the rectum is separated from the bladder, only by the peritoneal coverings of the two organs, and behind, it is united to the sacrum by the meso-rectum. The extremity of the gut is surrounded by the fibres of the sphincter, and higher up, the gut is covered on each side to a considerable extent by the fibres of the levator ani.

CHAP. IV.

DISSECTION OF THE PERINEUM AND EXTERNAL ORGANS OF GENERATION IN THE FEMALE.

The student must, in the first place, examine the external organs of generation which can be seen without the aid of dissection.

The Mons Veneris is the broad eminence covered with hair, placed between the groins and in front of the pubes. It consists merely of an accumulation of adipose tissue beneath the integuments, varying in quantity according to the general state of the individual.

From the mons veneris, a longitudinal fissure extends downwards and backwards to within an inch of the anus. This is the Vulva or Pudendum. The space between the termination of the pudendum and the anus is the perineum. On each side of the vulva, there is a thick elongated fold of integuments, containing adipose and cellular tissue, which are the Labia or Alæ Majores. The Labia are united below by a prominent line of a crescent-shape, which is called the COMMISSURE of the LABIA or FRENULUM.

By separating the labia, the following parts are seen in succession from above downwards.

A conical eminence of a reddish colour, which is the GLANS CLITORIDIS. This is only a small part of the clitoris. Hereafter the clitoris will be seen arising by two crura resembling the crura penis which are attached to the inside of the rami of the ischia and pubes. The crura approach each other as they ascend towards the arch of the pubes, and unite in the body of the clitoris, which is of a cylindrical shape and lies between the upper side of the vagina and the under part of the arch of the pubes, and is terminated in front by the glans already mentioned. The glans is covered above and at the sides by a loose fold of membrane which is named the PREPUTIUM CLITORIDIS. A white sebaceous substance is deposited between the preputium and the glans, similar to that which is secreted by the glandulæ odoriferæ of the penis.

From the preputium clitoridis, two thin membranous folds descend on the inside of the labia to about the middle of the opening of the vagina. These are the NYMPHÆ or ALÆ MINORES.

About an inch below the clitoris, and in the same perpendicular line with it, is the orifice of the urethra, or MEATUS URINARIUS. It is of a roundish form, and its margin is thick and prominent.

Immediately below the meatus urinarius is the opening of the VAGINA, the size and appearance of which vary considerably under different circumstances. In the virgin, the diameter of the opening is diminished by a membranous duplicature denominated the HYMEN, which is usually crescent-shaped, with its concavity turned upwards, and has its convex edge attached to the lower part and sides of the vagina. After the rupture of the hymen, several fleshy eminences of a reddish or livid colour are seen about the orifice of the vagina. These are named CARUNCULÆ MYRTIFORMES, and they have been generally regarded as the remains of the lacerated hymen. It has, however, been remarked, that some of these fleshy eminences exist previously to the rupture of the membrane. All the parts in the pudendum are covered by a membrane abundantly supplied with mucus from the orifices of numerous ducts, some of which are seen above and at the sides of the urethra, and others at the sides of the vagina.

The integuments of the perineum and around the orifice of the vagina are now to be removed, when the following muscles will be brought into view.

The ERECTORES CLITORIDIS covering the crura of the clitoris.

The SPHINCTER VAGINÆ surrounding the orifice of the vagina.

The TRANSVERSI PERINEI, extending across the perineum.

The SPHINCTER ANI, LEVATORES ANI, and COCCYGEI muscles, which correspond in their course to the same muscles in the male.

The ERECTOR CLITORIDIS muscle is smaller than the erector penis of the male, but in every other respect, resembles it. Arising from the inside of the tuber ischii, it ascends and passes forwards, to be inserted tendinous into the lower part of the crus clitoridis.

The SPHINCTER VAGINÆ, arising above from the body of the clitoris, descends on each side of the vagina, surrounding its anterior extremity immediately behind the labia, and terminates below in the centre of the perineum, where its fibres are intermixed with those of the sphincter ani, and of the transversi perinei.

The TRANSVERSUS PERINEI arises from the tuber ischii, and proceeds across to the centre of the perineum where its fibres are intermixed with those of the opposite muscle, and with the fibres of the sphincter vaginæ above, and sphincter ani below. This muscle is usually not so distinct as in the male, and sometimes it is altogether wanting.

The SPHINCTER ANI differs from the same muscle in the male only in the circumstance of its connexion above with the fibres of the sphincter vaginæ.

The LEVATOR ANI descends by the side of the vagina in its course to the rectum, but this muscle will be more clearly seen in the lateral view of the pelvic viscera.

The vessels and nerves correspond to those described in the perineum of the male. The Arteria Perinea Superficialis is seen ascending between the erector clitoridis and sphincter vaginæ muscles.

CHAP. V.

DISSECTION OF THE PELVIS IN THE FEMALE.

THE pelvis is to be prepared for the dissection of the viscera in the female by the removal of the os innominatum and the extremity attached to it on one side, in the same manner as already described in the dissection of the male.

The bladder and rectum hold the same situation in the female pelvis as in the male, except, that in the female, the uterus, with certain parts attached to it, denominated its appendages, and the vagina are placed between them.

The course of the peritoneum through the pelvis must be first examined. The bladder receives a covering of peritoneum to the same extent as the bladder of the male, the membrane being continued from the abdominal muscles downwards, first upon its fundus, and then upon its posterior part. From the lower and back part of the bladder, the peritoneum is reflected backwards to the front of the uterus, whence it is continued upwards upon the cervix and body to the superior edge or fundus of the uterus, and thence downwards upon the posterior part of the organ. The uterus is thus included between two layers of peritoneum.

From the lower and back part of the cervix uteri, the peritoneum is continued downwards upon the posterior side of the vagina in the upper half of its extent, and is thence reflected backwards to the front of the rectum, leaving a loose pouch between the two organs. By passing the hand downwards between the vagina and rectum, it will readily enter the peritoneal pouch, which is similar to that left between the bladder and rectum in the male. The peritoneum extending to the rectum, invests the gut precisely in the same manner as in the male subject.

From the lateral edges of the uterus, the two layers of peritoneum, covering the anterior and posterior surfaces of the organ, are extended outwards to the walls of the pelvis on each side, forming the Broad Ligaments of the Uterus. Between these layers which constitute the broad ligaments, there are enclosed the Ovary, with its Ligament, and the Fallopian Tube and the Round Ligament, with the vessels and nerves distributed to these parts.

From the manner in which each broad ligament is extended across from the lateral edge of the uterus, to the side of the pelvis, it will be observed that the uterus, together with its broad ligaments, forms a complete partition, extending transversely across the cavity of the pelvis, and separating it into an anterior division, containing the bladder, and a posterior division, the rectum.

ANTERIOR and POSTERIOR LIGAMENTS of the UTERUS are sometimes described. The former consist of two small folds formed by the peritoneum as it is reflected from the back of the bladder to the front of the uterus, and the latter, of two similar folds, sometimes but indistinctly seen, between the vagina and rectum, on each side of the peritoneal pouch.

The UTERUS is placed rather obliquely in the pelvis between the bladder and the rectum, its superior broadest part or fundus having an inclination backwards, and its lower contracted part or cervix having an inclination forwards. The figure of the uterus is triangular with its greatest breadth in the transverse direction. Its anterior and posterior surfaces are convex. That part of the organ which is between the fundus and cervix is denominated its body. The lower end of the cervix uteri is united to the vagina, and has an oval opening, the longest diameter of which is in the transverse direction. This opening is named either the OS UTERI, OS INTERNUM, or OS TINCÆ. The uterus is fixed in its situation by the broad ligaments connecting its sides with the walls of the pelvis.

The appendages of the uterus consist of the Fallopian Tubes, the Ovaries with their Ligaments, and the Round Ligaments. All these parts are contained with the vessels and nerves of the uterus between the layers of the Broad Ligaments.

The FALLOPIAN TUBES are two small and tortuous canals between four and five inches in length. Each tube arising from the upper angle of the uterus proceeds transversely outwards in the upper part of the broad ligament. At its termination each tube presents an expanded orifice, the margin of which is divided into separate portions so as to have a fringed appearance; hence it is denominated the fimbriated extremity. This extremity of the fallopian tube perforates the peritoneum, by which a communication is formed between the interior of the tube and the cavity of the abdomen. The different portions into which the extremity of the fallopian tube is divided are not all of the same length, and the longest of them is extended backwards to the ovary of the same side, with which it is connected.

The OVARIES are two whitish bodies of an oblong and flattened figure enclosed within the broad ligaments, but more especially connected with their posterior layer. A small fibrous cord, named the Ligament of the ovary is attached to each of these bodies on their inner sides. At its other extremity this cord is fixed to the upper angle of the uterus behind the fallopian tube.

The ROUND LIGAMENTS are two whitish cords arising from the upper angles of the uterus in front of and rather below the Fallopian tubes. Each round ligament proceeds from the uterus outwards and rather upwards within the broad ligament, and then ascends on the inside of the external iliac vessels to the aperture in the fascia transversalis, through which it is continued with the spermatic vessels to the groin.

The course of the vagina is now to be examined. The levator ani muscle is seen passing downwards from the neck of the bladder by the side of the vagina to the rectum. When this muscle is turned downwards, the vagina will be exposed, and is to be cleaned with the urethra, which is in close union with its upper or anterior side.

The VAGINA is a membranous canal placed in the middle of the inferior aperture of the pelvis, between the bladder and urethra which are in front of it, and the rectum which is behind it. The length of the vagina is between five and six inches, and its breadth about one inch. Beginning above at the neck of the uterus, it is extended rather obliquely downwards and forwards, and with a slight concavity towards the bladder and urethra, to the pudendum, where it terminates by an orifice which is sometimes denominated the Os EXTERNUM. The sides of the vagina are composed of a thick and firm substance, of a greyish colour, with numerous large vessels ramifying through it. The upper extremity of the vagina surrounds the neck of the uterus obliquely, so that the os uteri approaches nearer to the os externum in front than behind. The fibres of the sphincter vaginæ surround the canal near its external orifice, and when these are removed, a spongy substance is brought into view, which also encircles the canal. This substance is about an inch in breadth, of a dark blue colour, is composed altogether of veins, and is named the PLEXUS RETIFORMIS. The anterior side of the vagina is united to the lower part of the bladder by loose cellular tissue, and to the urethra by a substance of a much firmer texture. On its posterior side, the canal is covered externally in its upper half by the peritoneum in its reflection from the uterus to the rectum, and in the rest of its extent it is united to the rectum by cellular tissue which is loose above, but lower down, is of so firm a texture as to render these parts hardly separable without injury.

The situation of the female bladder corresponds to that of the male. The female bladder is, however, usually larger than that of the male, and has a different form. It is rather of a triangular than oval shape, with its broadest part turned downwards, and extending transversely across the cavity of the pelvis. In the female, the bladder, when filled, acquires a rounded figure, and does not rise upwards to the same extent as in the male.

The female urethra is between one and two inches in length. The canal is also of larger diameter, and more susceptible of dilatation than the urethra of the male. Beginning at the neck of the bladder, it proceeds almost horizontally forwards beneath the arch of the pubes to the pudendum, where it terminates by the orifice, named the meatus urinarius, the situation of which has been already described. The urethra is united to the arch of the pubes by two small slips of muscular fibres, corresponding to those described in the male, which descending from the bone, encircle the canal, and are united beneath it. The sides of the female urethra are formed internally by a thin mucous membrane; and externally, by a thick layer of soft and vascular substance of a peculiar nature, which is connected with the surrounding parts by loose cellular tissue.

CHAP. VI.

VESSELS AND NERVES OF THE PELVIS.

The Internal Iliac Artery descends into the pelvis, between its walls and the viscera, and terminates by dividing into many branches, some of which are distributed to the parts within the pelvis; and others leaving the pelvis, are distributed to the parts on its outside. These branches may be altogether enumerated in the following order:

1. Ilio-Lumbalis, which passes outwards between the psoas magnus and iliacus internus muscles, towards the crista ilii, where it ends in branches which are distributed to the lumbar and abdominal muscles, and communicate with the lumbar and circumflexa ilii arteries.

2. Sacræ Laterales, which vary in their number and mode of origin. Sometimes there is but one artery on each side, but more commonly there are two or three, or even four small arteries, which arising either from the internal iliac or from one of its

branches, descend upon the sacrum, and terminate in communications with the arteria sacra media. Branches of the sacræ laterales, entering the holes in the sacrum, are distributed upon the cauda equina and its membranes.

3. UMBILICALIS. The umbilical artery, forming an essential part of the fœtal circulating system, is changed after birth into an impervious fibrous cord, which ascends obliquely along the side of the bladder, whence it continues its course upwards to the umbilicus. The artery, for a small distance after its origin from the internal iliac, remains pervious in the adult, and gives off the following branches:

(*a*) Two or three vesical arteries distributed upon the side of the bladder.

(*b*) Hæmorrhoidal arteries distributed to the side of the rectum.

(*c*) Branches distributed to the side of the uterus and vagina.

4. VESICALES usually consisting of one or more small arteries distributed to the bladder, but varying in number and size according to the number of arteries which the bladder derives from the other branches of the internal iliac.

5. HÆMORRHOIDALIS MEDIA, which is a large artery running along the front of the rectum to the sphincter. It communicates freely with the other arteries of the gut and gives off branches to the bladder, vesiculæ seminales, prostate, and to the vagina.

The hæmorrhoidalis media is frequently given off by one of the branches, and not by the trunk of the internal iliac. Sometimes it is altogether wanting.

6. Uterina, which entering between the layers of the broad ligament, passes along the side of the uterus, and is reflected to the posterior surface of the organ. It terminates in branches, which ramify through the substance of the uterus, and communicate freely with the artery of the opposite side. In its course to the uterus, the uterine artery gives off:

(*a*) A branch to the fallopian tube and ovary, which communicates with the spermatic artery.

(*b*) Branches to the bladder and vagina.

7. Obturatoria. The obturator artery passes forwards from the internal iliac to the upper edge of the obturator internus muscle, and is then continued with the corresponding vein and nerve through the obturator foramen into the thigh, where it divides into two branches, which distribute themselves upon the capsule of the hip, and upon the surrounding muscles. They communicate with the internal circumflex branch of the femoral and with the ischiatic artery. Before the obturator artery leaves the pelvis, it gives off branches to the obturator internus muscle to the bladder and prostate gland.

The obturator artery is subject to many varieties in the mode of its origin. It sometimes arises from the external iliac by a common trunk with the epigastric, or it may have its origin from one of the principal branches of the internal iliac, as from the ilio-lumbalis, glutæal, ischiatic or pudendal arteries. In a few instances it has been seen to arise from the femoral artery, and to ascend from the thigh beneath Poupart's ligament into the pelvis. When it arises by a common trunk with the epigastric, it then descends behind the os pubis to the obturator foramen.

8. GLUTÆA, which is the largest branch of the internal iliac, arising from the back part of the trunk, turns outwards and backwards to pass out of the pelvis through the highest part of the great sacro-ischiatic notch, and above the pyriformis muscle. Its further distribution will be described with the dissection of the buttock.

9. ISCHIATICA, which is next in size to the glutæal, passes out of the pelvis through the lower part of the great ischiatic notch and below the pyriformis muscle. Its further distribution will be described with the dissection of the buttock.

10. PUDENDA. The pudendal artery also passes out of the pelvis through the lower part of the great ischiatic notch, and then turns downwards beneath the posterior ischiatic ligament and enters the pelvis again through the lesser ischiatic notch.

Within the pelvis, the pudendal artery proceeds almost horizontally across the lower part of the obturator internus muscle to the ramus ischii just above the tuberosity, and then ascends upon the inside of the ramus as high as the attachments of the transversus perinei and erector penis muscles, where it terminates by dividing into two branches which will be presently mentioned. The artery is covered in this part of its course within the pelvis by the aponeurotic expansion, which is extended over the obturator internus muscle. The branches which it gives off before its division are,

(*a*) Several arteries to the muscles of the buttock, some of which descend upon the back of the thigh, and communicate with the internal circumflex branch of the femoral, and with the obturator artery.

(*b*) Hæmorrhoidales Externæ, distributed to the levator and sphincter ani muscles, and communicating with the hæmorrhoidales mediæ.

The two branches in which the pudendal artery terminates are named the perinea superficialis and profunda penis, the former of which has been described with the dissection of the perineum.

The Profunda Penis, continuing the course of the pudendal trunk, proceeds upwards on the inside of the ramus of the ischium and pubes to the symphysis pubis, where it divides into

(*a*) The Superficialis Dorsi Penis, which is distributed upon the back of the penis to the glans and prepuce in which its branches terminate.

(*b*) A deep-seated branch which enters the corpus cavernosum of its own side, and is distributed through it to its front extremity. The ramifications of this artery open into the cells of the corpus cavernosum, and by distending them with blood, produce the erection of the penis.

In females, the artery corresponding to the profunda penis ascends to the body of the clitoris, and here divides into two branches, the superficialis dorsi clitoridis and the deep-seated branch which penetrates the corpus cavernosum clitoridis.

The ultimate branches of the pudendal artery, distributed to the external organs of generation, have communications with the external pudic branches of the femoral artery.

The pudendal artery frequently has its origin by a common trunk with some of the branches of the internal iliac, especially with the ischiatic artery.

In the dissection of the abdomen, it is stated that the Inferior Mesenteric Artery, descending into the pelvis, changes its name for that of Internal Hæmorrhoidal. This artery is now seen continuing its course along the posterior surface of the rectum, and between the layers of the meso-rectum. Its branches surround the rectum, and communicate freely with the other hæmorrhoidal arteries.

The Veins of the pelvis corresponding to the branches of the internal iliac artery, form by their union the internal iliac vein, which on the right side is placed immediately behind the corresponding artery, and on the left rather below and on the inside of it.

The Internal Hæmorrhoidal vein, corresponding to the internal hæmorrhoidal artery, ascends from the pelvis into the abdomen, and is continued into the inferior mesenteric vein.

The Sacral Plexus of Nerves is formed by the union of branches of the four first sacral nerves with the branch which descends from the last lumbar nerve. The plexus is placed at the back part of the pelvis, close upon the origin of the pyriformis muscle. It will be sufficient to enumerate the branches of the plexus, which are named according to the parts they supply. They are the Glutæal, Pudendal, Hæmorrhoidal, Vesical, Uterine, and Vaginal Nerves. The sacral plexus, having given off these branches, terminates in the ISCHIATIC NERVE, which descends in front of the pyriformis muscle and passes out of the pelvis through the lower part of the great ischiatic notch. Its further course will be described with the dissection of the lower extremity.

The ABSORBENT GLANDS of the pelvis are very numerous. Some of them are distributed round the large blood vessels, and upon the sides of the bladder, uterus, and vagina; and others are found between the layers of the meso-rectum.

CHAP. VII.

DISSECTION OF THE INFERIOR EXTREMITY.

SECT. I.

OF THE THIGH, FRONT PART.

THE integuments are to be carefully reflected from the front and inside of the thigh, in order that the vessels and nerves may not be injured, which ramify superficially, upon the fascia binding down the muscles. Before the fascia itself is dissected, these vessels and nerves must be examined.

Many CUTANEOUS NERVES pass through apertures in the fascia, and then ramify downwards upon the front and inside of the thigh. These are derived, either from the lumbar nerves, or from the anterior crural nerve.

The VENA SAPHENA MAJOR, or INTERNA, ascends from the knee obliquely up the inside of the thigh to its upper part. It then enters a space which is left in the fascia, and opens into the femoral vein, at about an inch and a half below Poupart's ligament. The Saphena Major receives many small veins in different parts of its course. One of these, larger than the rest, frequently proceeds some way up the inside of the thigh before it opens into the saphena.

Absorbent Glands, from six to eight in number, are disposed in clusters about the upper part of the thigh, near the termination of the vena saphena. Absorbent vessels pass up the front of the thigh, and terminate in these glands. The vessels, however, are seldom discernible, except when they are distended by fluid in anasarcous subjects.

These absorbent glands, vessels and nerves, are enclosed between irregular layers of cellular tissue, forming altogether a dense covering, immediately beneath the integuments, which has been described by the name of Fascia Superficialis of the thigh, although it has, in fact, nothing of a tendinous structure.

When the Fascia Superficialis is removed, the Fascia Lata, which binds down the muscles, is brought into view. It extends entirely round the thigh, but is not of equal thickness throughout. It is very thick on the outer side, not so thick at the back part and in front, and towards the inner side of the thigh it becomes so thin that it almost loses the appearance of tendinous structure, resembling common cellular tissue, and requiring, on that account, a very careful dissection to demonstrate it. This fascia not only gives the muscles a covering externally, but at the outer side and back part of the thigh, sends processes inwards, forming partitions between them. In the front of the thigh, the fascia is attached above to Poupart's ligament, and to the anterior edge of the os pubis. Behind, it begins as high as from the external border of the crista of the ilium, and has a firm and broad attachment to the tendon of the glutæus maximus, and some of its fibres gradually arise upon the muscle itself. In tracing the fascia downwards, we find it firmly united in front with the tendon of the rectus muscle, and behind, it is continued from the lower part of the thigh over the back of the knee joint, and is joined to the fascia of the leg.

In various parts of the fascia lata, small apertures are seen for the passage of vessels and nerves, and just below Poupart's ligament, there is a considerable interval where the vena saphena major joins the femoral vein. This interval is formed by the division of the fascia into two portions, which have the distinct attachments already noticed, one to the front of Poupart's ligament, the other to the front edge of the os pubis. That portion of the fascia attached to Poupart's ligament, presents a crescent-shaped edge, the concavity of which is directed towards the pubes, and is denominated either its semilunar edge or falciform process. If this semilunar edge of the fascia is traced downwards, it will be found continued into a second semilunar edge, the concavity of which is directed upwards. It is over this second semilunar edge that the vena saphena passes, as it ascends to the interval between the two portions of the fascia where it joins the femoral vein. These semilunar edges are occasionally not distinct in fat subjects, in whom the fascia is often separated into layers, with fat deposited between them. We may here observe, that for the dissection of fasciæ, and other parts of a tendinous nature, emaciated and anasarcous subjects are the most suitable.

The anatomy of the fascia lata at the upper and inner part of the thigh, as here described, may be easily comprehended by the student in his first dissection, but for a complete knowledge of these important parts, he must refer to the more minute description of them in Mr. Lawrence's Treatise on Ruptures.

The fascia lata being removed from the front and sides of the thigh, it must be the first object of the student to expose the trunks of the femoral vessels and the anterior crural nerve, immediately below Poupart's ligament. The femoral vein is situated internally, or is the nearest to the pubes. The artery is situated close to the outer side of the vein, and the crural nerve at a short space from the outer side of the artery.

Having well remarked the situation of these vessels and of the nerve, the student should then proceed to clean the muscles which occupy the front and sides of the thigh, taking care, in the mean time, not to sepahe muscles first in situ to be rem

rate them in the least degree from their lateral connexions, so that he may be enabled to learn the name of each muscle as it lies in its natural situation.

Immediately on the outer side of the femoral vessels, and anterior crural nerve, the Psoas Magnus and Iliacus Internus muscles are seen descending together in one mass beneath Poupart's ligament into the thigh.

On the outer side of this mass, the Sartorius muscle is seen attached above, to the anterior superior spine of the ilium, and thence winding obliquely round the front and inside of the thigh down below the knee.

On the outer side of the sartorius, is a small muscle, the Tensor Vaginæ, descending from the anterior superior spine of the ilium along the outer side of the thigh.

Immediately on the inside of the femoral vessels and crural nerve, and rather behind the former, is the Pectinalis muscle, attached above to the front of the os pubis.

Next to the pectinalis, is a large mass of muscle occupying the inside of the thigh at its upper part, and denominated the Triceps.

Next to the triceps, is a long slender muscle, the Gracilis, running straight from the symphysis pubis down below the knee.

On the outer side of the thigh, at its lower part, is the Vastus Externus muscle.

On the inside of the thigh, at its lower part, is the Vastus Internus muscle.

The front of the thigh is occupied by a mass of muscle, consisting of the Rectus, placed between the two vasti, and of the Cruræus placed beneath the rectus, closely upon the front of the femur. The cruræus is here necessarily mentioned, although it cannot be seen until in the progressive dissection of the vessels and nerves the surrounding muscles are separated.

VESSELS AND NERVES ON THE FRONT OF THE THIGH.

The student having gained a knowledge of the names and general position of the muscles occupying the front and sides of the thigh, must now continue the dissection of the vessels and nerves; and in tracing these downwards from beneath Poupart's ligament, he will be perplexed by a confusion of parts, unless he is careful to clean, in the first place, the trunks of the vessels and nerves, and then to follow the branches of each regularly to their terminations. The smaller veins may be removed in order that the arteries and nerves may be more readily dissected.

The Femoral Artery passes from beneath Poupart's ligament, obliquely down the front and inside of the thigh, over the pectinalis and triceps muscles. Reaching the lower part and inside of the thigh, it is here contained in a tendinous sheath, and then passes into the ham through a wide opening left between the tendons of those portions of the triceps hereafter described as the adductor longus and magnus. In the ham it acquires the name of popliteal.

In passing beneath Poupart's ligament, the femoral artery is found just above the smooth surface in the upper and front part of the os pubis, and at the mid-space between the anterior superior spine of the ilium and the spine of the pubes. The femoral vein in passing beneath Poupart's ligament is found close by the inner side of the artery, a thin stratum of cellular tissue only intervening. The anterior crural nerve is found about half an inch on the outer side of the artery, and some fibres of the psoas magnus are seen projecting between them.

Between the integuments and the femoral artery in the upper part of its course, the fascia lata and cellular tissue only intervene; but as the artery descends, it becomes covered in front by the sartorius, which crosses obliquely over it, and conceals it in the rest of its course down the inside of the thigh.

The tendinous sheath in which the artery is lodged just before it enters the ham, is formed in the following manner. Posteriorly and laterally, it is formed by the tendon of that portion of the triceps, denominated the adductor longus, and by the tendon of the vastus internus. Anteriorly, it is formed by a broad portion of fascia which is extended across from the tendon of the adductor magnus to the vastus internus muscle. The whole length of the sheath is about three inches. At about one third from the lower end of the femur the artery quits the sheath, and enters the opening between the tendons of the adductors into the ham. Besides the artery, the femoral vein and the branch of the crural nerve, denominated the Nervus Saphenus, are lodged in this sheath.

The femoral vein formed by the continuation of the popliteal vein from the ham, proceeds up the thigh, first behind, and rather towards the outer side of the femoral artery. Then changing its direction, the vein passes gradually towards the inner side of the artery, in which situation it is found at the upper part of the thigh from the point where it receives the saphena to its passage beneath Poupart's ligament into the abdomen.

The femoral artery and vein are surrounded and closely connected in their whole course by condensed cellular tissue, and immediately below Poupart's ligament, they are enclosed between the portion of fascia which is extended downwards from the fascia iliaca, and that part of the fascia lata which terminates in the semilunar edge. The vessels are not, however, completely covered in front by the fascia lata, a small part of the femoral vein on its inner side is covered only by the condensed cellular tissue just mentioned. If the handle of a knife is passed behind the femoral vessels so as to raise them, it will be seen that the production of the fascia iliaca upon which they lie, is continuous with the fascia lata covering the pectinalis muscle.

Three or four ABSORBENT GLANDS are found beneath the fascia lata at the upper part of the thigh, and generally close to the femoral vessels.

BRANCHES OF THE FEMORAL ARTERY.

1. Small arteries to the inguinal glands.

2. The EXTERNAL PUDICS, which are two or three small branches distributed to the external organs of generation as the scrotum, penis, and labia pudendi. They communicate with the ramifications of the internal pudendal arteries which are distributed to the same organs.

The external pudics sometimes arise from the profunda.

3. The PROFUNDA, which arises from the femoral at about an inch and a half or two inches below Poupart's ligament, is of so large a size, that it seems to be formed by a division of the femoral artery into two equal branches, one superficial, which is the continued trunk, the other deep-seated, named the profunda. At its origin, the profunda is covered by the femoral trunk, and it descends obliquely backwards upon the triceps, and down the inside of the femur almost to its middle, where it ends in two branches, denominated PERFORATING ARTERIES. These penetrate between the fibres of the triceps, and are distributed to

the muscles on the back part of the thigh, where they communicate with the branches of the ischiatic and obturator arteries.

The profunda gives off,

(a) The External Circumflex, which arising from the outer side of the profunda soon after its origin, passes beneath the rectus and sartorius muscles, towards the trochanter major, and ends in branches distributed to the surrounding muscles, and communicating below with the articular arteries of the knee.

(b) The Internal Circumflex, which arising from the inner side of the profunda opposite to the middle of the pectinalis, passes outwards and backwards near to the os femoris, and ends in branches distributed to the muscles surrounding the bone, and to the flexor muscles of the leg. They have free communications with the branches of the obturator artery.

The circumflex arteries are sometimes branches of the femoral trunk.

These are all the branches of the femoral artery which admit of distinct description, but in its whole course down the thigh it sends off other small branches to the surrounding parts.

The Femoral Vein receives branches corresponding to the principal branches of the femoral artery; and a little below Poupart's ligament, it receives the saphena, which has been already described.

The ANTERIOR CRURAL NERVE passing beneath Poupart's ligament into the thigh, soon divides into branches which may be distinguished into two sets, the superficial or cutaneous, and the deep-seated or muscular. The cutaneous branches varying from two to six, pass through the apertures of the fascia, and ramify upon it. The muscular branches are variable in number, and are distributed to the muscles occupying the front and inside of the thigh. One of these smaller than the rest descends immediately in front of the femoral artery as far as the knee. Two larger branches pass downwards close to the outer side of the artery; of these, one penetrates the vastus internus, the other, denominated the NERVUS SAPHENUS, continuing its course downwards, enters the tendinous sheath in front of the artery. Then passing out of the sheath at its lower end, the nerve appears superficially on the inside of the thigh, a little above the knee.

The dissection of the vessels and nerves being thus completed, the student must, in the next place, separate the muscles throughout their course, in order that a distinct view may be gained of their origins and insertions.

ORIGINS AND INSERTIONS OF THE MUSCLES ON THE FRONT OF THE THIGH.

The SARTORIUS arises by a short tendon from the anterior superior spine of the ilium, between the tensor vaginæ and the iliacus internus,[r] and descends the superior half of the thigh, passing obliquely in front of it to its inner side, whence it is continued almost in a strait line to the knee. Below the knee, it turns forwards, and ends in a flattened tendon which is inserted into the inside of the tibia just below its anterior tuberosity. As the sartorius crosses the upper part of the thigh, it passes successively over the rectus, vastus internus and adductor longus. In the lower part of its course it is placed between the tendon of the adductor magnus and the gracilis, and at its insertion it is placed above the tendons of the gracilis and semitendinosus muscles, to both of which it is connected by tendinous fibres.

The TENSOR VAGINÆ, or FASCIALIS arises by a short tendon from the anterior superior spine of the ilium between the sartorius and the anterior fibres of the glutæus medius, and descends straight along the outer edge of the rectus to a short distance below the trochanter major, where it terminates by becoming enclosed within a duplicature of the fascia lata.

The PECTINALIS arises from the ridge in the upper and front part of the os pubis, and proceeds downwards and backwards between the psoas magnus and adductor longus; here ending in a flat tendon, which is fixed into the upper part of the linea aspera immediately below the trochanter minor.

The insertion of the pectinalis being exposed, the conjoined tendon of the psoas magnus and iliacus internus will now be seen descending over the hip joint close upon the capsule to be attached to the trochanter minor. A large bursa mucosa is placed between the tendon and the capsule of the hip.

The Triceps Adductor. This consists of three portions descending from the inside of the os pubis and ischium to the inner side and back part of the thigh. These portions are distinguished by the epithets Longus, Brevis, and Magnus.

The Adductor Longus is placed most superficially along the lower and inner edge of the pectinalis.

The Adductor Brevis, the smallest portion, is placed partly behind the adductor longus and partly behind the pectinalis.

The Adductor Magnus is the large mass of muscle situated behind the adductor longus and brevis, and extending towards the back part of the thigh.

The Adductor Longus arises by a short round tendon from the upper part and inside of the os pubis near its symphysis. It forms a thick muscle which becomes broader as it descends, and terminates by a tendinous attachment to the linea aspera in its middle part and along one third of its extent.

The Adductor Brevis arises by a thick flat tendon from the lower part of the os pubis near its symphysis, and descending inwards behind the pectinalis and adductor longus, is inserted tendinous into the upper part of the linea aspera, above and behind the insertion of the adductor longus.

The Adductor Magnus arises tendinous from the ramus of the os pubis and ischium as low down as the tuberosity. It forms a very broad and large muscle, the fibres of which run outwards and downwards with various degrees of obliquity. The upper fibres run almost directly across the back part of the thigh, and along the lower edge of the quadratus femoris to be inserted into the upper part of the linea aspera. The lower fibres proceed more obliquely downwards to be attached to the linea aspera and to the oblique ridge leading to the inner condyle, and into the condyle itself by a round tendon.

These three portions of the triceps are often so intimately connected as to render their separation difficult.

The GRACILIS arises by a flat tendon from the lower part of the os pubis close to its symphysis, and proceeds strait down the inside of the thigh to the knee, where it ends in a tendon which turns forwards and is attached to the inside of the tibia between the tendons of the sartorius and semitendinosus.

The RECTUS arises by two tendons, one from the anterior inferior spine of the ilium, the other from the surface of the ilium just above the acetabulum and from the capsule of the hip joint. The two tendons soon unite, and end in a mass of muscle which proceeds strait downwards, and becomes gradually broader to the middle of the thigh. Here it contracts, and terminates in a thick flat tendon which is connected on each side with the tendons of the vasti, and is attached to the upper extremity of the patella.

The VASTUS EXTERNUS arises from the lower part of the trochanter major, from the outer side of the linea aspera, and from nearly the whole external surface of the os femoris. Soon after its origin, it overlaps the cruræus and becomes connected with it in the rest of its course down the thigh. Towards its termination, the fibres proceed obliquely forwards, and are inserted, partly into the edge of the tendon of the rectus, and partly by distinct tendinous fibres into the side of the patella.

The Vastus Internus arises from the fore part of the trochanter minor, from the inside of the linea aspera and from the whole internal side of the os femoris as far as the condyle. Its fibres proceed obliquely forwards, and are inserted partly into the edge of the tendon of the rectus, and partly by a tendinous attachment into the side of the patella. The fibres of the vastus internus are intimately connected in the greater part of their course with the fibres of the cruræus. An aponeurosis is extended downwards from the tendon of the rectus and from the tendinous attachments of the vasti, over the front of the patella and sides of the knee. Below, it is connected with the ligamentum patellæ and with the head of the tibia, and is joined to the fascia of the leg. In its passage over the sides of the knee, this aponeurosis is united to the capsule of the joint by cellular tissue.

The Cruræus arises from the front of the os femoris, where it begins above between the trochanter major and minor, and thence extends a considerable way downwards, and is in great part overlapped by the two vasti. From the lower part of the cruræus, a flat tendon proceeds downwards, between the vasti and behind the tendon of the rectus, to be attached to the upper edge of the patella.

These three muscles, the two vasti and cruræus, form but one mass of flesh, covering the front and sides of the femur, nearly in its whole length. It is only at their commencement above, that a distinct separation can be traced between them. At their insertions, the tendons of the three muscles, and the tendon of the rectus, are all intimately connected.

When the muscles proceeding from the pelvis to the inside of the thigh are removed, the origin of the obturator externus will be brought into view from the front of the os pubis and the external surface of the obturator ligament.

SECT. II.

OF THE BUTTOCK AND BACK PART OF THE THIGH.

Upon the reflection of the integuments from the buttock and back part of the thigh, the Glutæus Maximus muscle is seen covering the lower and back part of the os innominatum. From the front edge of the glutæus maximus, a portion of fascia is extended over a part of the Glutæus Medius muscle, to the posterior margin of the crista ilii, where it is attached.

The Glutæus Maximus arises from the posterior margin of the crista ilii in about one half of its length, from the posterior surface of the sacrum and coccyx, and from the posterior sacro-ischiatic ligament, over which the muscle hangs in a loose fold. Its fibres, which are very large, proceed from these origins obliquely downwards, forming a broad and thick muscle, which ends in a flat tendon. The tendon slides over the back part of the trochanter major, and terminates partly in a broad and firm connexion with the fascia lata, and partly by insertion into a rough surface of the os femoris at the upper and external part of the linea aspera, immediately below the trochanter major. A large bursa mucosa is placed between the tendon of the glutæus maximus and the trochanter major.

When the glutæus maximus is reflected from its origins, and the portion of fascia in front of the muscle is removed, the whole of the Glutæus Medius will then be exposed. In raising the glutæus maximus, care is required to avoid detaching at the same time any of the small muscles beneath it. Numerous large branches of the glutæal artery are distributed to the under surface of the glutæus maximus, and must necessarily be divided in reflecting the muscle.

The GLUTÆUS MEDIUS arises from that part of the dorsum ilii which is between the crista and the semicircular ridge extending across between the anterior superior spine and the ischiatic notch, also from the fascia which covers it. Its fibres form a thick and triangular muscle which proceeds downwards, and ends in a tendon attached to the upper and front part of the trochanter major.

The glutæus medius is to be reflected from its origin, and in doing this, care is required to avoid raising the next muscle, the Glutæus Minimus. This is situated beneath the lower part of the glutæus medius, and closely covers the lower and front surface of the os innominatum.

The GLUTÆUS MINIMUS arises from the whole surface of the dorsum ilii, below the semicircular ridge. Its fibres proceed downwards, converging into a tendon which is attached to the upper and front part of the trochanter major.

A small pyramidal muscle emerges from the ischiatic notch, and descends obliquely over the glutæus minimus to the trochanter major. This is

The Pyriformis. It has its origin within the pelvis from the hollow of the sacrum, by distinct fleshy digitations, which are attached to the bone in the intervals between the anterior sacral foramina. Some fibres also arise from the anterior sacro-ischiatic ligament and adjacent part of the ilium. The muscle passing out at the great sacro-ischiatic notch, proceeds obliquely downwards, and ends in a round tendon which is attached to the cavity at the root of the trochanter major, above the tendons of the gemelli and obturator internus, with which it is intimately connected. The pyriformis is sometimes separated into two portions, a division of the ischiatic nerve passing between them.

Above the pyriformis, the glutæal artery passes out of the pelvis through the great sacro-ischiatic notch. Below the pyriformis, the ischiatic and the pudendal arteries, the ischiatic nerve, with some smaller nerves, also pass out of the same notch.

At a short distance below the pyriformis, three small muscles are seen, one in the middle denominated the Obturator Internus, and one on each side denominated the Gemelli, which are distinguished by the epithets superior and inferior. The ischiatic nerve is seen passing over these three muscles in its course to the back of the thigh.

The OBTURATOR INTERNUS arises within the pelvis, from the posterior surface of the os pubis, and from the obturator ligament. It proceeds downwards, and passes out of the pelvis at the lesser sacro-ischiatic notch. On leaving the pelvis, the muscle is received between the gemelli, and ends in a tendon which passes downwards, closely connected with the tendons of the gemelli on each side, and is inserted into the cavity at the root of the trochanter major. Within the pelvis, the obturator internus is covered by an aponeurotic expansion, from which the fibres of the levator ani take their origin. The surface of the ischium is covered by a thin layer of cartilage, where the obturator internus turns round the bone, and a bursa mucosa is placed between the tendon and the cartilage beneath it.

The GEMELLI or GEMINI. The GEMELLUS SUPERIOR arises from the spinous process of the ischium. The GEMELLUS INFERIOR arises from the back part of the tuberosity of the same bone. The two muscles proceed horizontally outwards by the sides of the obturator internus, and are inserted with it into the cavity at the root of the trochanter major, below the insertion of the pyriformis.

Below the gemellus inferior, a small square muscle extends across from the tuber ischii to the trochanter major. This is

The QUADRATUS FEMORIS, which, arising from the external side of the tuber ischii, proceeds across between the gemellus inferior and the upper fibres of the adductor magnus, to be fixed by a broad attachment to the posterior and inferior part of the trochanter major.

The quadratus femoris being reflected from the trochanter major, the insertion of another muscle is brought into view,

The OBTURATOR EXTERNUS, which has a broad origin from the front of the os pubis, and from the external surface of the obturator ligament; its fibres proceeding outwards, converge into a tendon which passes beneath the neck of the femur, where it adheres to the capsule, and is attached to the cavity at the root of the trochanter major, below the gemellus inferior.

VESSELS AND NERVES OF THE BUTTOCK.

The GLUTÆAL ARTERY passing out of the pelvis through the upper part of the great sacro-ischiatic notch, above the pyriformis and beneath the glutæus maximus, almost immediately divides into two branches, one superficial, the other deep-seated. The superficial branch distributes its ramifications between the glutæus maximus and medius. The deep-seated branch, covered by the glutæus medius, ramifies upon the muscles, and gives off one branch in particular, which extends across the dorsum ilii, so as to form an arch along the glutæus minimus.

The Ischiatic Artery, passing out of the pelvis through the lower part of the great sacro-ischiatic notch, and below the pyriformis, descends towards the thigh beneath the glutæus maximus, and distributes its ramifications downwards between the tuber ischii and trochanter major, where they communicate freely with the upper perforating branches of the profunda, and with the internal circumflex artery.

The Pudendal Artery passing out of the pelvis, through the lower part of the great sacro-ischiatic notch, turns downwards beneath the posterior ischiatic ligament, and enters the pelvis again through the lesser sacro-ischiatic notch. Its further course will be described with the arteries of the pelvis.

The Ischiatic Nerve passing out of the pelvis with the ischiatic artery, and below the pyriformis muscle, descends over the gemelli and obturator internus into the space between the tuber ischii and trochanter major, to the back part of the thigh.

Many small branches of the sacral nerves pass outwards through the posterior sacral holes and great ischiatic notch, and terminate in the glutæi and adjacent muscles.

MUSCLES ON THE BACK PART OF THE THIGH.

Upon the reflection of the fascia, three muscles are exposed.

The Biceps, formed of two portions, placed along the outer side of the thigh.

The SEMITENDINOSUS, connected at its upper part with the biceps.

The SEMIMEMBRANOSUS, lying immediately beneath the semitendinosus.

The BICEPS arises by two distinct heads. The one, the long head, has its origin from the tuber ischii, by a short tendon which is joined to the tendon of the semitendinosus. The other, the short head, arises between the triceps and vastus externus, from the outer side and lower part of the linea aspera, and from the oblique ridge leading to the outer condyle. The fibres of the long head proceed obliquely downwards, and unite with the short head a little above the knee. The muscle then continuing its course downwards, terminates in a tendon which is inserted into the outer side of the head of the fibula.

The SEMITENDINOSUS arises by a tendon from the tuber ischii with the long head of the biceps, to which it is connected by fleshy fibres to the extent of two or three inches down the thigh. Then leaving the biceps, it proceeds obliquely downwards to the inside of the thigh, and soon ends in a long round tendon which passes behind the inner condyle, and is reflected forwards to be attached to the inside of the tibia, below the tendons of the sartorius and gracilis, to which it is connected by aponeurotic fibres. A white tendinous line intersects this muscle obliquely at about its middle.

The SEMIMEMBRANOSUS arises from the tuber ischii in front of the biceps and semitendinosus, by a flat tendon which gives an oblique origin to the fleshy fibres. These proceed down the thigh, and at the lower part end in a tendon which passes behind the inner condyle, to be attached to the back part and inner side of the head of the tibia. Some tendinous fibres are continued downwards from the insertion of this muscle into the fascia covering the popliteus muscle.

Upon the removal of the muscles just described, the attachments of the triceps to the linea aspera in its whole length will then be brought into view.

The perforating branches of the profunda are now met with, penetrating between the fibres of the triceps to the back part of the thigh.

The Ischiatic Nerve descending along the back part of the thigh, passes first over the quadratus femoris and beneath the glutæus maximus, then over the posterior surface of the triceps and beneath the long head of the biceps and semitendinosus. It then enters the ham, and acquires the name of Popliteal. The ischiatic nerve in its course down the thigh gives off many branches, of which some distribute themselves upon the muscles, and others ramify between the integuments and the fascia.

SECT. III.

OF THE HAM.

The Ham is the space left between the tendons of the muscles, at the lower and back part of the thigh, and behind the bend of the knee joint. The tendons thus forming the lateral boundaries of this space are named the ham-strings, and consist of the semitendinosus and semimembranosus on the inner side, and the biceps on the outer. The lower boundary of the ham is formed by the two heads of the gastrocnemius, which pass obliquely downwards from the upper and back part of the condyles of the femur into the leg, and here unite into a single muscle a little below the knee joint.

The Fascia Lata covering the ham is very thin, and beneath it, is a large quantity of soft fat. In dissecting through this fat, the popliteal nerve is first exposed. The popliteal vein and artery are placed more deeply than the nerve, and are closely connected by cellular tissue. The artery lies beneath the vein, and is almost in contact with the femur.

Three or four Absorbent Glands are found deeply imbedded in the fat of the ham, and situated near the popliteal artery; but they are generally so small, that a very careful dissection is required to discover them.

The Popliteal Artery descends rather obliquely outwards through the ham. It first passes between the flexor muscles, and next between the condyles of the femur and the heads of the gastrocnemius. It is then continued downwards behind the knee joint, passing close upon the capsule and over the popliteus muscle. At the lower edge of the latter it terminates by dividing into the anterior and posterior tibial arteries. The popliteal artery gives off

The Articular Arteries, which consist of four or five branches, arising from both sides of the trunk, and thence ramifying round the knee. They communicate above with the lower perforating arteries, and with the external circumflex, and below, with the recurrent branch of the anterior tibial.

Besides the articular arteries, other smaller branches are given off by the popliteal to the gastrocnemius and soleus muscles, and to the parts in the ham.

The Popliteal Vein, formed by the union of the anterior and posterior tibial veins, proceeds upwards through the ham behind, and a little on the outer side of the popliteal artery. The popliteal vein receives a large branch, denominated the saphena minor or externa which ascends from the outer side of the leg.

The ISCHIATIC NERVE usually divides itself at the lower third of the thigh into two branches. In many subjects, however, its division is found much higher, and in some it takes place even as soon as the nerve emerges from the cavity of the pelvis. Of the two branches formed by this division, one is so large as to have the appearance of the continued trunk. This retains the name of ISCHIATIC, until it enters the ham, where it becomes POPLITEAL. The smaller branch is denominated PERONEAL.

The POPLITEAL NERVE proceeds straight downwards through the ham along the edge of the semimembranosus, and then entering the space which is left between the two heads of the gastrocnemius, continues its course into the leg where it acquires the name of POSTERIOR TIBIAL.

The PERONEAL NERVE proceeds obliquely downwards along the edge of the biceps, and passing behind the external head of the gastrocnemius, turns a little forwards, and penetrates between the peroneus longus and fibula. Its further course will be described with the other nerves of the leg.

SECT. IV.

OF THE LEG. FRONT PART.

The muscles of the leg are covered by a fascia, which will be noticed after the description of the parts found between it and the integuments.

The Vena Saphena Major or Interna ascends along the inside and front of the leg. It is formed at the lower part by the union of many branches from the upper surface of the foot, and is continued straight upwards between the skin and fascia of the leg to the knee. It then ascends a little obliquely backwards behind the inner condyle to the inside of the thigh.

The Nervus Saphenus proceeds from the thigh down the inside of the knee with the vena saphena, and is thence continued in company with the vein down the inside of the leg. The filaments of the nerve are distributed superficially, and some of them may be traced over the foot as far as the great toe.

On the outer side and towards the lower part of the leg, a branch of the peroneal nerve is seen penetrating the fascia, and thence continuing its course downwards, it distributes its filaments upon the upper surface of the foot, where they communicate with the filaments of the nervus saphenus.

The Fascia is much thicker where it covers the muscles in the front of the leg than in other situations. It is continuous above with the fascia lata, and is besides attached to the head of the fibula, and is firmly connected with the tendinous insertions of the sartorius, semitendinosus, and gracilis. In its course downwards, the fascia is extended over the muscles in front and behind the leg, and is fixed to the outer and inner edges of the tibia, where it terminates without being continued over the front of the bone, so that the latter is in immediate contact with the skin. Below, the fascia appears lost in the cellular tissue about the heel, and in front, it is continuous with a broad band of tendinous fibres extended across the front of the ancle joint, and denominated the Annular, or Transverse Ligament. The annular ligament is attached on the outer side of the foot, to the upper part of the os calcis, and is thence continued across the front of the ancle joint, binding down the tendons of the extensor muscles, and on the inner side, is attached to the malleolus internus and os naviculare.

A broad band of tendinous fibres, which may be denominated the Internal Annular Ligament, extends from the malleolus internus to the posterior part and inner side of the os calcis. The tendons of the flexor muscles, and the posterior tibial vessels and nerve pass beneath this ligament in their course from the leg into the sole of the foot.

In reflecting the fascia from the front of the leg, it is found so firmly adherent to the muscles at the upper part, that their surfaces are necessarily left rough and irregular. Processes of the fascia are also remarked entering between the muscles, separating them and giving attachments to their fibres. Upon the removal of the fascia, three muscles are brought into view in the front of the leg, between the tibia and fibula, and two along the outer side of the fibula. The three in front and between the tibia and fibula, consist of

The Tibialis Anticus, placed close to the tibia.

The Extensor Longus Digitorum Pedis, situated on the outer side of the tibialis anticus at its upper part.

The Extensor Proprius Pollicis Pedis, situated between the tibialis anticus and the extensor longus digitorum at their lower part.

The two muscles placed along the outer side of the fibula, are

The Peroneus Longus, attached to the upper part of the fibula.

The Peroneus Brevis, situated beneath the lower part of the peroneus longus.

The Tibialis Anticus arises from the tuberosity and outer side of the tibia in the upper half of its extent, and from the adjacent part of the interosseous ligament. Its fibres proceed downwards and inwards, and are firmly connected with the aponeurotic expansion, separating them from the extensor longus digitorum. At the beginning of the lower third of the leg, they terminate in a thick and flat tendon, which passes forwards from the lower end of the tibia over the ancle joint, and beneath the annular ligament, and continues its course to the inside of the foot, where it is attached to the internal side of the os cuneiforme internum, and to the metatarsal bone of the great toe. Between the tendon and the cuneiform bone, there is a small bursa mucosa.

The Extensor Longus Digitorum Pedis arises from the outer side of the head of the tibia, from the adjacent part of the head of the fibula, from the interosseous ligament, and from the front surface of the fibula nearly all the way down the leg. It proceeds obliquely downwards and inwards, and is connected in its course with the aponeurotic expansions, separating it on one side from the peronei muscles, and on the other, from the tibialis anticus. In the lower part of the leg it terminates in four tendons, which pass beneath the annular ligament, and are continued forwards upon the foot to the four lesser toes, where they are expanded over the upper surfaces of their phalanges.

The Extensor Proprius Pollicis Pedis arises from the inner side of the fibula, and from the interosseous ligament. Its origin begins just below the head of the bone, and extends almost to its lower end. It terminates in a tendon which passes beneath the annular ligament, and then proceeds forwards upon the foot, inclining at the same time inwards to terminate in the first and second phalanges of the great toe by distinct tendinous slips.

A small muscle is occasionally placed along the outer side of the extensor longus digitorum. This is

The PERONEUS TERTIUS. It arises from the lower part of the fibula, and proceeds downwards beneath the annular ligament, and over the foot to be attached by a distinct tendon to the tarsal end of the metatarsal bone belonging to the little toe.

This muscle is sometimes wanting, and when it does exist, it varies so much in its appearance that it will scarcely be found alike in any two subjects. The tendon alone may be present, and when there are distinct fleshy fibres giving rise to the tendon, they are almost constantly united with the extensor longus digitorum, so completely as to form a part of it.

The PERONEUS LONGUS arises from the outer side of the two upper thirds of the fibula, and by a few fibres from the head of the tibia. It proceeds downwards, and is connected in its course with the aponeurotic expansions, separating it in front and behind from the adjacent muscles. It terminates in a tendon which proceeds through a groove in the lower end of the fibula behind the projection of the bone, forming the malleolus externus. The tendon is then reflected forwards obliquely over the outer side of the os calcis, is continued through a groove in the os cuboides, and passes across the sole of the foot to terminate in the tarsal end of the metatarsal bone belonging to the great toe. Its insertion cannot be seen until the muscles of the foot are dissected.

The PERONEUS BREVIS arises from the outer side of the lower half of the fibula and from the aponeurotic expansions separating it behind from the flexor longus digitorum, and in front, from the peroneus tertius. It terminates obliquely in a tendon which passes through the same groove in the lower end of the fibula, as the peroneus longus. The tendon of the peroneus brevis is then reflected almost horizontally forwards to be attached to the tarsal end of the metatarsal bone of the little toe.

The tendons of the peroneus longus and brevis, as they pass through the groove in the fibula, are confined in their situations by complete sheaths, which are of a fibrous structure, and are lined by synovial membrane.

There is one muscle placed upon the upper surface of the foot, beneath the tendons of the extensor longus digitorum and extensor proprius pollicis. This is

The EXTENSOR BREVIS DIGITORUM PEDIS. It arises from the upper part of the os calcis, and from the ligament connecting this bone to the astragalus, and forms a thin and square muscle, which proceeds obliquely forwards upon the foot, and separates itself into four fasciculi. These fasciculi end in distinct tendons, which proceed forwards over the metatarsal bones, crossing the tendons of the extensor longus, and are attached to the metatarsal ends of the first phalanx of the great toe, and of the three toes next to it, where they are united with the tendons of the extensor longus.

VESSELS AND NERVES IN THE FRONT OF THE LEG.

The Anterior Tibial Artery passes from the ham between the lower border of the popliteus and the upper fibres of the soleus muscle, and through a wide aperture in the interosseous ligament to the front of the leg. It is here continued downwards, close upon the interosseous ligament, gradually approaching nearer to the tibia as it descends. In the upper part of the leg the artery is found between the tibialis anticus, and extensor longus digitorum muscles, and lower down, between the tibialis anticus and extensor proprius pollicis. From the lower part of the leg, the artery proceeds forwards, and inwards over the ancle joint, and beneath the annular ligament, and crossing under the tendon of the extensor proprius pollicis, is placed between this tendon and the first tendon of the extensor longus digitorum. It is then continued directly forwards over the tarsus to the space between the tarsal ends of the two first metatarsal bones, and penetrates between them into the sole of the foot, where it terminates by joining a large branch of the posterior tibial artery.

The branches of the anterior tibial are,

1. Recurrens, which arising just after the artery appears in the front of the leg, turns upwards, and ramifies over the knee joint, where it communicates with the lower articular arteries.

2. Muscular Branches, which arise from the artery in its whole course.

3. Malleolaris Interna, which ramifies on the inner ancle.

4. Malleolaris Externa, which ramifies on the outer ancle.

5. Tarsea, which passes across the tarsus, beneath the extensor brevis digitorum to the outer edge of the foot, thus forming the tarsal arch, from which proceed the interosseous arteries.

6. Metatarsea, which ramifies upon the metatarsal bones. This is sometimes wanting.

7. Dorsalis Hallucis, which arises from the anterior tibial just before its passage into the sole of the foot, and proceeds forwards between the two first metatarsal bones, here ending in branches distributed to the great toe, and to the toe next to it.

The Anterior Tibial Veins are two in number, accompanying the artery, one on each side. At the upper part of the leg, they join into a single trunk, which penetrates the aperture, in the interosseous ligament, and opens into the popliteal vein.

The ANTERIOR TIBIAL NERVE is a branch of the PERONEAL. In the dissection of the ham the course of the peroneal nerve was described, to the point where it penetrates between the peroneus longus and the fibula. It here divides into two branches, one the ANTERIOR TIBIAL, the other passing some way down between the peronei and extensor longus digitorum, then penetrates the fascia, and continues its course down the leg superficially, as already described. The anterior tibial nerve penetrates the upper end of the peroneus longus and extensor longus digitorum to the front of the leg, where it is continued downwards between the muscles, and in front of the anterior tibial artery. It passes with the anterior tibial vessels beneath the annular ligament to the upper surface of the foot, and here divides into filaments, which are distributed to the foot, and extend to the toes.

SECT. V.

OF THE BACK PART OF THE LEG.

In reflecting the fascia from the back part of the leg, we meet with the Vena Saphena, Minor or Externa, which begins at the lower part of the leg, and is formed by the union of many small branches from the upper surface and outside of the foot. In its ascent, it passes along the outside of the tendo Achillis, and thence between the fascia and muscles into the ham, where it opens into the popliteal vein.

Some small branches of the popliteal and peroneal nerves are also met with ramifying down the leg, between the fascia and muscles. One of these accompanies the vena saphena externa, and their filaments may be traced into the sole of the foot.

Upon the removal of the fascia the thick mass of muscles is exposed, which forms the calf of the leg, and is attached below to the os calcis by a very thick tendon, the Tendo Achillis. This mass is constituted of two muscles, the Gastro-

CNEMIUS EXTERNUS, or GEMELLUS, placed superficially, and the SOLEUS, or GASTROCNEMIUS INTERNUS, placed beneath it.

The GASTROCNEMIUS EXTERNUS arises by two distinct tendinous heads from the upper and back part of the condyles of the os femoris. The two heads, of which the internal is the larger, proceed obliquely downwards, and unite a little below the knee into one muscle. The muscle, as it descends, has a straight tendinous line, extending from the point where its heads unite, and dividing it into two equal halves. At about the middle of the leg the muscle is continued into a broad and flat tendon, which soon becomes united with the tendon of the soleus. Both the anterior and posterior surfaces of the gastrocnemius are formed in great part by aponeurotic expansions, with which the muscular fibres are very firmly united.

The popliteal vessels and nerve enter into the triangular space left between the two heads of the gastrocnemius, as they pass from the ham into the leg.

The gastrocnemius being reflected from its origins, the soleus is brought into view beneath it. Between them is seen the long narrow tendon of a small pyramidal muscle, denominated

The PLANTARIS. It arises from the upper and back part of the external condyle, where it is connected with the external head of the gastrocnemius, and proceeding downwards and inwards, it ends a little below the knee joint, in a thin and flat tendon, which is continued downwards between the gastrocnemius and soleus, and then on the inside of the tendo Achillis, to be attached with it to the back part of the os calcis.

This muscle is frequently wanting.

The SOLEUS has two distinct origins, the one from the posterior surface of the head of the fibula, and from the external angle of the bone, along its upper two-thirds, behind the peroneus longus; the other from the oblique ridge in the posterior surface of the tibia just below the popliteus, and from the inner edge of the bone, along the middle third of its extent. From these origins, the fibres proceed downwards, forming a broad and thick muscle, which becoming tendinous near the lower part of the leg, unites with the tendon of the gastrocnemius to form the tendo Achillis. Reaching the os calcis, the tendo Achillis slides over a smooth surface in its upper and back part, which is covered by cartilage, and lined by synovial membrane, and terminates in a rough surface on the lower and back part of the bone. The posterior surface of the soleus, in contact with the gastrocnemius, is formed in great part by an expansion of tendinous fibres.

The soleus being reflected, a small muscle is seen just below the knee, extended obliquely across the back of the leg, close upon the tibia. This is

The POPLITEUS. It arises from an excavation in the outer side of the external condyle, by a thick flat tendon, which passing obliquely backwards and inwards, is connected with the outer edge of the external semilunar cartilage, and is covered by the synovial membrane of the joint, which is reflected over it to the commencement of its fleshy fibres. Becoming fleshy it proceeds obliquely downwards and inwards, and terminates by an attachment to the triangular surface in the upper and back part of the tibia. This muscle is covered by a thin aponeurotic expansion.

A fascia now presents itself covering the more deep-seated muscles, vessels, and nerves. Upon the removal of this fascia, three muscles are brought into view.

The FLEXOR LONGUS POLLICIS PEDIS situated upon the posterior surface of the fibula.

The FLEXOR LONGUS DIGITORUM PEDIS situated upon the posterior surface of the tibia.

The TIBIALIS POSTICUS placed between the two preceding muscles, and partly concealed by them.

The FLEXOR LONGUS POLLICIS PEDIS arises from the posterior surface of the fibula, and from the aponeurotic partitions separating it on one side from the peronei, and on the other from the tibialis posticus and flexor longus digitorum. Its origin beginning just below the head of the fibula, extends almost to the lower end of the bone, where it ends in a tendon which passes through a superficial groove in the back part and bottom of the tibia. The tendon is then reflected forwards into the sole of the foot beneath the os calcis and through a groove in the astragalus.

Here it crosses the tendon of the flexor longus digitorum, and proceeds to the inner side of the foot, where it is continued forwards between the two portions of the flexor brevis pollicis and between the two sesamoid bones to be attached to the last phalanx of the great toe.

The Flexor Longus Digitorum Pedis Perforans arises from the posterior flattened surface of the tibia just below the popliteus, and from the aponeurotic partitions separating it on each side from the tibialis posticus and from the flexor longus pollicis. It proceeds downwards, having attachments to the posterior surface of the tibia to within two inches of its lower end. Here its fibres terminate obliquely in a tendon which is continued downwards through a superficial groove in the lower end of the tibia, and is thence reflected forwards beneath the astragalus into the sole of the foot, where it crosses the tendon of the flexor longus pollicis and then divides into four small slips. These slips proceed forwards, and become contained in fibrous sheaths in which they pass through the slits in the tendons of the flexor brevis digitorum and are attached to the last phalanx of the four lesser toes. The tendons of the flexor longus digitorum and flexor longus pollicis are connected by a cross slip of tendon in the sole of the foot.

The Tibialis Posticus arises from the posterior surface of the tibia, where it begins just below the popliteus, also from the posterior surface of the fibula, from the interosseous ligament, and from the aponeurotic partitions connecting it with the muscles on each side. Its fibres descend, continuing their attachments nearly all the way down the leg. At the lower part, they terminate obliquely in a tendon which proceeds through a groove in the lower end of the tibia, behind the malleolus internus, and is reflected forwards to be fixed to the os naviculare, to the internal cuneiform bone, and to the ligaments connecting the bones of the tarsus.

The tendons of the three muscles last described, are confined by fibrous sheaths, where they pass through grooves in the tibia, os calcis, and astragalus.

VESSELS AND NERVES IN THE BACK OF THE LEG.

The POSTERIOR TIBIAL ARTERY descends from the ham to the lower end of the tibia between the soleus and flexor longus digitorum muscles. As the artery descends, it becomes gradually more superficial, and in the lower part of its course is covered only by cellular tissue and by the fascia. Following the direction of the flexor tendons, it passes behind the malleolus internus into the hollow on the inside of the os calcis. Here it is lodged with the tendons and with the Posterior Tibial Nerve behind the broad band of tendinous fibres which extends from the malleolus internus to the os calcis. It then passes beneath the abductor pollicis, and terminates by dividing into the external and internal plantar arteries, which will be described with the dissection of the sole of the foot.

The branches of the posterior tibial artery are

1. Small arteries which are distributed to the muscles and adjacent parts.

2. The Peroneal Artery, which varies much in size. It usually arises from the posterior tibial near its commencement, and thence descending immediately behind the fibula, is partly covered by the flexor longus pollicis. The peroneal gives off branches to the muscles, and at the lower part of the leg it divides into an anterior and posterior branch. The Peronea Anterior penetrates the interosseous ligament, and thus reaching the front of the leg, ends in branches which communicate freely with the anterior tibial. The Peronea Posterior, which is the larger branch, descends to the outer side of the os calcis, where it ends in communications with the posterior tibial.

The Posterior Tibial Veins are two in number, accompanying the artery, one on each side. They terminate above in the popliteal vein.

Two veins accompany the peroneal artery. These also open into the popliteal vein.

The Posterior Tibial Nerve descends from the ham beneath the soleus, and accompanies the posterior tibial artery down the leg, the nerve being placed close to the artery on its outer or fibular side. From the lower part of the leg the nerve passes with the artery behind the malleolus internus into the hollow on the inside of the os calcis, and is here placed a little behind the artery, or nearer to the projection of the heel. The posterior tibial nerve passing beneath the abductor pollicis muscle near its origin, divides into the external and internal plantar nerves, which will be described with the dissection of the sole of the foot. The posterior tibial nerve gives off many branches to the muscles in its course down the leg, and just before its division into the plantar nerves, it distributes many branches to the muscles of the foot.

SECT. VI.

OF THE SOLE OF THE FOOT.

Beneath the integuments covering the sole of the foot we find a considerable depth of firm and granulated fat, with threads of fibrous tissue extending irregularly through it. When this fat is dissected away, there is brought into view the plantar fascia, which binds down the muscles, vessels, and nerves of the foot, and we may remark that the fat is very firmly united to the plantar fascia by the fibrous threads just mentioned.

The Plantar Fascia is very thick and firm in its texture. It arises from the under and back part of the projection of the os calcis, which forms the heel, and thence advancing forwards, soon divides into three portions, one on each side covering the muscles in those situations, and the third which is the larger portion covering the muscles and tendons in the middle of the foot. The two lateral portions of the fascia are attached to the outer and inner edges of the foot, and to the digital ends of the metatarsal bones. The middle portion diverging as it advances forwards, terminates in front by dividing into five distinct slips, which again divide into smaller slips. These slips penetrate inwards, and become united to the digital ends of the metatarsal bones. Through the spaces left between these slips, the tendons, vessels, and nerves pass forwards to the toes.

The plantar fascia is firmly attached on its inner surface to the muscles beneath. Two processes of the fascia are extended inwards between the muscles, so as to form partitions, separating them into distinct masses.

The plantar fascia is to be removed, and the muscles beneath it are to be cautiously dissected, in order that the vessels and nerves passing between them may be preserved.

There are three distinct masses of muscles in the foot, one on each side, and the third in the middle.

The mass on the inner side consists of

The Abductor Pollicis Pedis extending from the os calcis to the inside of the great toe.

The Flexor Brevis Pollicis Pedis, lying upon the metatarsal bone of the great toe, and partly united with the abductor.

The Adductor Pollicis Pedis, situated on the outer side of the Flexor Brevis, and connected with it by cellular tissue.

The mass on the outer side consists of

The Abductor Minimi Digiti Pedis, extending from the os calcis to the outside of the little toe.

The Flexor Brevis Minimi Digiti Pedis,

lying upon the metatarsal bone of the little toe, and partly beneath the abductor.

The middle mass of muscles in the foot consists of

The FLEXOR BREVIS DIGITORUM PEDIS, attached behind to the os calcis, and sending off four tendons to the toes.

Beneath the flexor brevis digitorum, the tendons of the flexor longus digitorum, and flexor longus pollicis, are seen proceeding to the toes.

Four small muscles, denominated LUMBRICALES, are connected with the tendons of the flexor longus digitorum in the front of the foot; and behind, a mass of muscle is extended obliquely across the foot between these tendons and the os calcis. This is the MASSA CARNEA SYLVII, or, FLEXOR ACCESSORIUS.

VESSELS AND NERVES IN THE SOLE OF THE FOOT.

The POSTERIOR TIBIAL ARTERY passing from the inside of the Os Calcis, beneath the abductor pollicis, here divides into the EXTERNAL and INTERNAL PLANTAR ARTERIES.

The EXTERNAL PLANTAR ARTERY is the larger of the two. It proceeds forwards between the flexor brevis digitorum and massa carnea to the tarsal end of the metatarsal bone belonging to the little toe. It then proceeds across the metatarsal bones near their digital ends to the great toe, thus forming the PLANTAR

Arch, the convexity of which is turned towards the toes. Between the two first metatarsal bones, the extremity of the plantar arch inosculates with the trunk of the anterior tibial. From the convex side of the arch, there arise four digital arteries, each of these after proceeding some way forwards divides into two branches which run along the opposite edges of the toes. At the extremity of each toe, the arteries communicate, and form arches in the same manner as the branches of the Ulnar Artery at the ends of the fingers. From the concave side of the plantar arch, interosseous arteries are given off, and perforating branches which penetrate between the metatarsal bones, and anastomose with the arteries on the upper surface of the foot.

The Internal Plantar Artery divides itself beneath the abductor pollicis into several branches, which are distributed principally to the muscles of the great toe.

The Posterior Tibial Nerve entering the sole of the foot beneath the abductor pollicis, here divides into the External and Internal Plantar Nerves,

The External Plantar Nerve proceeds to the outer side of the foot, and divides into filaments, some of which are distributed to the superficial, and others to the deep-seated parts in the foot.

The Internal Plantar Nerve proceeds directly forwards to the middle of the foot, where it divides itself into four branches, which are distributed to the toes.

ORIGINS AND INSERTIONS OF THE MUSCLES IN THE SOLE OF THE FOOT.

The ABDUCTOR POLLICIS PEDIS arises from the lower and back part, and from the inside of the os calcis, also from an aponeurotic expansion, which extends across from the os calcis to the inner ancle. Its fibres pass obliquely into a tendon, which is united to the flexor brevis pollicis, and proceeding forwards with it, is attached to the posterior part, and inside of the first phalanx of the great toe.

The FLEXOR BREVIS DIGITORUM PEDIS PERFORATUS arises from the under part of the projection of the os calcis, and forms a thick fleshy belly ending in four tendons, which pass forwards to the toes, and there enter the fibrous sheaths with the tendons of the flexor longus. Within these sheaths the tendons of the flexor brevis divide to allow the tendons of the flexor longus to pass through them. Each tendon of the flexor brevis uniting again after its division becomes attached by a bifurcated extremity to the sides of the second phalanx of the four lesser toes.

The ABDUCTOR MINIMI DIGITI PEDIS arises from the under part and external side of the os calcis, close to the projection of the heel. Its fibres proceed obliquely forwards to the outer side of the foot, where they have a tendinous attachment to the tarsal end of the metatarsal bone of the little toe. The muscle is then continued forwards to be attached to the outside of the first phalanx of the same toe.

The three muscles just described are to be detached from their origins, in order to bring the rest more completely into view.

The Flexor Brevis Pollicis Pedis arises by a distinct broad tendon from the under part of the os calcis, and proceeds obliquely along the metatarsal bone, gradually separating into two distinct portions, which are attached separately to the two sesamoid bones, and to the first phalanx of the great toe. The tendon of the flexor longus is placed between the two portions of the flexor brevis.

The Adductor Pollicis Pedis arises from the under part of the os cuboides, and from the ligaments connecting the metatarsal bones. It proceeds obliquely forwards by the side of the flexor brevis, to be attached to the external sesamoid bone, and to the tarsal end of the first phalanx of the great toe.

The Flexor Brevis Minimi Digiti Pedis arises from the tarsal end of the metatarsal bone of the little toe, and proceeds directly forwards to be attached to its first phalanx.

Massa Carnea Sylvii, or Flexor Digitorum Accessorius. This muscle has a very broad origin from the inside and under part of the os calcis, behind the posterior tibial vessels and nerve, whence it proceeds obliquely forwards to be attached to the tendon of the flexor longus digitorum on its outer edge.

The tendon of the flexor longus digitorum is now seen passing forwards from the inside of the os calcis to the middle of the foot, where it divides into four smaller tendons. These tendons proceed forwards and are received into the fibrous sheaths. Then perforating the slits in the tendons of the flexor brevis, they are at length attached to the last phalanx of the four lesser toes.

The tendon of the flexor longus pollicis is also seen passing forwards from the inside of the os calcis, along the sole of the foot, where it crosses beneath the tendon of the flexor longus digitorum*, and is connected with it by a slip of tendon passing obliquely between them. The tendon of the flexor longus pollicis then proceeds to the inside of the foot, and passing forwards between the two portions of the flexor brevis pollicis, and between the two sesamoid bones, is attached to the last phalanx of the great toe.

* The sole of the foot is here supposed to be placed uppermost. In the erect posture of the body, the tendon of the flexor pollicis is situated above the tendon of the flexor digitorum.

The LUMBRICALES PEDIS are four small muscular slips, arising from the tendons of the flexor longus digitorum near their commencement. They proceed forwards and end in distinct tendons, which are attached to the insides of the first phalanx of the four lesser toes, and into the tendinous expansions covering their upper surfaces.

The tendons of the flexor longus digitorum are to be divided and turned aside, when the remaining muscles of the foot will be brought into view, consisting of the TRANSVERSALIS PEDIS and INTEROSSEI.

The TRANSVERSALIS PEDIS is a thin narrow muscle, extending across the foot, close upon the digital ends of the metatarsal bones. One end of the transversalis pedis is attached to the metatarsal bone of the great toe, and to the adductor pollicis. The other end of the muscle is attached to the metatarsal bone of the little toe.

The INTEROSSEI are seven small muscles placed between the metatarsal bones. They are called abductors and adductors of the toes to which they are attached, or they are separated into the INTEROSSEI INTERNI seen in the sole of the foot, and the INTEROSSEI EXTERNI seen on the upper part of the foot.

The INTEROSSEI INTERNI are three in number. They arise from the insides of the metatarsal bones of the four lesser toes, and are inserted by distinct tendons into the insides of the first phalanx of the same toes.

The Interossei Externi, also named Bicipites, are four in number. They arise by double heads from the opposite sides of the metatarsal bones of all the toes, and are inserted by distinct tendons into the sides of the first phalanx of the four lesser toes, the great toe having no interosseous muscle inserted into it.

With the dissection of the deep-seated parts in the sole of the foot, we see the terminations of the tendons of the tibialis posticus and peroneus longus. The tendon of the tibialis posticus passing forwards from behind the inner ancle is fixed to the os naviculare, to the internal cuneiform bone, and to the ligaments connecting the adjacent bones of the tarsus. The tendon of the peroneus longus, passing behind the outer ancle, proceeds obliquely over the outside of the os calcis, then through a groove in the os cuboides, and obliquely across the foot, to become attached to the tarsal end of the metatarsal bone belonging to the great toe.

CHAP. VII.

DISSECTION OF THE NECK.

An incision is to be made cautiously through the integuments down the side of the neck, from the basis of the lower jaw to about the middle of the clavicle. Immediately beneath, muscular fibres will be seen running in an oblique direction. The skin is then to be carefully dissected from these fibres, turning one part towards the front, and the other towards the back of the neck, until the whole of the subjacent muscular expansion is exposed, and it is this expansion which we denominate

The Platisma Myoides. It arises in the cellular tissue that covers the upper part of the deltoid and pectoralis major muscles. At its origin the fibres are separated from each other, but gradually approaching they at length unite and form a broad muscle, which is continued obliquely over the front and side of the neck to the lower jaw, to the basis of which it is attached. Some of the fibres of the muscle are continued so much higher that they become mixed with the muscles of the face, but more particularly with the depressor labii inferioris and the depressor anguli oris.

In muscular subjects, the platisma myoides is formed throughout of one stratum of fleshy fibres, closely connected by cellular tissue; but in thin and extenuated subjects it is composed merely of pale and thin fibres, scattered irregularly over the side of the neck.

The platisma myoides is to be reflected from below upwards, when many filaments of nerves, derived from the second and third pairs of the cervical nerves will be seen ramifying beneath it. These filaments are distributed partly to the muscle itself, and partly to the integuments covering it.

Immediately beneath the platisma myoides is

The External Jugular Vein. This vein is formed above by several branches from the face, temple, and neck, which unite into one trunk near the upper part and front edge of the sterno-cleido-mastoideus muscle. It proceeds obliquely downwards between the platisma and mastoid muscles, to the lower part and posterior edge of the latter, whence it passes inwards behind the clavicle, and terminates in the subclavian vein more outwardly than the internal jugular. The external jugular frequently divides into two branches at the lower part of the neck, which have separate terminations in the subclavian vein. Many small veins from the surrounding parts open into the external jugular vein.

Several large veins are generally seen running up the front of the neck. Some of these open into the external jugular, and others into the internal jugular trunks.

It may be remarked, that occasionally there will be no large vein found pursuing the course of the external jugular, as here described, but some smaller branches only will be discovered ramifying irregularly between the platisma and mastoid muscles.

When the platisma myoides is reflected, two nerves are brought into view, which are remarkable only for their size. These are derived from the second and third pairs of the cervical nerves. One of them ascends along the posterior border of the mastoid muscle, and terminates above in filaments, which are distributed to the integuments covering the side and back part of the head. The other ascends obliquely upon the mastoid to its upper part and front edge, where it ends in filaments, distributed to the parotid gland, and to the external ear.

A very firm cellular tissue connects all the parts in the neck. In the progress of the dissection, this cellular tissue will be found penetrating inwards between the muscles, vessels and nerves, so as to form sheaths around them; and in dissecting away this tissue, we necessarily, at the same time, remove the absorbent glands, which are placed between its layers.

The Absorbent Glands of the neck are very numerous. Some of them are placed superficially between the platisma and mastoid muscles, but the greater number accompany the deep-seated vessels. These latter form altogether one connected chain of glands extending down the side of the neck, and are hence denominated GLANDULÆ CONCATENATÆ. At the lower part of the neck there are numerous glands of large size, and from these, others are continued downwards behind the clavicle into the axilla.

The STERNO-CLEIDO-MASTOIDEUS is a broad and thick muscle extended obliquely along the side of the neck. Below, it has two distinct attachments, between which there is an interval filled only by cellular tissue. One attachment is by a thick tendon to the upper border of the sternum at its front part; the other is by short aponeurotic fibres to the upper part of the clavicle, occupying about an inch and a half of the bone near its sternal end. That portion of the muscle arising from the sternum ascends obliquely backwards to the clavicular portion, in front of which it passes. The two portions thus unite into one muscle, which is inserted above by aponeurotic fibres into the upper and back part of the mastoid process, and into the ridge which is extended from it some way backwards across the occipital bone.

The mastoid muscle is next to be divided across its middle, and each half is to be reflected towards its attachment. In the reflection of the upper half, the nervus accessorius will be seen beneath it.

The NERVUS ACCESSORIUS forms one of the divisions of the eighth pair of the cerebral nerves. It passes out of the skull at the foramen jugulare, and descends some way along the neck, behind the internal jugular vein. It then turns outwards, and penetrates some of the fibres of the mastoid muscle near its posterior edge, and about one third from its upper end. The nerve is next continued backwards beneath the trapezius muscle, where it ends in communications with the cervical nerves.

Before the student proceeds further in the dissection, it will be necessary that he should have a general knowledge of the parts which occupy the front and middle of the neck.

At the upper part of the neck is the Os HYOIDES, so termed from its resemblance to the Greek υ. The Os Hyoides is firmly united above, to the root of the tongue, by giving attachments to the principal muscles of the organ. It is divided into a basis placed in front, and into two cornua, which are extended backwards from the basis on each side. Just at the point where each cornu begins, two short processes rise perpendicularly from the bone. These are the lesser cornua.

Below the Os Hyoides is the LARYNX, which is formed by a series of highly elastic cartilages, connected by parts of a ligamentous and membranous structure. The uppermost of these cartilages is denominated

The THYROID CARTILAGE. It is composed of two lateral portions or alæ joined obliquely in front, where they form a projection in the male subject, denominated Pomum Adami. In the female, the two alæ are more widely separated, and less oblique at their union, so that the projection of the Pomum Adami does not exist. From the upper and back part of each ala of the thyroid cartilage, a process rises upwards, which is denominated the superior cornu. From the lower and back part of each ala, a similar but shorter process descends, named the inferior cornu.

Below the thyroid cartilage is the second cartilage of the larynx, denominated the CRICOID CARTILAGE, from its annular figure. It is narrow in front, where it is placed immediately below the thyroid, while at the sides and back part its breadth is considerably increased. In its external surface, the cricoid cartilage is every where convex.

Three other cartilages enter into the composition of the larynx, viz., the Two ARYTENOID CARTILAGES, of small size, situated at the back part of the larynx upon the upper edge of the cricoid cartilage; and the EPIGLOTTIS placed within the larynx at its upper part, and just below the root of the tongue.

Below the larynx is the TRACHEA, continued from the cricoid cartilage down the front of the neck into the chest. The trachea is a tube partly of a cartilaginous, and partly of a membranous structure. In front and at the sides it is cylindrical, and is formed of cartilaginous rings connected by membrane. Behind it is flattened, and is formed wholly of membranous structure.

Behind the larynx is a membranous bag, denominated the PHARYNX, which terminates below, just behind the commencement of the trachea, by contracting into a cylindrical tube, named the Œsophagus.

The ŒSOPHAGUS is continued downwards behind the trachea into the chest. At its commencement the œsophagus is placed in the middle of the neck, but as it descends it inclines to the left, so that in the lower part of the neck, it projects a little beyond the side of the trachea. The œsophagus is united in front, to the trachea, and behind, to the vertebral column, by a loose cellular tissue.

Between the sterno-cleido-mastoidei, two long and narrow muscles pass up the front of the neck. These are the sterno-hyoidei.

The STERNO-HYOIDEUS arises below, from the upper part of the posterior surface of the sternum behind its articulation with the clavicle, and sometimes from the first rib. It proceeds upwards and inwards, approaching to the muscle of the opposite side, and is attached above, to the lower border of the basis of the os hyoides.

A long slender muscle extends itself obliquely along the side of the neck. This is

The OMO-HYOIDEUS. It arises from the superior costa of the scapula, behind the semilunar notch, and ascends obliquely forwards behind the clavicle, and through the triangular space left between the opposite margins of the mastoid and trapezius muscles. It then crosses obliquely beneath the mastoid, and when it reaches the outer edge of the sterno-hyoideus, proceeds directly upwards, and is attached to the os hyoides just at the union of its basis and cornu. The omo-hyoideus is tendinous to an extent that varies in different subjects in the situation where it crosses beneath the sterno-cleido-mastoideus.

When the sterno-hyoideus is reflected from the os hyoides downwards, the next muscle brought into view immediately beneath, is

The STERNO-THYROIDEUS, which is a shorter and broader muscle than the sterno-hyoideus. It arises from the posterior part of the sternum, below the origin of the sterno-hyoideus, and sometimes from the cartilage of the second rib, and proceeding directly upwards, is attached to the oblique line which extends across the ala of the thyroid cartilage.

The filaments of the nonus descendens nerve are now seen distributed to the fibres of the sterno-thyroideus.

The sterno-thyroidei being detached from the thyroid cartilage, and turned downwards, immediately beneath them is seen the thyroid gland.

The THYROID GLAND is situated upon the sides of the larynx, and upon the upper part of the trachea, and is united to these parts by loose cellular tissue. The size of the gland varies considerably in different subjects, and is usually larger in the female. It is formed of two distinct lateral portions which are of a pyramidal shape. The broadest part of each is turned downwards and covers the upper rings of the trachea, and the narrow end extends upwards upon the side of the cricoid and upon the lower part of the thyroid cartilages. These two portions are united in front by a narrow slip of the gland which extends transversely across the front of the trachea, just below the cricoid cartilage. Sometimes, however, this transverse portion of the gland is wanting.

Two Thyroideal Veins, of large size, generally descend from the gland along the front of the trachea into the chest, where they terminate either in the superior cava, or in the left subclavian vein.

The student is next to proceed with the dissection of the muscles situated at the upper part of the neck, beginning with

The Digastricus, which consists of an anterior and a posterior fleshy portion, and an intermediate tendon. The posterior portion arises from the groove behind the mastoid process, and proceeding obliquely downwards and forwards, terminates in a tendon which perforates the fibres of the stylo-hyoideus muscle, and is fixed to the cornu of the os hyoides by an aponeurotic expansion, the length of which varies in different subjects. The tendon is then reflected upwards, and gives origin to fleshy fibres, forming the anterior portion of the muscle, which ascends obliquely to the basis of the jaw, where it is attached to a depression in the bone near its symphysis, and close to the muscle of the opposite side. The tendon of the digastricus sometimes passes behind the stylo-hyoideus instead of perforating its fibres.

In the triangular space between the digastricus and the inner surface of the basis of the jaw, is found,

The SUBMAXILLARY GLAND, which is of a roundish form. It lies imbedded in loose cellular tissue, and is surrounded by many absorbent glands. It is extended outwards to the angle of the jaw, where it is sometimes connected with the lower end of the parotid gland. A portion of the submaxillary gland is frequently continued inwards beneath the posterior edge of the Mylo-Hyoideus muscle.

Close to the posterior portion of the digastricus, is the STYLO-HYOIDEUS muscle, which arises tendinous from the styloid process, and proceeding downwards and forwards, follows the direction of the posterior portion of the digastricus, by the tendon of which it is generally perforated. It is then continued to the Os Hyoides to which it is attached near to the junction of the basis and cornu.

The stylo-hyoideus is sometimes accompanied by another muscle which has the same origin and insertion, and is denominated the STYLO-HYOIDEUS ALTER.

The anterior portion of the digastricus is to be detached from the jaw, and the sub-maxillary gland raised a little from its connexions, in order to bring the next muscle into view, which is

The Mylo-Hyoideus. This is a broad and thin muscle, arising above from the oblique line in the inner side of the basis of the lower jaw, where it extends from the chin backwards to the last molar tooth. From this origin, the front and middle fibres proceed obliquely downwards and inwards, and meet the corresponding fibres of the opposite muscle, with which they are united; a line, more or less distinct in different subjects, is formed at their junction. The posterior fibres descend almost perpendicularly, and are attached to the upper border of the basis of the os hyoides.

The mylo-hyoideus is to be carefully detached from the jaw, and reflected towards the opposite side of the neck, and immediately beneath it, is

The Genio-Hyoideus muscle, which arises from an eminence on the inside of the symphysis of the lower jaw, above the attachment of the digastricus, and proceeding downwards and backwards, is inserted into the basis of the os hyoides.

Between the os hyoides and the thyroid cartilage, there is a short and narrow muscle, denominated

The Thyro-Hyoideus. This muscle arises from the oblique line which extends across the ala of the thyroid cartilage, and proceeding directly upwards is attached partly to the basis, and partly to the cornu of the os hyoides.

In front of the larynx is found another small muscle covering the cricoid cartilage. This is

The Crico-Thyroideus, which arises from the front and side of the cricoid cartilage, and proceeding obliquely upwards and outwards, is attached to the lower border and inferior cornu of the thyroid cartilage.

When the stylo-hyoideus is reflected from its origin, two other muscles are brought into view, which arise from the styloid process, viz., the stylo-pharyngeus and stylo-glossus.

The Stylo-Pharyngeus arises from the styloid process near its root, and proceeding inwards and backwards to the side of the pharynx, terminates partly by being intermixed with the fibres of the Constrictor muscles, and partly by an attachment to the os hyoides and thyroid cartilage.

The Stylo-Glossus arises from the styloid process near its point, and from the ligament which extends from this process to the angle of the jaw. It proceeds downwards, and at the same time forwards and inwards to the side of the tongue, where its fibres terminate by being intermixed with the fibres of the hyo-glossus muscle.

The Glosso-Pharyngeal Nerve is seen in contact with the stylo-pharyngeus muscle. This nerve forms one of the divisions of the eighth pair of the cerebral nerves. It leaves the skull at the foramen jugulare, and proceeds downwards and forwards immediately below the stylo-pharyngeus, and then passes between this muscle and the stylo-glossus to the tongue.

The glosso-pharyngeal nerve gives off in its course to the tongue, many filaments to the stylo-pharyngeus and constrictor muscles of the pharynx.

When the nerve reaches the tongue it divides into many filaments which penetrate the muscular substance of the organ, and are distributed principally to the mucous membrane extending from the back of the tongue to the epiglottis, a few filaments only are distributed to the muscular fasciculi themselves.

When the genio-hyoideus is reflected from the jaw, two other muscles of the tongue are brought into view, viz., the genio-hyo-glossus and the hyo-glossus.

The Genio-Hyo-Glossus is a broad and radiated muscle situated beneath the genio-hyoideus, and between the tongue, lower jaw, and os hyoides. It arises by a small tendon from the inside of the lower jaw above the origin of the genio-hyoideus. Its fibres thence diverge in such a radiated manner, as to give to the muscle an increase of breadth as it proceeds to the under and middle part of the tongue, where it is attached all the way from the basis to the apex of this organ. Some of the posterior fibres are also fixed to the lesser cornu of the os hyoides.

The HYO-GLOSSUS is a broad and thin muscle, placed more outwardly than the genio-glossus, and extended between the cornu of the os hyoides and the side of the tongue. It arises below from a part of the body and from the whole length of the cornu of the os hyoides, and then proceeding upwards is inserted into the side of the tongue.

Another muscle of the tongue remains to be described, which is the LINGUALIS, but this will be more conveniently examined hereafter, with the structure of the tongue itself in the dissection of the nose, mouth, and larynx.

In this stage of the dissection, are seen the Excretory Duct of the Submaxillary Gland, the Hypoglossal Nerve, and the Lingual or Gustatory branch of the Inferior Maxillary Nerve.

The SUBMAXILLARY DUCT is of a large size, and formed of thin and transparent coats. It leaves the gland close to the posterior edge of the mylo-hyoideus, and then proceeding horizontally inwards between the mylo-hyoideus and hyo-glossus, perforates the mucous membrane of the mouth close by the side of the frænum of the tongue.

The SUBLINGUAL GLAND is also here brought into view. This is the smallest of the salivary glands, it is of a flattened figure, and narrower from side to side than from above downwards. It lies immediately under the tongue, between the mylo-hyoideus and genio-glossus. The superior margin of the gland projects into the mouth, and is covered only by the mucous membrane. On its outer side, it is sometimes connected with the portion of the sub-maxillary gland which is continued beneath the mylo-hyoideus. The excretory ducts of the sublingual gland are variously arranged. Sometimes there is but one large duct which joins the duct of the sub-maxillary gland. In other instances, several small ducts arise from the sublingual gland, and penetrate the mucous membrane of the mouth by the side of the frænum of the tongue.

The HYPO-GLOSSAL NERVE forms the ninth pair of the cerebral nerves. Leaving the skull at the anterior condyloid hole, it proceeds obliquely downwards and forwards beneath the posterior portion of the digastricus, and the stylo-hyoideus. Becoming gradually more superficial as it descends, it turns upwards beneath the tendon of the digastricus, so as to form a sort of loop with its convexity downwards. The nerve then proceeds between the mylo-hyoideus and hyo-glossus to the tongue. In this course, it gives off many filaments of communication with the other nerves in the upper part of the neck, and from the convexity of its loop, a considerable branch arises, denominated

The NONUS DESCENDENS, which proceeds strait down the neck in front of the carotid artery, sometimes within the cellular sheath of the jugular vein, carotid artery, and par vagum, and sometimes without, and in front of it. The nonus descendens distributes its filaments principally to the sterno-thyroideus muscle. About the middle of the neck, it communicates with the cervical nerves by a branch which extends in the form of an arch across the front of the internal jugular vein. As the hypo-glossal nerve approaches the tongue, it distributes many filaments to the surrounding muscles. The trunk of the nerve penetrating the genio-glossus, here ends by splitting into a number of branches which are distributed to the muscular fibres along the middle of the tongue from the basis towards the apex; none of the filaments of this nerve are traced into the papillæ. There are communicating branches between the hypo-glossal and gustatory nerves.

The LINGUAL or GUSTATORY BRANCH of the INFERIOR MAXILLARY NERVE passes forwards from the inside of the lower jaw, between the mylo-hyoideus and hyo-glossus, with the submaxillary duct, and then turns upwards to the side of the tongue. In this course it distributes many filaments to the surrounding parts, especially to the submaxillary gland, and some of these have communications with the hypo-glossal nerve. The gustatory nerve, at its termination, splits into ten or twelve filaments which penetrate between the muscular fibres of the tongue, and are distributed to the mucous membrane covering the sides and point of the organ where they are traced in the papillæ.

The student should next proceed to expose the vessels and nerves which are placed deep in the neck by the side of the trachea, and immediately in front of the vertebral column. By dissecting a little in this situation, he will bring into view the carotid artery, internal jugular vein, and par vagum, which are all lodged in the same sheath of cellular tissue. The Artery is situated nearest the trachea, the Vein on the outer side of the artery, the Nerve between and rather behind the artery and the vein. It is to be observed that the carotid artery and jugular vein are placed so near to each other that the vein in its distended state will advance forwards in front of the artery, so as almost to conceal it. Behind the sheath containing the vessels and the par vagum, the Sympathetic Nerve will be found in close contact with the front of the spine. It will be readily brought into view by drawing the carotid artery forwards, and then cautiously dividing the cellular tissue which forms the posterior part of its sheath.

The Carotid Artery, emerging from the chest, proceeds strait up the neck, parallel with the trachea, and is connected behind, by cellular tissue to the longus colli and rectus anticus major muscles, which lie upon the fronts of the bodies of the vertebræ. As soon as the artery emerges from the chest, it has its course deep in the neck, and is covered anteriorly by the platisma myoides, sterno-cleido-mastoideus, and by the cellular tissue connecting this muscle to the sterno-hyoideus. Higher in the neck, the artery becomes more superficial, and is covered only by the platisma myoides, and by cellular tissue, except where it is crossed by the omo-hyoideus muscle. At the lower part of the neck on the left side, the carotid lies close to the œsophagus where this tube projects from beneath the trachea.

The carotid artery does not give off any branches until it has ascended so high in the neck as to be opposite to the upper margin of the thyroid cartilage, when it divides into two arteries, which in the adult are nearly of equal size, the External and the Internal Carotid.

The External Carotid rises at first in a parallel direction with the internal carotid, and then ascends obliquely backwards beneath the posterior portion of the digastricus, into the space between the angle of the jaw and the ear, where it is lodged deeply beneath the parotid gland. In this part of its course, the external carotid gives off several large branches, of which we may remark that there are many varieties in the mode of their origin. Two of the branches frequently arise by a common trunk. In some subjects, there being no regular division of the common carotid into external and internal, the branches usually given off by the former all arise at one point from the side of the common trunk, and in other subjects, the external carotid consisting only of a short stem instead of a continued trunk, all the branches take their origin from the top of it.

The branches of the external carotid are, the Superior Thyroid, the Lingual, the External Maxillary, the Ascending Pharyngeal, the Occipital, and the Posterior Auricular.

1. The SUPERIOR THYROID arises usually at the commencement of the external carotid, and descends in a serpentine course to the thyroid gland, where it terminates in branches which ramify through the gland, and communicate freely with the other thyroid arteries. The superior thyroid gives off in its course to the thyroid gland many small arteries to the surrounding parts, and one branch in particular, denominated

(*a*) The LARYNGEAL, which enters the larynx with the superior laryngeal nerve, either by penetrating the membranous connexion between the os hyoides and thyroid cartilage, or by passing through a hole in the ala of the thyroid cartilage itself. It supplies the internal parts of the larynx.

2. The LINGUAL arises behind the posterior portion of the digastricus by which it is concealed, and proceeds almost horizontally forwards and inwards above the os hyoides, and under the hyo-glossus. It then bends upwards to the lower and back part of the tongue, and here ends by dividing into two branches, denominated SUBLINGUAL and RANINE. The lingual artery gives off in its course to the tongue, a branch, denominated

(*a*) The DORSALIS LINGUÆ, which arises near the insertion of the stylo-glossus, and proceeds upwards and outwards to the dorsum of the tongue and epiglottis.

The SUBLINGUAL is the more superficial of the two branches in which the lingual artery ends. It advances forwards between the genio-hyoideus and mylo-hyoideus to the chin, where it is sometimes distributed; but in other instances, it penetrates the mylo-hyoideus, and then ascends upon the lower jaw, distributing its branches to the muscles of the lower lip, and ending in communications with the other arteries of the face.

The RANINE BRANCH of the LINGUAL bends horizontally forwards along the middle of the under surface of the tongue, where it is in close contact with the fibres of the genio-glossus muscle. At the apex of the tongue, the two ranine arteries communicate by a transverse branch which is found beneath the fold of the mucous membrane of the mouth forming the frænum linguæ.

3. The EXTERNAL MAXILLARY arises behind the posterior portion of the digastricus and the stylo-hyoideus, and ascends in a tortuous direction beneath the submaxillary gland to the basis of the jaw. It then turns upwards upon the face close to the anterior edge of the masseter muscle, and here acquires the name of FACIAL. The description of its further course belongs to the dissection of the face. The external maxillary gives off in its course to the basis of the jaw, a branch of considerable size, denominated

(*a*) The SUBMENTAL, which advances forwards between the anterior portion of the digastricus and the mylo-hyoideus to the symphysis of the jaw, where it ends in branches to the muscles of the lower lip, which communicate with the other arteries of the face.

(*b*) Numerous small branches also arise from the external maxillary for the supply of the submaxillary gland.

4. The Ascending Pharyngeal, which is the smallest branch of the external carotid, arises from the back part of the trunk, and proceeds directly upwards to the basis of the skull, giving off in its course many branches to the surrounding parts.

One branch of the ascending pharyngeal enters the skull through the foramen jugulare, and is distributed upon the dura mater.

5. The Occipital arises from the external carotid opposite to the lingual, and ascends obliquely backwards behind the posterior portion of the digastricus, and in front of the internal jugular vein, to the space between the transverse process of the atlas and the mastoid process. It continues its course transversely outwards through a groove in the temporal bone, just below the fossa from which the posterior portion of the digastricus arises, and then passes beneath the splenius capitis muscle to the back of the neck, where it emerges by the side of the ligamentum nuchæ. Here it becomes superficial and ascending upon the occiput, divides into several branches which are distributed upon the back part and side of the head, where they communicate with the opposite

occipital and with the temporal arteries. In its course to the occiput, the occipital artery gives off

(*a*) Branches to the muscles covering the posterior part of the spine, which communicate with the vertebral and other ascending branches of the subclavian artery.

(*b*) A Meningeal branch, which entering the skull at the foramen jugulare is distributed upon the dura mater.

6. The Posterior Auricular, is a small branch arising from the external carotid beneath the parotid gland; it ascends to the back part of the ear, and divides into branches which are distributed partly upon the internal surface of the ear, and partly upon the side of the head, where they communicate with the occipital and temporal arteries.

One branch of the posterior auricular enters the foramen-stylo-mastoideum, and is distributed to the meatus auditorius externus, to the parts in the tympanum, and to the internal ear.

The further description of the external carotid artery belongs to the dissection of the face.

The Internal Carotid Artery separating itself from the external, proceeds upwards and a little inwards in front of the vertebræ, and on the outside of the internal jugular vein, to the canalis carotideus. It is generally rather tortuous, and does not give off any branches before it enters the temporal bone.

The further description of the internal carotid artery will be given with the dissection of the brain.

The INTERNAL JUGULAR VEIN begins above at the foramen jugulare, which is the termination of the lateral sinus of the brain, and descends on the inside of the internal carotid artery, and behind the styloid process to the side of the neck. It is then continued strait downwards on the outside of the common carotid artery and par vagum, and is included with them in the same cellular sheath. At the lower part of the neck the internal jugular vein opens into the subclavian vein, just where it passes into the chest, and on the inside of the termination of the external jugular.

The internal jugular vein receives, in its course along the neck, branches corresponding to the ramifications of the external carotid artery, of which it will be sufficient to mention the names. They are the SUPERIOR THYROIDEAL, EXTERNAL MAXILLARY, LINGUAL, PHARYNGEAL, and OCCIPITAL VEINS.

The PAR VAGUM forms one of the divisions of the eighth pair of the cerebral nerves. Leaving the skull at the foramen jugulare, the par vagum is first found in front of the hypo-glossal nerve, and then passing behind it, is continued strait down the neck between, and rather behind, the carotid artery and internal jugular vein, as it has been already mentioned. In entering the chest, the par vagum passes immediately in front of the subclavian artery on the right side, and on the left, in front of the arch of the aorta. Its further course will be described with the dissection of the thorax.

The branches which the par vagum gives off in the neck, are

1. Filaments of communication with the glosso-pharyngeal and other nerves at the basis of the skull.

2. A Pharyngeal branch, which descends obliquely inwards to the pharynx, where it separates into many filaments, forming the pharyngeal plexus, which is distributed principally to the constrictor muscles of the pharynx.

3. The Superior Laryngeal Nerve, which arises below the preceding, passes downwards and forwards, behind the internal carotid artery to the larynx, into which it enters either by penetrating the mucous membrane, which connects the os hyoides with the thyroid cartilage, or by passing through a hole in the ala of the thyroid cartilage itself. Its filaments are distributed to the muscles and to the mucous membrane lining the larynx and pharynx. They communicate with the filaments of the recurrent nerve.

The superior laryngeal nerve, before it enters the larynx, gives off a branch, sometimes denominated the external laryngeal nerve, which is distributed principally to the muscles on the outside of the larynx and pharynx.

4. Filaments, which arising from the par vagum at the lower part of the neck, proceed down-

wards into the chest, and join the cardiac plexus, which is destined for the supply of the heart.

The Recurrent Nerve is found in the lower part of the neck, between the trachea and œsophagus. It arises from the par vagum, just after its entrance into the chest, and thence turns upwards into the neck. The complete description of this nerve will be given with the dissection of the thorax.

The Great Sympathetic or Intercostal Nerve begins in the upper part of the neck, at the Superior Cervical Ganglion, which is deeply situated immediately under the basis of the skull, behind the internal carotid artery, and on the outside of the par vagum and hypo-glossal nerves. The extent of the ganglion varies much in different subjects. It may terminate at the third cervical vertebra, or it may reach as low as the fifth. From the upper end of the ganglion, two filaments generally arise, which ascending into the canalis carotideus, are continued through it, and join the fifth and sixth pairs of the cerebral nerves.

From the lower end of the superior cervical ganglion, a single filament arises, which is generally regarded as the continued trunk of the Sympathetic. It descends along the neck behind the carotid artery, close upon the rectus anticus major and longus colli muscles to the Middle Cervical Ganglion, which is situated at about the fifth vertebra. The middle ganglion is frequently so small that it rather has the appearance of a slight swelling of the nerve than of a distinct substance, and occasionally it is altogether wanting

From the middle cervical ganglion, the Sympathetic nerve is continued along the neck to the INFERIOR CERVICAL GANGLION, which is found in the hollow between the transverse process of the seventh cervical vertebra and the neck of the first rib. It cannot, however, be satisfactorily seen in the present stage of the dissection. The Sympathetic gives off in the neck,

1. From the SUPERIOR CERVICAL GANGLION, several sets of filaments, of which some communicate with the other nerves at the basis of the skull, and with the upper cervical nerves; others are distributed to the deep muscles of the spine; others to the larynx and pharynx, and to the thyroid gland; and one particular set, which is formed into plexuses, denominated from their soft texture NERVI MOLLES, surrounding the trunk and branches of the carotid artery, and adhering closely to their coats; and lastly, a single filament denominated NERVUS CORDIS SUPERFICIALIS, which descends along the neck, and joins the other cardiac nerves.

2. From the MIDDLE CERVICAL GANGLION the Sympathetic gives off many filaments, some of which communicate with the cervical nerves, and with the recurrent, and others unite to form the MIDDLE CARDIAC NERVE, which descends along the neck

into the chest, and there joins the other nerves of the heart.

The Middle Cervical Ganglion is frequently connected with the Inferior Ganglion by three or four branches, which encircle the vertebral, inferior thyroid, and subclavian arteries. Occasionally these branches are altogether wanting, and the two lower cervical ganglia are joined, so as to form a continuous substance.

OF THE CERVICAL NERVES CONNECTED WITH THE DISSECTION OF THE NECK.

Between the occiput and the atlas is seen

The anterior branch of the first cervical nerve, which has communications with the anterior branch of the second, and with the superior cervical ganglion, and with the other nerves at the basis of the skull.

Below the preceding we meet with

The anterior branches of the second, third, and fourth cervical nerves, which communicate so as to form arches between each other. From these arches other branches arise, which unite and divide again, and thus constitute altogether an intricate plexus, which is denominated the cervical plexus.

The CERVICAL PLEXUS is extended along the side of the neck behind the mastoid muscle, and on the outside of the carotid artery and jugular vein. The nervous filaments are imbedded in much cellular tissue, and surrounded by vessels and absorbent glands, which must be carefully removed before the plexus can be fairly exposed. From the plexus there proceed many branches. Some communicate with the cervical ganglia of the Sympathetic, with the nervus accessorius and hypo-glossal nerve. Others descend, and soon divide into smaller filaments. These proceed downwards, partly in front of the clavicle, and partly behind it. In the former situation they are distributed to the integuments and muscles covering the shoulder and chest, and in the latter, to the parts in the axilla.

Two other filaments ascend from the plexus, and have been already described, as being distributed to the integuments of the head, parotid gland, and external ear. And, lastly, other filaments pass across the external surface of the mastoid muscle, and are distributed to the platisma myoides, and integuments.

The PHRENIC NERVE is also seen in this stage of the dissection. It is formed by filaments from the fourth and fifth cervical nerves, and sometimes also from the third, which unite into a single nerve upon the anterior scalenus muscle. The phrenic nerve descends, connected by cellular tissue to the front of this muscle, and thence passes between the subclavian vein and artery into the chest. It distributes a few branches to the scalenus anticus muscle, and has communications with the inferior cervical ganglion of the Sympathetic.

There are other vessels and nerves situated in the lower part of the neck, but as these are destined principally for the supply of the upper extremity, it will be better to leave their dissection until the muscles covering the front of the chest have been reflected. A complete view will then be gained of these vessels and nerves in their whole course from the neck into the axilla.

CHAP. VIII.

DISSECTION OF THE THORAX.

SECT. I.

OF THE PARTS SITUATED ON THE OUTSIDE AND FRONT OF THE THORAX.

Beneath the integuments covering the front and side of the chest is the Mammary Gland, imbedded in a considerable quantity of fat, which is very closely united with its substance. When this fat is carefully removed, we find the gland to be of a flattened hemispherical form, and thicker in the centre than towards its circumference. It is of a whitish colour, and of a soft pulpy texture, and is formed by the union of many portions, or lobes, united by dense cellular tissue. Some of these portions frequently extend themselves irregularly outwards from the centre of the gland into the surrounding fat. The mammary gland and the fat which surrounds it are connected by a loose cellular tissue to the pectoralis major muscle immediately beneath it. The skin covering the mammary gland is remarkable for its softness and delicacy of texture, and nearly in its centre is the nipple, surrounded by a circle of a deeper colour termed the areola. At the extremity of the nipple, numerous orifices may be distinguished. These are the terminations of the lactiferous ducts which arise in the substance of the gland.

In the male subject the mammary gland bears no comparison in its size with that which is found in the female.

When the integuments which cover the whole front and side of the chest are removed, we expose

The Pectoralis Major. This is a broad and triangular muscle, divided into a superior portion, which arises by short aponeurotic fibres from the inner half of the clavicle, and into an inferior portion, which arises by aponeurotic fibres from the whole front surface of the sternum, and by fleshy fibres from the cartilages of the third, fourth, fifth, sixth, and sometimes of the seventh ribs. From these origins the fibres proceed in an oblique direction across the chest, and converge towards the inside of the arm, where they terminate in a flat tendon, which is inserted into the os humeri, along the front margin of the bicipital groove. The sternal and clavicular portions of the muscle are separated by a distinct line, occupied only by cellular tissue, and between the clavicular portion and the front edge of the deltoid there is an interspace occupied by fat and cellular tissue, and by the cephalic vein, which passes through it to open into the axillary vein. The aponeurotic fibres belonging to the pectoralis major on each side decussate with each other, so as to form an expansion which covers the front of the sternum. The sternal portion of the muscle, as it approaches the os humeri, is folded back beneath the edge of the clavicular portion, so as to give the muscle a twisted appearance in this situation, where it forms the front margin of the axilla. From the lower part of the pectoralis major, a distinct fleshy slip is frequently extended downwards, and joins the obliquus externus muscle.

The pectoralis major is to be detached from the clavicle, sternum, and ribs, and in reflecting it, many branches of the axillary vessels and nerves will be seen distributed to its under surface. These are to be left connected with the muscle, as they will then be more advantageously examined in the next stage of the dissection. Beneath the pectoralis major is

The Pectoralis Minor, which is a triangular muscle of much less breadth than the preceding. It arises by distinct digitations from the third, fourth, and fifth ribs, near their cartilages; and proceeding upwards and backwards, its fibres converge into a flat tendon, which is inserted into the coracoid process, and is here connected with the coraco-brachialis and with the short head of the biceps muscle.

A small muscle is placed obliquely between the under surface of the clavicle and the first rib. This is

The SUBCLAVIUS. It arises by a flattened tendon from the cartilage, and sometimes from the bone of the first rib, and proceeding obliquely outwards, and a little backwards, is attached to the groove along the under surface of the clavicle. This attachment occupies the bone in its whole length except about an inch at each end.

A thin aponeurotic expansion, more or less distinct in different subjects, is extended across from the first rib to the coracoid process, in an arched form over the axillary vessels.

When the pectoralis minor is reflected from the ribs, we bring into view a broad muscle which is expanded over the side and back part of the chest. This is

The SERRATUS MAGNUS. It arises by distinct digitations from the eight or nine upper ribs, at a short distance from their cartilages; and proceeding upwards and backwards, is attached to the basis of the scapula in its whole length, between the insertions of the rhomboideus and subscapularis muscles. In the present stage of the dissection, only that part of the serratus magnus can be seen, which covers the side of the chest. The greater part of the muscle is concealed between the scapula and ribs, and will be more advantageously seen after the dissection of the muscles of the back.

The dissection of the muscles, covering the front and side of the chest, is here concluded, but it is still necessary to point out three small muscles which are found in the lower part and side of the neck, before we proceed to the vessels and nerves. These three muscles are denominated the scaleni, and from their situation are distinguished into the anticus, medius and posticus.

The SCALENUS ANTICUS arises tendinous from the external surface and upper border of the first rib, near its cartilage, and thence proceeding obliquely upwards and inwards, is attached by distinct tendons to the transverse processes of the third, fourth, fifth, and sixth cervical vertebræ.

The SCALENUS MEDIUS arises from the external surface of the first rib, about half an inch from the scalenus anticus, and proceeding obliquely upwards, is attached by distinct tendons to the transverse processes of the six upper cervical vertebræ.

The SCALENUS POSTICUS arises from the external surface of the first rib near the spine, and sometimes from the upper border of the second rib, and ascending obliquely inwards, is attached by distinct tendons to the transverse processes of the fifth and sixth cervical vertebræ.

In many subjects, the scalenus medius and posticus are united into one muscle; hence, by some anatomists, only two scaleni are described.

VESSELS AND NERVES PASSING FROM THE NECK INTO THE AXILLA.

The Subclavian Artery, which arises on the right side, with the carotid, from the arteria innominata, and on the left, as a distinct branch from the arch of the aorta as before described. Having passed out of the chest, it proceeds first transversely outwards, and then obliquely downwards, over the flattened surface of the first rib, with which it is in immediate contact. Just in this situation the artery occupies the space between the origins of the scalenus anticus and medius muscles. The axillary plexus of nerves is placed immediately above, and a little behind the artery, and the subclavian vein, in front of it, the scalenus anticus intervening. Having passed beneath the clavicle, the subclavian artery acquires the name of Axillary.

Before we describe the branches of the subclavian artery, it will be necessary to remark, that they are more irregular in their distribution than any other series of arteries of equal size in the body; hence no given description will correspond to the arrangement of them in any two subjects.

The branches of the subclavian artery are, the Internal Mammary, the Inferior Thyroid, the Superior Intercostal, the Vertebral, the Cervicalis Profunda, and the Cervicalis Superficialis.

1. The Internal Mammary arises from the

lower and front part of the subclavian, just before its passage between the scaleni, and entering the chest, proceeds downwards, immediately beneath the cartilages of the ribs. Having reached the cartilage of the seventh rib, it penetrates the diaphragm, and then ramifying between the abdominal muscles, is distributed principally to the rectus, and communicates with the branches of the epigastric and lumbar arteries. In this course, the internal mammary gives off

(*a*) Branches to the muscles of the neck, to the thymus, pericardium, and other parts in the chest.

(*b*) One small branch, denominated Comes Nervi Phrenici, accompanying the phrenic nerve to the diaphragm, where it communicates with the phrenic arteries derived from the aorta.

(*c*) Branches which pass out of the chest through the intervals between the ribs, to be distributed to the mamma, and to the muscles covering the front of the chest, where they communicate with the intercostal and thoracic arteries.

2. The Inferior Thyroid arises from the front of the subclavian. It first proceeds upwards and outwards, but soon bends transversely inwards between the carotid artery, and the spine, and then ascends in a very tortuous course to the thyroid gland, where it ends in branches, which ramify through the gland, and communicate with the other thyroid arteries. The inferior thyroid usually gives off in its course to the thyroid gland, the following branches,

(*a*) The SUPRA-SCAPULAR, an artery of variable size, sometimes denominated TRANSVERSALIS SCAPULARIS, or, TRANSVERSALIS HUMERI. From its origin, it bends obliquely downwards, and then runs across the neck, immediately behind the clavicle to the superior costa of the scapula. It next proceeds downwards, either under or above the ligament which extends across the supra-scapular notch, and then continues its course beneath the acromion, where it ends by inosculating with a large branch of the infra-scapular artery, which is derived from the axillary trunk. Many other communications also take place upon the scapula, between the branches of the supra-scapular and infra-scapular arteries.

(*b*) The TRANSVERSALIS COLLI, which runs transversely across the neck, and passing beneath the trapezius, ends in branches to the surrounding muscles which communicate above with the branches of the occipital artery.

(*c*) The RAMUS THYROIDEÆ ASCENDENS, which ascends in front of the transverse processes of the vertebræ, and distributes its branches to the deep-seated muscles of the neck. Some of these enter the vertebral canal and terminate upon the membranes of the medulla spinalis, where they communicate with the branches of the vertebral artery. The Ramus Thyroideæ Ascendens ends above in communications with the occipital artery.

The transversalis colli and supra-scapular arteries frequently arise as distinct branches of the subclavian.

3. The SUPERIOR INTERCOSTAL arises from the posterior part of the subclavian. It first proceeds backwards, and then turns suddenly downwards in the chest over the necks of the first and second ribs, where it ends in branches to the intercostal muscles, which communicate with the intercostal branches of the aorta.

4. The VERTEBRAL, which is the largest branch, arises from the upper part of the subclavian. It has its origin deep in the neck, and proceeds directly upwards to the holes in the transverse processes of the vertebræ. It generally enters them at the sixth vertebra, occasionally at the seventh, and sometimes not until it has reached the third. It continues its course directly upwards from one transverse process to another as far as the atlas. Here, having turned outwards, it passes through the transverse process of this vertebra, and again suddenly bending inwards, passes along the groove in the upper surface of the bone to the foramen magnum, through which it enters the cranium. Sometimes the groove in the atlas is formed into a complete bony canal.

It is to be remarked, that when the vertebral artery does not enter the transverse processes until it has reached as high as the fourth or third vertebra, it has its course along the neck close upon the spine behind the common carotid artery.

The vertebral artery gives off in the neck,

(*a*) Branches to the deep-seated muscles, and to the membranes of the medulla spinalis. Some of these communicate with the branches of the occipital.

(*b*) POSTERIOR MENINGEAL ARTERIES ramifying upon the dura mater at the back part of the skull.

A large vein accompanies the vertebral artery in its course through the holes in the transverse processes of the vertebræ.

The vertebral artery occasionally arises as a distinct branch from the arch of the aorta.

The distribution of the vertebral artery within the cranium will be described with the arteries of the brain.

5. The CERVICALIS PROFUNDA, or POSTERIOR, which usually arises from the subclavian just before it passes beneath the scalenus anticus. It ascends obliquely backwards, and ends in branches which distribute themselves to the muscles covering the posterior part of the spine, and communicate above with the branches of the occipital.

6. The CERVICALIS SUPERFICIALIS, or, ANTERIOR, which arises from the upper part of the subclavian after it has passed beneath the scalenus anticus. At its origin, it is concealed by the nerves of the axillary plexus. It proceeds transversely across the neck to the superior costa of the scapula, where it ends in branches to the surrounding muscles.

The cervicalis superficialis is frequently a branch of the transversalis colli.

Of the AXILLA. The axilla is the deep hollow at the upper part and inside of the arm, which is bounded in front by the pectoralis major muscle, and behind, by the latissimus dorsi. Within this hollow there lie imbedded the trunks of the vessels and nerves passing between the neck and the arm, with many absorbent glands, and a large quantity of loose cellular and adipose tissue.

When the pectoral muscles are reflected, the axillary vessels are not immediately exposed, as they are concealed by the loose cellular tissue just mentioned. By dissecting carefully through this tissue, the Axillary Vein will be first seen, as it lies rather in front of the Artery. Behind the artery, is the Axillary Plexus of Nerves.

The axillary absorbent glands vary both in their number and size. They are imbedded in the cellular tissue of the axilla, and are generally placed closely round the vessels and nerves. They are continued upwards beneath the pectoral muscles and the clavicle, and are connected with the absorbent glands of the neck.

Of the AXILLARY ARTERY. The subclavian artery, immediately after it has passed beneath the clavicle, acquiring the name of Axillary, continues its course obliquely downwards and outwards, beneath the pectoral muscles, and through the axilla to the inside of the coraco-brachialis, along which it is continued down the arm, and arriving at the lower margin of the tendon of the latissimus dorsi, it acquires the name of Brachial. Immediately below the axillary artery, is the axillary vein when in a collapsed state, but if distended, is almost completely in front of it. In front of the artery, one or two small nerves are generally seen crossing it in an oblique direction, the rest of the axillary plexus are placed behind it. Around the artery, as it approaches the inside of the arm, the nerves are so arranged, that with the connecting cellular tissue, they form a complete sheath for the vessel.

The Branches of the AXILLARY ARTERY are, the SUPERIOR THORACIC, the INFERIOR THORACIC, the THORACICA HUMERARIA, the THORACICA ALARIS, the INFRA-SCAPULAR, the POSTERIOR CIRCUMFLEX, and the ANTERIOR CIRCUMFLEX.

1. The SUPERIOR, or SHORT THORACIC, which ascends from its origin, and turns over the upper border of the pectoralis minor, where it divides into branches which are distributed to the surrounding muscles.

2. The INFERIOR, or LONG THORACIC, sometimes denominated the External Mammary, descends behind the pectoralis minor along the side of the chest, distributing its branches to the surrounding muscles which communicate with the branches of the internal mammary, and with the branches of the intercostal arteries perforating the intercostal muscles.

There are frequent varieties in the arrangement of these thoracic arteries. Very often, instead of one large inferior thoracic, there are three or four small branches arising separately and running down the side of the chest. Occasionally, the inferior thoracic is a branch of the circumflex or of the infra-scapular arteries.

3. The Thoracica Humeraria, which is a small branch, and proceeds from its origin upwards and outwards, into the space between the deltoid and pectoralis major, where it ends in branches to the surrounding muscles.

The thoracica humeraria is frequently a branch of the superior thoracic.

4. The Thoracica Alaris, a branch of uncertain size and origin, distributed to the axillary glands, and other parts in the axilla.

5. The Infra-Scapular, which is a large artery arising near the tendon of the latissimus dorsi. Soon after its origin, it divides into two branches. One of them proceeds backwards nearly in the direction of the inferior costa of the scapula, and distributes its ramifications to the subscapularis and other muscles adjacent. Some of these are reflected over the lower and back part of the bone to its dorsum, where they communicate with the branches of the supra-scapular. The other branch in which the infra-scapular ends, turns over the inferior costa of the scapula near its neck, and running under the teres minor and infraspinatus, distributes its ramifications to these mus-

cles. One large branch of this artery inosculates under the acromion with a branch of the supra-scapular.

The infra-scapular is sometimes a branch of one of the thoracic arteries.

6. The POSTERIOR CIRCUMFLEX, which is usually a large branch arising at a short distance from the infra-scapular. It proceeds backwards, and winds round the neck of the humerus to the under surface of the deltoid, where its ramifications are principally distributed.

The posterior circumflex is frequently a branch of the infra-scapular.

7. The ANTERIOR CIRCUMFLEX, which is a smaller branch than the preceding, passes forwards beneath the coraco-brachialis and short head of the biceps around the front of the neck of the humerus, and ends in ramifications to the under surface of the deltoid.

The circumflex arteries frequently have their origin by a common trunk.

The AXILLARY VEIN is formed by a continuation of the basilic vein which ascends along the inside of the arm. From the commencement of the axilla, the axillary vein proceeds obliquely upwards and inwards in the direction of the axillary artery beneath the clavicle into the neck. Here acquiring the name of Subclavian, it continues its course transversely inwards, and in front of the scalenus anticus, and then enters the chest. From the axilla to the clavicle the vein is placed immediately below and rather in front of the axillary artery ; and in the neck, the vein is situated quite in front of the subclavian artery, the scalenus anticus intervening. The axillary vein receives branches corresponding to the ramifications of the axillary artery, and just before it passes beneath the clavicle, it usually receives the cephalic vein, which may terminate either in the axillary vein itself, or in one of the branches leading to it. The subclavian vein receives in the neck, the external and internal jugular veins. The termination of the latter takes place just as the subclavian vein enters the chest.

The Axillary Plexus of Nerves, is formed by the union of the anterior branches of the four last cervical nerves, with the first dorsal nerve, which is seen ascending from the chest. These five nerves mutually giving and receiving branches, thus form a plexus of considerable breadth, which is situated at its commencement between the scaleni, and is covered in front by the scalenus anticus. From beneath this muscle, the plexus proceeds obliquely downwards and outwards between the subclavius muscle and the first rib, and then continues its course in the same direction beneath the pectoral muscles into the axilla. In the neck, the plexus is placed above and rather behind the subclavian artery, and below the clavicle, it is situated behind the axillary artery and vein. The branches which the axillary plexus gives off are

1. Filaments of communication with the cervical ganglia of the Sympathetic.

2. Two THORACIC NERVES, which descend on the outside of the chest, and are distributed to the pectoral and serratus magnus muscles.

3. SUPRA-SCAPULAR NERVE, which arising from the upper part of the plexus, proceeds obliquely backwards to the supra-scapular notch through which it passes, and then terminates in filaments distributed to the supra-spinatus, infra-spinatus, and teres minor muscles.

4. Two or three INFRA-SCAPULAR NERVES, which are distributed to the subscapularis, latissimus dorsi, and teres major muscles.

In the dissection of the axilla, filaments of the intercostal nerves are seen penetrating the intercostal muscles to the outside of the chest, where they communicate with the branches of the axillary nerves.

The axillary plexus having given off the branches above described, terminates in six nerves for the supply of the arm. These are the CIRCUMFLEX, the EXTERNAL and INTERNAL CUTANEOUS, the MEDIAN, the MUSCULAR SPIRAL or RADIAL, and the ULNAR nerves.

SECT. II.

OF THE CONTENTS OF THE THORAX.

THE cavity of the thorax is to be laid open in the following manner:—The cartilages of the ribs are to be divided on each side, close to their union with the bones, and the articulations uniting the clavicles with the sternum are to be separated. The sternum, together with the cartilages of the ribs, are then to be gradually raised from below upwards, the connexions between their under surfaces, and the parts beneath, are at the same time to be divided in succession.

The organs contained in the thorax are the heart and lungs, with the great vessels passing to and from them, and several other vessels and nerves placed in the posterior part of the cavity.

The thoracic organs, like those of the abdomen, are confined in their situation, and are invested by the several reflections of a serous membrane. In the chest there are three distinct serous membranes, one for each lung, forming together the PLEURÆ, and one for the heart, which is the PERICARDIUM. These three serous membranes, like the others of the same class, form imperforate sacs, which are reflected partly upon the walls of the chest, and partly upon the viscera, so as to give to each a smooth covering.

When the sternum and cartilages of the ribs are raised, we see the two LUNGS occupying the sides of the chest, and between them a middle partition, which is the MEDIASTINUM. In the middle and lower part of the chest is the HEART concealed by the Pericardium.

The PLEURÆ are generally represented as membranous bags, placed laterally with respect to each other in the chest, and forming, by their apposition in the middle, the mediastinum. But it will be necessary to give a description more in detail of each pleura, in order that the student may understand the manner in which it is extended upon the walls of the chest, and how it is reflected over the lungs, so that each lung is completely on the outside of the pleura, as the abdominal viscera are on the outside of the peritoneum.

As each pleura is an imperforate sac, it is immaterial at what point the description of its course is commenced. If then we begin at the under surface of the sternum, the pleura will be traced from this point, extending itself outwards upon the whole side of the chest. It is united to the ribs and intercostal muscles by loose cellular tissue, and forms in this situation the PLEURA COSTALIS. From the lowermost ribs, the pleura is continued upon the upper surface of the diaphragm, giving to it the same smooth covering as to the other walls of the chest. From the back parts of the ribs the pleura is extended to the sides of the dorsal vertebræ, and then continues its course forwards to the pulmonary vessels at the posterior part of the root of the lung.

The passage of the pleura from the sides of the vertebræ to the posterior part of the lung is easily seen by drawing the lung out of the chest, and pressing it towards the opposite side, so as to permit a full view of the back part of the cavity. The pleura thus reaching the lung is continued over every part of the organ, and closely adhering to it, constitutes the smooth covering denominated the PLEURA PULMONALIS. From the front of the lung the pleura is again continued to the pulmonary vessels, and thence passes forwards to the under surface of the sternum, where our description commenced.

Each pleura, as it proceeds forwards to the under surface of the sternum, is connected with the sides of the pericardium, which is thus included between the two pleuræ. Immediately in front of the pulmonary vessels, the two pleuræ come in contact, and from this point, in their course forwards to the sternum, they gradually diverge so as to leave a triangular space between them.

We have already seen that the mediastinum is a partition dividing the chest into a right and left cavity, and formed by the apposition of the two pleuræ in the centre. When the sternum is raised in the manner already described, the mediastinum appears. But it may be well to mention, that the mediastinum is most advantageously viewed when the sternum is left entire, and the cartilages of the ribs are taken away on each side; for thus, that part of the mediastinum which is between the front of the pulmonary vessels and the under surface of the sternum is allowed to preserve its natural connexions. The mediastinum does not preserve a strait direction beneath the middle of the sternum in its whole length; but if it be traced from above downwards, it is observed to pass obliquely from the right towards the left side. In some subjects, however, it has been seen to descend strait beneath the middle of the sternum, and, in a very few instances, inclining from the left to the right side.

The mediastinum is generally distinguished into an anterior and a posterior division. Within the anterior division of the mediastinum are contained; above, the Subclavian Veins and Vena Cava Superior, the Arch of the Aorta, and branches proceeding from it, and generally in the early periods of life some remains of the part called the thymus, which is peculiar to the fœtus; and below, the heart and pericardium. Between these parts and the under surface of the sternum, a large quantity of loose cellular tissue intervenes, in which there are several absorbent glands. Within the posterior division of the mediastinum are contained the Pulmonary Vessels, the trachea with the commencement of the bronchi, the œsophagus, the aorta, the two nerves of the eighth pair, the vena azygos, the thoracic duct, and several absorbent glands.

Of the LUNGS. In the living body the lungs accurately fill the cavity on each side of the chest; but after death, when the chest is opened, the lungs suffer a diminution in their bulk, greater or less in proportion to the quantity of fluids contained within them. Thus they will be observed to recede from the walls of the chest in a less degree when they are loaded with blood, or other fluid increasing their natural solidity.

The lungs as necessarily moulded to the form of the cavities which they fill, are conical, with their broadest part downwards, and their narrowest upwards. From the inclination of the heart to the left side, there is less space for the base of the left than for that of the right lung, and the latter is consequently the broadest. Each lung corresponding on its external side to the walls of the chest, is convex in its whole extent, and on its internal side each lung is flattened. The bronchus, pulmonary vessels, and nerves, enter the lung on its internal flattened side, not exactly in the middle, but rather towards the upper and back part. The term root of the lung refers to that part of the organ where it is penetrated by the vessels and nerves. The basis of each lung presents a concavity corresponding to the convexity of the diaphragm. This, however, applies to the condition of the parts in the dead subject, when the diaphragm is seen only in the state in which it is during expiration. In the living body, when the diaphragm descends in the act of inspiration, and becomes almost horizontal, the lungs closely following it, necessarily undergo a corresponding change in their figure. Each lung is divided by very deep fissures into lobes, the right into three lobes, of which the middle is the smallest; and the left into two of nearly equal extent.

The lungs, it should be observed, possess no power of motion within themselves. In respiration, therefore, being wholly passive, they can only follow the movements of the organs by which they are surrounded. Each lung, therefore, must accurately fill the side of the chest in which it is lodged, and the external surface of the lung, formed by the pleura pulmonalis, must be in close contact with the lining of the chest, formed by the pleura costalis.

The Heart, surrounded by its serous membrane, the pericardium, is lodged between the pleuræ in the lower and middle part of the chest, towards the left side. The Pericardium presents itself to our view as a pyramidal bag, with its basis turned upwards and backwards as corresponding to the basis of the heart. It lies behind the sternum, and the cartilages of the third, fourth, and fifth ribs, and is connected with these parts only by loose cellular tissue. The sides of the pericardium are covered by the pleuræ, and below, the pericardium is attached to the central tendon of the diaphragm by cellular tissue, which, in the adult, unites them so firmly that they cannot be separated without injury.

By laying open the pericardium, we shall be enabled to observe the mode of its connexion with the heart. The size of the bag is so much larger than that of the heart, as to admit the free motion of this organ within it. There is always a proportion between the size of the pericardium and that of the heart; hence, if in the dead subject, the former appears disproportionally large, it must be attributed to the empty and contracted state of the cavities of the latter organ. The pericardium becomes attached to the large vessels a little above the basis of the heart, and is then continued downwards upon the vessels and over the whole surface of the heart itself. The heart and its large vessels, for a small part of their course, thus receive a smooth covering from a reflection of the pericardium, and are still placed on the outer side of the bag. The external surface of the heart formed by the reflected pericardium, and the internal surface of that part of the membrane which forms the bag surrounding the heart, are moistened during life by a serous fluid. After death this moisture is collected into a small quantity of transparent water within the pericardium, which is denominated the Liquor Pericardii.

The Heart is placed obliquely in the chest with its broadest part, or basis, turned upwards and backwards, towards the right side, and with its apex turned downwards and forwards, towards the left, where it corresponds to the interval between the cartilages of the fifth and sixth ribs. The upper surface of the heart which is presented to view on opening the pericardium, is convex, while the opposite surface which rests upon that part of the pericardium attached to the central tendon of the diaphragm, is flattened. The heart is fixed in its situation by the large vessels attached to its basis, and by its connexion with the pericardium; but it must be remarked, that under the different circumstances of expiration and inspiration, and in the varied positions of the body, the heart deviates to a certain extent from the exact position here described.

The student having made himself acquainted with the general situation of the contents of the thorax, must proceed in the next place to the dissection of the large vessels which are found at the superior part and middle of the cavity.

By merely dissecting through the loose cellular tissue found in the upper and middle part of the chest, the two subclavian veins will be brought into view. In the dissection of the neck, the course of the subclavian veins has been described as far as the inner edge of the scalenus anticus muscle on each side, from which point the veins are immediately continued into the chest.

The Right Subclavian Vein is shorter, and usually smaller, than the left, and descends from the scalenus muscle almost in a strait direction through the chest to the point where it is joined with the left subclavian vein, to form the vena cava superior.

The LEFT SUBCLAVIAN VEIN proceeds from the scalenus muscle, nearly in an horizontal direction across the chest to its termination. In this course it is placed just above the arch of the aorta. In front, it is separated from the sternum only by loose cellular tissue, and behind, it crosses the trachea and the arteria innominata.

The SUBCLAVIAN VEINS receive the following branches.

1. The EXTERNAL and INTERNAL JUGULAR VEINS, already described in the dissection of the neck.

2. The VERTEBRAL VEINS, which are two in number, descending from the holes in the transverse processes of the cervical vertebræ.

3. The INTERNAL MAMMARY VEINS, which accompany the internal mammary arteries.

4. The INFERIOR THYROIDEAL VEINS, described in the dissection of the neck.

The VENA CAVA SUPERIOR is formed by the junction of the two subclavian veins on the right side of the chest, a little above the arch of the aorta, and opposite to the cartilage of the first rib. It descends in a strait course on the right of the aorta from which it is separated by a small space filled by cellular tissue. In its descent, it becomes covered by the reflection of the pericardium, and continuing its course downwards to the extent of two inches within the bag, it opens into the Right Auricle of the heart, at its upper and outer part.

Before the vena cava superior receives the reflection of the pericardium, many small veins open into it from the surrounding parts, and one of larger size, which is the Vena Azygos.

The Vena Cava Inferior, immediately after it has entered the chest, by passing through the hole in the central tendon of the diaphragm, receives the reflection of the pericardium, and opens into the right auricle of the heart at its lower and outer part. The termination of the vein may be readily seen by raising the point of the heart, and then looking within the bag of the pericardium towards its back part and right side.

The course of the first portion of the aorta, and the branches which are sent off from it are now to be examined.

The Aorta arises from the upper and back part of the left ventricle of the heart, and is placed at its commencement opposite to the lower margin of the cartilage of the third rib on the right side. From its origin it ascends behind the pulmonary artery, and inclines a little to the right. When it reaches as high as to be opposite to the lower margin of the first rib, it bends obliquely backwards to the left side of the third dorsal vertebra. All this part of the aorta is denominated its Transverse Arch, or, Curvature. The arch of the aorta is separated in front, only by loose cellular tissue, from the first bone of the sternum.

The first branches which the aorta gives off, are for the supply of the heart itself. These are named the CORONARY ARTERIES, and will be described with the dissection of the heart.

From the convex side of the arch of the aorta, three great branches usually arise, the ARTERIA INNOMINATA, the LEFT CAROTID, and the LEFT SUBCLAVIAN.

The ARTERIA INNOMINATA, which is the first of the three branches, arises from the arch near its summit, and ascends obliquely to the right upon the trachea, and beneath the left subclavian vein. After a course of between one and two inches, the arteria innominata divides into the RIGHT SUBCLAVIAN and RIGHT CAROTID arteries.

The RIGHT SUBCLAVIAN ARTERY proceeds obliquely upwards and outwards into the neck to the space between the scalenus anticus and medius muscles.

The RIGHT CAROTID ARTERY ascends with a slight obliquity outwards to the right side of the neck.

The LEFT CAROTID ARTERY arises from the arch of the aorta, nearly at the same level with the arteria innominata, and ascends obliquely outwards to the left side of the neck.

The LEFT SUBCLAVIAN ARTERY arises from the arch just before the aorta descends upon the dorsal vertebræ, hence its origin is somewhat concealed from being placed deeply in the chest. It ascends directly upwards into the neck, and then turns suddenly outwards into the space between the scalenus anticus and medius muscles.

There are several varieties both in the number and in the mode of origin of the branches given off from the arch of the aorta. The vertebral artery occasionally arises as a distinct branch from the arch. The right subclavian and right carotid arteries sometimes arise separately from the arch without the formation of an arteria innominata. In a few instances, two branches only have been seen arising from the arch, one of them dividing into the right subclavian and right carotid, the other into the left carotid and left subclavian. The right subclavian artery has been seen arising separately from the arch near its termination, and thence proceeding transversely either between the trachea and œsophagus, or between the œsophagus and spine, to the right side of the neck.

The course of the phrenic nerve through the chest is next to be examined.

The Phrenic Nerve passing from the neck into the chest between the subclavian artery and vein, proceeds downwards in front of the pulmonary vessels, and on the outside of the pleura to the lateral part of the pericardium, along which it is continued to the diaphragm. It gives off no branches in its course through the chest until it reaches the diaphragm. Here each nerve divides into several branches, of which the greater number are distributed to the diaphragm itself; while the rest penetrating the muscle through its central tendon, pass into the abdomen, and end in communications with the ganglia and plexuses formed about the cœliac artery.

The last stage in the dissection of the chest consists in the examination of the several vessels and nerves in the posterior part of the mediastinum. For this purpose, the ribs are to be removed on each side to within three or four inches of the spine. Either lung is then to be drawn out of its cavity, and fixed towards the opposite side of the chest, and the pleura which passes from the sides of the vertebræ to the root of the lung is to be divided; when the several vessels and nerves in the posterior part of the mediastinum will be brought into view. These vessels and nerves are connected by a loose cellular tissue which requires a cautious dissection in its removal.

The TRACHEA, descending from the middle of the neck, continues its course strait downwards through the chest, to the second or third dorsal vertebra, where it ends by dividing into the two BRONCHI. Each bronchus proceeds obliquely downwards and outwards to the corresponding lung. The bronchi, entering the lungs in the situations already mentioned, ramify in every direction through their substance, dividing into branches, successively smaller and smaller, while their cartilaginous structure becomes at the same time gradually less distinct. The minute ramifications of the bronchi terminate in the air cells of the lungs.

The absorbent glands of the lungs, denominated the bronchial glands, are situated closely round the bronchi, some of them extending into the substance of the lung. They are numerous, and of a large size, of a rounded or oval figure, and of a dark blue or black colour.

The Œsophagus, descending from the neck, continues its course through the chest, passing first behind the trachea, next obliquely behind the left bronchus. It then becomes placed in the middle line of the body, in front and on the right of the aorta. From the chest it is continued through the opening in the diaphragm into the abdomen.

The Aorta proceeds from the left side of the third dorsal vertebra, where its arch terminates, in a strait course through the chest, close upon the spine, to the opening in the diaphragm, through which it passes into the abdomen. This part of the aorta, between the termination of the arch and the diaphragm, is usually denominated its thoracic or descending portion. It gives off the following branches:—

1. The Bronchial Arteries, which are of small size, and vary from two to five in number. They accompany the ramifications of the bronchi through the lungs. In their course to the lungs, they distribute branches to the pericardium, aorta, bronchial glands, and pulmonary vessels.

The bronchial arteries vary much in their origin. They frequently arise by a common trunk with one of the intercostal arteries, or with the œsophageal arteries, next to be described.

It has been shewn by injections, that the bronchial arteries communicate with the branches of the pulmonary artery in the lungs.

2. The Œsophageal Arteries, which consist of several small branches distributed upon the coats of the œsophagus. The lowermost of them accompany the œsophagus to the stomach, and communicate with the branches of the coronaria ventriculi which is derived from the cœliac artery.

The œsophageal arteries may arise by common trunks, either with the bronchial, or with the intercostal arteries.

3. The Intercostal Arteries, varying in number from seven to ten. They arise from the lateral and back part of the aorta, and proceed transversely outwards to the lower margins of the ribs, the arteries of the right side passing over the bodies of the vertebræ, and the upper arteries ascending obliquely to the ribs. Each intercostal artery proceeds forwards along the groove in the lower margin of the rib, with the intercostal vein and nerve towards the sternum, where the arteries terminate in communications with the internal mammary arteries, and with the thoracic branches of the subclavian artery. The uppermost intercostal communicates with the superior intercostal branch of the subclavian, and the two or three lower-

most intercostals communicate with the branches of the phrenic, epigastric, and circumflexa ilii arteries. As the intercostal arteries proceed along the ribs, they give off

(*a*) Branches which enter the spinal canal, and are distributed upon the medulla spinalis and its coverings.

(*b*) Branches which penetrate between the transverse processes of the vertebræ, and are distributed to the muscles of the back.

(*c*) Branches which are distributed partly to the intercostal muscles, and partly to the muscles on the outside of the chest.

The PAR VAGUM entering the chest on the right side, immediately in front of the subclavian artery, and on the left, immediately in front of the arch of the aorta, the two nerves then proceed downwards and backwards to the posterior part of the bronchi and root of the lungs. They are next continued upon the œsophagus, which they accompany to the diaphragm, the left nerve being placed towards the front of the tube, and the right at its back part. The two nerves then pass out of the chest with the œsophagus through the cardiac opening of the diaphragm to be distributed upon the stomach. The par vagum gives off the following branches in the chest:

1. The RECURRENT, or INFERIOR LARYNGEAL NERVE. On the right side the recurrent nerve arising from the par vagum, at an acute angle, just below the subclavian artery, turns round the vessel

so as to include it in a sort of loop, and then proceeds upwards and inwards into the neck, where it is placed in the loose cellular tissue which connects the posterior part of the trachea with the œsophagus. On the left side, the recurrent nerve arising from the par vagum lower down than on the right, turns round the arch of the aorta, so as to include it in a loop, and then ascending into the neck, is placed upon the front of the œsophagus where the tube projects beyond the left side of the trachea. The two recurrent nerves reaching the lower part of the larynx, pass beneath the constrictor inferior muscle and divide into several filaments, some of which are distributed to the mucous membrane of the pharynx and larynx, but the greater number are distributed to the muscles moving the arytenoid cartilages, and have communications with the filaments of the superior laryngeal nerve.

The recurrent nerves distribute at their commencement, two or three filaments which join the cardiac nerves, and others which descend to the lungs. Lastly, in their course up the neck, they distribute filaments to the œsophagus, thyroid gland, and trachea.

2. The Pulmonary Nerves. As each par vagum passes downwards behind the bronchus, it separates into several filaments, which, uniting again, present a plexiform appearance. Many branches here arise from the nerve, some of which passing in front, and others behind the bronchi, form the an-

terior and posterior pulmonary plexuses. The branches of these plexuses accompany the ramifications of the bronchi through the lungs, and appear to be distributed almost entirely to the mucous membrane lining the air tubes.

3. The Œsophageal Nerves. Each par vagum divides upon the œsophagus into several branches which communicate and divide again, so as to form a plexus in front and behind the tube. These œsophageal plexuses communicate freely, and distribute their filaments to the coats of the œsophagus and to the aorta. Towards the lower part of the chest the branches of each plexus unite again into a single nerve which accompanies the œsophagus into the abdomen, the right nerve being still behind the tube, and the left in front of it.

The final distribution of the par vagum in the abdomen will be described with the ganglia and plexuses of the abdominal viscera.

The Vena Azygos entering the chest either through the aortic opening of the diaphragm, or through a distinct opening in the lesser muscle, ascends in a strait course upon the right side of the spine to about the fourth dorsal vertebra, where it bends forwards to terminate in the posterior part of the vena cava superior in the situation already mentioned. The branches which the vena azygos receive in its course through the chest are

1. The Right Intercostal Veins corresponding to the intercostal arteries given off by the aorta. The

veins from the two or three upper intercostal spaces unite into a superior intercostal vein which terminates in the subclavian vein.

2. The Œsophageal Veins, with some small veins from the coats of the aorta.

3. The Right Bronchial Vein. The left bronchial vein ends in the left superior intercostal vein.

On the left side of the spine, a large venous trunk is formed, which has received the name of Semi-Azygos. It begins below by branches of communication with the lumbar and renal veins in the abdomen, and it usually terminates in the middle of the thorax by passing across the spine to open into the vena azygos. It receives the left intercostal veins, and sometimes other veins from the surrounding parts. The arrangement of the veins opening into the vena azygos will, however, scarcely be found alike in any two subjects.

The Thoracic Duct passing from the abdomen into the chest, through the aortic opening of the diaphragm, ascends upon the bodies of the dorsal vertebræ, between the vena azygos and the aorta. By carefully dissecting through the loose cellular tissue between these vessels, the duct will be readily seen in the form of a transparent tube about the size of a crow quill. Reaching as high as the sixth or fifth dorsal vertebra, the duct here changes its direction, and ascends obliquely towards the left side, and beneath the arch of the aorta. Then continuing its course upwards, it proceeds behind the left subclavian artery into the neck. Here it ascends close upon the longus colli muscle, as high as the sixth cervical vertebra, and then turns forwards, and a little downwards, to terminate either at the back part of the internal jugular or subclavian vein, or precisely at the angle of union between the two. Upon slitting open the vein anteriorly opposite to the termination of the duct, two membranous folds, serving the purpose of valves, will be seen placed around its orifice.

The thoracic duct is frequently tortuous in its course through the chest, and its diameter varies a little at different parts. About the middle of the chest it frequently splits into several branches, which soon unite again into one trunk, and at its termination it sometimes divides into two or three branches, which open separately into the internal jugular or subclavian veins near their union. Each branch is furnished with a distinct valve at its termination.

A second principal trunk of the absorbent system is usually found on the right side of the neck, terminating in the angle of union between the right internal jugular and the right subclavian veins. Its size is nearly equal to that of the thoracic duct.

Of the Sympathetic Nerve in the Chest. The sympathetic nerve in the chest consists of twelve small ganglia placed beneath the pleura upon the heads of the ribs, with connecting filaments passing between them. In the dissection of the neck it was stated that the inferior cervical ganglion of the Sympathetic would be more advantageously seen when we came to the chest. The ganglion is placed deeply in the hollow between the transverse process of the seventh cervical vertebra and the neck of the first rib. Its size and form vary much. Generally it is joined by a single filament to the first thoracic ganglion, but sometimes the two ganglia are united by a continuity of substance without any connecting filament. The thoracic ganglia are joined by a single filament passing between them, and the lowermost of them is joined by a filament to the first of the lumbar or abdominal ganglia. The other branches of the thoracic ganglia are,

1. Filaments, from one to four from each ganglion, which proceed obliquely upwards and outwards, and communicate with the respective intercostal nerves.

2. Small filaments distributed upon the coats of the aorta.

3. The Great Splanchnic Nerve, which arises by four or five filaments, between the sixth and the tenth ganglia. The filaments proceed from the ganglia obliquely forwards upon the spine, and unite into a single nerve about the eleventh dorsal vertebra, which continues its course forwards, and enters the abdomen, by penetrating between the fibres of the lesser muscle of the diaphragm.

4. The Lesser, or Accessory Splanchnic Nerve, which arises by two filaments, from the

tenth and eleventh thoracic ganglia. The filaments proceed obliquely forwards, and unite into a single nerve, which enters the abdomen through an opening in the lesser muscle of the diaphragm, and sometimes in company with the preceding nerve.

The distribution of the splanchnic nerves in the abdomen will be described with the ganglia and plexuses of the abdominal viscera.

Of the DISTRIBUTION of the NERVES of the HEART. In the dissection of the neck, it is seen that the nerves of the heart are derived from the cervical ganglia of the Sympathetic, a few communicating filaments being added to them by the par vagum and by the recurrent nerves. Five cardiac nerves resulting from this union, descend from the neck into the chest, three on the right side, and two on the left, and unite into a plexus, which is placed at the posterior part of the arch of the aorta, just above its origin from the heart. From this cardiac plexus there proceed,

1. Anterior branches distributed to the front of the aorta.

2. Posterior branches joining the pulmonary plexuses.

3. Inferior branches which are the largest and most numerous. They are partly distributed upon the great vessels of the heart, and partly form an anterior and posterior coronary plexus, which accompany the ramifications of the anterior and posterior

branches of the coronary arteries into the heart. The nerves have not been traced beyond the third and fourth divisions of the coronary arteries in the heart, and it has been doubted whether they give any filaments to its muscular structure.

CHAP. IX.

DISSECTION OF THE EXTERNAL PARTS OF THE HEAD, AND OF THE FACE.

SECT. I.

MUSCLES SITUATED ON THE OUTSIDE OF THE HEAD.

The integuments of the head are characterized by the thickness and density of their texture, and by the closeness of their union with the parts beneath.

Beneath the integuments there are found two broad and thin strata of fleshy fibres, extended upon the anterior part of the frontal bone, and two similar strata of fibres extended upon the back part of the occipital bone ; and between these an aponeurosis is expanded over the whole of the superior part of the head. The two strata of fleshy fibres, in front and behind, form together the occipito-frontales muscles, and the aponeurosis extended between them, is regarded as their common tendon.

The Occipito-Frontalis arises behind from the upper transverse ridge of the occipital bone, whence its fibres ascend and terminate in the aponeurosis. Towards the front of the head the fleshy fibres, again arising from the aponeurosis, descend upon the frontal bone, and are inserted partly into the skin of the eyebrow, and are partly intermixed with the fibres of the orbicularis palpebrarum and corrugator supercilii muscles. A small slip of muscular fibres is continued from the front part of the occipito-frontalis downwards upon the upper part of the nose. The aponeurosis connecting the occipito-frontales is united to the periosteum of the skull, by cellular tissue, in which fat is never deposited.

The fleshy portions of the occipito-frontalis are penetrated by numerous filaments of nerves. In front, these are derived on each side, from the supra-orbitary branch of the fifth pair of the cerebral nerves, and behind, from the great occipital nerve, which is a branch of the second pair of the cervical nerves. The Occipital Nerve penetrates the complexus muscle close to the occiput, then becoming subcutaneous, it divides into numerous filaments, which are distributed to the occipito-frontalis muscle, and to the integuments covering the posterior part, sides, and upper part of the head. Towards the front they communicate with the filaments of the supra-orbitary nerve.

The other muscles on the outside of the head are connected with the external ear. They are three in number.

The Attollens Aurem is a thin and triangular muscle, situated upon the side of the head just above the ear. Its fibres arising in a curved line from the aponeurosis of the occipito-frontalis, converge in their descent, and end in a tendon, which is fixed to the upper part of the cartilage of the ear.

The ANTERIOR AURIS is a very small muscle, situated upon the temple, in front of the ear. It arises from that part of the aponeurosis of the occipito-frontalis, which is over the middle of the zygoma, whence it proceeds backwards and a little downwards, and ends in a tendon which is attached to that part of the cartilage of the ear, denominated the helix.

The RETRAHENS AUREM is situated behind the ear. It arises from the outer and back part of the mastoid process, and proceeding transversely forwards, is attached to the back part of the cartilage of the ear. The appearance of this muscle varies considerably in different subjects. Frequently it is divided into two or three separate portions.

SECT. II.

MUSCLES OF THE FACE.

The dissection of the face is to be commenced by exposing a thin and broad muscle, which surrounds the bony ridges of the orbits, and is continued from them upon the cartilages of the eyelids. The integuments are united to the muscular fibres by loose cellular tissue, in which fat is never deposited, and in emaciated subjects, the fibres are so pale and indistinct as to require a very cautious dissection to exhibit them. The muscle is denominated

The Orbicularis Palpebrarum. It arises on the inner side of the orbit, from the internal angular process of the frontal bone, from the superior maxillary bone along the front edge of the groove in which the lacrymal sac is lodged; and, lastly, from a small round tendon, which is fixed to the nasal process of the superior maxillary bone. Its fibres pass outwards from these origins, and expand themselves upon the bony ridges of the orbit, and upon the cartilages of the upper and lower eye-lids. At the outer side of the eye the upper and lower fibres of the muscle meet, and are continued into each other. The orbicularis palpebrarum is connected above with the occipito-frontalis, and with the corrugator supercilii muscles. Some fibres are generally observed to detach themselves from the lower part of the orbicularis; and proceeding downwards, they terminate in the fat of the cheek, or become connected with some of the adjacent muscles.

That part of the orbicularis palpebrarum which covers the eyelids, is sometimes described as a distinct muscle by the name of CILIARIS.

The fibres of the occipito-frontalis, which are extended downwards towards the upper and inner corner of the eye, are now to be carefully separated from the orbicularis palpebrarum, and reflected upwards, when a small muscle will be brought into view, which is

The CORRUGATOR SUPERCILII. It arises from the internal angular process of the frontal bone, and proceeding obliquely upwards and outwards, terminates above the middle of the orbit by being intermixed with the fibres of the occipito-frontalis and orbicularis palpebrarum muscles.

A very small muscle is situated upon the ala nasi, which is

The COMPRESSOR NARIUM. It arises from the side of the ala nasi, close to its connexion with the superior maxillary bone, and proceeds across the ala to the dorsum nasi. Some of its fibres are connected with the descending fibres of the occipito-frontalis.

The lower border of the orbicularis palpebrarum towards the inner side of the orbit is now to be turned a little upwards, when the origins of the next muscle will be brought into view, which is

The LEVATOR LABII SUPERIORIS ALÆQUE NASI. It arises by two distinct portions which are separated by cellular tissue, one from the nasal process of the superior maxillary bone, the other from the front edge of the orbit to the extent of an inch above the supra-orbitary foramen. The two portions descending from their origins, become joined into one muscle, which is inserted partly into the side of the ala nasi, where it is united with the compressor narium, and partly into the upper lip, where it is united with the Orbicularis Oris and with the Levator Anguli Oris.

Beneath that portion of the Levator labii superioris which arises from the edge of the orbit, the infra-orbitary artery, vein, and nerve, are seen emerging from the infra-orbitary foramen, and immediately beneath these, is a small muscle, named

The LEVATOR ANGULI ORIS. It arises from the fossa in the superior maxillary bone, just under the infra-orbitary foramen, and proceeding obliquely downwards and outwards to the corner of the mouth, terminates by mixing with the fibres of the Orbicularis Oris and the Depressor Anguli Oris.

Two slender muscles are extended obliquely across the face from the os malæ to the corner of the mouth. These are the Zygomaticus Major and Minor. The latter, however, is frequently wanting.

The Zygomaticus Major is the outermost of the two. It arises from the convex and projecting part of the os malæ, and descends obliquely inwards to the corner of the mouth, where it is intermixed with the Orbicularis Oris, and with the other muscles of the lips.

The Zygomaticus Minor arises from the os malæ on the inside of the preceding, and proceeds in the same direction to the corner of the mouth.

A flattened and triangular muscle is extended between the corner of the mouth, and the basis of the lower jaw at its side. This is

The Depressor Anguli Oris. It arises broad from the external edge of the lower jaw just above its basis, and ascends, gradually contracting in breadth as it approaches the corner of the mouth, where it is intermixed with the Zygomaticus Major, Levator Anguli, and Orbicularis Oris. The outer edge of this muscle is united to the fibres of the Platisma Myoides, which ascend upon the face.

On the inside of the preceding muscle, and partly covered by it, is

The Depressor Labii Inferioris. It arises broad from the front and side of the lower jaw, a little above its basis, and proceeding obliquely upwards and inwards, unites with the opposite muscle, and terminates in the lower lip where its fibres are intermixed with those of the orbicularis oris. Fat is closely intermixed with the fibres of this muscle rendering it difficult of dissection, and the fibres are united with the ascending fibres of the platisma myoides.

Beneath the integuments of the cheek and the zygomatic muscles, there is a very considerable quantity of soft fat. When this fat is removed, a broad and thin muscle is brought into view, which is extended between the two jaws, and is denominated

The BUCCINATOR. It arises above from the surface of the upper jaw, behind the last grinding tooth, and from the extremity of the pterygoid process; below, from the external side of the lower jaw, between the last grinding tooth and the coronoid process, and in the middle, from a ligament which is extended between the two jaws. Its fibres proceed from these origins forwards to the corner of the mouth where they terminate beneath the elevator and depressor muscles by being intermixed with the fibres of the orbicularis oris. The inner surface of the buccinator is covered by the mucous membrane of the mouth, and the muscle is perforated by the duct of the parotid gland in the situation which will be presently mentioned.

Around the opening of the mouth is

The ORBICULARIS ORIS muscle. This is formed partly by the insertions of the several muscles of the lips which have been described, and partly by two distinct strata of fibres which are placed around the loose edges of the lips, and decussate with each other at the angles of the mouth. The orbicularis oris is closely united to the skin, and on its inner side, is covered by the mucous membrane of the mouth.

By drawing the upper lip forwards and upwards, and carefully dissecting through the mucous membrane on either side of the frænum which unites the lip to the gums, a small muscle will be brought into view, which is

The Depressor Labii Superioris Alæque Nasi. It arises from the superior maxillary bone just above the sockets of the incisor teeth, and proceeding upwards, terminates partly in the ala nasi, and partly in the upper lip.

By drawing the lower lip downwards and forwards, and dissecting through the mucous membrane in the same situation on either side of the frænum, a similar muscle will be brought into view, which is

The Levator Labii Inferioris. It arises from the lower jaw just below the socket of the cuspidatus tooth, and descending inwards, terminates in the cellular tissue and skin of the chin.

Of the Parotid Gland. The situation of the parotid gland is in the next place to be examined. This is the largest of the salivary glands, and derives its name from being placed near the ear. It is immediately exposed by the reflection of the integuments, and appears as a large flattened mass somewhat of an oval form occupying the space between the masseter muscle in front which it partly covers, the external ear behind, the zygoma above, and the angle of the jaw below. It is, however, but a small part of the parotid gland which is exposed in a superficial dissection, since its substance is extended deeply inwards into the hollow between the ramus of the jaw and the mastoid process, where it is firmly united to all the surrounding parts, namely, above, to the articulation of the jaw, in front, to the inside of the ramus of the jaw and to the pterygoideus internus muscle, and behind, to the mastoid process and to the meatus auditorius, and at its lower part, the gland extends a little behind the front margin of the sterno-cleido-mastoideus muscle. In some subjects, the lower end of the parotid terminates at the angle of the jaw, and is here separated from the submaxillary gland, by an interval containing only cellular tissue, while in others, the two glands are continued into each other. The external carotid artery and the facial nerve lie imbedded in the substance of the parotid. One or two absorbent glands are found superficially upon the parotid, or are partly imbedded in its substance.

The excretory duct of the parotid emerges from the front margin of the gland, and proceeds horizontally across the masseter muscle, at about an inch below the zygoma. The duct reaching the anterior edge of the masseter then turns inwards, through the fat of the cheek to the buccinator muscle, which it penetrates, and finally opens into the mouth by a small round orifice opposite to the first grinding tooth of the upper jaw.

A small portion separated from the rest of the parotid, denominated SOCIA PAROTIDIS, is generally connected with the parotid duct near its commencement. This part is, however, not constant, either in its size or situation, and in some subjects, it is altogether wanting.

The masseter and temporal muscles are in the next place to be dissected.

The MASSETER is a thick muscle covering the ramus of the jaw, and is formed by an intermixture of muscular and tendinous fibres. It arises partly tendinous, and partly fleshy, from the under part of the superior maxillary bone, close to its union with the os malæ, and from the lower edge and internal surface of the zygoma. Its fibres proceed in different directions to the lower jaw, hence a division is made of the muscle into an anterior and a posterior portion. The anterior portion descends obliquely backwards, the posterior portion obliquely forwards, and both portions uniting, they are inserted into the outer side of the angle and ramus of the jaw as high up as the root of the coronoid process.

The TEMPORAL muscle is covered by a thick and strong aponeurosis, which is fixed above to the whole extent of the temporal ridge formed in the sides of the frontal, parietal, and temporal bones, and below to the upper edge of the zygoma, and to the outer edge of the os malæ, where it forms the side of the orbit. In removing the aponeurosis, its inner surface will be found closely united to the muscular fibres beneath. The origins of the temporal muscle are, from the temporal ridge, and from the temporal fossa formed by the frontal, temporal, sphenoidal, and malar bones ; from the inside of the zygoma; and, lastly, from the inner surface of the aponeurosis just described. The fibres descend from these origins between the zygoma and the side of the skull, and terminate in a tendon, which is inserted into the coronoid process of the lower jaw. The masseter muscle must be removed before the insertion of the temporal muscle can be seen, when the tendon of the latter will be observed to surround the coronoid process almost completely, so as to include it in a sort of sheath.

There are two other muscles belonging to the lower jaw, denominated the PTERYGOIDEI. These will be more conveniently examined after the dissection of the muscles of the Pharynx.

SECT. III.

VESSELS AND NERVES OF THE FACE.

The External Carotid Artery was described in the dissection of the neck to the point where it ascends into the space between the angle of the jaw and ear, and becomes lodged deeply beneath the parotid gland. It continues its course directly upwards beneath the parotid towards the neck of the condyle of the lower jaw, where it terminates by dividing into two branches, which are the Temporal and Internal Maxillary Arteries.

Numerous small arteries arise from the External Carotid before its division, and are distributed to the substance of the parotid gland.

The Temporal Artery continuing the course of the trunk upwards through the substance of the parotid, crosses over the zygoma, and ascends upon the temporal aponeurosis where it terminates. The branches given off by the temporal are

(*a*) Numerous small arteries distributed to the substance of the parotid gland.

(*b*) TRANSVERSALIS FACIEI, which is usually a large artery. It passes across the masseter muscle into the face in the same direction with the parotid duct, and divides into several branches which are distributed to the side of the face, and communicate with the branches of the Infra-orbitary and Facial Arteries.

The Temporal Artery divides at its termination into an anterior and a posterior branch, the one distributes its ramifications backwards upon the occiput, where they communicate with the Occipital and Posterior Auricular Arteries, the other distributes its ramifications forwards upon the forehead, where they communicate with branches of the Ophthalmic Artery which are reflected from the orbit upwards upon the frontal bone.

The INTERNAL MAXILLARY ARTERY proceeds from its origin in a very tortuous course upwards and inwards behind the superior maxillary bone, towards the fissure between the superior maxillary and the sphenoid bones at the lower and back part of the orbit. In this course it gives off the following branches,

(*a*) ARTERIA MENINGEA MEDIA, a large branch which ascends directly upwards to the foramen spinosum, through which it is continued into the skull. Within the skull, it ascends obliquely forwards on the inside of the temporal and sphenoid bones, to the anterior inferior angle of the parietal bone, where it is lodged either in a deep groove, or in a complete canal of the bone. It then terminates by distributing its branches upon the dura mater in an arborescent course which is marked by the grooves on the inside of the parietal bone. The branches of the Meningea Media communicate in front with the Anterior Meningeal Arteries, which are derived from the ophthalmic, and behind, with the Posterior Meningeal Arteries which arise from the Vertebral and Occipital Arteries.

(*b*) The INFERIOR MAXILLARY, or DENTAL ARTERY, is a large branch which descends on the inside of the ramus of the jaw to the particular canal destined for it and its accompanying nerve. The artery passes forwards within the canal, sending branches upwards to the sockets of the teeth; and reaching the foramen mentale, it divides into two branches, one continuing its course forwards within the canal for the supply of the incisor teeth, the other passing outwards through the foramen mentale upon the face, here ends in several branches which are distributed to the muscles of the lower lip, and communicate with the branches of the facial artery.

(*c*) Branches distributed to the pterygoid muscles.

(*d*) TEMPORALES PROFUNDÆ, which are generally two, ascending to the temporal muscle.

(*e*) BUCCAL BRANCH distributed to the buccinator muscle.

(*f*) ALVEOLAR BRANCH, which is distributed to the gums of the upper jaw, and enters a canal in the bone for the supply of the teeth.

(*g*) PHARYNGEAL BRANCHES distributed to the upper part of the pharynx.

(*h*) PTERYGO-PALATINE BRANCHES which pass through the pterygo-palatine canal to be distributed upon the palate, tonsils, and uvula.

(*i*) SPHENO-PALATINE BRANCH, which passes through the spheno-palatine foramen to the nose.

The Internal Maxillary Artery having given off these branches, now receives the name of INFRA-ORBITARY, and passing through the infra-orbitary canal with the accompanying nerve, it emerges upon the face from the infra-orbitary foramen, and here divides into several branches which communicate freely with the Transversalis Faciei, Ophthalmic, and Facial arteries, thus forming a net-work of vessels on the side of the face.

The EXTERNAL MAXILLARY ARTERY was described in the dissection of the neck to the point where it ascends upon the lower jaw, close to the front edge of the masseter muscle. It then takes the name of FACIAL, and ascends obliquely forwards in a very tortuous course to the corner of the mouth, whence it is continued upwards beneath the zygomatic muscles to the side of the nose. The branches given off by the facial artery, are

(*a*) Branches distributed to the masseter muscles.

(*b*) The SUPERIOR and INFERIOR CORONARY ARTERIES which run along each lip near its edge, and at the middle of the lips, inosculate with the arteries of the opposite side.

(c) Branches to the nose.

The external maxillary artery ends in communications with the infra-orbitary artery, and with branches of the ophthalmic artery.

The veins returning the blood from the outside of the head and face, have a general arrangement corresponding with that of the arteries distributed to the same parts.

A TEMPORAL VEIN is formed on each side of the head, and descends close by the side of the temporal artery over the zygoma, and beneath the parotid gland.

A FRONTAL VEIN is formed at the upper and front part of the forehead, whence it descends upon the face by the side of the nose, and near to the inner corner of the eye, where it is denominated the ANGULAR VEIN, and has branches of communication with the ophthalmic vein. The Angular Vein changing its name for that of FACIAL, continues its course upon the face obliquely downwards and outwards at a little distance from the artery to the lower jaw. Here it becomes placed close to the outer side of the artery, and is continued downwards into the neck.

The INTERNAL MAXILLARY VEIN accompanies the corresponding artery.

There is a considerable variety in the mode by which these veins terminate. In some subjects, the Temporal, Internal Maxillary, and Facial Veins, unite to form the External Jugular Vein, while in others, the Temporal Vein only is continued into the External Jugular, and the other Veins terminate in the Internal Jugular.

OF THE NERVES.

The Portio Dura, or Facial Nerve, forming one of the divisions of the seventh pair of the cerebral nerves, passes out of the skull at the foramen stylo-mastoideum. It immediately enters the substance of the parotid, in which it is at first deeply buried. Then proceeding obliquely downwards and forwards, it approaches nearer to the surface of the gland, and divides into two or three branches, which emerging from beneath the front edge of the parotid, pass forwards upon the masseter muscle into the face. These branches split into numerous filaments which diverge over the side of the face and temple, thus forming the distribution, denominated the Pes Anserinus. The lowermost branch into which the portio dura divides passing forwards upon the masseter muscle, separates into filaments, some of which are distributed to the muscles and integuments of the lower lip, and others communicate with filaments of the upper cervical nerves.

The Infra-Orbitary Nerve, which is derived from the superior maxillary nerve, forming the second division of the fifth pair of the cerebral nerves, emerging upon the face from the infra-orbitary foramen, immediately separates into many branches, which distribute themselves upon all the surrounding parts, and have many communications with the branches of the facial nerve.

A Branch of the INFERIOR MAXILLARY, which is the third division of the fifth pair of the cerebral nerves, passes out of the foramen mentale upon the face, and immediately divides into numerous filaments which communicate with those of the facial nerve.

It may be observed, that few, if any, filaments of communication can be traced between the nerves belonging to the opposite sides of the face.

The FRONTAL NERVE, which is a branch of the ophthalmic nerve, forming the first division of the fifth pair of the cerebral nerves, passes through the superciliary notch, where it may be readily discovered by dividing the fibres of the orbicularis palpebrarum muscle. The nerve sometimes splits into two branches before its passage through the notch, and immediately after it emerges upon the forehead, it divides into several branches, some of which are distributed to the muscles and integuments of the forehead, others penetrating the occipito-frontalis, are distributed superficially upon the upper part of the head almost as far as the occiput.

The deep-seated parts of the face are supplied by the SUPERIOR and INFERIOR MAXILLARY NERVES, which will be described with the general distribution of the cerebral nerves.

CHAP. X.

OF THE TUNICA CONJUNCTIVA, EYE-LIDS, AND LACRYMAL PARTS OF THE EYE.

Of the Tunica Conjunctiva. The Tunica Conjunctiva is the membrane which lines the posterior surface of the eye-lids, and from them is continued over the front of the eye-ball. Its name is derived from its office of connecting the globe with the lids. That part of the membrane which lines the lids is denominated the Conjunctiva Palpebrarum, and that part which covers the globe, the Conjunctiva Oculi. The former is distinguished by a red appearance, which is derived from its vessels carrying red blood, while the latter is transparent, so as to allow the colour of the subjacent parts to appear through it. The conjunctiva is continued from the inside of the eye-lids, first over the front of the sclerotica, to which it is united by loose cellular tissue, and then over the cornea, to which it is so closely adherent as to be almost inseparable from it. At the inner angle of the eye, the conjunctiva forms a semilunar fold, variously distinct in different individuals, which has been considered to resemble the third eye-lid found in birds, and in some quadrupeds, and is denominated the MEMBRANA NICTITANS.

Of the EYE-LIDS. The eye-lids are not of equal size, the upper is the larger and more moveable; hence when the lids are brought together, the upper descends below the transverse diameter of the eye, and covers the larger share of the organ, while the lower ascends in a very small degree to meet it. The opening between the lids is not uniformly of the same extent; and it is to this circumstance that the apparent difference in the size of the eye in different persons is referable rather than to any actual difference in the globe itself. The two eye-lids form angles at their union, which are denominated Canthi. The insides, or posterior surface of the lids, is concave, and adapted to the globe with which it is in contact. The edges of the eye-lids present in front an angular margin, along which the Cilia, or eye-lashes, are arranged, and behind these, the edges are sloped off obliquely; so that when the lids are closed, a triangular canal is here left between them and the opposite surface of the eye. This canal is narrow towards the temple, and becomes gradually wider towards the nose. It is considered to serve the purpose of conveying the tears from the outer towards the inner corner of the eye.

Each eye-lid is composed of the following parts:

of the skin, which is of a fine texture; of the fibres of the orbicularis palpebrarum muscle; and beneath these, of a thin plate of cartilage, named the Tarsus, which determines the figure of the lid. The posterior surface of the tarsus is lined by the conjunctiva.

The cartilage of the upper eye-lid is the largest. It is broad in the middle, and gradually contracts towards either end, while the cartilage of the lower lid is nearly of uniform breadth throughout. The posterior margins of the tarsi are united to the edges of the orbit by broad fibrous expansions, which are named the Ligaments of the Tarsi. These ligaments are more distinct towards the temporal side of the eye; and at the outer canthus, the fibres of the upper and lower tarsal ligaments are interlaced so as to form a distinct band connecting the eye-lids, and thence extending outwards to the edge of the orbit. At the inner corner of the eye, the lids are connected by the tendon of the orbicularis palpebrarum, which arising from the nasal process of the superior maxillary bone, proceeds transversely to the commissure of the eye-lids, and here divides into two portions, which are continued into the tarsi.

Meibomian Glands. These are very small bodies of a white or yellowish colour, situated between the posterior surface of each tarsus and the conjunctiva lining it. They are arranged in clusters, and are more numerous in the upper than in the lower lid. The secretion from these bodies is sebaceous, and is discharged by numerous minute holes, arranged in a line along the edge of each tarsus. Its use is to anoint the edges of the lids.

The Lacrymal Parts of the Eye consist of the Lacrymal Gland, which secretes the tears;—of the Puncta Lacrymalia, and Ducts, into which the tears pass from the lids and from the globe;—of the Lacrymal Sac, which receives the tears from the lacrymal ducts;—of the Nasal Duct, which conveys them from the sac downwards into the nose; and lastly, of the Lacrymal Caruncle, which is subservient in its unctions to the preceding parts.

The Lacrymal Gland is placed within the orbit, at its upper and outer part, beneath the fossa in the orbitar plate of the frontal bone. The gland may be readily discovered, either by dividing the integuments of the upper eye-lid, and then dissecting towards the cavity of the orbit, between the upper tarsus and the supra-orbitary ridge, or by dividing the conjunctiva uniting the upper tarsus to the globe, and then drawing the eye a little forwards. The gland is of a yellowish white colour, and of an oval and flattened figure, and is connected with the surrounding parts by loose cellular tissue. It is composed of numerous small portions united by cellular tissue. Its excretory ducts are so small in the human subject that they are not easily discovered. Their number is from six to eight. They leave the gland along its front edge, and descending between the tarsal ligament and the conjunctiva, open externally by perforating the latter towards the temporal side of the eye, and near the ciliary edge of the upper lid.

The PUNCTA LACRYMALIA are two small orifices placed at the edges of the eye-lids, just within their ciliary margins, and towards the inner corner of the eye. The two openings are opposite to each other, so that they meet when the eye is shut. Each punctum is situated upon an eminence, or projecting papilla.

From the puncta lacrymalia, two small Ducts are continued through the eye-lids, to terminate in the lacrymal sac. The duct, proceeding from the punctum in the upper lid, first ascends a little, and then turning inwards at an acute angle, passes obliquely downwards. The duct in the lower lid, first descends, and then turning inwards at an acute angle, proceeds obliquely upwards. In the latter part of their course, the two ducts follow the direction of the edges of the lids, and are placed near their internal surfaces. They gradually approach each other, and unite at the inner angle of the eye into a common duct, which proceeds transversely behind the tendon of the orbicularis palpebrarum into the lacrymal sac at its superior and external part. Sometimes the two ducts are not joined, but proceed separately and terminate in the sac by distinct orifices.

The LACRYMAL SAC is lodged in the groove formed by the os unguis, and by the nasal process of the superior maxillary bone. Above, it is closed, and has a rounded form. Below, it contracts in size, and is continued into the nasal duct. The tendon of the orbicularis palpebrarum crosses the sac transversely over its front part, and at about one-fourth from its upper end. The sac is closely adherent on its inner side to the groove in the bones, and on its external side, is covered by a membrane of a fibrous texture.

The NASAL DUCT, continued from the lower end of the lacrymal sac, descends obliquely backwards through the canal formed by the os unguis, by the superior maxillary and inferior spongy bones. It terminates in the nose on the ontside of the inferior spongy bone, and at about one-third from its front extremity by a small opening, which in its natural state has a slit-like appearance, but becomes oblong or circular when the mucous membrane around it, is in any degree stretched. The orifice is overhung by the spongy bone, so as to be concealed completely from view, until a part of the bone has been taken away. The nasal duct is formed only by the mucous lining, which is continuous above, with the lining of the sac, below, with the pituitary membrane of the nose, and externally, is adherent to the periosteum of the bones surrounding it. The nasal duct and lacrymal sac are together about an inch and a quarter in length.

The LACRYMAL CARUNCLE is a small reddish body, placed between the internal angle of the eye-lids and the globe. It is composed of a number of mucous glands, united by cellular tissue, and the conjunctiva is continued over it, giving to it its red colour. Fine hairs may be seen growing from its surface.

CHAP. XI.

DISSECTION OF THE MUSCLES, VESSELS, AND NERVES, CONTAINED WITHIN THE ORBIT.

For the examination of the muscles, vessels, and nerves, in the orbit, it will be necessary to remove the portion of bone forming the upper part, or roof of the cavity.

The orbit is occupied in its front part by the globe of the eye, the rest of its cavity being filled by the muscles, vessels, and nerves, and by a large quantity of soft adipose tissue. This fat must be removed with much caution, in order to avoid injuring the nervous filaments which lie imbedded in it. The blood vessels are for the most part too small to admit of dissection, except when they are previously distended by injection.

There are seven muscles contained within the orbit, six of these belong to the eye, and the seventh to the upper eye-lid.

The muscle belonging to the upper eye-lid is first discovered in the upper part, and extending from the front to the back of the cavity. It is named,

The LEVATOR PALPEBRÆ SUPERIORIS. It arises at the back part of the orbit, from the upper margin of the foramen opticum, and proceeds directly forwards, becoming broader as it approaches to the front of the orbit. It ends in an aponeurotic expansion, which turns downwards, and is attached to the cartilage of the upper eye-lid, nearly along the whole length of its superior border.

Of the muscles of the eye there are four, which are distinguished either according to their direction, and are called the RECTI; or according to their action, and are called the LEVATOR, DEPRESSOR, ABDUCTOR, and ADDUCTOR. One of these muscles is situated above, and one below the eye, and one on each side. The two other muscles are named the OBLIQUI. One of them is placed at the upper and inner side of the orbit, and the other at the lower and outer side; hence they are distinguished by the terms Superior and Inferior.

The RECTUS SUPERIOR, or LEVATOR OCULI, arises by tendinous fibres from the upper border of the foramen opticum, immediately underneath the levator palpebræ superioris, and proceeds directly forwards above the optic nerve to the upper part of the eye, where it ends in an aponeurosis, which turns over the globe, and is fixed to the front of the sclerotica.

The RECTUS INFERIOR, or DEPRESSOR OCULI, arises by a tendon from the lower border of the foramen opticum, and proceeding forwards beneath the optic nerve, is inserted into the lower and front part of the sclerotica.

The Rectus Externus, or Abductor Oculi, arises partly from the tendon of the preceding muscle, and partly from the surface of bone between the foramen opticum and foramen lacerum; and proceeding forwards on the outside of the optic nerve, is inserted into the outer and front part of the sclerotica.

The Rectus Internus, or Adductor Oculi, arises partly from the same tendon as the preceding muscle, and partly from the inner border of the foramen opticum, and proceeding forwards to the inner side of the eye, is inserted into the inner and front part of the sclerotica.

The four Recti muscles become surrounded by cellular sheaths as they approach the globe, and they terminate in flat tendons, which are inserted into the front of the sclerotica opposite to each other, and at about equal distances from the cornea. Each tendon, at its insertion, is so firmly united to the sclerotica, that their separation cannot be effected without injury.

The Obliquus Superior, or Trochlearis, arises from the upper and internal side of the orbit, at a short distance from the foramen opticum, and proceeding forwards along the inner side of the cavity to the internal angular process, here ends in a tendon, which passes through a cartilaginous pulley before it proceeds to its insertion. This pulley is formed by a piece of cartilage, which is fixed by ligamentous fibres to the upper and inner side of the orbit, and is lined by synovial membrane, which is continued upon the tendon of the trochlearis as far as its insertion into the globe. The tendon having passed through this pulley, turns a little backwards and outwards, and proceeding beneath the rectus superior is inserted into the upper and back part of the sclerotica, at about the mid-distance between the insertion of the rectus superior and the optic nerve.

The Obliquus Inferior arises in front from the anterior edge of the orbitar process of the superior maxillary bone near the groove in which the lacrymal sac is lodged, and proceeds obliquely outwards and backwards beneath the rectus inferior. Then turning upwards between the rectus externus and the globe, it is inserted into the upper and outer part of the sclerotica, rather nearer to the optic nerve than the insertion of the obliquus superior.

OF THE VESSELS OF THE EYE.

The Ophthalmic Artery, which is a branch of the Internal Carotid, passes through the foramen opticum into the orbit. The artery is first placed on the outer side of the optic nerve, but soon crosses obliquely over the nerve to the inner side of the orbit, along which it is continued forwards to the nose. The ophthalmic artery gives off many branches which may be arranged in the following order:

(*a*) Branches distributed to all the parts in the orbit and to the eye-lids.

(*b*) Branches which pass through the foramen, orbitarium internum posterius, and are distributed to the ethmoidal cells, and other parts of the nose.

(*c*) ANTERIOR MENINGEAL ARTERIES, which entering the skull, are distributed upon the front part of the dura mater, and communicate with the other meningeal arteries.

(*d*) SUPRA-ORBITARY ARTERY which passes through the superciliary notch, and distributes its ramifications to the muscles and integuments of the forehead, where they communicate with branches of the temporal artery. Another smaller branch of the ophthalmic is reflected over the ridge of the orbit to the forehead.

(*e*) CENTRALIS RETINÆ; which enters the optic nerve, and is continued forwards through it to the retina.

(*f*) CILIARY ARTERIES distributed to the globe of the eye. They are divided into three sets.

1. The LONG CILIARY ARTERIES, two in number, which penetrate the sclerotica at about one-third of the distance between the optic nerve and the cornea, and are distributed to the choroid coat as far as the orbiculus ciliaris.

2. The SHORT CILIARY ARTERIES, from twenty

to thirty in number, which penetrate the sclerotica near the optic nerve, and are distributed to the back part of the choroid coat.

3. The ANTERIOR CILIARY ARTERIES, varying from three to twelve, which penetrate the sclerotica, near its union with the cornea, and are distributed to the ciliary processes and iris.

The ophthalmic artery at its termination passes from the inner corner of the eye to the nose, and here communicates with branches of the facial and of the infra-orbitary arteries.

The VEINS of the eye correspond to the arteries. Thus the veins of the choroid coat and iris penetrate different parts of the sclerotica. The VENA CENTRALIS RETINÆ accompanies the corresponding artery. These branches unite into the OPHTHALMIC VEIN, which passes out of the orbit through the fissura lacera into the cranium, and terminates in the cavernous sinus.

OF THE NERVES OF THE EYE.

The OPTIC NERVE entering the orbit through the foramen opticum, proceeds forwards, and rather obliquely outwards to the back part of the globe which it penetrates on the inner or nasal side of its axis. In this course, the nerve is surrounded by a dense fibrous sheath, which it obtains in the following manner. The dura mater is continued from within the skull through the foramen opticum into the orbit. Around the edge of the foramen it separates into two layers, one of which is continuous with the periosteum of the orbit, and the other forms the sheath in question.

The nerves of the third and fourth pairs, the first division of the fifth and the sixth pairs of the cerebral nerves are met with in the dissection of the orbit.

The nerve of the third pair, the MOTOR OCULI passes through the fissura lacera into the orbit. It divides into two branches before its passage through the foramen, and immediately on entering the orbit, these two branches divide into other secondary branches which are distributed to the following muscles, the levator palpebræ superioris, rectus superior, rectus internus, rectus inferior, and obliquus inferior.

From that branch of the third pair distributed to the obliquus inferior, there arises a filament which is joined to the lenticular ganglion, presently to be described.

The nerve of the fourth pair, the TROCHLEARIS, passes through the fissura lacera into the orbit, and proceeding to the inner side of the cavity, is distributed to the superior oblique muscle.

The first division of the fifth pair, named the OPHTHALMIC NERVE, passes through the fissura lacera into the orbit, and immediately divides into three branches, which are the LACRYMAL NERVE, the NASAL NERVE, and the SUPRA-ORBITARY NERVE.

The Lacrymal Nerve proceeds along the outer side of the orbit between the periosteum and the rectus externus muscle to the lacrymal gland, in which its branches are principally distributed, some few of its filaments extending to the upper eye-lid.

The Nasal Nerve gives off a filament which is joined to the lenticular ganglion, then proceeding to the inner side of the orbit, it divides into two branches. One of these passes through the foramen orbitarium internum anterius into the skull, and then proceeds through one of the holes in the cribriform lamella of the ethmoid bone into the nose, where it is distributed to the pituitary membrane, principally upon the septum nasi. The other branch proceeds to the inner corner of the eye, and ends in filaments which are distributed to the muscles and integuments, and communicate with the infra-orbitary and facial nerves.

The Supra-Orbitary, or, Frontal Nerve, proceeds forwards along the upper side of the orbit, immediately beneath the periosteum to the superciliary notch, through which it passes outwards upon the forehead. In its course through the orbit, the supra-orbitary nerve sends off a branch to the upper eye-lid. Its distribution upon the forehead has been described with the nerves of the face.

The Lenticular Ganglion is a very small reddish body placed at the back part of the orbit, close to the outer side of the optic nerve : its appearance and size vary much in different subjects. Sometimes it is so small that it can only be discovered by very careful dissection. The ganglion is connected at its back part with the two filaments already mentioned, one derived from the third pair, and the other from the first division of the fifth pair. From the front part of the ganglion arise the CILIARY NERVES, which vary in number from six to twelve. These proceed forwards in the orbit, some of them above and others below the optic nerve to the back part of the sclerotica which they penetrate, and then continue their course forwards between the sclerotic and choroid coats to the iris in which they are exclusively distributed.

The nerve of the sixth pair, the ABDUCTOR, passes through the fissura lacera into the orbit, and proceeding to the outer side of the cavity, terminates in filaments which are distributed to the rectus externus muscle.

CHAP. XII.

DISSECTION OF THE MUSCLES OF THE PHARYNX AND OF THE PALATE.

For the dissection of the muscles of the pharynx and palate, the parts are to be prepared in the following manner :

The trachea and œsophagus are to be divided just above the sternum. The œsophagus and pharynx are to be separated from the front of the spine by dividing the cellular tissue which unites them to it. The ligaments uniting the atlas to the occiput, and all the other connexions between the cranium and spine are to be separated, so that after the removal of the spine, the pharynx may remain attached to the basis of the skull. The bag of the pharynx is then to be distended with horse-hair or tow passed into it from the mouth above, and from the œsophagus below.

It will be hereafter stated in the description of the pharynx, that the back part and sides of the bag are covered externally by an uniform stratum of muscular fibres. These are so arranged as to allow of their division into three distinct muscles, the CONSTRICTOR INFERIOR covering the lower part of the bag; the CONSTRICTOR MEDIUS, covering the middle; and, the CONSTRICTOR SUPERIOR, covering the upper part. The fibres of the three constrictors overlap each other successively from below upwards, and the muscles of each side meet in the middle where there is a white tendinous line formed at their junction.

The CONSTRICTOR INFERIOR arises from the external side of the cricoid cartilage, from the inferior cornu and back part of the ala of the thyroid cartilage. Its fibres proceed backwards, and expand over the lower part of the pharynx to its middle where they meet the fibres of the opposite muscle. The upper fibres of the constrictor inferior ascend obliquely to their insertion, and cover a considerable extent of the constrictor medius, while its lower fibres run more transversely, and the lowermost are connected with the muscular coat of the œsophagus.

The CONSTRICTOR MEDIUS arises from the cornu of the os hyoides, and from the ligament by which this is united to the thyroid cartilage, and is expanded over the pharynx to its middle. The uppermost of its fibres ascend obliquely over the constrictor superior to the upper part of the pharynx, and are fixed above in a pointed form to the basilar process of the occiput in front of the foramen magnum. Its middle fibres run transversely, and its lowermost fibres descending obliquely beneath the constrictor inferior, terminate also in a pointed form at their union with the opposite muscle.

The CONSTRICTOR SUPERIOR arises from the internal plate of the pterygoid process, from the back part of both jaws, close to the origins of the buccinator muscle, and from the side of the tongue at its basis. It proceeds transversely to the back of the pharynx, and here meets the opposite muscle. The uppermost of its fibres are also attached to the basilar process of the occipital bone.

The insertion of the stylo-pharyngeus is here seen. Its fibres pass beneath the constrictor medius, and are expanded upon the pharynx.

The pharynx is now to be laid open in its whole length by dividing the constrictor muscles along the middle line of their union. By looking into the pharynx and towards the mouth, the soft palate, or velum palati, is seen with the uvula projecting from its middle. The soft palate is united on each side to the pharynx and to the root of the tongue by two folds of membrane containing muscular fibres, and presenting the appearance of half arches. These folds gradually separate from each other as they descend from the palate, the anterior terminating in the side of the tongue at its base, the posterior being lost in the side of the pharynx.

By carefully reflecting the mucous membrane of the anterior fold, or half arch of the palate on either side, a few thin muscular fibres are brought into view, which form

The CONSTRICTOR ISTHMI FAUCIUM, or PALATO-GLOSSUS muscle. It arises from the side of the tongue at its base, and ascending within the fold of the mucous membrane forming the anterior half arch of the palate, terminates in the middle of the velum palati.

By the reflection of the mucous membrane of the posterior half arch of the palate, muscular fibres are discovered, which form

The PALATO-PHARYNGEUS muscle. This arises from the side of the pharynx, where its fibres are intermixed with those of the constrictor medius and stylo-pharyngeus, and from the thyroid cartilage. It ascends within the posterior half arch of the palate, and then becoming broader, is inserted into the middle of the velum palati, where it is connected with the tendons of the circumflexi palati muscles.

By removing the mucous membrane from the posterior surface of the velum palati at its middle and from the uvula, a distinct muscle is brought into view, which is,

The AZYGOS UVULÆ. It arises from the pointed projection at the back part of the ossa palati, where the two bones are united, and proceeds along the middle of the velum into the uvula.

By dissecting through the mucous membrane, at the upper part and side of the pharynx, another muscle of the palate is brought into view, situated at the side of the posterior opening of the nose. It is denominated, The LEVATOR PALATI. It arises from the under part of the petrous portion of the temporal bone, and from the cartilage of the Eustachian tube, and proceeding from its origin obliquely downwards and inwards, terminates by expanding into the middle of the soft palate.

By separating the side of the pharynx from the pterygoideus internus muscle, which is attached to the inside of the ramus of the lower jaw, there will be brought into view,

The CIRCUMFLEXUS, or TENSOR PALATI muscle, which arises from the cartilage of the Eustachian tube, and from a fossa at the root of the internal pterygoid plate of the sphenoid bone. It proceeds downwards along the inside of the pterygoideus internus, and ends in a thin tendon, which contracts itself, and turns round the hook at the extremity of the internal pterygoid plate. The tendon then proceeds horizontally inwards to the middle of the palate, where it is expanded, and is joined to the tendon of the opposite muscle.

It will be recollected, that after the description of the masseter and temporal muscles, it was mentioned that there were two other muscles of the lower jaw, the Pterygoidei, which would be more conveniently examined in the present dissection.

The PTERYGOIDEUS INTERNUS is situated on the inside of the ramus of the lower jaw. It arises from the whole surface of the pterygoid fossa, and descending outwards and backwards, is attached to the inside of the angle and ramus of the lower jaw.

The PTERYGOIDEUS EXTERNUS is placed more deeply towards the basis of the skull, where it extends obliquely across from the pterygoid process to the condyle of the lower jaw. It arises from the outer surface of the external pterygoid plate, from the adjacent part of the os palati, and from the sphenoid bone near the temporal fossa; and proceeding from these origins obliquely outwards and backwards, is attached to a depression in the front of the condyle, and to the interarticular cartilage of the lower jaw.

CHAP. XIII.

OF THE NOSE, MOUTH, AND PHARYNX.

For the examination of these parts a perpendicular section is to be made of the head and face, directly through their middle; and in dividing the nose, the student must be careful that the saw penetrates between the spongy bones and the septum narium, in order that the latter may be left uninjured, with one half of the section. The division of the face is to extend completely through the superior maxillary bone into the mouth, but the lower jaw is to be left entire. A full view will thus be gained of all the parts, which are now to be described.

OF THE NOSE.

The nose consists externally of the arch formed by the ossa nasi, and of the alæ, which are formed by four pieces of cartilage. Internally it consists of two cavities denominated the nostrils.

The four pieces of cartilage are united to each other, and to the edges of the surrounding bones, by a dense fibrous substance. They are covered on their internal surface by the mucous membrane of the nose, and externally by the common integuments.

The nostrils are extended rather obliquely downwards and backwards, from their commencement in the face to their termination in the pharynx. They are separated above from the cavity of the skull by the cribriform lamella of the ethmoid bone, and by the body of the sphenoid bone; hence their upper boundary is horizontal beneath the cribriform lamella, but farther backwards, slopes obliquely downwards from the inclination of the sphenoid bone. Their lower boundary is horizontal in its whole extent, and is formed by the palatine processes of the superior maxillary bones, and by the two palatine bones, which together separate the nose from the mouth. The lateral and external boundaries of the nostrils are formed by the os planum, or orbitar portion of the ethmoid bone, and by the os unguis, which together separate the nose from the orbit, also by the palatine and superior maxillary bones, and by the spongy bones, which project into the cavity of the nostril.

The two nostrils are separated from each other by the septum, which is formed above, by the nasal lamella of the ethmoid bone, below and behind, by the vomer, and in front, by a flat piece of cartilage, which is connected with the cartilages of the alæ nasi. This cartilage is of a triangular form. Its upper edge is united to the nasal lamella of the ethmoid bone, and its lower edge is received into the groove between the two plates of the vomer. The nostrils terminate behind, in the pharynx, by two openings somewhat of an oval form, which are placed immediately over the velum palati, and are about an inch in length, and half an inch in width. These openings are separated by the posterior edge of the vomer, and are bounded externally on each side by the internal plate of the pterygoid process.

The cavity of each nostril is divided into three passages, denominated the Meatus Narium. The inferior, which is the largest, includes the space between the floor of the nostril and the os spongiosum inferius; the middle includes the space between the two ossa spongiosa, and the superior is situated above the back part of the os spongiosum superius.

The openings of the several sinuses, which are connected with the nose, will be found in the following situations :—

The Frontal Sinuses terminate in the middle meatus of each nostril at its front part.

The Sphenoidal Sinuses open into the superior meatus of each nostril at its back part.

The Maxillary Sinuses open into the middle meatus of the nostrils, between the two spongy bones. The orifice of each sinus is placed underneath the os spongiosum superius, and at about mid-distance between its extremities.

The Ethmoid Cells communicate with the nose by several distinct openings, which are found in the superior and middle meatus of each nostril.

The termination of the Nasal Duct is found in the inferior meatus, underneath the inferior spongy bone, and at about one-third from its front extremity.

The nose is lined throughout by the pituitary membrane, which is thick, of a soft spongy texture, and plentifully supplied by vessels. It appears to be composed of a layer of mucous membrane, and of a fibrous stratum beneath, which is in close contact with the bones. The pituitary membrane is extended into the sinuses connected with the nose, but it here loses its spongy texture, and becomes thin and smooth on its surface. At the back part of the nose, the pituitary membrane is continuous with the mucous lining of the pharynx, and in front, it is continuous with the common integuments.

OF THE MOUTH AND PHARYNX.

The cavity of the mouth is bounded above, by the arch of the palate, formed by the superior maxillary and palate bones, behind, by the velum palati, in front, and at the sides, by the lips and cheeks, and below, by the tongue. At its lower and back part, the mouth communicates with the pharynx by an opening, which is denominated the Isthmus Faucium.

The mouth is lined throughout by a mucous membrane, which is continuous in front upon the lips, with the integuments of the face; and behind, with the mucous lining of the pharynx. The mucous membrane forms in its reflection from the lips to the adjacent parts, two small triangular folds, denominated fræna, which unite the lips more closely to the middle and front of the maxillary bones. Between the under surface and middle of the tongue, and the opposite part of the lower jaw, the mucous membrane forms another fold, which is the Frænum Linguæ.

Beneath the mucous membrane of the mouth, numerous small mucous glands are found which are arranged according to their situation, into the Buccales distributed in the cheeks;—Molares also in the cheeks, opposite to the molar teeth;—Labiales in the lips;—Palatinæ upon the palate, and Linguales at the root of the tongue. These glands are of a roundish form, and short ducts proceed from them which open into the cavity of the mouth.

The Velum Palati, or Soft Palate, is a fleshy curtain, extended from the posterior edge of the palatine arch downwards into the pharynx. Its anterior surface is inclined downwards and forwards towards the tongue. Its upper border, which is its thickest part, is fixed to the posterior edge of the palatine bones; and its lower border, which is loose in the pharynx, is divided into two parts, presenting the appearance of half arches, by the uvula, which hangs from its middle. The length of the uvula varies in different individuals. Its form is conical, with the broadest end upwards. The lateral parts of the soft palate are formed by two membranous folds already described, which descend to the root of the tongue, and to the sides of the pharynx. At their commencement in the palate these folds are united, but as they descend to their termination, they gradually separate, so as to leave between them a triangular space on each side, in which the tonsil is contained.

The Tonsils, or Amygdalæ, are two glandular bodies, one of them being placed on each side of the palate, in the situation just mentioned. Their figure is generally compared with that of an almond, from which their name of amygdalæ is derived. They are of a grey colour, and appear to be divided, more or less distinctly, into lobes. On that surface of the tonsil, which projects between the palatine folds, there are seen numerous small orifices, leading to cells in the interior of the gland, and from which the mucous secretion may be discharged by pressure.

The boundaries of the opening of communication between the mouth and pharynx, denominated the Isthmus Faucium, are formed by the parts we have just described. In the view of this opening from the mouth, we see it bounded above, by the half arches of the soft palate, and by the uvula; below, by the basis of the tongue, and at the sides, by the membranous folds of the palate, between which the tonsils are apparent.

The terminations of the Salivary Ducts in the mouth are next to be examined.

The Parotid Duct penetrates the mucous membrane of the cheek, opposite to the first grinding tooth, by a small opening, around which there is a loose fold of the mucous membrane.

The Submaxillary Duct terminates in the mouth by a very small opening, close to the side of the frænum of the tongue.

The principal Sublingual Duct joins the submaxillary duct just before its termination. Other smaller ducts frequently arise from the sublingual gland, and open into the mouth behind the termination of the submaxillary duct.

The Tongue is divided into the basis which is its thickest and broadest part, and into the apex which is thinner and of a rounded form. The tongue is fixed throughout the greater extent of its under surface by its connexions with the several muscles, which arising from the styloid process, os hyoides and lower jaw, are thence continued into the substance of the organ. Its base is connected with the epiglottis, which will be presently described, by three folds formed by the mucous membrane in its reflections between these parts.

The tongue is formed throughout of muscular fibres, covered by mucous membrane. The muscular fibres consist partly of the insertions of the several muscles just mentioned, which are the stylo-glossi, hyo-glossi, genio-hyo-glossi, and partly of other fibres, which arise and terminate in the organ. Some of these run transversely, others obliquely, and two longitudinal fasciculi are distinguished by the name of

The LINGUALIS muscle, which extends along the under part of the tongue, from the basis to the apex. These different sets of muscular fibres, which altogether make up the substance of the tongue, are so closely connected with each other, and with the vessels and nerves of the organ, that it is very difficult to ascertain their arrangement.

The PHARYNX is a large bag, extending from the basis of the skull downwards in the neck, as low as the commencement of the trachea, where it terminates, by contracting into the œsophagus. The breadth of the pharynx corresponds at its upper part to the space between the pterygoid processes, and towards its lower part its breadth gradually diminishes, so as to present in this situation a funnel-shaped appearance. The pharynx is attached above, to the basilar process of the occipital bone, and to the body of the sphenoid bone, by a dense fibrous substance; and behind, to the bodies of the vertebræ by loose cellular tissue. On each side it is attached to the several parts from which the fibres of the constrictor muscles take their origin, viz., the pterygoid processes and back of the jaws, the cornu of the os hyoides, and sides of the cricoid and thyroid cartilages.

The pharynx is not to be regarded as a complete bag, since it is deficient anteriorly, where it is connected with the several parts which have been described. Thus when we lay open the pharynx from behind, by a longitudinal incision, and look towards the front, we see above, the posterior openings of the nose, and below, the soft palate, the opening of the mouth, and the base of the tongue.

Further, the larynx is seen projecting into the lower and front part of the pharynx. Between the basis of the tongue and the upper part of the larynx, is seen a flattened and moveable piece of cartilage, denominated the Epiglottis. Immediately below the epiglottis is the opening which leads into the larynx, denominated the Glottis.

The sides of the pharynx are formed externally by the strata of muscular fibres, already described under the name of constrictores pharyngis, and internally, of the mucous membrane which lines the bag throughout, and is continued downwards into the mucous membrane of the œsophagus, and of the larynx and trachea.

The terminations of the Eustachian Tubes in the pharynx are found at the upper and external part of the bag, above the soft palate, immediately behind the posterior openings of the nose, and opposite to the middle meatus narium. The orifice of each tube is rather expanded, and immediately behind it, there is a swelling formed by a moveable and projecting portion of the cartilage, which partly forms the sides of the tube.

CHAP. XIV.

DISSECTION OF THE MUSCLES SITUATED UPON THE POSTERIOR PART OF THE NECK AND OF THE TRUNK.

When the integuments are reflected from the posterior part of the neck, and from the whole extent of the back, the superficial stratum of muscles which is exposed, consists of the Trapezius above, of the Latissimus Dorsi below, and of a small portion of the Rhomboideus between them.

The Trapezius is a broad, flattened, and triangular muscle, extending from the occiput, downwards to the lower part of the back, and outwards to the shoulder. It arises by a thin aponeurotic expansion from the superior transverse ridge of the occipital bone, from the whole length of the Ligamentum Nuchæ * from the spinous processes of the last cer-

* The Ligamentum Nuchæ is a thin stratum of fibrous substance attached above to the tuberosity and middle perpendicular line of the occipital bone, and thence extending downwards, is fixed to the spinous processes of all the cervical vertebræ. From its lateral surfaces, which are flattened, the muscular fibres take their origin.

vical and of all the dorsal vertebræ. Its upper fibres descend obliquely outwards, its middle fibres proceed horizontally, and its lower fibres ascend obliquely. All of them converge towards the shoulder, and are inserted into the posterior border of the clavicle, along a third part of the bone at its humeral end, into the posterior edge of the acromion, and into the whole upper border of the spine of the scapula by an aponeurosis which slides over the triangular flattened surface at the commencement of the spine towards the basis.

The Latissimus Dorsi is a broad and flattened muscle situated upon the lower part of the back and upon the loins, and thence extending outwards to the arm. It arises by a broad and strong aponeurosis, and by distinct fleshy digitations. The aponeurosis is fixed to the spinous processes of the six lower dorsal, and of all the lumbar vertebræ, to the posterior part of the sacrum, and to the crista ilii, along its posterior third. The fleshy digitations are fixed to the external surfaces of the three lowermost ribs, and are received between the corresponding digitations of the external oblique muscle. The lower fibres of the latissimus dorsi ascend obliquely, and the upper fibres proceed transversely, all of them converging towards the posterior inferior angle of the scapula, over which they pass, and then continue their course obliquely upwards and outwards over the teres major to the arm. As the latissimus dorsi approaches the humerus, it twists itself beneath the teres major, and terminates in a broad tendon, which is inserted immediately in front of the tendon of the latter muscle into the posterior margin of the groove in which the tendon of the biceps is lodged. The upper part of the latissimus dorsi where it arises from the dorsal vertebræ, is covered by the trapezius. A distinct fasciculus of fibres frequently proceeds from the posterior inferior angle of the scapula to the latissimus dorsi as it passes over the bone.

It has been mentioned in the dissection of the abdomen, that the aponeurosis of the latissimus dors. being connected with the obliquus internus, and with the serratus posticus inferior muscles, is sometimes described as a tendon common to the three muscles, by the name of the Fascia Lumborum.

The trapezius and latissimus dorsi are to be reflected from the back towards their insertions. In reflecting that part of the tendon of the latissimus dorsi which arises from the spinous processes of the upper lumbar vertebræ, the student will find it so intimately united with the tendon of the serratus posticus inferior muscle beneath, as to require great care in effecting the separation.

Beneath the middle of the trapezius, are the Rhomboideus Major and Minor muscles.

The Rhomboideus Major is the lowest of the two. It arises by aponeurotic fibres from the spinous processes of the four or five upper dorsal vertebræ, and proceeding obliquely downwards and outwards, is inserted into the basis of the scapula, between the spine and the inferior angle.

The Rhomboideus Minor arises from the ligamentum nuchæ, and from the spinous process of the last cervical vertebra, and descending obliquely outwards, is inserted into the basis of the scapula, opposite to the triangular surface at the commencement of the spine.

The rhomboid muscles are to be reflected from the spine, and beneath them is seen

The Serratus Posticus Superior, which arises by a thin aponeurosis from the lower part of the ligamentum nuchæ, and from the spinous processes of the two or three first dorsal vertebræ. It proceeds obliquely downwards, and is inserted by distinct fleshy slips into the posterior parts of the second, third, fourth, and fifth ribs.

The Serratus Posticus Inferior is placed beneath that part of the latissimus dorsi, which is extended over the four last ribs. It arises from the spinous processes of the two last dorsal and of the three first lumbar vertebræ, by a broad aponeurosis which, as already mentioned, is very closely united with the aponeurosis of the latissimus dorsi. It proceeds outwards, and divides into four distinct fleshy portions which are inserted into the lower edges of the four last ribs.

The two preceding muscles are to be reflected from the spine, and left attached to the ribs.

At the upper part of the neck is seen

The SPLENIUS CAPITIS extended obliquely between the occiput and spine. It arises from the spinous processes of the two upper dorsal vertebræ, and from the lower two thirds of the ligamentum nuchæ, and ascending obliquely outwards is inserted into the back part of the mastoid process, and into the adjacent curved portion of the superior transverse ridge of the occipital bone.

The insertion of the splenius capitis is covered by the insertion of the sterno-cleido-mastoideus. Between the splenius capitis of each side, a triangular space is left in which a part of the complexi muscles is seen.

Along the front edge of the splenius capitis, is

The SPLENIUS COLLI, which arises from the spinous processes of the third, fourth, and fifth dorsal vertebræ, and ascending obliquely outwards, is inserted by distinct tendinous and fleshy portions into the transverse processes of the two or three upper cervical vertebræ.

The splenius capitis and colli are united so closely at the lower part of the neck, as here to form but one muscle.

The splenius capitis is to be reflected from the spine, and left attached to the occiput, and the splenius colli is to be reflected from the dorsal vertebræ, and left attached to the transverse processes of the cervical vertebræ.

A long narrow muscle is extended between the neck and the superior angle of the scapula. This is

The Levator Scapulæ. It arises by distinct tendinous and fleshy portions from the transverse processes of the four upper cervical vertebræ, and descending obliquely backwards, is inserted into the basis of the scapula, immediately below its superior angle.

Beneath the splenius capitis is seen

The Complexus, which arises by tendinous and fleshy fibres from the transverse processes of the four or five upper dorsal vertebræ, and of the six lower cervical vertebræ, and ascending obliquely inwards, is inserted into the rough surface of the occipital bone between the superior and inferior transverse ridges, from the middle perpendicular line outwards, towards the mastoid process. Several distinct portions of tendon extend themselves irregularly through this muscle, and are firmly united with its fleshy fibres.

Along the front edge of the complexus is a long slender muscle, denominated

The Trachelo-Mastoideus, which arises by small tendons from the transverse processes of the four lower cervical, and sometimes of the first dorsal vertebræ, and ascending directly upwards, is inserted by a flattened tendon into the back part of the mastoid process.

The complexus is to be reflected from the occiput, and beneath its upper part, there are seen four small muscles extended between the occiput and the two first vertebræ. These are the Rectus Posticus Major and Minor, the Obliquus Superior, and Inferior.

The Rectus Posticus Major arises from the spinous process of the second cervical vertebra; and ascending obliquely outwards, is inserted into the posterior part of the inferior transverse ridge of the occipital bone.

Beneath the preceding is,

The Rectus Posticus Minor, which arises from the eminence at the back part of the atlas. It ascends, gradually increasing in breadth, and is inserted into the rough hollow surface of the occipital bone, below the inferior transverse ridge, and close to the middle perpendicular line.

Between the occiput and the transverse process of the atlas, is

The Obliquus Superior, which arises from the transverse process of the atlas, and ascending obliquely backwards, is inserted into the rough surface of the occipital bone below the superior transverse ridge, and at the mid-distance between the middle perpendicular line and the mastoid process.

Between the first and second vertebræ, is

The Obliquus Inferior, which arises from the spinous process of the vertebra dentata, and ascending obliquely outwards, is inserted into the transverse process of the atlas.

Beneath the lower part of the complexus, is a mass of muscle occupying the space between the spinous and transverse processes from the second vertebra of the neck to the middle of the back. This is

The SEMI-SPINALIS COLLI, which arises from the transverse processes of the six or seven upper dorsal vertebræ, and ascending obliquely, is inserted into the spinous processes of all the cervical vertebræ between the first and the seventh.

Lower down in the back, is another mass of muscle lying close upon the spine. This is

The SEMI-SPINALIS DORSI, which arises from the transverse processes of the seventh, eighth, and ninth dorsal vertebræ, and ascending, is inserted into the spinous processes of the four or five upper dorsal, and of the two lower cervical vertebræ.

Lower still than the preceding, is a smaller mass of muscle lying upon the spinous processes of the dorsal and lumbar vertebræ. This is

The SPINALIS DORSI, which arises from the spinous processes of the two upper lumbar, and of the two lower dorsal vertebræ, and is inserted into the spinous processes of the upper dorsal vertebræ, from the first to the seventh or eighth.

On the outside of the spinalis dorsi, is a large mass of muscle extending from the sacrum upwards, upon the transverse processes of the lumbar and dorsal vertebræ; and occupying the hollow between the spinous processes and angles of the ribs. At its lower part, this mass forms only one muscle, but it divides, about opposite to the last rib, into two muscles, named

Sacro-Lumbalis, and Longissimus Dorsi, the latter of which is placed more internally and close to the spinalis dorsi.

The Sacro-Lumbalis and Longissimus Dorsi, thus forming but one mass of muscle at their commencement, arise by a common tendon externally, and by fleshy fibres internally, from the posterior part of the crista ilii, from the posterior surface of the sacrum, and from the spinous and transverse processes of the lumbar vertebræ.

The Sacro-Lumbalis is inserted by distinct tendons into all the ribs near their angles.

The Longissimus Dorsi is inserted into the transverse processes of all the dorsal vertebræ, and into the ribs between their tubercles and angles.

The tendon of the Transversalis Abdominis muscle is now to be examined in its passage between the Quadratus Lumborum, and the lower part of the Sacro-Lumbalis and Longissimus Dorsi, to be attached to the transverse processes of the lumbar vertebræ.

The sacro-lumbalis and longissimus dorsi muscles are covered at the upper part of the back by a thin aponeurotic expansion, which is united by one edge to the angles of the ribs, and by the other to the spinous processes of the dorsal vertebræ.

By separating the sacro-lumbalis and longissimus dorsi from each other, there are seen

The Musculi Accessorii, which consist of six or eight small fleshy slips extended between the inner side of the sacro-lumbalis and the six or eight lower ribs.

A small thin muscle is connected with the inside of the sacro-lumbalis at its upper part. This is

The CERVICALIS DESCENDENS. It arises from the six upper ribs near their tubercles, and ascending, is inserted by distinct tendons into the transverse processes of the fourth, fifth, and sixth cervical vertebræ.

Another small muscle is connected with the inside of the longissimus dorsi at its upper part. This is

The TRANSVERSALIS COLLI, which arises from the transverse processes of the four or five upper dorsal vertebræ, and ascending, is inserted into the transverse processes of the four or five lower cervical vertebræ.

When the muscles which have been described are removed from the side of the spine, there is exposed,

The MULTIFIDUS SPINÆ, which consists of bundles of fleshy fibres extended obliquely between the transverse and spinous processes along the whole length of the spine, from the second cervical vertebra to the sacrum. The fibres of the multifidus spinæ lie close upon the transverse and spinous processes, and at the lower part of the back, they are united to the posterior part of the sacrum and to the ilium.

The INTERSPINALES muscles are small bundles of fibres, extended between the spinous processes of the cervical, dorsal, and lumbar vertebræ. They are most distinct in the neck, and are sometimes scarcely to be seen between the spinous processes of the dorsal and lumbar vertebræ.

The INTERTRANSVERSALES are short muscles extended between the transverse processes of the cervical, dorsal, and lumbar vertebræ. They are not found between the transverse processes of the two or three upper dorsal vertebræ.

Upon the reflection of the sacro-lumbalis and longissimus dorsi, twelve small muscles are seen extended between the transverse processes of the dorsal vertebræ and the ribs. These are

The LEVATORES COSTARUM. Each muscle arising from the extremity of the transverse process of the dorsal vertebra, proceeds obliquely downwards, expanding in breadth, and is inserted into the upper border of the next rib. Some of the fibres are frequently continued downwards, over the next rib, to be inserted into the rib below it.

It must be remarked, that the attachments of the muscles of the back, will not, in every instance, exactly correspond with the description which has been here given of them. If they are dissected in several subjects, considerable variations will be found in the number of vertebræ or ribs to which each muscle may be fixed, and the lines of separation between them are not so distinctly marked as between the muscles in other parts of the body.

CHAP. XV.

DISSECTION OF THE MUSCLES SITUATED BETWEEN THE RIBS AND ON THE POSTERIOR SURFACE OF THE STERNUM.

Two layers of muscles connected by fine cellular tissue, are situated in the interstices between the ribs. They are denominated

The EXTERNAL and INTERNAL INTERCOSTALS. The fibres of the former are arranged obliquely from behind forwards, while the fibres of the latter have an opposite direction, so that the two layers cross each other.

The EXTERNAL INTERCOSTALS extend from the spine forwards, to the union of the bones with the cartilages of the ribs. Here they terminate, so that from this point to the sternum, there exists only the internal layer of fibres.

The EXTERNAL INTERCOSTAL muscles arise from the lower edge of each rib, and proceeding obliquely downwards and forwards, are inserted into the upper edge of the next rib in succession.

The INTERNAL INTERCOSTALS extend from the sternum backwards to the angles of the ribs, so that between the angles and the spine, there exists only the external layer of fibres. The internal intercostal muscles arise from the lower edge of each rib, and proceeding obliquely downwards and backwards, are inserted into the upper edge of the next rib in succession.

Small portions of muscular fibres, distinct from the intercostals, are seen passing obliquely between the ribs on their insides. These vary in their number and situation. Their direction corresponds to that of the external intercostals.

The posterior surfaces of the sternum and cartilages of the ribs on each side are covered by a muscle, denominated

The TRIANGULARIS STERNI, which arises from the posterior surface and lateral edges of the lower half of the sternum, and from the ensiform cartilage; its fibres ascending obliquely outwards, are inserted by distinct digitations into the posterior surfaces of the cartilages of the third, fourth, fifth, and sixth ribs.

CHAP. XVI.

DISSECTION OF THE MUSCLES SITUATED UPON THE FRONT OF THE VERTEBRÆ.

Two long and thin muscles are placed upon the front and sides of the lower cervical and upper dorsal vertebræ. These are the Longi Colli.

The Longus Colli of each side consists of a superior portion having its fibres arranged obliquely, and an inferior portion having its fibres arranged longitudinally.

The superior portion arises from the transverse processes of the third, fourth, and fifth cervical vertebræ, and ascending obliquely inwards, is fixed to the front of the atlas. The inferior portion arises from the bodies of the three upper dorsal vertebræ, and ascending, is inserted into the bodies of the six lower cervical vertebræ.

On the outside of the superior portion of the longus colli, is seen

The Rectus Anticus Major. It arises from the transverse processes of the third, fourth, fifth, and sixth vertebræ of the neck, and ascending obliquely inwards upon the bodies of the vertebræ, covers the outer edge of the longus colli, and is inserted into the basilar process of the occipital bone, close to the foramen magnum.

Beneath, and a little to the outside of the preceding, is

The **Rectus Internus Minor**, which arises from the root of the transverse process of the atlas, and ascending obliquely inwards, is inserted into the basilar process of the occipital bone, immediately in front of the condyle on the same side.

A small muscle is extended between the transverse process of the atlas and the occiput, which is

The Rectus Lateralis; arising from the front of the transverse process of the atlas, it ascends, and is inserted into a depression of the occiput between the condyle and mastoid process.

CHAP. XVII.

DISSECTION OF THE SUPERIOR EXTREMITY.

SECT. I.

OF THE UPPER ARM.

Upon the removal of the integuments from the upper arm, a thin layer of condensed cellular tissue is seen surrounding the muscles, vessels, and nerves. In some situations tendinous fibres are scattered irregularly through this cellular tissue. These fibres are, however, never so numerous as to present the appearance of a continued aponeurotic expansion, yet they are nevertheless denominated the fascia of the upper arm.

The cellular layer and tendinous fibres are to be removed, when the following muscles will be brought into view:—

The Biceps Flexor Cubiti, placed superficially along the front and inside of the arm.

The Coraco-Brachialis, a small muscle, connected with the upper part of the biceps, on its inner side.

The Brachialis Internus, placed beneath the biceps, and closely applied upon the front and sides of the os humeri at its lower part.

The Triceps, consisting of the large mass of flesh occupying the whole of the back part of the arm.

The muscles on the front of the arm are separated from those on the back part by two narrow slips of fascia, which are attached, one to the ridge on the side of the os humeri leading to the outer condyle; the other to the ridge on the opposite side of the bone leading to the inner condyle. These slips are sometimes denominated the External andInternal Intermuscular Ligaments.

VESSELS AND NERVES IN THE UPPER ARM.

The student must in the next place proceed with the dissection of the vessels and nerves which are continued from the axilla down the inside of the arm.

The Brachial Artery, beginning at the lower margin of the tendon of the latissimus dorsi, proceeds down the inside of the arm. As it descends, it becomes more superficial, and gradually bends forwards to the front of the elbow joint. In this course the artery is first placed close to the inner side of the coraco-brachialis; then crossing the tendinous insertion of this muscle, it proceeds close to the inner side of the biceps, and upon the brachialis internus to the front of the elbow joint. The brachial artery is found immediately beneath the fascia, and is surrounded by a sheath of condensed cellular tissue, which also includes the Venæ Comites, the Median Nerve, and the Basilic Vein. The Venæ Comites are two in number, one placed close to each side of the artery. The Median Nerve, in the upper part of the arm, lies in front of the artery, but as it descends, passes to its inner side. The Vena Basilica is also found on the inner side of the artery, and rather in front of the Median Nerve.

The principal branches of the brachial artery are the Profunda Superior, Profunda Inferior, and Ramus Anastomoticus.

1. The Profunda Superior arises from the inside of the trunk, near the lower edge of the teres major, and bends backwards between the long head of the triceps and the os humeri. It then winds obliquely round the bone to its outer side and lower part, and ends in branches, which are distributed about the external condyle, and communicate with the Recurrens Radialis from the forearm.

The profunda superior is sometimes a branch of the infra-scapulary, or of the posterior circumflex arteries. Occasionally there are two branches having the course of the profunda superior.

2. The Profunda Inferior arises from the inside of the trunk below the profunda superior, and

descending along the inside of the arm, ends in branches, which communicate about the internal condyle with the Recurrens Ulnaris from the fore-arm.

The profunda inferior is frequently a branch of the profunda superior.

3. The Ramus Anastomoticus arises from the inside of the trunk, within a short distance of the elbow joint, and passing towards the inner condyle ends in branches, which communicate above, with the profundæ, and below, with the recurrent arteries of the forearm.

It will frequently happen, that instead of one large ramus anastomoticus there are two or three smaller branches given off from the brachial trunk, just above the elbow joint.

Besides these branches, the brachial artery gives off many ramifications to the muscles in its course down the arm.

The principal veins seen in the dissection of the upper arm, are the Vena Basilica, the Vena Cephalica, and the Venæ Comites.

The Vena Basilica passes up the inside of the arm, on the inner or ulnar side of the brachial artery, and rather in front of the median nerve. From the upper part of the arm, the basilic vein is continued into the axilla, and here takes the name of axillary.

The Vena Cephalica passes up the outside of the arm, above the fascia, and near the outer edge of the biceps muscle. From the upper part of the arm, it continues its course upwards, between the deltoid and pectoralis major muscles, and then turns inwards into the space between the lower border of the clavicle and the pectoralis minor muscle, to terminate either in one of the branches leading to the axillary vein, or immediately into the axillary vein itself.

The VENÆ COMITES, or SATELLITES, are two branches placed close to the brachial artery, one on each side. They terminate above in the axillary vein.

The venous trunks just described are formed by the union of the veins of the fore-arm, which are distinguished into the superficial, ramifying between the integuments and fascia, and the deep-seated, accompanying the arteries.

The superficial veins of the forearm are very numerous, especially on the front part. They are formed by the union of branches, which beginning upon the fingers and in the palm of the hand, ramify upon the back of the metacarpus and carpus, and thence proceed along the front and back part of the forearm, between the integuments and fascia. One branch situated between the metacarpal bones of the thumb and of the forefinger is generally denominated VENA CEPHALICA POLLICIS, as it was considered to be the commencement of the cephalic vein. Another branch, situated on the inner side of the back of the metacarpus, near the little finger, is denominated Vena Salvatella. As the veins proceed along the forearm, they divide and reunite many times, so as to form a continued plexus from the wrist to the elbow. One vein running along the front of the forearm is generally distinguished by the name of Vena Mediana. At the upper part, the Vena Mediana divides into two branches, the Mediana Cephalica and Mediana Basilica. These proceed obliquely upwards over the elbow joint, one to the outer, the other to the inner side of the arm, where they terminate, one in the Cephalic, and the other in the Basilic veins.

The superficial veins of the forearm are here described according to the view which is generally given of them, but it must at the same time be remarked, that the varieties in their distribution are so numerous that they will not be found exactly alike in any two subjects.

One or two Absorbent Glands of small size are generally found on the inside of the arm, a little above the internal condyle. They lie superficially near the basilic vein.

The Axillary Plexus of Nerves has been already described as terminating in six nerves for the supply of the arm. The Circumflex, the External and Internal Cutaneous, the Median, the Muscular Spiral, or Radial, and the Ulnar Nerves.

The Circumflex Nerve proceeds from the plexus obliquely downwards and outwards to the neck of the humerus, around which it turns in company with the posterior circumflex artery, and terminates in branches distributed to the under surface of the deltoid muscle.

The EXTERNAL CUTANEOUS NERVE, or NERVUS PERFORANS, passes from the plexus obliquely downwards and outwards to the coraco-brachialis, the fibres of which it penetrates, and then proceeds directly downwards between the biceps and brachialis internus. At the lower part of the arm, it emerges from beneath the outer edge of the biceps, and becomes placed superficially along the edge of the supinator radii longus muscle. It then continues its course over the front of the elbow joint to the anterior part of the forearm, where it is found between the integuments and the fascia. The nerve may be traced superficially along the forearm, inclining towards its outer side, and at the wrist, it terminates in filaments, some of which are lost upon the thumb in front, and others pass to the back of the hand, and thence to the fingers. The external cutaneous nerve gives off filaments to the muscles in the upper arm, and in the forearm it gives off filaments on each side, which ramify upon the fascia, and communicate with the filaments of the internal cutaneous nerve. Occasionally, the external cutaneous nerve passes along the edge of the coraco-brachialis without penetrating its fibres. A branch of communication is sometimes seen between the external cutaneous, and the median nerves.

The INTERNAL CUTANEOUS NERVE proceeds from the plexus, directly down the inside of the arm, beneath the fascia, and immediately in front of the basilic vein. Towards the lower part of the arm it divides into filaments, which penetrate the fascia, and pass in front, and on the inside of the elbow joint into the forearm. The filaments may be here traced distributing themselves superficially between the skin and fascia along the front, inner side, and back of the forearm, extending to the wrist and back of the hand, and communicating with the filaments of the external cutaneous nerve.

A third cutaneous nerve is sometimes described by the name of CUTANEUS MINOR, or NERVE of WRISBERG. It is a small branch which arises in the axilla, and thence descending along the arm, is distributed to the integuments covering the triceps muscle.

The MEDIAN NERVE proceeds from the plexus downwards, along the inner edge of the biceps muscle. In the upper part of its course the nerve is placed in front of the brachial artery, but as it descends passes to its inner side. From the lower part of the arm the median nerve is continued forwards with the brachial artery to the front of the elbow joint. It does not give off any branches in its course down the arm.

The MUSCULAR SPIRAL, or RADIAL NERVE descends from the plexus obliquely backwards, along the inside of the arm, concealed by the other nerves.

It enters the space between the second and third heads of the triceps, and winds obliquely round the os humeri, between the muscle and bone, and in company with the arteria profunda superior, to the outer side and lower part of the arm, where it is found deeply placed between the brachialis internus and supinator radii longus. Thence it descends into the forearm. The muscular spiral nerve gives off in its course down the arm many branches to the muscles, and one filament which descends superficially along the forearm.

The ULNAR NERVE descends from the plexus strait along the inside of the arm, united by cellular tissue to the line of union between the triceps and brachialis internus. At the lower part, the nerve passes between the inner condyle and olecranon into the forearm. In its course down the arm, the ulnar nerve gives off small filaments, some of which are distributed upon the triceps, and others are lost in the integuments.

Of the BEND of the ELBOW JOINT. Above the fascia, the Vena Mediana Cephalica, and the Vena Mediana Basilica, are seen passing over the front of the joint. Other superficial veins are seen ascending upon the sides of the joint and terminate in the basilic and cephalic veins. The cutaneous nerves in their passage over the elbow-joint are closely connected with these veins, some filaments passing above, and others below them. Beneath the fascia are seen the Brachial Artery and the Median Nerve imbedded in much cellular and adipose tissue. The artery and nerve lie close together, and the former is close to the inner side of the tendon of the biceps muscle.

MUSCLES OF THE SHOULDER.

It will now be convenient to remove the upper extremity, by dividing the muscles which connect the shoulder with the trunk, and when this is done, the student should review the attachments of these muscles to the scapula, clavicle, and os humeri. He will then proceed to the dissection of the muscles of the shoulder, beginning with

The Deltoid, which is a broad and thick muscle, extending from the shoulder downwards to the middle and external side of the humerus. It arises tendinous from the spine of the scapula in its whole length, from the front edge of the acromion, and from the front margin of the clavicle, along its outer third. From these origins, the muscle descends to the os humeri. Its anterior fibres have a direction obliquely backwards, its posterior fibres obliquely forwards, and its middle fibres perpendicularly, until they all converge into one tendon, which is inserted into the rough surface on the outside of the os humeri near its middle, and immediately above the origin of the brachialis internus. The fasciculi of this muscle are very large, and are sometimes separated by aponeurotic fibres passing between them. Its posterior surface is united by loose cellular tissue, to the capsule of the shoulder-joint. In reflecting the muscle, we meet with the branches of the circumflex vessels and nerve distributed to its under surface.

The deltoid muscle must now be reflected from its origins, in order to bring the other muscles of the scapula more completely into view.

A thick aponeurosis covers the muscles on the dorsum of the scapula, both above and below the spine. In removing this aponeurosis, it will be found adherent, in some situations, to the muscles beneath, so as to leave their surfaces rough and irregular.

Above the spine of the scapula we meet with

The Supra-Spinatus muscle, which occupies the whole fossa in the bone between the spine and superior costa. Its fibres have their origin from great part of the surface of the bone which the muscle covers, and thence converging towards the neck of the scapula, they terminate in a thick tendon which passes beneath the ligament extended between the acromion and coracoid process, and then continues its course beneath the deltoid, and over the shoulder-joint, to the capsule of which it is firmly united, and is at length attached to the front part of the great tuberosity of the os humeri.

Below the spine of the scapula we meet with

The Infra-Spinatus muscle, which occupies the whole extent of the scapula between the spine, basis, and inferior costa. Its fibres arise from nearly all the surface of the bone which the muscle covers, and thence converging towards the neck of the scapula, they terminate in a broad and thick tendon, which proceeds forwards beneath the deltoid and upon the shoulder-joint, to the capsule of which it is firmly united, and is attached to the middle part of the great tuberosity of the os humeri, immediately below the insertion of the supra-spinatus.

Below the infra-spinatus, is

The Teres Minor, which arises from the narrow depression extending from the neck of the scapula along its inferior costa almost to the inferior angle. It proceeds obliquely upwards and outwards along the lower edge of the infra-spinatus, and terminates in a tendon which passes forwards beneath the deltoid and upon the capsule of the shoulder-joint to which it adheres, and is attached to the lower part of the great tuberosity of the os humeri, below the insertion of the infra-spinatus.

In some subjects, the teres minor and infra-spinatus are so closely united, that there is no natural line of division between them.

Below, and behind the teres minor, is

The Teres Major, which arises from a rough and flattened service on the dorsum of the scapula just above its inferior angle, and proceeds obliquely upwards and outwards along the lower edge of the teres minor. Then leaving this muscle, it passes to the inside of the humerus, and terminates in a broad and flat tendon, which is inserted immediately behind the tendon of the latissimus dorsi into the posterior margin of the groove in the os humeri, which lodges the tendon of the biceps muscle. The tendons of the teres major and latissimus dorsi are closely connected, and a bursa mucosa is found between them just before their insertion.

The whole of the internal surface of the scapula is occupied by

The SUBSCAPULARIS muscle. Its fibres arising from the concave surface of the scapula, converge towards the neck of the bone, and terminate in a tendon which passes beneath the coracoid process, and upon the capsule of the shoulder-joint, to which it is firmly united, and is attached to the lesser tuberosity of the os humeri. This muscle is formed of large fasciculi separated by aponeurotic fibres. A bursa mucosa is found between its tendon and the under part of the coracoid process.

ORIGINS AND INSERTIONS OF THE MUSCLES OF THE UPPER ARM.

The BICEPS FLEXOR CUBITI has two distinct heads; one, the short head, arises tendinous from the coracoid process of the scapula where it is connected with the coraco-brachialis, and descending along the arm, soon becomes fleshy. The other, the long head, arises by a distinct tendon from the upper edge of the glenoid cavity, and then turning over the head of the humerus, proceeds downwards through the bicipital groove between the tendons of the pectoralis major in front, and of the teres major, and latissimus dorsi, behind. Quitting the groove, the long head continues to descend, and soon becomes fleshy. The two heads are still continued separately some way downwards, until they unite about the middle of the arm. The single muscle thus formed, continues its course down the inside of the arm, and terminates at the lower part in a tendon which passes over the front of the elbow-joint, between the pronator radii teres, and supinator radii longus, and is then turned backwards to be attached to the tubercle of the radius. A bursa mucosa is found beneath the tendon just before its insertion. At the bend of the elbow, a broad portion of fascia arises from the inside of the tendon of the biceps, and is continued into the fascia of the forearm. The tendon of the long head of the biceps, in its passage through the shoulder-joint is on the outside of the synovial membrane, and therefore not in contact with the synovia. The membrane is reflected around the tendon in this situation, giving to it a polished surface. The insertion of the biceps will be seen in the dissection of the fore-arm.

The Coraco-Brachialis arises from the coracoid process by a tendon, which is united with the short head of the biceps, and descends along the arm, adhering some way down to the edge of the biceps. Thence passing a little obliquely backwards to the inside of the humerus, it is attached to a rough surface of the bone at about its middle.

The coraco-brachialis is generally perforated by the external cutaneous nerve.

The BRACHIALIS INTERNUS arises by two distinct fleshy portions from the middle of the os humeri, on each side of the insertion of the deltoid which occupies the space between them; its fibres thence descend, having attachments in their course to the front and sides of the bone, and to the intermuscular ligament on each side. At the lower part of the arm, the fibres converge, and pass over the front of the elbow-joint where they adhere to the capsule, and then terminate by a tendinous insertion into a rough surface of the ulna at the root of its coronoid process. The insertion of this muscle will be seen in the dissection of the forearm.

The TRICEPS EXTENSOR CUBITI is divided above, into three distinct heads. The first, or long head, arises by a broad tendon from the inferior costa of the scapula near its neck, and thence proceeds between the teres major and minor, strait down the arm. The second head begins in a pointed form at the upper part of the os humeri, just below the insertion of the teres minor; and thence continues its origin downwards, from the ridge which extends along the outside of the bone to the external condyle. The third head, called BRACHIALIS EXTERNUS, arises in a pointed form from the os humeri, just below the insertions of the latissimus dorsi and teres major, and thence continues its origin downwards from the ridge which extends along the inside of the bone to the inner condyle. The three heads unite about the middle of the arm, into the thick fleshy mass which is attached to the whole lower and back part of the os humeri, and to the intermuscular ligament on each side, and terminates below in a strong tendon which is inserted into the extremity and lateral edges of the olecranon, and is further continued into the fascia of the forearm.

SECT. II.

OF THE FOREARM, FRONT PART.

Upon the removal of the integuments from the forearm, we meet with the filaments of the External and Internal Cutaneous Nerves, and the Superficial Veins ramifying upon the fascia. These have been already described in the dissection of the upper arm.

The muscles of the forearm are covered by a fascia, which is thick and strong, especially on the back part. The fascia should be exposed all the way round the forearm, in order to learn its extent and connexions before the dissection of the muscles is commenced. We shall then see that it not only binds down the muscles, but sends processes inwards between them, to which their fibres are closely united. At the upper part of the forearm, the fascia is connected in front, with the expansion given off from the tendon of the biceps. On each side, it is attached to the condyles of the humerus, and behind, to the tendon of the triceps, to the olecranon, and to the ulna, nearly in its whole length. At the lower part of the forearm, it is connected in front with the Anterior Annular Ligament; and behind, it forms a thick band, which is attached to the back parts of the radius and ulna, and extends across the carpus, binding down the tendons of the supinator and extensor muscles in their passage from the fore-arm to the hand. This band is denominated the POSTERIOR ANNULAR LIGAMENT, or LIGAMENTUM CARPI TRANSVERSALE EXTERNUM.

Upon the removal of the fascia from the front of the forearm, the attention of the student will be first directed to a hollow immediately below the elbow-joint. This hollow is bounded on each side by two thick masses of muscles. The mass on the ulnar side is formed by the FLEXORS and PRONATORS which are attached to the inner condyle. The mass on the radial side is formed by the SUPINATORS and EXTENSORS, which are attached to the outer condyle. The hollow itself is occupied by the principal vessels and nerves.

The Flexor and Pronator muscles form altogether but one mass of flesh, attached by a common tendon to the inner condyle, to the olecranon and to the ulna, along two-thirds of its length. This mass soon divides into the several muscles which we may arrange in the following order, beginning from the hollow in which the vessels are found, and thence proceeding to the ulnar side of the forearm.

The PRONATOR RADII TERES.

The FLEXOR CARPI RADIALIS.

The PALMARIS LONGUS.

The FLEXOR DIGITORUM SUBLIMIS.

The FLEXOR CARPI ULNARIS.

Beneath the flexor digitorum sublimis, we find

The FLEXOR DIGITORUM PROFUNDUS.

And lying close upon the radius, is

The FLEXOR LONGUS POLLICIS.

Beneath the lower part of the Flexor Digitorum Profundus, there is a thin and square muscle extended across between the radius and ulna. This is

The PRONATOR QUADRATUS.

The Supinator and Extensor muscles forming the outer boundary of the hollow just mentioned, are

The SUPINATOR RADII LONGUS, running along the radial edge of the forearm.

The EXTENSOR CARPI RADIALIS LONGIOR, situated behind the supinator radii longus.

The EXTENSOR CARPI RADIALIS BREVIOR, situated behind the extensor carpi radialis longior.

VESSELS AND NERVES IN THE FOREARM.

At this stage of the dissection, the student must attend to the course of the vessels and nerves in the forearm.

The BRACHIAL ARTERY advances forwards from the inside of the upper arm to the front of the elbow-joint, where it is found close to the inside of the tendon of the biceps, lying upon the brachialis internus, and covered only by the fascia and cellular tissue. It continues its course downwards beneath the aponeurotic expansion which connects the tendon of the biceps with the fascia of the forearm, and then enters the hollow just below the elbow-joint, between the flexor and pronator muscles on one side, and the supinator and extensor muscles on the other. Here it divides into the Radial and Ulnar arteries. From the Ulnar artery, the Interosseous artery is given off.

The preceding description corresponds to that which is usually given of the division of the brachial artery into the arteries of the forearm, but the varieties are so numerous, that no given description can be relied upon, as invariably correct.

The Radial, Ulnar, and Interosseous arteries, have been seen arising together at the bend of the arm. The most frequent distribution is, that the Radial is the first branch given off from the Brachial, which afterwards terminates in the Ulnar and Interosseous. The distribution next in frequency is, that the Ulnar is the first branch given off from the Brachial, which afterwards terminates in the Radial and Interosseous. The least frequent distribution is, that the Interosseous is the first branch given off from the Brachial, which afterwards terminates in the Radial and Ulnar.

Either of the three arteries of the forearm may arise from the brachial in any part of its course, even as high as its commencement from the axilla, thus forming what is called the high division. But it is to be remembered, that whatever may be the variety in the origins of the branches, the brachial trunk constantly preserves its regular course down the inside of the arm, and that whatever may be the branch given off in the high division, it always passes down the inside of the arm in company with the brachial trunk. Occasionally when the ulnar is the branch given off in the high division, it is found superficially above the fascia in its course to the fore arm.

A large branch is sometimes given off high up from the brachial, and after running some way down the arm, it enters either the brachial trunk again, or one of its branches.

The RADIAL ARTERY is situated, at its commencement, between the pronator radii teres and the supinator radii longus muscles, and then descending between these muscles, it crosses the insertion of the pronator teres, and continues its course down the forearm between the supinator longus and the flexor carpi radialis, and upon the flexor longus pollicis. Arriving at the lower end of the radius, the artery here turns outwards and backwards in an oblique direction, beneath the tendons of the extensor muscles of the thumb to the space between the metacarpal bones of the thumb and of the forefinger, whence it penetrates into the palm of the hand.

The branches of the radial artery are,

1. The RECURRENS RADIALIS, which turns up-

wards from its origin to the external condyle, and ends in communications with the branches of the brachial, especially with the profunda superior.

2. Muscular Branches in its whole course down the forearm.

3. The Superficialis Volæ, which is subject to considerable varieties, both in the place of its origin, and in its size. It is usually given off just before the radial turns towards the back of the hand, but occasionally, it arises much higher in the forearm. In some subjects the superficialis volæ is a small branch proceeding directly to the muscles of the thumb, in which it terminates. In other instances the superficialis volæ is of so large a size that it may be said to be formed by a division of the radial into two equal branches. It then proceeds downwards over the abductor pollicis muscle, and sometimes through a part of its fibres into the hand, where it ends in communications with the superficial palmar arch, formed by the ulnar artery.

4. The Dorsales Pollicis, which are small branches, distributed to the back of the thumb.

5. The Dorsalis Carpi, ramifying on the back of the carpus.

6. The Dorsalis Indicis, ramifying upon the back of the forefinger.

7. The Magna Pollicis, distributed principally to the thumb. This artery is usually divided into three branches, of which two are distributed to the thumb, and one to the radial side of the fore-

to which they are attached, but more commonly they are separated into the INTEROSSEI INTERNI seen in the palm, and the INTEROSSEI EXTERNI seen on the back of the hand.

The INTEROSSEI INTERNI are four in number, one placed on the outside of the metacarpal bone of the fore finger, the second between the metacarpal bones of the fore and middle fingers, the third between the middle and ring fingers, and the fourth between the ring and little fingers. They all arise from the opposite sides of the metacarpal bones at their carpal ends, and send off distinct tendons, which penetrate backwards between the fingers, to be inserted with the tendons of the lumbricales and of the extensor communis, into the phalanges of the fingers.

The INTEROSSEI EXTERNI, or BICIPITES, are three in number, one placed between the metacarpal bones of the fore and middle fingers, the second between the middle and ring fingers, and the third between the ring and little fingers. They arise by double heads from the opposite sides of the metacarpal bones, and are inserted into the sides of the fingers with the tendons of the extensor communis digitorum.

CHAP. XVIII.

DISSECTION OF THE JOINTS.

It will be necessary that the joints should be examined in their recent state, before the soft parts around them have become dried, or they must be macerated in water until the cellular tissue is so soft as to be removed with facility.

ARTICULATION OF THE LOWER JAW.

This joint has two lateral ligaments, a capsule formed by synovial membrane, and an interarticular cartilage.

The External Lateral Ligament consists of two distinct bands, one having an oblique, and the other a perpendicular direction. They arise above, from the lower margin of the zygomatic process of the temporal bone, and descending upon the capsule, are inserted into the outer side of the neck of the condyle of the lower jaw.

The INTERNAL LATERAL LIGAMENT arises from the inner edge of the glenoid cavity, close to the spinous process of the sphenoid bone, and descending obliquely forwards, is inserted into the inside of the lower jaw, at about mid-distance between the angle and the condyle.

The SYNOVIAL MEMBRANE consists of two distinct sacs, one covers the cartilaginous surface of the eminentia articularis and glenoid cavity, and is continued downwards upon the upper surface of the interarticular cartilage, the other covers the under surface of the interarticular cartilage, and is continued downwards upon the condyle. The joint is thus formed of two distinct cavities, having no communication with each other.

The INTERARTICULAR CARTILAGE is of an oval form, and thicker in its circumference than towards the centre. Its upper surface is adapted to the eminentia articularis and glenoid cavity, and its lower surface to the condyle. Externally, some of the fibres of the pterygoideus externus muscle are inserted into its front part, and the external lateral ligament adheres to it. In some instances, there is a hole in the centre of the cartilage.

When the cavity of the joint is opened, the student must notice the extent and direction of the upper articular surface, which is formed by the eminentia articularis, and by that part of the glenoid cavity which is in front of the fissura Glaseri.

Between the styloid process and the angle of the jaw, there is extended a thin aponeurotic expansion which gives origin to a part of the fibres of the stylo-glossus muscle.

OF THE LIGAMENTS CONNECTING THE HEAD WITH THE FIRST AND SECOND VERTEBRÆ, AND THESE VERTEBRÆ WITH EACH OTHER.

For the preparation of these ligaments, the head, with the first and second vertebræ, is to be separated from the rest of the spine. The skull-cap having been removed, two vertical sections of the occiput should be made down to the lateral margins of the foramen magnum, so that when the intermediate piece of bone is removed, the foramen may be laid widely open at its back part. The spinous processes of the first and second vertebræ are then to be sawn away, so as to expose the vertebral canal.

The ligaments connecting the occiput with the atlas, are

An Anterior Ligament, which is extended from the edge of the foramen magnum to the front part of the atlas, between its articular cavities. A Posterior Ligament, which is extended behind in the same manner from the edge of the foramen, to the back part of the atlas.

A synovial membrane is found between the condyles and the superior articular surfaces of the atlas.

When the dura mater is removed from the basilar process of the occipital bone, and from the vertebral canal, a broad ligamentous expansion is seen proceeding from the occipital bone downwards upon the bodies of the vertebræ. Upon the removal of this expansion, other ligamentous fibres are brought into view, which extend from the edge of the foramen magnum downwards, and terminate below by an insertion, partly into the transverse ligament of the odontoid process, and partly into the body of the second vertebra. These fibres form the APPARATUS COLLI LIGAMENTOSUS.

Beneath the preceding ligamentous fibres, we expose

The two ODONTOID LIGAMENTS, which are thick and of a rounded form. They arise from the point and sides of the odontoid process, and proceeding upwards in a diverging manner, are attached to the edge of the foramen magnum close to the front of the condyles.

A perpendicular ligament extends from the point of the odontoid process to the edge of the foramen magnum. This, however, is not very distinct. Its fibres appear to be more of a cellular than ligamentous texture.

The ligaments connecting the atlas with the dentata, are

A TRANSVERSE LIGAMENT, which is extended across the back part of the odontoid process, and is attached at each extremity to a tubercle on the inside of the atlas, just below its superior articular surface. This ligament and the front of the atlas, form together a sort of ring in which the turning motions of the odontoid process take place.

The odontoid process presents in front, a convex articular surface adapted to the concave surface in the front part of the atlas, and behind, a similar convex surface, where it moves in contact with the transverse ligament. These articular surfaces are covered by cartilage and by synovial membranes.

The inferior articular surfaces of the atlas are connected with the corresponding surfaces of the dentata by synovial membranes, and by ligamentous bands, which extend over the front and back part of each articulation. The synovial membranes are very loose, so as to allow a considerable extent of motion between the two vertebræ.

OF THE LIGAMENTS OF THE VERTEBRÆ IN GENERAL.

The bodies of the vertebræ are united by an Anterior and a Posterior ligament, and by the Intervertebral Substances.

The Anterior Vertebral Ligament consists of a strong band of fibres extended down the front of the spine from the atlas to the sacrum, adhering to the bones and to the intervertebral substances. Beneath this longitudinal band, other fibres are seen crossing obliquely between the bodies of the vertebræ upon the intervertebral substances.

The Posterior Vertebral Ligament consists of a band of fibres extended down the back parts of the bodies of the vertebræ, where they form the front of the spinal canal.

The Intervertebral Substances occupy the intervals between the bodies of the vertebræ throughout the spine, except between the atlas and dentata. They are united very firmly above and below to the flattened surfaces of the vertebræ. Their general thickness increases gradually from above downwards, and on this account, there are more considerable distances between the lumbar vertebræ than between the cervical and the dorsal. In the neck, the intervertebral substances are thicker in front than behind, while in the back, the reverse arrangement takes place, and in the loins they are again thicker in their front parts.

The intervertebral substances are formed of fibrous laminæ, decussating each other, and having intervals between them, which are successively more considerable towards the centre. These intervals are filled by a soft pulpy tissue, which is gradually increased in quantity towards the centre; and in the centre itself, each intervertebral substance consists altogether of this tissue without any intermixture of fibrous layers. When an intervertebral substance is immersed in water, its fibrous laminæ acquire a reddish tint, and when a section is made of it, the pulpy tissue in the centre swells out beyond the level of the surrounding surface.

The articulating processes of the several vertebræ are closely connected by capsules and by ligamentous fibres extended irregularly between them.

Between the back parts of the rings of the vertebræ there are ligaments which are of a flattened form, and composed of a very elastic and yellowish substance, hence they are denominated Ligamenta Subflava. These ligaments close the intervals between the vertebræ, and thus complete the back part of the spinal canal. They extend from the second vertebra downwards to the sacrum. The best method of examining them is to remove the rings of the vertebræ with the intervening ligaments in one piece from the whole length of the spine.

The intervals between the spinous processes of the dorsal and lumbar vertebræ are filled by ligamentous expansions formed of decussating fibres, which are attached above to the lower edge of one spinous process, and below, to the upper edge of the next in succession.

The points of the dorsal and lumbar spinous processes are further connected by a distinct longitudinal ligament extending between them. The fibres of the muscles on each side are intimately united to this ligament.

Thin ligamentous bands are extended between the transverse processes of the dorsal vertebræ from the fifth to the eleventh.

ARTICULATIONS OF THE RIBS.

The ribs are joined to the spine by the articulations between their heads and the cavities formed for them in the two adjoining vertebræ, and in the intervertebral substance; and by the articulations between their tubercles and the transverse processes. The first, tenth, and eleventh ribs are each joined only to a single vertebra, and the two latter have no articulations with the transverse processes.

The head of each rib is joined to the spine by an Anterior and an Interarticular Ligament, and by Synovial Membrane.

The Anterior Ligament consists of fibres attached to the front of the head of the rib, and thence extending over the articulation upwards and downwards in a radiated manner upon the sides of the vertebræ and upon the intervertebral substance.

The joint belonging to the head of each rib is divided into an upper and a lower part by the interarticular ligament, which is attached on one side to the projecting ridge in the articular surface of the rib, and on the other to the cavity in the intervertebral substance, in which the head is received. The upper and lower divisions of this joint are provided with distinct synovial membranes.

There are three ligaments and a synovial membrane uniting each rib to the transverse process of the corresponding vertebra.

The LIGAMENTUM TRANSVERSUM EXTERNUM is a strong ligament arising from the extremity of the transverse process of the vertebra, and proceeding horizontally outwards, is attached to the rough surface upon the tubercle of the rib.

The LIGAMENTUM CERVICIS COSTÆ INTERNUM arises from the lower part of the transverse process of the vertebra, and descends obliquely to the neck of the rib immediately below it.

The LIGAMENTUM CERVICIS COSTÆ EXTERNUM is situated upon the back part of the rib. It arises from the root of the transvere process of the vertebra, and descending obliquely in an opposite direction to the ligament last described, is inserted into the upper edge of the neck of the rib.

The SYNOVIAL Membranes covering the cartilaginous surfaces of the transverse processes and tubercles of the ribs are very distinct, and more loose than those belonging to the articulations of the heads of the ribs.

The Cartilages of the ribs, at their costal extremities, present convex surfaces which are very closely united with the concave surfaces in the extremities of the bones. The sternal ends of the cartilages of the seven true ribs present convex articular surfaces which are adapted to the hollows in the lateral edge of the sternum. These hollows are covered by cartilage and by synovial membranes, so that distinct joints are here formed. Each joint is strengthened by ligamentous bands which arise from the extremity of the cartilage, and thence passing in front and behind the articulation, are expanded upon the sternum. By the union of the ligamentous bands from each side, a strong aponeurotic expansion is formed which covers the whole of the anterior and posterior surfaces of the sternum, and is very closely adherent to the bone beneath. There is no distinct joint formed between the first rib and the sternum, the cartilage and bone are so intimately united that they appear to be continuous.

The opposite edges of the cartilages of the sixth, seventh, eighth, and sometimes of the ninth ribs, which are in contact with each other in the front of the chest, are connected by loose synovial membranes, so that distinct motion is allowed between them. Between the cartilages of the seventh, eighth, ninth, and tenth ribs, ligamentous fibres are extended so as to hold them in their position.

OF THE LIGAMENTS OF THE PELVIS.

The union of the last lumbar vertebra with the sacrum resembles in every respect the union of the other vertebræ severally with each other.

The last lumbar vertebra is connected with the ilium by a ligament which is sometimes divided into two parts. It is attached at one end to the transverse processes of the fifth, and sometimes of the fourth lumbar vertebra, and to the back part of the sacrum. Proceeding horizontally outwards, it is fixed at its other end to the posterior superior spine, and to the back part of the crista of the ilium.

OF THE ARTICULATION BETWEEN THE SACRUM AND THE ILIUM.

When the ilium is separated from the sacrum, the connecting surface of each is seen to be divided into two distinct parts, which result from the different modes of union between the bones in front and behind. In front, the ilium and sacrum are very firmly united by the intervention of cartilage which has been generally regarded as a single piece, but which some anatomists have stated to consist of two distinct layers, one belonging to each bone. Behind, the ilium and sacrum are united by short interarticular fibres passing between their opposite surfaces. Upon the separation of the bones, these fibres are detached, partly from one and partly from the other, so as to leave the surfaces of both rough and irregular.

The articulation of the ilium with the sacrum is strengthened in front, by ligamentous bands passing irregularly over it, and behind, by numerous ligamentous bands passing from the posterior superior and inferior spines of the ilium downwards to the back part of the sacrum.

The POSTERIOR or GREAT SACRO-ISCHIATIC LIGAMENT is placed at the lower and back part of the pelvis. It arises from the posterior extremity of the crista ilii, from the sides and posterior part of the sacrum and coccyx, and descends obliquely outwards, becoming gradually narrower and thicker, and is attached to the tuberosity of the ischium.

The ANTERIOR or LESSER SACRO-ISCHIATIC LIGAMENT is placed in front of the former, with which it is partly connected. It arises from the sides of the sacrum and coccyx, and proceeding outwards is attached to the spine of the ischium.

Many ligamentous bands descend irregularly upon the back part of the sacrum. Some of these, surrounding the posterior sacral holes, contract them so as to allow only of the passage of small vessels and nerves.

OF THE ARTICULATION BETWEEN THE SACRUM AND THE COCCYX.

The coccyx is united to the lower end of the sacrum by a thin layer of substance resembling the intervertebral substance of the spine. Thin layers of similar substance are found between the three pieces of the coccyx, which remain separate during the earlier periods of life.

Ligamentous bands descend from the back part of the sacrum, over the lower end of the vertebral canal;

which they close, and are then expanded upon the back part of the coccyx. Smaller bands also descend in front from the lower end of the sacrum to the coccyx.

OF THE SYMPHYSIS PUBIS.

The opposite surfaces of the ossa pubis are very firmly united by the intervention of fibrous laminæ and of cartilage. When a section is made of the symphysis, a distinct band of fibrous substance is seen running superficially around the articulation, and beneath this superficial band, there are other fibrous laminæ extending some way within the articulation at its upper, lower, and front parts. These laminæ form the union between the ossa pubis in the situations just mentioned. Towards the back part of the articulation, the bones are covered by thin layers of cartilage, the opposite surfaces of which are moistened by a whitish fluid, and are kept closely in contact by the external ligaments of the joint. The extent of these cartilaginous surfaces varies in different subjects. Sometimes, and especially in females, they occupy almost the whole breadth of the articulation, while in a few instances, no cartilage has been discovered, the bones being then united only by the fibrous luminæ.

The articulation between the ossa pubis is strengthened at its lower part by ligamentous fibres passing across between the ramus of each bone, and in front, by fibres passing irregularly across from one bone to the other.

The OBTURATOR FORAMEN is almost completely closed by a thin aponeurotic expansion, which is fixed to the whole circumference of the foramen, except at its upper part, where an aperture is left for the passage of the obturator vessels and nerve.

ARTICULATION OF THE CLAVICLE WITH THE STERNUM.

The ligaments belonging to this articulation are

An ANTERIOR LIGAMENT, consisting of a broad band of fibres attached above to the upper and front edge of the extremity of the clavicle, and thence descending obliquely upon the front of the articulation, to be fixed to the edge of the articular cavity in the sternum.

A POSTERIOR LIGAMENT, consisting of a smaller band of fibres attached above, to the posterior edge of the extremity of the clavicle, and below, to the opposite edge of the sternum.

An INTERCLAVICULAR LIGAMENT, which is a flattened band of fibres extended between the extremities of the clavicles along the upper border of the sternum.

An INTERARTICULAR CARTILAGE exists in this joint. It is thin and rounded at its edges. Its upper and lower surfaces are flattened in adaptation to the urfaces of the clavicle and sternum with which they are in contact. In some instances, the cartilage has a hole in its centre.

The joint is divided by the interarticular cartilage into two parts, which are provided with distinct synovial membranes; one of them covers the articular surface of the clavicle, and is reflected downwards upon the upper surface of the cartilage, the other covers the under surface of the cartilage, and is reflected downwards upon the articular surface of the sternum.

The clavicle is fixed to the first rib by a strong ligament which proceeds from the cartilage of the ribs obliquely upwards and backwards, to a rough surface in the under part of the clavicle near its sternal extremity.

ARTICULATION OF THE CLAVICLE WITH THE SCAPULA.

The scapular end of the clavicle is fixed to the articular surface in the edge of the acromion by ligamentous fibres which extend across from one bone to the other, both above and below the articulation.

An Interarticular Cartilage is sometimes found in this joint, but its appearance varies so considerably, that no exact description can be given of it.

Two Ligaments are extended between the clavicle and the coracoid process of the scapula. One of these, denominated from its figure, CONOIDES, is extended between the root of the coracoid process, and the rough eminence in the under part of the clavicle near its humeral extremity; the other, denominated TRAPEZOIDES, is a broad flattened band, which proceeds from the upper part of the coracoid process to an oblique line in the under part of the clavicle, extending from the insertion of the last ligament towards the humeral end of the bone.

There are two ligaments which belong only to the scapula. One of these is extended between the acromion and the coracoid process, and forms with these bony projections the arch over the shoulder-joint. This ligament is of a flattened and triangular form. Its broad end is fixed to the external edge of the coracoid process, and its narrow end, to the extremity of the acromion. It usually consists of two distinct bands separated by cellular tissue. From the front edge of this ligament, a layer of dense cellular tissue is continued downwards beneath the deltoid muscle, and upon the tendons of the supra and infra-spinatus muscles.

The other ligament of the scapula extends from the basis of the coracoid process across the supra-scapulary notch to the opposite angle of the bone. The notch is thus converted into a hole for the passage of the supra-scapulary vessels and nerve.

ARTICULATION OF THE HUMERUS WITH THE SCAPULA.

The Capsule of the shoulder-joint is formed by the union of a fibrous with a synovial membrane. The fibrous membrane, which is external, terminates at the upper part of the joint in an attachment to the circumference of the glenoid cavity, and below, it is attached round the neck of the humerus. The synovial membrane is reflected from the inside of the fibrous membrane upon the cartilaginous surfaces of the glenoid cavity and head of the humerus.

The superior part of the capsule is the thickest, where it is covered by a band of ligamentous fibres, which, at their other extremities, are fixed to the coracoid process. The capsule is further strengthened by the tendons of the supra-spinatus, infra-spinatus, teres minor, and subscapularis muscles, which are united to it in various situations. The length of the capsule is such, that when it is extended by drawing the humerus and scapula in opposite directions, the space of an inch will intervene between the articular surfaces of the bones.

Upon close examination, a process of synovial membrane will be seen extended down the bicipital groove of the humerus, lining it for the extent of an inch, and then reflected upwards round the tendon of the biceps muscle, so as completely to cover it as far as its origin from the upper edge of the glenoid cavity. In this way it is effected, that the tendon just mentioned is on the outside of the synovial membrane, although apparently within the cavity of the joint. Moreover, it will be remarked, that by the reflection of the synovial membrane from the lower part of the bicipital groove to the tendon, a sort of cul de sac is formed round the latter, by which the escape of synovia from the cavity of the joint is prevented.

The layer of cartilage covering the head of the humerus is thicker in the centre than at the circumference, while the cartilaginous covering of the glenoid cavity is thickest at its edges.

The glenoid cavity is increased in depth by a border of fibrous substance attached to its external edge. This fibrous substance is connected above with the tendon of the biceps.

ARTICULATION OF THE HUMERUS WITH THE RADIUS AND ULNA.

The ligaments belonging to this articulation are

An Internal Lateral Ligament, which is fixed above to the internal condyle of the humerus, and thence descending in a radiated manner, it divides into an anterior and a posterior portion; the anterior portion is attached to the inside of the coronoid process of the ulna; the posterior portion is attached to the inside of the olecranon.

An External Lateral Ligament which is less distinct than the preceding. It arises from the external condyle, and descending in a diverging manner, terminates by a broad insertion into the coronary ligament surrounding the neck of the radius.

Anterior and Posterior Ligaments, consisting of fibrous bands extended irregularly upon the front and back part of the joint.

The synovial membrane of the elbow-joint is reflected downwards from the articular surface of the humerus upon the greater semilunar cavity of the ulna, by which it is articulated with the humerus, and upon its lesser semilunar cavity which receives the head of the radius; and, lastly, it is continued upon the head and neck of the radius itself. We thus observe that the synovial membrane of the elbow is also continued into the articulation between the radius and ulna.

ARTICULATIONS OF THE RADIUS WITH THE ULNA.

The articulation between the head of the radius and the lesser semilunar cavity of the ulna, is secured by a strong flattened band of fibres, denominated the Orbicular, or Coronary Ligament, which surrounds the neck of the radius, and is attached to the anterior and posterior edges of the semilunar cavity in the ulna. This ligament lies close upon the capsule of the joint, and is firmly united to it.

Between the upper and lower articulations of the radius with the ulna, the bones are connected by the interosseous ligament which is extended across between their opposite ridges. Above and below, there is an interval left in the ligament for the passage of the interosseous vessels. The radius and ulna are further bound together by a distinct band of ligamentous fibres proceeding from the coronoid process of the ulna obliquely downwards to the radius just below its tubercle.

The lower articulation of the radius with the ulna is formed by the adaptation of the semilunar cavity in the inner side of the radius to the opposite side of the ulna. The articular surfaces of the two bones are covered by a reflection of the synovial membrane which covers the inferior extremity of the ulna.

ARTICULATION OF THE RADIUS AND ULNA WITH THE BONES OF THE CARPUS.

The articulation of the radius and ulna with the carpus, is secured by the following ligaments:

An Internal Lateral Ligament, which is attached above to the styloid process of the ulna, and below, to the os cuneiforme, some of its fibres being also fixed to the annular ligament and os pisiforme.

An External Lateral Ligament, which is attached above to the styloid process of the radius, and below, to the os scaphoides, annular ligament, and os trapezium. Neither of these lateral ligaments are well defined, their edges being irregularly connected with the ligamentous bands next described.

Anterior and Posterior Ligamentous Bands, which proceed from the front and back edges of the articular cavity of the radius, and are attached to the first or upper row of the carpal bones.

An Interarticular Cartilage is placed between the extremity of the ulna and the bones of the carpus, which occupies the vacancy here seen in the skeleton. By this cartilage, the articulation between the forearm and the carpus is separated into an upper and lower division, each having a distinct synovial membrane. The upper division is formed by the extremity of the ulna above, and by the opposite surface of the interarticular cartilage below. The lower division constitutes the proper joint of the wrist, and is formed by the following parts :—The inferior articular surface of the radius, and the inferior surface of the cartilage just mentioned, present together a concavity, oblong, or elliptical transversely, which is adapted to the uniform convexity presented by the superior surfaces of the three first bones of the carpus, viz., the scaphoides, lunare, and cuneiforme.

The synovial membrane, which belongs to the upper division of this articulation, covers the extremity of the ulna and the upper surface of the interarticular cartilage, and is reflected upwards, as already stated, into the articulation between the opposite sides of the radius and ulna. This synovial membrane is denominated, from its looseness, the MEMBRANA CAPSULARIS SACCIFORMIS.

The synovial membrane, which belongs to the lower division of the articulation forming the joint of the wrist, is simply spread over the concave surfaces of the radius, and of the interarticular cartilage, and is reflected downwards upon the convex surfaces of the three carpal bones.

The joint of the wrist is strengthened by numerous ligamentous bands, which confine the several tendons passing over it in their course from the forearm to the hand and fingers.

The ANTERIOR ANNULAR LIGAMENT of the wrist is a very thick band of ligamentous fibres, extended transversely across the front of the carpus. At one extremity, it is attached to the os scaphoides and os trapezium, and at the other, to the os pisiforme and to the curved process of the os unciforme.

ARTICULATIONS BETWEEN THE CARPAL BONES.

One synovial membrane serves by its reflections for the articulations between the two rows of carpal bones, and for the articulation of each particular bone with that which is contiguous to it. The same synovial membrane is continued upon the articulation of the carpus with the metacarpus, and upon the articulations of the metacarpal bones of the fingers with each other.

The three first bones of the carpus are joined by ligamentous bands passing between their contiguous sides.

All the bones of the carpus are joined by ligamentous bands, passing across from one bone to the other, both in front and behind. Some of these bands are arranged transversely, and others obliquely.

The two rows of the carpal bones are further connected by an External and Internal Lateral Ligament. The former is extended between the os scaphoides and os trapezium, the latter between the os cuneiforme and os unciforme.

The os pisiforme, not being included in the ranks of the carpal bones, has no communication with their common joint. It is articulated to the os cuneiforme by cartilaginous surfaces covered by synovial membrane, and is fixed in its situation by ligamentous fibres, some of which proceed from it on one side to the os unciforme, and to the metacarpal bone of the little finger, and on the other side to the extremity of the ulna.

to which they are attached, but more commonly they are separated into the INTEROSSEI INTERNI seen in the palm, and the INTEROSSEI EXTERNI seen on the back of the hand.

The INTEROSSEI INTERNI are four in number, one placed on the outside of the metacarpal bone of the fore finger, the second between the metacarpal bones of the fore and middle fingers, the third between the middle and ring fingers, and the fourth between the ring and little fingers. They all arise from the opposite sides of the metacarpal bones at their carpal ends, and send off distinct tendons, which penetrate backwards between the fingers, to be inserted with the tendons of the lumbricales and of the extensor communis, into the phalanges of the fingers.

The INTEROSSEI EXTERNI, or BICIPITES, are three in number, one placed between the metacarpal bones of the fore and middle fingers, the second between the middle and ring fingers, and the third between the ring and little fingers. They arise by double heads from the opposite sides of the metacarpal bones, and are inserted into the sides of the fingers with the tendons of the extensor communis digitorum.

CHAP. XVIII.

DISSECTION OF THE JOINTS.

It will be necessary that the joints should be examined in their recent state, before the soft parts around them have become dried, or they must be macerated in water until the cellular tissue is so soft as to be removed with facility.

ARTICULATION OF THE LOWER JAW.

This joint has two lateral ligaments, a capsule formed by synovial membrane, and an interarticular cartilage.

The External Lateral Ligament consists of two distinct bands, one having an oblique, and the other a perpendicular direction. They arise above, from the lower margin of the zygomatic process of the temporal bone, and descending upon the capsule, are inserted into the outer side of the neck of the condyle of the lower jaw.

The INTERNAL LATERAL LIGAMENT arises from the inner edge of the glenoid cavity, close to the spinous process of the sphenoid bone, and descending obliquely forwards, is inserted into the inside of the lower jaw, at about mid-distance between the angle and the condyle.

The SYNOVIAL MEMBRANE consists of two distinct sacs, one covers the cartilaginous surface of the eminentia articularis and glenoid cavity, and is continued downwards upon the upper surface of the interarticular cartilage, the other covers the under surface of the interarticular cartilage, and is continued downwards upon the condyle. The joint is thus formed of two distinct cavities, having no communication with each other.

The INTERARTICULAR CARTILAGE is of an oval form, and thicker in its circumference than towards the centre. Its upper surface is adapted to the eminentia articularis and glenoid cavity, and its lower surface to the condyle. Externally, some of the fibres of the pterygoideus externus muscle are inserted into its front part, and the external lateral ligament adheres to it. In some instances, there is a hole in the centre of the cartilage.

When the cavity of the joint is opened, the student must notice the extent and direction of the upper articular surface, which is formed by the eminentia articularis, and by that part of the glenoid cavity which is in front of the fissura Glaseri.

Between the styloid process and the angle of the jaw, there is extended a thin aponeurotic expansion which gives origin to a part of the fibres of the stylo-glossus muscle.

OF THE LIGAMENTS CONNECTING THE HEAD WITH THE FIRST AND SECOND VERTEBRÆ, AND THESE VERTEBRÆ WITH EACH OTHER.

For the preparation of these ligaments, the head, with the first and second vertebræ, is to be separated from the rest of the spine. The skull-cap having been removed, two vertical sections of the occiput should be made down to the lateral margins of the foramen magnum, so that when the intermediate piece of bone is removed, the foramen may be laid widely open at its back part. The spinous processes of the first and second vertebræ are then to be sawn away, so as to expose the vertebral canal.

The ligaments connecting the occiput with the atlas, are

An Anterior Ligament, which is extended from the edge of the foramen magnum to the front part of the atlas, between its articular cavities. A Posterior Ligament, which is extended behind in the same manner from the edge of the foramen, to the back part of the atlas.

A synovial membrane is found between the condyles and the superior articular surfaces of the atlas.

When the dura mater is removed from the basilar process of the occipital bone, and from the vertebral canal, a broad ligamentous expansion is seen proceeding from the occipital bone downwards upon the bodies of the vertebræ. Upon the removal of this expansion, other ligamentous fibres are brought into view, which extend from the edge of the foramen magnum downwards, and terminate below by an insertion, partly into the transverse ligament of the odontoid process, and partly into the body of the second vertebra. These fibres form the APPARATUS COLLI LIGAMENTOSUS.

Beneath the preceding ligamentous fibres, we expose

The two ODONTOID LIGAMENTS, which are thick and of a rounded form. They arise from the point and sides of the odontoid process, and proceeding upwards in a diverging manner, are attached to the edge of the foramen magnum close to the front of the condyles.

A perpendicular ligament extends from the point of the odontoid process to the edge of the foramen magnum. This, however, is not very distinct. Its fibres appear to be more of a cellular than ligamentous texture.

The ligaments connecting the atlas with the dentata, are

A TRANSVERSE LIGAMENT, which is extended across the back part of the odontoid process, and is attached at each extremity to a tubercle on the inside of the atlas, just below its superior articular surface. This ligament and the front of the atlas, form together a sort of ring in which the turning motions of the odontoid process take place.

The odontoid process presents in front, a convex articular surface adapted to the concave surface in the front part of the atlas, and behind, a similar convex surface, where it moves in contact with the transverse ligament. These articular surfaces are covered by cartilage and by synovial membranes.

The inferior articular surfaces of the atlas are connected with the corresponding surfaces of the dentata by synovial membranes, and by ligamentous bands, which extend over the front and back part of each articulation. The synovial membranes are very loose, so as to allow a considerable extent of motion between the two vertebræ.

OF THE LIGAMENTS OF THE VERTEBRÆ IN GENERAL.

The bodies of the vertebræ are united by an Anterior and a Posterior ligament, and by the Intervertebral Substances.

The Anterior Vertebral Ligament consists of a strong band of fibres extended down the front of the spine from the atlas to the sacrum, adhering to the bones and to the intervertebral substances. Beneath this longitudinal band, other fibres are seen crossing obliquely between the bodies of the vertebræ upon the intervertebral substances.

The POSTERIOR VERTEBRAL LIGAMENT consists of a band of fibres extended down the back parts of the bodies of the vertebræ, where they form the front of the spinal canal.

The INTERVERTEBRAL SUBSTANCES occupy the intervals between the bodies of the vertebræ throughout the spine, except between the atlas and dentata. They are united very firmly above and below to the flattened surfaces of the vertebræ. Their general thickness increases gradually from above downwards, and on this account, there are more considerable distances between the lumbar vertebræ than between the cervical and the dorsal. In the neck, the intervertebral substances are thicker in front than behind, while in the back, the reverse arrangement takes place, and in the loins they are again thicker in their front parts.

The intervertebral substances are formed of fibrous laminæ, decussating each other, and having intervals between them, which are successively more considerable towards the centre. These intervals are filled by a soft pulpy tissue, which is gradually increased in quantity towards the centre; and in the centre itself, each intervertebral substance consists altogether of this tissue without any intermixture of fibrous layers. When an intervertebral substance is immersed in water, its fibrous laminæ acquire a reddish tint, and when a section is made of it, the pulpy tissue in the centre swells out beyond the level of the surrounding surface.

The articulating processes of the several vertebræ are closely connected by capsules and by ligamentous fibres extended irregularly between them.

Between the back parts of the rings of the vertebræ there are ligaments which are of a flattened form, and composed of a very elastic and yellowish substance, hence they are denominated LIGAMENTA SUBFLAVA. These ligaments close the intervals between the vertebræ, and thus complete the back part of the spinal canal. They extend from the second vertebra downwards to the sacrum. The best method of examining them is to remove the rings of the vertebræ with the intervening ligaments in one piece from the whole length of the spine.

The intervals between the spinous processes of the dorsal and lumbar vertebræ are filled by ligamentous expansions formed of decussating fibres, which are attached above to the lower edge of one spinous process, and below, to the upper edge of the next in succession.

The points of the dorsal and lumbar spinous processes are further connected by a distinct longitudinal ligament extending between them. The fibres of the muscles on each side are intimately united to this ligament.

Thin ligamentous bands are extended between the transverse processes of the dorsal vertebræ from the fifth to the eleventh.

ARTICULATIONS OF THE RIBS.

The ribs are joined to the spine by the articulations between their heads and the cavities formed for them in the two adjoining vertebræ, and in the intervertebral substance; and by the articulations between their tubercles and the transverse processes. The first, tenth, and eleventh ribs are each joined only to a single vertebra, and the two latter have no articulations with the transverse processes.

The head of each rib is joined to the spine by an Anterior and an Interarticular Ligament, and by Synovial Membrane.

The Anterior Ligament consists of fibres attached to the front of the head of the rib, and thence extending over the articulation upwards and downwards in a radiated manner upon the sides of the vertebræ and upon the intervertebral substance.

The joint belonging to the head of each rib is divided into an upper and a lower part by the interarticular ligament, which is attached on one side to the projecting ridge in the articular surface of the rib, and on the other to the cavity in the intervertebral substance, in which the head is received. The upper and lower divisions of this joint are provided with distinct synovial membranes.

There are three ligaments and a synovial membrane uniting each rib to the transverse process of the corresponding vertebra.

The Ligamentum Transversum Externum is a strong ligament arising from the extremity of the transverse process of the vertebra, and proceeding horizontally outwards, is attached to the rough surface upon the tubercle of the rib.

The Ligamentum Cervicis Costæ Internum arises from the lower part of the transverse process of the vertebra, and descends obliquely to the neck of the rib immediately below it.

The Ligamentum Cervicis Costæ Externum is situated upon the back part of the rib. It arises from the root of the transvere process of the vertebra, and descending obliquely in an opposite direction to the ligament last described, is inserted into the upper edge of the neck of the rib.

The Synovial Membranes covering the cartilaginous surfaces of the transverse processes and tubercles of the ribs are very distinct, and more loose than those belonging to the articulations of the heads of the ribs.

The Cartilages of the ribs, at their còstal extremities, present convex surfaces which are very closely united with the concave surfaces in the extremities of the bones. The sternal ends of the cartilages of the seven true ribs present convex articular surfaces which are adapted to the hollows in the lateral edge of the sternum. These hollows are covered by cartilage and by synovial membranes, so that distinct joints are here formed. Each joint is strengthened by ligamentous bands which arise from the extremity of the cartilage, and thence passing in front and behind the articulation, are expanded upon the sternum. By the union of the ligamentous bands from each side, a strong aponeurotic expansion is formed which covers the whole of the anterior and posterior surfaces of the sternum, and is very closely adherent to the bone beneath. There is no distinct joint formed between the first rib and the sternum, the cartilage and bone are so intimately united that they appear to be continuous.

The opposite edges of the cartilages of the sixth, seventh, eighth, and sometimes of the ninth ribs, which are in contact with each other in the front of the chest, are connected by loose synovial membranes, so that distinct motion is allowed between them. Between the cartilages of the seventh, eighth, ninth, and tenth ribs, ligamentous fibres are extended so as to hold them in their position.

OF THE LIGAMENTS OF THE PELVIS.

The union of the last lumbar vertebra with the sacrum resembles in every respect the union of the other vertebræ severally with each other.

The last lumbar vertebra is connected with the ilium by a ligament which is sometimes divided into two parts. It is attached at one end to the transverse processes of the fifth, and sometimes of the fourth lumbar vertebra, and to the back part of the sacrum. Proceeding horizontally outwards, it is fixed at its other end to the posterior superior spine, and to the back part of the crista of the ilium.

OF THE ARTICULATION BETWEEN THE SACRUM AND THE ILIUM.

When the ilium is separated from the sacrum, the connecting surface of each is seen to be divided into two distinct parts, which result from the different modes of union between the bones in front and behind. In front, the ilium and sacrum are very firmly united by the intervention of cartilage which has been generally regarded as a single piece, but which some anatomists have stated to consist of two distinct layers, one belonging to each bone. Behind, the ilium and sacrum are united by short interarticular fibres passing between their opposite surfaces. Upon the separation of the bones, these fibres are detached, partly from one and partly from the other, so as to leave the surfaces of both rough and irregular.

The articulation of the ilium with the sacrum is strengthened in front, by ligamentous bands passing irregularly over it, and behind, by numerous ligamentous bands passing from the posterior superior and inferior spines of the ilium downwards to the back part of the sacrum.

The POSTERIOR or GREAT SACRO-ISCHIATIC LIGAMENT is placed at the lower and back part of the pelvis. It arises from the posterior extremity of the crista ilii, from the sides and posterior part of the sacrum and coccyx, and descends obliquely outwards, becoming gradually narrower and thicker, and is attached to the tuberosity of the ischium.

The ANTERIOR or LESSER SACRO-ISCHIATIC LIGAMENT is placed in front of the former, with which it is partly connected. It arises from the sides of the sacrum and coccyx, and proceeding outwards is attached to the spine of the ischium.

Many ligamentous bands descend irregularly upon the back part of the sacrum. Some of these, surrounding the posterior sacral holes, contract them so as to allow only of the passage of small vessels and nerves.

OF THE ARTICULATION BETWEEN THE SACRUM AND THE COCCYX.

The coccyx is united to the lower end of the sacrum by a thin layer of substance resembling the intervertebral substance of the spine. Thin layers of similar substance are found between the three pieces of the coccyx, which remain separate during the earlier periods of life.

Ligamentous bands descend from the back part of the sacrum, over the lower end of the vertebral canal, which they close, and are then expanded upon the back part of the coccyx. Smaller bands also descend in front from the lower end of the sacrum to the coccyx.

OF THE SYMPHYSIS PUBIS.

The opposite surfaces of the ossa pubis are very firmly united by the intervention of fibrous laminæ and of cartilage. When a section is made of the symphysis, a distinct band of fibrous substance is seen running superficially around the articulation, and beneath this superficial band, there are other fibrous laminæ extending some way within the articulation at its upper, lower, and front parts. These laminæ form the union between the ossa pubis in the situations just mentioned. Towards the back part of the articulation, the bones are covered by thin layers of cartilage, the opposite surfaces of which are moistened by a whitish fluid, and are kept closely in contact by the external ligaments of the joint. The extent of these cartilaginous surfaces varies in different subjects. Sometimes, and especially in females, they occupy almost the whole breadth of the articulation, while in a few instances, no cartilage has been discovered, the bones being then united only by the fibrous luminæ.

The articulation between the ossa pubis is strengthened at its lower part by ligamentous fibres passing across between the ramus of each bone, and in front, by fibres passing irregularly across from one bone to the other.

The Obturator Foramen is almost completely closed by a thin aponeurotic expansion, which is fixed to the whole circumference of the foramen, except at its upper part, where an aperture is left for the passage of the obturator vessels and nerve.

ARTICULATION OF THE CLAVICLE WITH THE STERNUM.

The ligaments belonging to this articulation are

An Anterior Ligament, consisting of a broad band of fibres attached above to the upper and front edge of the extremity of the clavicle, and thence descending obliquely upon the front of the articulation, to be fixed to the edge of the articular cavity in the sternum.

A Posterior Ligament, consisting of a smaller band of fibres attached above, to the posterior edge of the extremity of the clavicle, and below, to the opposite edge of the sternum.

An Interclavicular Ligament, which is a flattened band of fibres extended between the extremities of the clavicles along the upper border of the sternum.

An Interarticular Cartilage exists in this joint. It is thin and rounded at its edges. Its upper and lower surfaces are flattened in adaptation to the urfaces of the clavicle and sternum with which they are in contact. In some instances, the cartilage has a hole in its centre.

The joint is divided by the interarticular cartilage into two parts, which are provided with distinct synovial membranes; one of them covers the articular surface of the clavicle, and is reflected downwards upon the upper surface of the cartilage, the other covers the under surface of the cartilage, and is reflected downwards upon the articular surface of the sternum.

The clavicle is fixed to the first rib by a strong ligament which proceeds from the cartilage of the ribs obliquely upwards and backwards, to a rough surface in the under part of the clavicle near its sternal extremity.

ARTICULATION OF THE CLAVICLE WITH THE SCAPULA.

The scapular end of the clavicle is fixed to the articular surface in the edge of the acromion by ligamentous fibres which extend across from one bone to the other, both above and below the articulation.

An Interarticular Cartilage is sometimes found in this joint, but its appearance varies so considerably, that no exact description can be given of it.

Two Ligaments are extended between the clavicle and the coracoid process of the scapula. One of these, denominated from its figure, Conoides, is extended between the root of the coracoid process, and the rough eminence in the under part of the clavicle near its humeral extremity; the other, denominated Trapezoides, is a broad flattened band, which proceeds from the upper part of the coracoid process to an oblique line in the under part of the clavicle, extending from the insertion of the last ligament towards the humeral end of the bone.

There are two ligaments which belong only to the scapula. One of these is extended between the acromion and the coracoid process, and forms with these bony projections the arch over the shoulder-joint. This ligament is of a flattened and triangular form. Its broad end is fixed to the external edge of the coracoid process, and its narrow end, to the extremity of the acromion. It usually consists of two distinct bands separated by cellular tissue. From the front edge of this ligament, a layer of dense cellular tissue is continued downwards beneath the deltoid muscle, and upon the tendons of the supra and infra-spinatus muscles.

The other ligament of the scapula extends from the basis of the coracoid process across the supra-scapulary notch to the opposite angle of the bone. The notch is thus converted into a hole for the passage of the supra-scapulary vessels and nerve.

ARTICULATION OF THE HUMERUS WITH THE SCAPULA.

The Capsule of the shoulder-joint is formed by the union of a fibrous with a synovial membrane. The fibrous membrane, which is external, terminates at the upper part of the joint in an attachment to the circumference of the glenoid cavity, and below, it is attached round the neck of the humerus. The synovial membrane is reflected from the inside of the fibrous membrane upon the cartilaginous surfaces of the glenoid cavity and head of the humerus.

The superior part of the capsule is the thickest, where it is covered by a band of ligamentous fibres, which, at their other extremities, are fixed to the coracoid process. The capsule is further strengthened by the tendons of the supra-spinatus, infra-spinatus, teres minor, and subscapularis muscles, which are united to it in various situations. The length of the capsule is such, that when it is extended by drawing the humerus and scapula in opposite directions, the space of an inch will intervene between the articular surfaces of the bones.

Upon close examination, a process of synovial membrane will be seen extended down the bicipital groove of the humerus, lining it for the extent of an inch, and then reflected upwards round the tendon of the biceps muscle, so as completely to cover it as far as its origin from the upper edge of the glenoid cavity. In this way it is effected, that the tendon just mentioned is on the outside of the synovial membrane, although apparently within the cavity of the joint. Moreover, it will be remarked, that by the reflection of the synovial membrane from the lower part of the bicipital groove to the tendon, a sort of cul de sac is formed round the latter, by which the escape of synovia from the cavity of the joint is prevented.

The layer of cartilage covering the head of the humerus is thicker in the centre than at the circumference, while the cartilaginous covering of the glenoid cavity is thickest at its edges.

The glenoid cavity is increased in depth by a border of fibrous substance attached to its external edge. This fibrous substance is connected above with the tendon of the biceps.

ARTICULATION OF THE HUMERUS WITH THE RADIUS AND ULNA.

The ligaments belonging to this articulation are

An Internal Lateral Ligament, which is fixed above to the internal condyle of the humerus, and thence descending in a radiated manner, it divides into an anterior and a posterior portion; the anterior portion is attached to the inside of the coronoid process of the ulna; the posterior portion is attached to the inside of the olecranon.

An External Lateral Ligament which is less distinct than the preceding. It arises from the external condyle, and descending in a diverging manner, terminates by a broad insertion into the coronary ligament surrounding the neck of the radius.

Anterior and Posterior Ligaments, consisting of fibrous bands extended irregularly upon the front and back part of the joint.

The synovial membrane of the elbow-joint is reflected downwards from the articular surface of the humerus upon the greater semilunar cavity of the ulna, by which it is articulated with the humerus, and upon its lesser semilunar cavity which receives the head of the radius; and, lastly, it is continued upon the head and neck of the radius itself. We thus observe that the synovial membrane of the elbow is also continued into the articulation between the radius and ulna.

ARTICULATIONS OF THE RADIUS WITH THE ULNA.

The articulation between the head of the radius and the lesser semilunar cavity of the ulna, is secured by a strong flattened band of fibres, denominated the Orbicular, or Coronary Ligament, which surrounds the neck of the radius, and is attached to the anterior and posterior edges of the semilunar cavity in the ulna. This ligament lies close upon the capsule of the joint, and is firmly united to it.

Between the upper and lower articulations of the radius with the ulna, the bones are connected by the interosseous ligament which is extended across between their opposite ridges. Above and below, there is an interval left in the ligament for the passage of the interosseous vessels. The radius and ulna are further bound together by a distinct band of ligamentous fibres proceeding from the coronoid process of the ulna obliquely downwards to the radius just below its tubercle.

The lower articulation of the radius with the ulna is formed by the adaptation of the semilunar cavity in the inner side of the radius to the opposite side of the ulna. The articular surfaces of the two bones are covered by a reflection of the synovial membrane which covers the inferior extremity of the ulna.

ARTICULATION OF THE RADIUS AND ULNA WITH THE BONES OF THE CARPUS.

The articulation of the radius and ulna with the carpus, is secured by the following ligaments:

An Internal Lateral Ligament, which is attached above to the styloid process of the ulna, and below, to the os cuneiforme, some of its fibres being also fixed to the annular ligament and os pisiforme.

An External Lateral Ligament, which is attached above to the styloid process of the radius, and below, to the os scaphoides, annular ligament, and os trapezium. Neither of these lateral ligaments are well defined, their edges being irregularly connected with the ligamentous bands next described.

Anterior and Posterior Ligamentous Bands, which proceed from the front and back edges of the articular cavity of the radius, and are attached to the first or upper row of the carpal bones.

An Interarticular Cartilage is placed between the extremity of the ulna and the bones of the carpus, which occupies the vacancy here seen in the skeleton. By this cartilage, the articulation between the forearm and the carpus is separated into an upper and lower division, each having a distinct synovial membrane. The upper division is formed by the extremity of the ulna above, and by the opposite surface of the interarticular cartilage below. The lower division constitutes the proper joint of the wrist, and is formed by the following parts:—The inferior articular surface of the radius, and the inferior surface of the cartilage just mentioned, present together a concavity, oblong, or elliptical transversely, which is adapted to the uniform convexity presented by the superior surfaces of the three first bones of the carpus, viz., the scaphoides, lunare, and cuneiforme.

The synovial membrane, which belongs to the upper division of this articulation, covers the extremity of the ulna and the upper surface of the interarticular cartilage, and is reflected upwards, as already stated, into the articulation between the opposite sides of the radius and ulna. This synovial membrane is denominated, from its looseness, the Membrana Capsularis Sacciformis.

The synovial membrane, which belongs to the lower division of the articulation forming the joint of the wrist, is simply spread over the concave surfaces of the radius, and of the interarticular cartilage, and is reflected downwards upon the convex surfaces of the three carpal bones.

The joint of the wrist is strengthened by numerous ligamentous bands, which confine the several tendons passing over it in their course from the forearm to the hand and fingers.

The Anterior Annular Ligament of the wrist is a very thick band of ligamentous fibres, extended transversely across the front of the carpus. At one extremity, it is attached to the os scaphoides and os trapezium, and at the other, to the os pisiforme and to the curved process of the os unciforme.

ARTICULATIONS BETWEEN THE CARPAL BONES.

One synovial membrane serves by its reflections for the articulations between the two rows of carpal bones, and for the articulation of each particular bone with that which is contiguous to it. The same synovial membrane is continued upon the articulation of the carpus with the metacarpus, and upon the articulations of the metacarpal bones of the fingers with each other.

The three first bones of the carpus are joined by ligamentous bands passing between their contiguous sides.

All the bones of the carpus are joined by ligamentous bands, passing across from one bone to the other, both in front and behind. Some of these bands are arranged transversely, and others obliquely.

The two rows of the carpal bones are further connected by an External and Internal Lateral Ligament. The former is extended between the os scaphoides and os trapezium, the latter between the os cuneiforme and os unciforme.

The os pisiforme, not being included in the ranks of the carpal bones, has no communication with their common joint. It is articulated to the os cuneiforme by cartilaginous surfaces covered by synovial membrane, and is fixed in its situation by ligamentous fibres, some of which proceed from it on one side to the os unciforme, and to the metacarpal bone of the little finger, and on the other side to the extremity of the ulna.

ARTICULATIONS BETWEEN THE CARPUS AND METACARPUS, AND BETWEEN THE METACARPAL BONES.

The articulation between the os trapezium and the metacarpal bone of the thumb has a distinct synovial membrane, and is surrounded by ligamentous fibres passing from one bone to the other.

The articulations between the carpus and the metacarpal bones of the fingers are covered, as already stated, by reflections of the synovial membrane of the carpus.

Numerous ligamentous bands pass in front and behind, between the lower row of the carpal bones and the ends of the metacarpal bones.

The articulations between the contiguous sides of the metacarpal bones of the fingers, are covered by the reflections of the synovial membrane of the carpus.

The metacarpal bones are connected at their carpal ends by ligamentous bands passing transversely from one bone to the other, both in front and behind. Other ligamentous fibres pass between the metacarpal bones more deeply, uniting them very firmly together. At their digital ends, the metacarpal bones are united by transverse bands, which here exist only on their anterior, or palmar sides.

ARTICULATIONS BETWEEN THE METACARPUS AND PHALANGES OF THE THUMB AND FINGERS, AND OF THE PHALANGES BETWEEN THEMSELVES.

The articulations between the metacarpal bones and the first digital phalanx, are each of them provided with a distinct synovial membrane, and with lateral ligaments.

The LATERAL LIGAMENTS arise from the sides of the metacarpal bones, near their extremities, and proceeding obliquely forwards, are fixed to the sides of the corresponding bones of the first phalanx.

Each of these joints is further strengthened by the sheath of the flexor tendon in front, and by the extensor tendon behind, both of which are adherent to the capsule. At their sides, the joints are strengthened by the tendons of the interossei passing over them.

The articulations between the phalanges of the thumb and fingers are all of them in every respect alike. Each joint is furnished with a distinct capsule, and with lateral ligaments, resembling those of the articulations last described. Each joint is further strengthened by the sheath of the flexor tendon in front, and by the extensor tendon behind.

ARTICULATION OF THE FEMUR WITH THE OS INNOMINATUM.

The Capsule of the hip joint is the thickest and strongest in the body. It is formed like the capsule of the shoulder joint, by the union of a fibrous with a synovial membrane. The fibrous membrane is attached above, to the circumference of the acetabulum, and descending to the basis, or lowest part of the neck of the femur, is fixed to the root of the trochanter major, and to the oblique line extended between the two trochanters in front; and, lastly, to the posterior part of the root of the neck, just above the oblique line extended between the two trochanters behind. When the joint is opened, the synovial membrane is seen to be reflected from the inside of the fibrous membrane upon the periosteum of the neck, and upon the cartilaginous surface of the head of the femur. From the head of the femur, it is reflected around the interarticular ligament, or ligamentum teres, and is then continued upon the cartilaginous surface of the acetabulum.

The capsule of the hip is not of the same thickness throughout. It is thick in its external part, and especially so in front, where it is strengthened by a thick band of fibres, descending from the anterior inferior spine, and front margin of the ilium. The capsule is so much thinner in its inner part, as to be much weaker here than in the situations just mentioned.

The depth of the acetabulum is considerably increased by a band of fibrous substance, attached to the whole circumference of its bony margin, and extending across the notch on its inner side. This band is strengthened above by the addition of fibres from one of the tendons of the rectus muscle.

The notch on the inner side of the acetabulum is occupied partly by the fibrous band just mentioned, and partly by two additional ligamentous bands, denominated the TRANSVERSE LIGAMENTS of the ACETABULUM, which are extended between the opposite edges of the notch, and decussate each other in their course. These bands are all united, and they together completely fill the notch, except at its lower part, where a vacancy is left for the passage of vessels into the joint.

The INTERARTICULAR LIGAMENT of the hip, although it is denominated the LIGAMENTUM TERES, is of a flattened and triangular form. It is fixed, at its narrow end, to the depression in the head of the femur, and at its broad end, it divides into two portions, which are attached to the corners of the notch in the acetabulum, and to the transverse ligament extending across it.

The synovial membrane is reflected, as already stated, around the ligamentum teres. Hence the ligament is placed on the outer side of the membrane, although it appears within the cavity of the joint.

The depression which exists at the bottom of the acetabulum, is filled by a mass of soft adipose and cellular tissue.

The cartilage covering the head of the femur is thicker in the middle than towards its circumference, while the cartilage covering the acetabulum is thinner in its middle than towards its edges. It may be observed, that the acetabulum, notwithstanding its apparent depth, is still insufficient to include the entire cartilaginous surface of the head of the femur. In every position of the bones, a small portion of the head is always beyond the brim of its cavity.

ARTICULATION OF THE FEMUR WITH THE TIBIA AND PATELLA.

In this articulation we meet with several strong ligaments securing the bones in their relative situations; a synovial membrane, and two semilunar interarticular cartilages placed between the condylès of the femur and the articular surfaces of the tibia.

Three lateral ligaments are usually described, one internal and two external.

The Internal Lateral Ligament is broad and flattened. It is attached above to the internal condyle of the femur, whence it descends gradually increasing in breadth, and is fixed below to the edge of the internal semilunar cartilage, and to the head and inside of the tibia.

The External Lateral Ligaments are distinguished into the Long and Short. The first is a round cord, attached above to the external condyle, and below to the outside of the head of the fibula. The short external lateral ligament is placed behind the former. It is fixed above, to the lowest point of the external condyle, and below, to the extremity of the head of the fibula. This ligament is not always distinctly seen.

The LIGAMENTUM POSTICUM WINSLOWII is a broad expansion, extended obliquely across the back part of the joint between the external condyle and the head of the tibia, where it is connected with the tendon of the semimembranosus muscle. Other smaller bands of fibres are here extended irregularly upon the capsule.

The LIGAMENTUM PATELLÆ is to be regarded as the termination of the tendons of the extensor muscles. It is a very thick band of fibres, about two inches in length and one inch in breadth, attached above to the inferior angle of the patella, and to the depression in its posterior surface, and below, to the anterior tuberosity of the tibia. A bursa mucosa is placed between the ligament and the front of the tibia, just above the tuberosity. Above the bursa, a large quantity of fat occupies the space between the posterior surface of the ligament and the synovial membrane of the joint.

In order to examine the extent and connexions of the synovial membrane, the surrounding parts must be very carefully reflected from its external surface.

On each side of the patella, the membrane is covered by the aponeurotic expansion which is extended over the joint. Above, it is covered by the cruræus muscle, and is so closely united to its tendon, that their separation cannot be effected.

If we begin to trace the synovial membrane from the upper part of the joint, we find it covering the condyles of the femur, and continued upon the bone for some way beyond its cartilaginous surface. From the front of the femur, it is reflected loosely downwards behind the tendon of the cruræus, to the posterior surface of the patella which it lines, and then continuing its reflection downwards, it next covers both the upper and under surfaces of the semilunar cartilages, and is continued from them to the articular surfaces in the head of the tibia. From the middle of the head of the tibia, the synovial membrane is reflected upwards over the front and sides of the crucial ligaments, to their insertion into the femur. From the back part of the head of the tibia, it is reflected upwards to the posterior part of the condyles, and in this part of its course, it envelopes the tendon of the popliteus muscle.

The synovial membrane forms a fold on each side of the patella, which is denominated the Ligamentum Alare. These two folds are united below the patella, and from the point of their union, a duplicature of the membrane is extended through the joint backwards, to the hollow between the condyles. This duplicature is named the Ligamentum Mucosum.

At the back part of the articulation are seen the two CRUCIAL LIGAMENTS extended obliquely from the hollow between the condyles to the head of the tibia, and crossing each other in their course. It has been already stated that these ligaments are covered by the synovial membrane only on their front and lateral parts. Hence they are actually on the outside of the synovial sac. When we dissect them from the back part of the joint, we find them here united only by loose cellular tissue to the Ligamentum Posticum.

The ANTERIOR CRUCIAL LIGAMENT arises above from the inner side of the external condyle, and proceeding obliquely downwards and forwards, is inserted into a depression in the head of the tibia in front of the protuberance between its articular surfaces.

The POSTERIOR CRUCIAL LIGAMENT arises above from the outer side of the internal condyle, and proceeding obliquely downwards and backwards, divides into two distinct bands, one of which is inserted into a depression in the head of the tibia, behind its middle protuberance, and the other is connected with the external semilunar cartilage.

The SEMILUNAR CARTILAGES are placed upon the articular surfaces of the tibia. Each cartilage, in its external convex margin is thick, and becoming gradually thinner, its internal concave margin has a sharp delicate edge. Each cartilage presents above, an excavated surface adapted to the convexities of the condyles, and below, a flattened surface adapted to the head of the tibia. Externally, the cartilages are connected with the lateral ligaments, while their internal thin edges are loose in the cavity of the joint. The anterior and posterior extremities of each cartilage are fixed to the head of the tibia, in front and behind its middle protuberance. In some subjects, the two cartilages are united in front by a shor transverse ligament extended across between their convex borders.

The cartilage covering the condyles of the femur is thicker in the middle than in the circumference. The cartilage covering the head of the tibia is the reverse. The cartilage covering the posterior surface of the patella is thicker than that upon the tibia.

ARTICULATIONS BETWEEN THE TIBIA AND FIBULA.

The tibia and fibula are united at their extremities by distinct articulations, and in the middle, by the interosseous ligament.

The superior articulation of the tibia and fibula is formed by the contact of their flattened cartilaginous surfaces. These surfaces are covered by synovial membrane, and the articulation is strengthened by ligamentous bands which are extended obliquely from one bone to the other, both in front and behind. The tendon of the biceps assists in giving strength to this joint.

The INTEROSSEOUS LIGAMENT is a thin expansion extended between the opposite edges of the tibia and fibula. In its upper part, there is a large opening for the passage of the anterior tibial vessels, and another below, for a branch of the peroneal artery.

The inferior articulation of the tibia and fibula is formed by the adaptation of the convex cartilaginous surface in the side of the fibula, to the opposite concave surface in the side of the tibia. These surfaces are covered by a reflection of the synovial membrane from the ancle joint. Ligamentous bands are extended obliquely across from the tibia to the fibula, both in front and behind the articulation, and the two bones are further connected by a fibrous substance passing between their contiguous sides, just above the cartilaginous surfaces.

ARTICULATIONS OF THE TIBIA AND FIBULA WITH THE TARSUS.

The articulation of the tibia and fibula with the astragalus, forming the ancle joint, is secured by several strong ligaments.

The Internal Lateral Ligament, or Ligamentum Deltoides, is of considerable breadth. It arises above from a great part of the circumference of the malleolus internus, and descending rather in a radiated manner, terminates below by a very broad insertion into the sides of the astragalus, os calcis, and os naviculare. The breadth of this ligament is such, that it not only occupies the side of the joint, but also extends to its front and back parts.

The EXTERNAL LATERAL LIGAMENT is thick, and of a rounded form. It arises above, from the extremity of the malleolus externus, and descending obliquely backwards, is inserted into the outer side of the os calcis.

The ANTERIOR LIGAMENT of the fibula is placed in front of the preceding. It consists of a broad band of fibres which arise from the front part of the malleolus externus, and proceeding obliquely forwards, are inserted into the upper and outer part of the astragalus.

The POSTERIOR LIGAMENT of the fibula is situated at the back part of the joint. It arises from the lower and back part of the malleolus externus, and proceeding obliquely downwards and inwards, is attached to the back part of the astragalus.

The joint is further strengthened in front by ligamentous fibres which descend from the front of the lower extremity of the tibia, and extending themselves irregularly upon the capsule, are fixed to the astragalus in front of its upper articular surface.

The synovial membrane covering the articular surfaces of the ancle joint is reflected upwards, as already stated, into the articulation between the tibia and fibula. The membrane is very thin, and in the front of the joint, is loose, and covered by a considerable quantity of fat and cellular tissue.

ARTICULATIONS BETWEEN THE BONES OF THE TARSUS AND METATARSUS.

The articulation between the inferior surface of the astragalus and the upper part of the os calcis has a distinct synovial membrane, and is secured by an interosseous and a posterior ligament.

The Interosseous Ligament is formed of numerous strong fibres passing from the groove between the articular surfaces of the astragalus to the corresponding groove between the articular surfaces in the upper part of the os calcis.

The Posterior Ligament is formed of parallel fibres passing downwards from the back part of the astragalus to the adjacent part of the os calcis.

The articulation between the astragalus, os naviculare and os calcis has a synovial membrane reflected upon the cartilaginous surfaces of the three bones, and is secured by the following ligaments.

A Superior or Dorsal Ligament, which passes across from the upper part of the astragalus to the upper rough surface of the os naviculare.

An Inferior or Plantar Ligament, which passes from the under and front part of the os calcis to the hollow in the under surface of the os naviculare. This ligament is very strong. It not only binds the os calcis to the os naviculare, but also supports the head of the astragalus which rests upon it above.

An External Ligament, which passes from the front of the os calcis to the outside of the os naviculare.

The articulation between the os calcis and os cuboides has a synovial membrane, and is secured by a superior and an inferior ligament.

The SUPERIOR or DORSAL LIGAMENT consists of short parallel fibres extending across from the upper and front part of the os calcis to the upper rough surface of the os cuboides.

The Inferior or Plantar Ligament is the longest and the strongest of the ligaments of the tarsus. It arises from the under concave surface of the os calcis, and proceeds horizontally forwards in a diverging manner. Some of its fibres are inserted into the os cuboides, others are continued forwards and inserted into the tarsal ends of the third and fourth metatarsal bones.

It may be observed that the articulation between the os calcis and the os cuboides is very nearly in the same transverse line with that between the astragalus and the os naviculare.

The opposite sides of the Os Cuboides and Os Naviculare are generally covered by cartilage and by synovial membrane. Occasionally, however, no distinct articulation is here formed, and the two bones are joined by ligamentous fibres passing between them. They are further connected above and below by ligamentous bands passing across from one bone to the other.

The articulation between the os cuboides and third cuneiform bone has a distinct synovial membrane, and is secured by superior and inferior ligamentous bands passing across from one bone to the other.

The articulation between the os naviculare and three cuneiform bones is secured by superior and inferior ligamentous bands passing irregularly from one bone to the other. The synovial membrane covers the opposite surfaces of the os naviculare and cuneiform bones, and is reflected into the articulations of the cuneiform bones severally with each other.

The articulations between the cuneiform bones are secured by superior and inferior ligamentous bands passing transversely from one bone to the other, and by short ligamentous fibres passing between the opposite sides of the contiguous bones. They are covered by the reflections of one synovial membrane, as already stated.

The Metatarsal bones are united to those of the Tarsus, by numerous Dorsal and Plantar ligaments, which are very irregular in their direction.

A distinct synovial membrane belongs to the articulations of the first and third metatarsal bones with the tarsus. The articulation of the second metatarsal bone is covered by a reflection of the synovial membrane from between the two first cuneiform bones. The articulation between the fourth and fifth metatarsal bones and the os cuboides is provided with a distinct synovial membrane.

Distinct articulations are formed between the opposite sides of the metatarsal bones at their tarsal extremities with the exception of the first and second. These articulations are covered by reflections of the synovial membranes from the articulations between the tarsus and metatarsus. They are secured by dorsal and plantar ligaments passing transversely from one bone to the other, and by interosseous ligaments, consisting of numerous short fibres passing between their contiguous sides.

The metatarsal bones are connected at their digital ends by a transverse ligament situated beneath them, and extending across from one bone to the other.

The articulations between the metatarsal bones and the first phalanx of the toes are provided with synovial membranes, and with lateral ligaments resembling those of the articulations between the metacarpus and fingers.

The sesamoid bones are united by ligaments to the first bone of the great toe.

The articulations between the phalanges of the toes so nearly resemble those of the fingers, that they do not require any particular description.

CHAP. XIX.

DISSECTION OF THE BRAIN.

THE general mass of the brain, which, with its membranes, vessels, and nerves, fills the cavity of the skull, is divided into the CEREBRUM, occupying the whole of the superior part of the cavity, the CEREBELLUM, smaller than the cerebrum, occupying the lower and back part, and the MEDULLA OBLONGATA, the smallest portion, situated at the basis, beneath the cerebrum and cerebellum. The Medulla Oblongata is continued through the foramen magnum into the MEDULLA SPINALIS, which is lodged in the vertebral canal.

Upon the removal of the skull cap, the first membrane of the brain is exposed, which is the Dura Mater.

The DURA MATER is a thick and strong membrane of a close fibrous texture. Its external surface is seen to be somewhat rough, and irregularly spotted by bloody points. These bloody points are produced by the torn orifices of vessels that pass between the membrane and the surrounding bones. In young subjects, these vessels are more numerous than in the adult, and the skull cap and dura mater are in consequence so strongly adherent, that their separation can scarcely be effected without injury to the latter. It may be remarked, that the dura mater and the surrounding bones are most firmly connected along the lines of the sutures.

A division is now to be made of the dura mater. It should commence at any point opposite the mid-distance between the vertex and basis of the brain. Thence it should be carried entirely round the brain except that a small portion of the membrane in front and behind should be left uncut. The membrane should then be raised from either side, whereby its internal surface will be brought into view, which is smooth and moistened by fluid.

There are processes of the dura mater extending into the cranium, and separating the different parts of the brain from each other. These are the Falx Cerebri, Tentorium Cerebelli, and Falx Cerebelli.

The Falx Cerebri is extended from the front to the back part of the skull, between the two lateral halves or hemispheres of the cerebrum. The form of the falx is denoted by its name. Its narrow end is attached in front, to the crista galli process of the ethmoid bone. Becoming gradually broader as it is extended backwards, it terminates behind, by being continued into the middle of the tentorium cerebelli. The upper border of the falx has a convexity adapted to the concavity of the skull, and it is along this convex border that the superior longitudinal sinus is formed by the separation of the dura mater into laminæ, which constitute the external boundaries of the sinus. The lower border of the falx is concave, and is separated into layers, which form the boundaries of the Inferior Longitudinal Sinus.

The Tentorium Cerebelli is extended across the back part of the skull, between the posterior lobes of the Cerebrum, and the two hemispheres of the Cerebellum, and is continued forwards on each side as far as the petrous portion of the temporal bone. The posterior border of the tentorium is separated into layers which form the Lateral Sinuses, and are attached to the margins of the grooves in the occipital bone in which these sinuses are lodged.

The Falx Cerebelli is situated between the hemispheres of the Cerebellum, and is of a triangular figure. It begins broad from the under and middle part of the tentorium, and descends along the spine of the occipital bone to the foramen magnum, in the sides of which it is lost.

The situation of the Superior Longitudinal Sinus is known by the groove which marks its course, beneath the middle of the frontal bone, along the line of union between the parietal bones, and down the middle of the occipital bone, until it is continued into the two lateral grooves which mark the course of the Lateral Sinuses. The Longitudinal Sinus is to be opened in its whole length, when it will be seen to commence in front by a small cul de sac close to the crista galli process of the ethmoid bone, and to become gradually wider as it proceeds backwards. At its termination, it sometimes opens into one lateral sinus only, and sometimes is continued into both. Slender fibrous threads extend across the cavity of the sinus from one side to the other, and small granular bodies of a whitish colour are observed in its cavity, especially towards its middle, and about the orifices of the veins. These bodies are the Glandulæ Pacchioni, which will be again mentioned.

The Veins which open into the Superior Longitudinal Sinus are derived from the external parts of the head, from the skull, from the dura mater, and from the brain. The veins derived from the brain are the largest in number and size. Ten or twelve large trunks from the upper convex surfaces of the hemispheres terminate in each side of the sinus. It will be noticed. that most of these veins run obliquely forwards as they approach the inner margins of the hemispheres.

The Inferior Longitudinal Sinus is situated, as already mentioned, in the lower border of the falx cerebri. It terminates behind in a sinus, named the Fourth Sinus, or Torcular Herophili which is placed between the posterior broad end of the falx and the tentorium.

The Glandulæ Pacchioni are found partly within the cavity of the superior longitudinal sinus and partly on the outside of it. Hence they are distinguished into the Internæ and Externæ. The Glandulæ Internæ have been already described. The Glandulæ Externæ are arranged in clusters along the upper and inner margin of each hemisphere of the cerebrum. They are enveloped in the pia mater, and when they exist in considerable number, they elevate the dura mater into little protuberances which produce corresponding excavations in the internal table of the skull on each side of the sagittal suture.

The smooth surface of the brain exposed by the reflection of the dura mater, is formed by its second membrane, named the ARACHNOID.

The ARACHNOID MEMBRANE is very thin, colourless, and transparent. On account of its extreme tenuity, and the close adhesion which it has to the third membrane of the brain,—the Pia Mater, it cannot be easily separated. There are, however, situations at the basis, where the arachnoid membrane, as it passes between opposite parts of the brain, can be seen distinct from the pia mater. It is the opinion of some anatomists, that the arachnoid membrane is reflected from the basis of the brain to the internal surface of the dura mater, giving to it its smooth appearance.

The PIA MATER differs from the two membranes already described, in that it not only invests the whole apparent exterior of the brain, but also extends into the sulci between the convolutions. The Pia Mater is formed of ramifications of vessels connected by fine cellular tissue. The arteries of the pia mater are the nutrient arteries of the brain, which thus ramify and divide very minutely upon its exterior surface before they enter its substance. The veins of the pia mater are derived only from the brain. When a portion of the pia mater is gently raised from the brain, the connecting vessels appear as fine delicate threads, elongating as they are drawn out of its substance.

The division of the Cerebrum into Hemispheres has been already mentioned. Each hemisphere is divided into an Anterior, a Middle, and a Posterior Lobe, but it is only on the under surface of the brain that these are accurately defined. The Anterior and Middle Lobes are separated by a fissure, named the FISSURA SYLVII, which extends obliquely backwards from the basis to a considerable depth between the convolutions. This fissure is partly filled by the transverse spinous process of the sphenoid bone, which projects a short way within it. The Middle Lobe is distinguished from the Posterior Lobe by the limits of a superficial excavation in the under surface of the latter, which is adapted to the upper convex surface of the cerebellum. The Anterior Lobes rest upon the orbitar plates of the frontal bone. The Middle Lobes are lodged in the temporal fossæ, formed by the sphenoid and temporal bones. The Posterior Lobes rest upon the tentorium.

Each Hemisphere has its upper surface uniformly convex, adapting itself to the concavity of the skull, and is flattened on its inner side, where it is in contact with the falx.

The whole of the exterior surface of the brain is formed into convolutions, which run in various directions. The clefts, or sulci, between the convolutions, generally penetrate the substance of the brain to the depth of about an inch, or inch and a half. In a section of the brain, the greater number of these sulci are observed to have a zigzag course; some of them run longitudinally, and others obliquely. In some situations the sulci terminate in communications with each other, and in others, they terminate separately in the substance of the brain.

The brain is composed of two distinct kinds of substance, one of which has been usually denominated CORTICAL, or CINERITIOUS, or GREY, and the other MEDULLARY, or WHITE. In a section of the hemisphere, it will be seen that the external surface of the convolutions is formed by a covering of grey substance, about the tenth of an inch in thickness. When an incision is made into the white substance, its surface is spotted by red points. These are produced by the division of the blood vessels, which will vary, both in their size and in their number, according as they may be more or less distended by blood.

We now proceed to the dissection of the brain, according to the plan usually adopted, when it is examined for the purpose of ascertaining its healthy or diseased condition.

The two Hemispheres of the Cerebrum are to be gently separated, when a broad portion of white substance will be brought into view, extending across from the bottom of the internal flattened side of one hemisphere to the opposite. This is the CORPUS CALLOSUM. In relation to the sides of the brain, it is placed in its centre, but approaches nearer to its front than to its back part. The upper surface of the corpus callosum is slightly convex, and is a little overlapped by the hemisphere on each side. Two longitudinal ridges, nearly parallel, are extended along the middle of its upper surface, and between these, a superficial furrow is left, named the RAPHE'. Other ridges, usually less distinct, run transversely across on either side of the raphé. These are named LINEÆ TRANSVERSÆ. Two arteries of considerable size ramify upon the corpus callosum. These are the Anterior Arteries of the cerebrum, which will be seen at the basis, arising from the Internal Carotids.

When both hemispheres are removed down to the level of the corpus callosum, we have the view of the brain which is named the CENTRUM OVALE. The large surface of white substance now exposed, forms an irregular oval, surrounded by the grey substance at its edges.

An incision is to be carefully made through the corpus callosum, on either side of the raphé, until an opening is made into the cavities named the LATERAL VENTRICLES. The upper part, or roof, of each venticle is formed by the under surface of the corpus callosum, and the two cavities are separated by a partition, named the SEPTUM LUCIDUM. The ventricles, beginning in the anterior lobes, proceed backwards in a direction parallel to each other. Towards the posterior part of the brain, they diverge, and gradually bending first downwards and then forwards, follow a direction which has been considered to resemble the windings of a ram's horn. Just at the point where each ventricle begins to bend downwards, an elongation of the cavity is continued almost horizontally backwards into the posterior lobe, and terminates in a pointed form. This is named either the Posterior Horn of the ventricle, or the Digital Cavity. That portion of the ventricle continued downwards and forwards is named the Inferior, the Descending, or the Reflected Horn; and the commencement of the ventricle in front, is named the Anterior Horn.

The Ventricles are lined throughout by a fine transparent membrane, which gives them a polished appearance. This membrane is the source of the fluid which moistens their opposite sides, and preserves them distinct from each other.

The SEPTUM LUCIDUM forms, as already stated, a partition between the lateral ventricles. It consists of two layers of white substance, descending from the under surface of the corpus callosum to the Fornix, which will next be described. Between these layers, there is a small space, which is named the FIFTH VENTRICLE, or Ventricle of the Septum

Lucidum. If the corpus callosum is cut transversely near its middle, and its anterior part carefully turned forwards, the two layers of white substance forming the septum lucidum, and the space between them will be distinctly seen.

Below the Septum Lucidum is the FORNIX. This is a triangular body with its broadest part turned backwards. It commences in front by two rounded cords, named the ANTERIOR CRURA. These cords bend downwards to the basis of the brain, and here terminate in two eminences, named the CORPORA ALBICANTIA. The anterior crura unite and form the body of the fornix, which proceeds backwards, and is continued into two flattened bands of white substance, named the POSTERIOR CRURA. The posterior crura diverge from each other, and descend into the Inferior Horns of the Ventricles to their termination. Each posterior crus, as it passes through the inferior horn of the ventricle, adheres by one margin to an eminence, named the Hippocampus Major. The other margin of the crus, which is turned forwards, is quite loose, and receives the name of CORPUS FIMBRIATUM, or TÆNIA HIPPOCAMPI.

On each side of the anterior extremity of the fornix, there is a small chink leading obliquely downwards from the lateral ventricles into the middle or third ventricle. This is the FORAMEN of MONRO. When the fornix is raised, as by the accumulation of fluid in the ventricles, the two apertures are widened, and more obviously apparent.

The body of the fornix is to be divided transversely in its middle, and its anterior part is to be turned forwards. The two anterior crura will then be distinctly brought into view. The posterior part of the fornix is to be turned backwards. It will then be seen that the triangular space between the posterior crura is occupied by a layer of white substance, the under surface of which is marked by several transverse and oblique lines on each side, producing the appearance named the PSALTERIUM, or LYRA.

Beneath the fornix is a thin membranous expansion, denominated the VELUM. It is extended over the cavity of the third ventricle, and upon the eminences named the Thalami Optici. The velum corresponds in its size and shape to the fornix. It is formed by a production of the pia mater, which is continued from the exterior of the brain into the ventricles. The pia mater passes into the ventricles through a transverse fissure, which is found beneath the posterior border of the corpus callosum. If the posterior border of the corpus callosum is carefully divided in its middle, and then gently raised on either side of the incision, the continuity between the velum and the external pia mater will be distinctly seen. The velum is joined by its lateral edges, and in front, to the Choroid Plexuses. Its upper surface is united to the fornix by numerous fine vessels, and its under surface is united in the same manner to the Thalami Optici.

The Choroid Plexuses are two soft and vascular substances, formed by duplicatures of the pia mater. Each plexus is seen in the lateral ventricle, beginning at the foramen of Monro, through which it is continued into the velum. From the foramina of Monro, the plexuses proceed obliquely backwards upon the thalami optici, external to the margins of the fornix, and are continued through the inferior horns of the ventricles to their termination. Small reddish or grey bodies, which sometimes have a vesicular appearance, are frequently found within the choroid plexuses.

The veins of the Choroid Plexuses and Velum unite into two trunks, named the Venæ Galeni, which proceed together along the middle of the velum to its back part, and here join into a single vessel, which opens into the Fourth Sinus, or Torcular Herophili.

We have seen that the Pia Mater is continued into the ventricles, and forms the velum and choroid plexuses. It may be further mentioned, that some anatomists have described the continuation of the Arachnoid membrane from the exterior of the brain into its cavities, to form the smooth lining, not only of the lateral ventricles, but also of the third and fourth ventricles.

Beneath the posterior part of the velum is the Pineal Gland, which is a reddish grey body, about the size of a horsebean, and generally of a conical figure, with its basis turned forwards, and its apex backwards. It is united in front, to the thalami optici by two cords of white substance, named its PEDUNCULI. A few small particles of hard semi-transparent matter are generally found within the pineal gland. Upon analysis, these particles have been found to be phosphate of lime.

In front of the pineal gland, is the MIDDLE or THIRD VENTRICLE, which is a vertical fissure bounded on each side, by the thalamus opticus; above, by the velum; and below, by certain parts at the basis of the brain hereafter to be described.

The inner flat surfaces of the thalami optici, forming the sides of the middle ventricle, are in contact with each other, so that there is merely the appearance of a fissure between them. At each extremity, however, this fissure enlarges into a triangular space. The space at the anterior extremity of the fissure is the FORAMEN COMMUNE ANTERIUS. Its boundaries are formed on each side, by the thalami; and, in front, by the anterior crura of the fornix. The space at the posterior extremity of the fissure is the FORAMEN COMMUNE POSTERIUS. Its lateral boundaries are the thalami, and its posterior boundary is the basis of the pineal gland. The foramen commune anterius communicates below, with the cavity of the third ventricle; and above, with the foramina of Monro; hence it is the intermediate passage between the lateral ventricles and the third. The foramen commune posterius also communicates below, with the cavity of the third ventricle, but the velum is extended so closely over it above, that no intermediate passage between the lateral ventricles and the third can take place through it, while the parts retain their natural connexions.

By gently separating the sides of the thalami optici, where they are in contact with each other, they are seen to be united a little below the level of their upper surface by grey substance, which is named the SOFT COMMISSURE. It has received this name in consequence of its being so soft in texture, that the weight of the parts on each side is sufficient to break it. The thalami then separate from each other, and no appearance remains of union having existed between them.

A rounded cord of white substance extends transversely across the anterior extremity of the middle ventricle, and immediately in front of the anterior crura of the fornix. This is the ANTERIOR COMMISSURE.

A similar cord extends transversely across the posterior extremity of the middle ventricle, and immediately beneath the basis of the pineal gland. This is the POSTERIOR COMMISSURE.

If a probe be introduced into the third ventricle, and passed in a direction downwards and forwards, below the anterior commissure, it will penetrate a conical process of grey substance, named the INFUNDIBULUM, which extends from the lower and front part of the third ventricle to the Pituitary Gland at the basis of the brain. The channel of communication between the third ventricle and the infundibulum, is named the ITER AD INFUNDIBULUM.

Immediately below the posterior commissure, there is a small round opening, which is the commencement of a canal leading from the third ventricle, obliquely downwards and backwards, beneath the eminences, named the Tubercula Quadrigemina into the fourth ventricle. This canal is denominated the CANALIS MEDIUS, or AQUÆ-DUCTUS SYLVII, or ITER A TERTIO AD QUARTUM VENTRICULUM.

The lower boundary of the lateral ventricles is formed by the following parts; viz., the Corpora Striata, Thalami Optici, and Tænia Semicircularis.

The CORPORA STRIATA are two eminences of a pyriform shape. Their broadest ends are placed forwards in the anterior horns of the ventricles, whence they are continued outwards and backwards, gradually receding from each other, and contracting in breadth until they terminate in a pointed form. They are grey externally, but within, they consist of a striated intermixture of the grey and white substance, from which their name has been derived.

The THALAMI OPTICI are two convex eminences placed more towards the middle and back part of the ventricles than the corpora striata. On their outer sides, the thalami are received into the concavities formed by the diverging corpora striata. The inner flat surfaces of the thalami, forming the sides of the middle ventricle are connected by the soft commissure already described.

The TÆNIA SEMICIRCULARIS is a very thin and narrow band of white substance lodged in a superficial groove between the corpus striatum, and thalamus opticus on each side.

There are certain objects which yet remain to be examined in the Inferior and Posterior Horn of each Lateral Ventricle.

A large white prominence, named the HIPPOCAMPUS MAJOR, or CORNU AMMONIS, extends along the bottom of the inferior horn of each ventricle. At the extremity of the ventricle, the hippocampus major terminates in a bulbous projection, which is marked by three or four superficial grooves presenting the appearance, named the PES HIPPOCAMPI. The posterior crus of the fornix, as it passes through the inferior horn of the ventricle, runs along the concave side of the hippocampus major, and adheres to it, as already stated.

In the bottom of the posterior horn, or digital cavity of each ventricle, a prominence is more or less distinctly seen, which is named the HIPPOCAMPUS MINOR.

Behind the posterior commissure, and below the pineal gland, there are four convex eminences, separated by superficial grooves. These are the TUBERCULA QUADRIGEMINA. The two anterior eminences are rather the highest, and are called the NATES, and the two posterior, the TESTES.

From the two posterior eminences, or TESTES, a thin layer of grey and white substance is extended obliquely downwards and backwards to the cerebellum. This is the VALVE of the fourth ventricle. It is united by its lateral edges to two rounded cords, named the PROCESSUS A CEREBELLO AD TESTES, extended between the testes and cerebellum. The two nerves of the fourth pair arise from the external surface of the valve, near its union with the cords just mentioned.

By dividing the valve along its middle, the FOURTH VENTRICLE, or VENTRICLE of the CEREBELLUM will be opened. This is a cavity of considerable extent, situated between the cerebellum, tuber annulare, and the back part of the medulla oblongata. Its posterior boundary is formed by the valve, its anterior boundary by the medulla oblongata, its lateral boundaries by the processus a cerebello ad testes, and by the crura cerebelli. It communicates above, with the canalis medius, and below, it is closed by the pia mater, which extends across from the cerebellum to the medulla oblongata. Along the middle of the anterior side of the fourth ventricle, there is a narrow groove ending below in a point. This is the CALAMUS SCRIPTORIUS. On each side of this groove there are two or three transverse streaks of white substance. These are regarded as the origins of the auditory nerves.

We here conclude the examination of the parts which are usually exposed in the dissection of the brain from above downwards, and must next proceed to the Basis.

If we begin at the front part of the basis, the first object here noticed is the junction of the optic nerves, which will hereafter be particularly described. Immediately behind this junction, there is a small square portion of grey substance with which the infundibulum and pituitary gland are connected.

The INFUNDIBULUM is, as already stated, a conical process of grey substance. Its length is about half an inch. It is broad above, where it is connected with the square portion of grey substance just mentioned. Thence proceeding downwards, and gradually contracting, it ends in a point which is attached to the middle of the upper surface of the pituitary gland.

The PITUITARY GLAND is a small body lodged in the sella turcica of the sphenoid bone. It is of a rounded or oval form, and has its upper surface flattened. It is generally of a dark-brown or yellowish colour, and is composed of two distinct substances which seem to be peculiar, as they do not exactly resemble the other parts of the brain. The pituitary gland is not joined to the brain in any other way than by its connexion with the infundibulum.

Behind the square portion of grey substance, there are two small convex eminences, which are named the CORPORA ALBICANTIA, or MAMMILLARIA.

It is already known, that the anterior crura of the fornix terminate in these bodies.

In the description of the third ventricle, it was stated that its lower boundary is formed by certain parts at the basis of the brain. These parts are, the square portion of grey substance just described, the corpora albicantia, and a small portion of white substance which is found behind the corpora albicantia and between the crura cerebri.

Of the CEREBELLUM. The cerebellum is rather of an elliptical form, its longest diameter extending transversely from one side to the other. It is divided into two lateral lobes or hemispheres, which are separated by the falx cerebelli. Its upper surface is obliquely flattened on each side, and in the centre, presents an eminence which is named the SUPERIOR VERMIFORM PROCESS. Its lower surface presents convexities on each side adapted to the fossæ of the occiput, and a deep fissure in the middle. At the bottom of this fissure there is a convex ridge which is named the INFERIOR VERMIFORM PROCESS. The external surface of the cerebellum is divided into flattened strata, between which there are fissures corresponding to the sulci between the convolutions of the cerebrum. The pia mater extends into these fissures, and the arachnoid membrane simply passes over them. If a vertical section be made through either lobe of the cerebellum, a thick mass of white substance is seen in the centre, which divides into the several strata in an arborescent manner, producing the appearance denominated ARBOR VITÆ. These strata diverge towards the circumference of the cerebellum, and are covered externally by grey substance.

The next object for examination in the basis, is the TUBER ANNULARE, or PONS VAROLII. This is a very considerable eminence placed in front of the cerebellum. In its natural situation, it rests upon the basilar process of the occipital bone. Its external surface is convex, and is divided into two lateral halves by a middle groove in which the basilar artery is lodged.

The TUBER ANNULARE is joined to the cerebrum, by two thick white cords, named the CRURA CEREBRI, and to the cerebellum, by two similar cords, named the CRURA CEREBELLI. The crura cerebri arise from each front angle of the tuber, and are continued outwards and forwards to the under part and middle of each hemisphere of the cerebrum in which they terminate. The crura cerebelli arise from each posterior angle, and side of the tuber, and are continued outwards and backwards into the hemispheres of the cerebellum. When a transverse section is made of either crus cerebri, a stratum of dark coloured substance is seen extending across the divided surface. This is named the LOCUS NIGER.

Of the MEDULLA OBLONGATA. The Medulla Oblongata is that portion of the brain which intervenes between the tuber annulare and the foramen magnum. It is broadest above, where it is separated from the tuber by a deep transverse fissure, and gradually contracts as it approaches the foramen magnum, through which it is continued into the Medulla SPINALIS. On the anterior side of the medulla oblongata there are four eminences contiguous to each other. The two internal are the CORPORA PYRAMIDALIA, and the two external, the CORPORA OLIVARIA. The groove between the corpora pyramidalia is continuous at its lower part with the groove which divides the medulla spinalis into its right and left halves. Immediately behind the tuber annulare, and between the corpora pyramidalia, there is a small depression, which is named the FORAMEN CŒCUM.

The arachnoid membrane and pia mater are to be carefully removed from the lower part of the medulla oblongata, immediately below the corpora pyramidalia, and the edges of the middle groove are to be gently drawn asunder, when there will be discovered four or five bands of white substance, ascending obliquely from one side of the medulla to the other. The bands of each side decussate, some of them passing above, and others below those of the opposite side, so that they are interwoven like plaited straw. These bands are named the Decussating Bands of the Corpora Pyramidalia.

ORIGINS OF THE NERVES OF THE BRAIN WITH THEIR COURSE TO THE FORAMINA THROUGH WHICH THEY PASS OUT OF THE SKULL.

The connexion which each nerve has with the brain is described as its origin. The nerves of the brain are double, hence they are described in pairs, each pair comprising the corresponding nerves on the right and left sides. The nerves pass out of the skull through apertures in the dura mater which are found immediately above the several openings in the bones.

The first pair of nerves is the OLFACTORY. Each Olfactory nerve arises from the under and back part of the anterior lobe of the cerebrum, near the fissura SYLVII, by three roots, two of which are formed of white substance, and the third of grey substance. From its origin, the nerve proceeds forwards beneath the anterior lobe in a groove between the convolutions. After a course of about an inch and a half, it swells into an oval bulb of a grey colour, and very soft consistence. From this bulb, there arise numerous small filaments, which immediately pass through the holes in the cribriform lamella of the ethmoid bone, to be distributed upon the pituitary membrane of the nose.

The second pair of nerves is the OPTIC. Each Optic nerve has been generally considered to arise from the posterior and inferior part of the eminence in the lateral ventricle, which is denominated the THALAMUS OPTICUS. Some anatomists, however, refer its origin to one of the eminences named the nates. The nerve forms a flattened band which turns round the crus cerebri, and advancing forwards, gradually approaches the nerve of the opposite side. This part of its course is named the TRACTUS

Opticus. The two nerves are united immediately above the smooth surface of the sphenoid bone between the anterior clinoid processes, and in front of the sella turcica. Each nerve then proceeds obliquely outwards and forwards to the foramen opticum, through which it passes into the orbit.

The third pair of nerves is named the Motores Oculorum. It arises from the front and inner edge of the crus cerebri, and proceeds from its origin obliquely outwards and forwards to the front part of the tentorium, where it enters the cavernous sinus. The nerve then continues its course forwards along the external side of the sinus, and passes through the fissura lacera into the orbit.

The fourth pair of nerves is named the Trochleares, or Pathetici, and is the smallest of the cerebral nerves. It arises by two or three filaments from the valve of the brain, whence it turns round the crus cerebri, between the cerebrum and the cerebellum, and proceeds forwards along the edge of the tentorium to the posterior clinoid process. Here it enters the cavernous sinus, and continues its course forwards along the external side of the sinus to the fissura lacera, through which it passes into the orbit.

The fifth pair of nerves is named the Trigemini, and is the largest of the cerebral nerves. It arises from the lower and front part of the crus cerebelli, just at its union with the tuber annulare. From its origin, it proceeds obliquely outwards and forwards to the extremity of the superior border of the petrous portion of the temporal bone. It then continues its course forwards between the dura mater and the basis of the skull to the internal temporal fossa, where it swells into a thick flattened band, denominated the GANGLION GASSERIANUM. This band is of a semilunar form. Its concave side is joined with the trunk of the nerve, and from its convex side, there proceed the three divisions of the nerve next to be mentioned.

1. The OPHTHALMIC NERVE, which enters the cavernous sinus, and proceeds along its external side to the fissura lacera, through which it passes into the orbit.

2. The SUPERIOR MAXILLARY NERVE, which passes out of the skull through the foramen rotundum.

3. The INFERIOR MAXILLARY NERVE, which passes out of the skull through the foramen ovale.

The sixth pair of nerves is named the ABDUCTORES or MOTORES EXTERNI, and is intermediate in size between the third and fourth pairs. It arises from the lower margin of the tuber annulare, and proceeds upwards and forwards to the lateral part of the basilar process of the occipital bone. Here it penetrates the dura mater, and entering the cavernous sinus, continues its courſe forwards close to the outer side of the carotid artery to the fissura lacera, through which it passes into the orbit.

The seventh pair of nerves is formed of two distinct nerves, the FACIAL or PORTIO DURA, and the AUDITORY or PORTIO MOLLIS.

The Facial Nerve arises from the posterior and lateral part of the tuber annulare.

The Auditory Nerve is stated to arise, either by the striæ of white substance on the anterior side of the fourth ventricle, or from the crus cerebelli immediately behind the origin of the facial nerve. The auditory nerve turns forwards and becomes closely united to the side of the facial. The two nerves then proceed together upwards and outwards to the meatus auditorius internus. At the bottom of the meatus, they separate for their distinct destinations, one to the internal ear, and the other to the face.

The eighth pair of nerves is formed of three distinct nerves, the GLOSSO-PHARYNGEAL, the NERVUS VAGUS, and the NERVUS ACCESSORIUS.

The GLOSSO-PHARYNGEAL NERVE arises by several filaments from the side of the medulla oblongata, immediately below the tuber annulare, and behind the corpus olivare.

The NERVUS VAGUS arises by many filaments arranged perpendicularly along the side of the medulla oblongata, immediately below the origins of the glosso-pharyngeal.

The Glosso-pharyngeal Nerve and the Nervus Vagus proceed together outwards and forwards to the foramen jugulare, through which they pass out of the skull.

The NERVUS ACCESSORIUS arises by a series of filaments from the side of the medulla spinalis between the anterior and posterior roots of the cervical nerves. There is considerable variety with respect to the point at which the filaments begin to arise. In some instances they commence as low down as the origin of the seventh cervical nerve. The filaments unite into a single nerve which ascends through the foramen magnum, and continues its course within the skull obliquely upwards and outwards to the foramen jugulare, through which it passes with the two other divisions of the eighth pair.

The ninth pair of nerves is named the HYPO-GLOSSAL, or LINGUAL. Each of these nerves arises by numerous delicate filaments from the bottom of the groove between the corpus pyramidale and corpus olivare. The filaments unite into a single nerve, which passes out of the skull through the foramen condyloideum anterius.

A tenth pair of cerebral nerves is sometimes described by the name of SUBOCCIPITAL. These nerves are, however, more commonly described as forming the first pair of the cervical nerves.

DISTRIBUTION OF THE ARTERIES OF THE BRAIN.

The Brain receives its supply of blood from the two Internal Carotid and the two Vertebral Arteries.

The INTERNAL CAROTID ARTERY, having passed through the tortuous canal in the petrous portion of the temporal bone, proceeds from the upper or internal opening of this canal into the cavernous sinus, and continues it course horizontally forwards in the groove of the sphenoid bone by the side of the sella turcica. When it reaches the anterior clinoid process, it turns upwards, penetrates the dura mater, and enters the cavity of the skull. Within the skull, the artery is first placed immediately beneath the optic nerve, whence it ascends obliquely outwards and backwards to the fissura Sylvii, and here terminates by dividing into two branches, which are the ANTERIOR and MIDDLE CEREBRAL ARTERIES. Before its division the internal carotid gives off,

(*a*) The OPHTHALMIC ARTERY, which arising, near the anterior clinoid process, proceeds forwards through the foramen opticum into the orbit. Its distribution has been already described, Chap. XI.

(*b*) The COMMUNICATING ARTERY, which is a small branch proceeding directly backwards, and inosculating with a branch of the Basilar Artery.

The ANTERIOR CEREBRAL ARTERY proceeds forwards and inwards to the fissure between the anterior lobes, and ascends to the front margin of the corpus callosum, round which it turns, and then continues its course backwards upon the upper surface of this body. Its ramifications are distributed to the surrounding parts of the brain.

The two anterior cerebral arteries communicate by a transverse branch extending across the fissure between the anterior lobes.

The MIDDLE CEREBRAL ARTERY proceeds outwards through the fissura Sylvii in its whole length to the posterior lobe, and distributes its branches to the surrounding parts of the brain.

The VERTEBRAL ARTERY penetrates the dura mater, and enters the skull through the foramen magnum. It then ascends between the basilar process of the occipital bone, and the side of the medulla oblongata to the tuber annulare. Here the two vertebral arteries unite into one trunk, which is the BASILAR ARTERY. The vertebral artery usually gives off the following branches within the skull before the formation of the basilar artery :

(*a*). An ANTERIOR and POSTERIOR SPINAL ARTERY. The first descends upon the front, and the latter upon the back part of the medulla spinalis. They extend along the medulla nearly in its whole length, and communicate freely with the arteries entering the spinal canal through the holes by which the nerves pass out of it.

(*b*) An INFERIOR CEREBELLAR ARTERY, which distributes its branches principally to the inferior surface of the cerebellum.

The BASILAR ARTERY, commencing at the fissure between the medulla oblongata and the tuber annulare, proceeds along the groove in the middle of the anterior surface of the tuber to its upper border.

In this course, the basilar artery gives off branches to the cerebellum, and at its termination, divides into two branches, named the Posterior Cerebral Arteries, which distribute their ramifications to the surrounding parts of the brain. Very soon after their origin, the Posterior Cerebral Arteries receive the Communicating Branches of the Internal Carotids. By the communications which thus take place between the two internal carotids and the basilar arteries, and between the two anterior cerebral branches of the carotids, a chain of communicating vessels is formed at the basis of the brain, which is denominated the Circle of Willis.

OF THE VEINS OF THE BRAIN AND SINUSES OF THE DURA MATER.

The Veins of the brain proceed to the pia mater, as it has been already stated. From the pia mater, they proceed to the several sinuses of the dura mater.

The Sinuses thus constitute the venous trunks, through which the blood, returning from the brain and its membranes, is conveyed into the internal jugular veins. The sinuses are formed by the separation of the dura mater into layers, which are so disposed as to leave spaces between them, for the most part of a triangular form. The laminæ of the dura mater, thus forming the external boundaries of the sinuses, are lined by a smooth membrane of the same nature with that which lines the veins in other parts.

The SUPERIOR and INFERIOR LONGITUDINAL SINUSES, The FOURTH SINUS, or TORCULAR HEROPHILI, and the LATERAL SINUSES, have been already described in the dissection of the brain. Besides these, there are other sinuses to be examined in the basis of the skull.

The SUPERIOR PETROSAL SINUS is lodged in the groove running along the upper border of the petrous portion of the temporal bone.

The INFERIOR PETROSAL SINUS is lodged in the channel between the lower border of the petrous portion of the temporal and the adjacent part of the occipital bone. Both the petrosal sinuses terminate in the lateral sinuses.

The TRANSVERSE SINUS extends between the petrosal sinuses, across the upper part of the basilar process of the occipital bone.

The CAVERNOUS SINUSES are of large size, and situated on each side of the sella turcica, upon the body of the sphenoid bone. They communicate with the petrosal, transverse, and circular sinuses, and they receive the ophthalmic veins from the orbit. Between the laminæ of the dura mater that form the boundaries of each cavernous sinus, there are found the internal carotid artery, the nerves of the third and fourth pairs, the first branch of the fifth pair, and the nerve of the sixth pair. All these are connected by a fine cellular tissue.

The CIRCULAR SINUS is placed around the pituitary gland, and opens into the cavernous sinuses.

The OCCIPITAL SINUSES are situated on each side of the foramen magnum, whence they ascend in the falx cerebelli, and terminate in the lateral sinuses.

From the preceding account we find that the several sinuses communicate freely with each other, and that they all lead to the two Lateral Sinuses, which are continued into the Internal Jugular Veins.

CHAP. XX.

DISTRIBUTION OF THE CEREBRAL NERVES.

The distribution of the Cerebral Nerves is for the most part described in the dissections of the several parts which they supply. It is only here necessary to describe the distribution of the second and third divisions of the fifth pair, and to complete the description of the sixth and seventh pairs.

The Superior Maxillary Nerve, forming the second division of the fifth pair, proceeds from the Ganglion Gasserianum, rather obliquely outwards and forwards to the foramen rotundum, through which it leaves the skull. From the foramen rotundum, it enters the space between the back part of the antrum and the pterygoid process, denominated the pterygo-maxillary fossa. It advances forwards in this space, imbedded in much cellular tissue, to the back part of the orbit. Here the nerve enters the infra-orbitary canal, and having passed through it, emerges from the infra-orbitary foramen upon the face. In the pterygo-maxillary fossa, the superior maxillary nerve generally gives off two branches which pass downwards, and unite close by the side of the spheno-palatine foramen. At the point of their union a swelling is formed, which is named the SPHENO-PALATINE GANGLION. Sometimes there is only one branch which enlarges a little in the situation just mentioned. From the spheno-palatine ganglion there proceed the SPHENO-PALATINE, PALATINE, and VIDIAN NERVES.

1. The SPHENO-PALATINE, or NASAL NERVES pass in variable number through the spheno-palatine foramen into the nose, where they are principally distributed. One filament descends in the nose to the palate, and passes through a canal in the bone behind the foramen incisivum, to be distributed upon the palatine membrane.

2. The PALATINE NERVES are three in number, one large and two smaller. The large palatine nerve descends through the pterygo-palatine canal formed between the maxillary, palatine, and sphenoid bones, and emerging from the canal at the posterior palatine foramen, then bends forwards and divides into several branches, which are distributed to the palatine membrane and gums of the upper teeth. The two smaller palatine nerves are placed behind the former, and descend through distinct bony canals. They are distributed to the tonsils, velum palati, and uvula.

3. The VIDIAN, or PTERYGOID NERVE passes backwards through the hole at the basis of the pterygoid

process, and then divides into two branches, one named Petrosal, or Cranial, and the other Carotid. The cranial branch passes into the skull through the irregular aperture between the side of the sphenoid and the petrous portion of the temporal bone. Then ascending to the upper border of the latter, it enters a peculiar canal in the bone, and terminates by joining the facial nerve in the aquæductus Fallopii. The carotid branch enters the canalis carotideus with the carotid artery, and terminates by joining the filaments of communication between the superior cervical ganglion of the Sympathetic and the abductor nerve.

Besides these branches proceeding from the spheno-palatine ganglion, there arise from the superior maxillary nerve, two or three dental nerves, which enter canals in the superior maxillary bone for the supply of the teeth.

The distribution of the superior maxillary nerve, after it has emerged from the infra-orbitary foramen, is described in the dissection of the face.

The Inferior Maxillary Nerve, forming the third division of the fifth pair, proceeds from the Ganglion Gasserianum, almost perpendicularly downwards to the foramen ovale, through which it leaves the skull. After its passage through the foramen, the nerve is placed between the zygomatic fossa, and pterygoideus externus muscle, and here divides into a superior and inferior portion. From the superior portion proceed the Temporal, Masseteric, Buccal, and Pterygoid Nerves. From the inferior portion proceed the Dental and Lingual Nerves.

1. The Temporal Nerves are usually two in number. They ascend to the temporal muscle in which they are distributed.

2. The Masseteric Nerve is of large size. It passes between the temporal muscle and the condyle of the jaw, to the internal surface of the masseter muscle, in which it terminates.

3. The Buccal Nerve proceeds downwards and forwards between the pterygoid muscles to the buccinator muscle, in which its filaments are principally distributed.

4. The Pterygoid Nerve supplies the pterygoideus internus muscle.

5. The Dental Nerve descends between the pterygoideus internus and the lower jaw, to the canal destined for it, with the accompanying artery and vein. The nerve passes through the canal, giving off filaments for the supply of the molares and bicuspides. When it reaches as far forwards in the canal as the foramen mentale, it divides into two branches; one of these continuing its course forwards, gives off filaments for the supply of the cuspidati and incisores, and the other passes through the foramen mentale to the face.

6. The Lingual Nerve, also named the Gustatory, descends between the pterygoideus internus and the jaw, and then turns forwards; first, between the submaxillary gland and the mucous

membrane of the mouth, next between the mylo-hyoideus and hyo-glossus muscles, where it is accompanied by the submaxillary duct. Its further course is described in the dissection of the neck. At a short distance below the fissura Glaseri, the lingual nerve receives the chorda tympani, which is joined to it at an acute angle pointing downwards. We may observe that the lingual nerve is increased in size after its junction with the chorda tympani.

The Nerve of the Sixth Pair has been described as passing through the cavernous sinus, close to the outer side of the carotid artery. Immediately above the superior orifice of the canalis carotideus, the nerve receives the two communicating filaments from the superior cervical ganglion of the Sympathetic. Sometimes one filament only from the ganglion proceeds to the abductor nerve, the other filament having terminated at its junction with the Vidian branch of the superior maxillary nerve. The communicating filaments join the abductor nerve at an acute angle pointing forwards, and it is to be remarked, that after the junction, the abductor nerve is increased in its size.

The Portio Dura of the seventh pair, or the Facial Nerve, leaving the auditory nerve at the bottom of the meatus auditorius internus, enters the aquæductus Fallopii, and passes through it to its termination at the foramen stylo-mastoideum. Within the aquæduct, the facial nerve receives the cranial branch of the Vidian nerve. It then gives off filaments to the muscles in the tympanum, and a large branch, which is the Chorda Tympani. The chorda tympani enters the tympanum, and passes obliquely through its cavity between the handle of the malleus and the long process of the incus. Then leaving the tympanum at its front part, it passes through the fissura Glaseri, and continues its course downwards and forwards to join the lingual branch of the inferior maxillary nerve. The distribution of the facial nerve after its passage through the foramen stylo-mastoideum is described in the dissection of the face.

CHAP. XXI.

OF THE MEDULLA SPINALIS, AND ITS NERVES.

The Medulla Spinalis is more properly termed the Spinal Cord. In order to examine it, the vertebral canal is to be laid open widely at its back part, by the removal of the spinous processes and rings of the vertebræ along the whole length of the spine.

The Spinal Cord is invested by membranes corresponding to those of the brain, which are continued from within the cranium through the foramen magnum into the vertebral canal.

The Dura Mater lining the vertebral canal forms a sheath around the spinal cord, named the Theca Vertebralis. This sheath is larger than the cord, so that the latter is lodged loosely within it. Its external surface is loosely connected with the vertebral canal by cellular tissue, except in front, where it is in close union with the posterior vertebral ligament covering the bodies of the vertebræ. On each side of the sheath there is a series of openings for the passage of the spinal nerves, and at its lower end, it has numerous openings for the passage of the nerves arising from the extremity of the cord. The internal surface of the sheath is smooth, and moistened by fluid, and it is believed by some anatomists, that this smooth surface is derived from a reflection of the arachnoid membrane.

The Arachnoid Membrane covering the spinal cord has the same appearance as the corresponding membrane of the brain. Its external surface is simply in contact with the dura mater. Its internal surface is united to the pia mater beneath, only by a few long and slender cellular threads; hence it may be very readily raised from the pia mater by the impulsion of air beneath it.

The Pia Mater covering the spinal cord is of a much denser and closer texture, and less vascular than the pia mater of the brain. Its internal surface is closely united with the substance of the cord.

The Ligamentum Denticulatum is a thin and narrow band of membranous substance extended down each side of the spinal cord, between the pia mater and arachnoid membrane. Its inner margin is straight, and is closely united to the pia mater in the space between the anterior and posterior filaments of the spinal nerves. Its outer margin presents a series of pointed projections which are attached to the dura mater in the intervals between the holes for the passage of the nerves.

The Spinal Cord commences above, at the foramen magnum, where it is continuous with the medulla oblongata, and terminates below, at the first or second lumbar vertebra. The thickness of the cord varies in its different parts between half an inch and an inch, and it is stated that the thickest parts are those where the largest number of nerves have their origin. Just before its termination, the cord swells transversely, and then gradually contracts into a point. A distinct fissure descends along the middle of the anterior and posterior surfaces of the cord in its whole length. The spinal cord is formed, like the brain, of two distinct kinds of substance, one white, and the other grey.

The arteries of the spinal cord are derived from the vertebral, inferior thyroid, intercostal, and lumbar arteries.

The veins of the spinal cord unite into two trunks, which are lodged in each side of the vertebral canal along its whole length, between the dura mater and the bones. These veins are named the VERTEBRAL SINUSES. There are numerous transverse branches of communication between the two sinuses, and there are other branches which arise from each sinus, and communicate freely with the vertebral, intercostal, lumbar, and sacral veins.

OF THE NERVES PROCEEDING FROM THE SPINAL CORD.

There are thirty pairs of nerves arising from the spinal cord, which are divided into the Cervical, Dorsal, Lumbar, and Sacral Nerves.

The Cervical Nerves are eight on each side. The first of these passes out of the spine between the occiput and the atlas, the last between the seventh cervical and the first dorsal vertebra. The Dorsal Nerves are twelve on each side. The first passes out of the spine beneath the first rib, the last beneath the twelfth rib. The Lumbar Nerves are five on each side. The first passes out of the spine between the first and second lumbar vertebræ, the last between the fifth lumbar vertebra and the sacrum. The Sacral Nerves are five on each side. The first passes outwards through the uppermost hole in the sacrum, the last between the sacrum and coccyx.

Each of the spinal nerves arises by two series of filaments, one from the anterior, the other from the posterior surface of the cord. The anterior and posterior filaments proceed outwards from their origins, and are at first separated by the ligamentum denticulatum. Continuing their course outwards, they gradually approach each other and unite into two fasciculi, which pass through separate openings of the dura mater. After their passage through the dura mater, the fasciculus formed of the posterior filaments swells into a small ganglion, to which the anterior fasciculus is united by cellular tissue. The two fasciculi then join into a single cord, which is the proper spinal nerve.

The three lower lumbar nerves, with the whole of the sacral nerves, incline downwards from the spinal cord, and occupy the lower part of the sheath of the dura mater. They are connected by vessels and by fine cellular tissue, and form a thick bundle of nerves, which is named the CAUDA EQUINA.

The Cervical Nerves divide at short distances from the ganglia into anterior and posterior branches. The anterior branches of the four first cervical nerves are described in the dissection of the neck. The anterior branches of the four last cervical nerves unite with the anterior branch of the first dorsal nerve to form the axillary plexus. The posterior branches of all the cervical nerves pass backwards, and are distributed principally to the muscles covering the posterior part of the neck. The posterior branch of the second cervical nerve, penetrating the complexus muscle, becomes superficial and takes the name of Occipital nerve. Its distribution is described p. 226.

The Dorsal Nerves divide in the same manner into Anterior or Intercostal branches, and Posterior or Dorsal branches. The Intercostal branches proceed outwards between the transverse processes of the vertebræ to the angles of the ribs. Here they enter between the two strata of the intercostal muscles, and pass to the grooves in the lower edges of the ribs, along which they are continued with the intercostal artery and vein. The intercostal nerves communicate with the thoracic ganglia of the Sympathetic. Their filaments are partly distributed to the intercostal and triangularis sterni muscles, and partly penetrating these muscles, are distributed to the mammary gland and other parts on the outside of the chest. The lower intercostal nerves distribute branches to the abdominal muscles. The Posterior branches of the dorsal nerves pass backwards between the transverse processes, and are distributed to the muscles covering the posterior part of the trunk. The twelfth dorsal nerve communicates with the first lumbar nerve.

The Lumbar Nerves divide into Anterior or Abdominal branches, and Posterior or Lumbar branches. The Anterior branches communicate with the lumbar ganglia of the Sympathetic, and unite into the Lumbar Plexus. The Posterior branches pass backwards between the transverse processes, and are distributed to the muscles of the spine and to the integuments of the upper and back part of the thigh.

The Sacral Nerves divide within the canal of the sacrum into anterior and posterior branches. The Anterior branches pass out of the anterior sacral foramina. The anterior branches of the four first sacral nerves communicate with the sacral ganglia of the Sympathetic, and unite into the sacral plexus. The anterior branch of the fifth sacral nerve is distributed to the levator and sphincter ani, and coccygeus muscles. The posterior branches pass out of the posterior sacral foramina, and are distributed to the muscles covering the back part of the sacrum, and to the muscles and integuments of the buttock.

CHAP. XXII.

OF THE GANGLIA AND PLEXUSES OF THE ABDOMINAL AND PELVIC VISCERA.

A LARGE ganglion, of a flattened and somewhat semi-lunar form, is situated on each side of the abdomen upon the crus of the diaphragm and near the cœliac artery. This is the SEMILUNAR GANGLION. Numerous other smaller ganglia of variable size and figure are placed near the semilunar. All these ganglia are united by numerous short and thick nervous filaments, so that they form a very intricate plexus around the cœliac artery, which is named the CŒLIAC or SOLAR PLEXUS.

From the Cœliac Plexus, there proceed other secondary plexuses formed also of ganglia and connecting filaments. These secondary plexuses surround the branches of the aorta, and accompany them in their distribution to the several organs in the abdomen and pelvis. Their names are derived from the arteries which they accompany, hence they are distinguished into the Diaphragmatic, Coronary Stomachic, Hepatic, Splenic, Superior Mesenteric, Inferior Mesenteric, Renal, Spermatic, and Hypogastric Plexuses. From the Lumbar Ganglia of the Sympathetic, there arise filaments which proceed forwards in front of the aorta, and are united by the intervention of ganglia with the corresponding filaments from the opposite side. From these ganglia proceed filaments to the coats of the aorta, and to the inferior mesenteric and hypogastric plexuses.

The Sacral Ganglia of the Sympathetic vary from three to five. They are situated on each side of the anterior surface of the sacrum, and are connected by one or more intervening filaments. The connecting filament between the uppermost sacral and the last lumbar ganglion is sometimes wanting. From the last sacral ganglion on each side, there proceeds a filament which descends upon the coccyx. Here the two filaments are united by the intervention of a ganglion, named the GANGLION IMPAR; in some instances, however, this ganglion is wanting. The sacral ganglia distribute branches to the rectum and to the hypogastric plexus.

The Right Par Vagum enters the abdomen on the side and towards the back part of the Œsophagus. It soon divides into branches which form a plexus around the superior orifice of the stomach. From this plexus proceed numerous filaments, some of which are distributed upon the stomach, and others, communicating with the cœliac plexus, extend to the liver, gallbladder, duodenum, and pancreas.

The Left Par Vagum enters the abdomen in front of the Œsophagus, and divides into several filaments which ramify between the coats of the stomach. Some of them proceed from the pylorus to the liver, and communicate with the hepatic plexus.

The Great Splanchnic Nerves, immediately after their entrance into the abdomen, divide into several branches, which terminate in the Semilunar ganglia.

The Lesser Splanchnic Nerves terminate partly in the cœliac, and partly in the renal plexuses.

CHAP. XXIII.

DISSECTION OF THE HEART.

The dissection of the heart consists in the examination of the several cavities of the organ, according to the order in which the circulating blood is conveyed through them.

The Heart varies considerably in respect to its size, in different individuals of the same age. The form of the heart approaches to that of a cone flattened on one side. The organ is divided into its basis, its apex, its convex, and flattened surfaces.

There are four cavities in the heart, two of which are termed Auricles, and two Ventricles. An auricle and a ventricle exists on each side of the organ, and the four cavities are distinguished by the terms Right and Left. The two sides of the heart are completely separated from each other by a partition. Each auricle communicates by a wide opening with the corresponding ventricle. Further, we may observe that the ventricles form much the larger part of the heart. The auricles appear as appendages attached to the bases of the ventricles.

The Right Auricle is to be first examined. Into the cavity of the right auricle, the blood returns from the general venous system, by the two Venæ Cavæ, and from the heart itself, by the Coronary Vein.

The Right Auricle is situated at the basis of the corresponding ventricle. Its figure is very irregular, and it is rather larger than the left auricle. A narrow portion of the right auricle projects from its upper part and left side. This is named the Appendix Auriculæ. The appendix has irregularly jagged edges, and terminates in a point.

The right auricle is now to be laid open in the following manner: One incision is to be made transversely across its front part into the appendix auriculæ. A second incision is to extend from the middle of the first, directly upwards into the vena cava superior, which opens into the auricle at its upper and back part.

On the anterior side of the cavity of the right auricle, and within the appendix auriculæ, there are numerous fasciculi of muscular fibres, separated by intervals of various widths, in which there are smaller fasciculi disposed obliquely. The larger fasciculi are generally parallel to each other, hence they are compared to the teeth of a comb, and are denominated the Musculi Pectinati. The inner side of the right auricle is formed by the partition separating it from the left. Towards the lower part of this partition there is an oval depression, which is the Fossa Ovalis. The fossa is deepest at its upper part, and becomes gradually shallower from above downwards. Its surface is generally rough. Above, and on each side, it is bounded by an arch of muscular fibres, which is the Annulus Ovalis. The extremities of this arch are turned downwards, and are named its Cornua. In the upper part of the fossa ovalis, there is frequently an opening leading into the left auricle. Such, however, is the obliquity of this opening, and the disposition of its sides that in the living body, it is constantly closed, and there cannot be any mixture of the black blood contained in the right auricle with the red blood contained in the left. The fossa ovalis varies much in its size and appearance in different instances, and sometimes it is entirely wanting. In the upper and back part of the right auricle, is the opening of the Vena Cava Superior, inclining a little forwards, and opposite to it, in the lower and back part of the auricle, is the opening of the Vena Cava Inferior, which is the larger of the two. Between the openings of the venæ cavæ, there is a slight increase of thickness at one point in the side of the auricle, so as to form a projection towards its cavity which is named the Tuberculum Loweri. This part, however, is in general very indistinct. Immediately below the opening of the Vena Cava Inferior, is a crescent-shaped fold of membrane, which is the Eustachian Valve. Its extent varies considerably. In some instances, it is nearly half an inch broad, and in others, is merely a slightly projecting ridge. Its convex border is attached to the circumference of the opening of the vena cava. Its concave border is loose in the cavity of the auricle, and is frequently perforated by several apertures. One surface of the valve is turned towards the opening of the Vena Cava, and the other towards the cavity of the auricle. We may here mention that in the fœtus, the Eustachian Valve is proportionally larger than in the adult; hence anatomists are of opinion, that its office is connected with the peculiarities of the fœtal circulation. Below the Eustachian Valve, is the opening of the great Coronary Vein. Its margin is provided with a valve which is calculated to prevent any reflux of blood from the auricle into the vein. The valve is not, however, always of sufficient breadth to cover the orifice of the vein. Several smaller veins open into various parts of the right auricle. The wide opening of communication between the right auricle and ventricle is denominated, either the ANNULUS VENOSUS, or the AURICULAR ORIFICE OF THE VENTRICLE. A white line extends around its edge, which some anatomists have stated to be of a tendinous nature.

The Right Ventricle is next to be examined. Its form is triangular, with its basis turned upwards, and joined to the auricle. On its left side, it is united to the opposite ventricle. The right ventricle is to be opened by an incision, which is to extend down the middle of its anterior side from the basis to the apex. Throughout the greater part of the internal surface of the right ventricle, there is an irregular network of muscular fasciculi, denominated CARNEÆ COLUMNÆ. These fasciculi are very irregularly arranged. Some of them are attached in their whole length to the side of the ventricle. Others are attached only at their extremities; and, lastly, there are other fasciculi, which are fixed at one extremity only to the side of the ventricle, and at the other extremity by tendinous threads, to the valve which intervenes between the auricle and the ventricle. Some of the fasciculi extend directly from the basis to the apex of the ventricle, and others cross these obliquely. The valve, which intervenes between the right auricle and ventricle, is of a membranous structure, and of a circular form above, where it is attached to the circumference of the Annulus Venosus. Thence extending downwards into the ventricle, its loose edge is divided into several pointed portions, three of which are more considerable than the rest, whence the whole valve is called TRICUSPID. From the loose edge of the Tricuspid Valve there arise numerous tendinous threads, named CHORDÆ TENDINEÆ, which descend in the ventricle. Some of them are fixed to the projecting ends of the carneæ columnæ, and others to the sides of the ventricle. Besides the chordæ tendineæ, which are connected with the tricuspid valve, there are others extended between the carneæ columnæ in various parts of the ventricle. The office of the tricuspid valve is to prevent any reflux of blood from the ventricle into the auricle. When the auricle contracts upon its blood, the loose portions of the valve lie flat upon the sides of the ventricle, and present no impediment to the entrance of the blood into its cavity. When, on the other hand, the ventricle contracts, the loose portions of the valve are raised by the blood, and meet in the centre of the annulus venosus, so as completely to fill the opening. The chordæ tendineæ, from their unyielding nature, will not allow the tricuspid valve to be carried farther backwards towards the auricle than the level of the annulus venosus. Of the three large portions of the tricuspid valve, that which is turned towards the pulmonary artery is the largest, and, indeed, is of sufficient extent to cover the opening of the artery, when the valve lies flat against the side of the ventricle, during the passage of the blood into it from the auricle.

A second incision is now to be made through the anterior side of the right ventricle, along the line of its union with the septum ventriculorum, from the apex, directly upwards into the Pulmonary Artery. The Pulmonary Artery arises from the upper part and left side of the right ventricle. At the entrance of the artery, there are three SEMILUNAR, or SIGmoid Valves, which have their convex edges fixed and turned downwards towards the ventricle, and their concave edges loose, and turned upwards towards the artery. The loose edge of each valve is its thickest part, and at about its middle, there is a small tubercle, sometimes not very distinct, which is named the Corpus Sesamoideum, or Corpus Arantii. The office of the semilunar valves is to prevent any reflux of blood from the pulmonary artery into the right ventricle. When the ventricle contracts, the three valves are pressed by the blood against the sides of the artery. When, on the other hand, the three valves are raised, by the pressure of blood from the artery towards the ventricle, they meet in the centre of the artery, so as to form a complete partition across its cavity.

The Pulmonary Artery proceeds from its origin obliquely upwards, and to the left closely around the commencement of the aorta, to which it is connected by cellular tissue. When it reaches the left side of the aorta it divides into a right and left branch which separate from each other, and proceed transversely to the corresponding lung. The right branch crosses beneath the aorta at a short distance above its origin from the heart. Just at the point where the pulmonary artery divides into its right and left branches, a thick fibrous and impervious cord proceeds from it, and is attached at its other extremity to the concave side of the arch of the aorta. This cord is the remains of the Ductus Arteriosus, which, in the fœtus, is a canal of communication between the pulmonary artery and the aorta.

We now proceed to the examination of the left side of the heart, beginning with the auricle.

The Left Auricle is of a very irregular figure. From its upper part and right side, an Appendix, similar to that of the right auricle, extends transversely upon the basis of the ventricle. An incision is to be made through the upper part of the auricle, and in such a direction as to leave the pulmonary veins uninjured. The internal surface of the left auricle is smooth, except within the appendix, where there are muscular fasciculi, but of smaller size and less numerous than in the appendix of the right auricle. On the inner side of the left auricle is an oval depression, but less distinct than in the opposite auricle, and sometimes it is altogether wanting. In the upper and back part of the Left Auricle, are the openings of the Four Pulmonary Veins. The two from the right lung terminate in the right side of the auricle, and the two from the left terminate opposite to them. The right pulmonary veins open into the auricle at some distance from each other, while the left open near to each other, and sometimes terminate by a common orifice. The opening of communication between the Left Auricle and Ventricle, is named the AURICULAR ORIFICE OF THE LEFT VENTRICLE. It is rather less in diameter than the corresponding orifice of the opposite side. Around the edge of the opening, there is a white line similar to that on the right side of the heart.

The Left Ventricle is longer than the right, and its point extends farther downwards, so that the apex of the heart is altogether constituted by it. The form of the left ventricle is conical, but flattened on that side by which it is united to the right ventricle. The two ventricles are joined together obliquely, so that the right forms the greater share of the convex surface of the heart, and the left, the greatest share of its flattened surface.

An incision is to be made directly downwards from the Left Auricle, through the anterior side of the Left Ventricle to its apex. The internal surface of the Left Ventricle presents the same arrangement of Carneæ Columnæ as the right. They are, however, in some respects different. In the left ventricle, the fleshy columns are generally shorter and rounder than in the right, and the greater number of them have a longitudinal direction. Between the left auricle and ventricle, there is a valve corresponding to the Tricuspid valve on the right side. It is attached to the circumference of the auricular orifice of the ventricle. Its loose edge is divided into two portions, which somewhat resemble the points of a mitre. Hence the whole valve is called Mitral. The two portions of the mitral valve are connected with the Carneæ Columnæ of the left ventricle by tendinous threads, corresponding to those of the Tricuspid Valve. Several of the Chordæ Tendineæ are extended between the fleshy columns, and have no connexion with the Mitral Valve. The Mitral Valve is thicker than the Tricuspid, and in its loose edge there are frequently several little eminences of a very hard texture. The office of the Mitral Valve corresponds to the office of the Tricuspid Valve. That portion of the mitral valve which is turned towards the origin of the aorta, is sufficiently large to cover the opening of the artery, when the valve lies flat against the sides of the ventricle.

A second incision is now to be made through the anterior side of the left ventricle, along the line of its union with the septum, from the apex directly upwards into the Aorta.

The Aorta arises from the upper and back part of the Left Ventricle. The internal surface of the ventricle leading to the orifice of the artery has no projecting muscular fasciculi. Three Semilunar Valves are placed around the commencement of the aorta, which differ from those of the pulmonary artery only in being thicker and stronger, and in having larger eminences, or Corpora Sesamoidea, at their edges. Behind the semilunar valves, the Aorta is dilated into three small pouches, which are denominated its SINUSES.

The SEPTUM which divides the auricles, is generally thin, but especially so towards the fossa ovalis. The SEPTUM which divides the ventricles, varies much in its thickness at different parts. It does not belong particularly to either ventricle, the fibres of both are closely intermixed with it.

The sides of the heart are formed of three distinct textures. The reflected pericardium forms the external surface; a fine transparent membrane forms the internal surface, over which the circulating blood flows; and between these, is the muscular substance. Immediately beneath the reflected pericardium, more or less fat is usually deposited. Generally it is more abundant at the basis, and on the right side of the heart. In some instances, it has been found an inch thick over the whole of the right ventricle.

The Auricles and Ventricles are furnished with muscular fibres proportionate to the power they require in the execution of their functions. The sides of the auricles are so thin in some situations, that they are transparent. The sides of the right ventricle are much thinner than the sides of the left. The first are generally about a quarter of an inch in thickness, and the latter about half an inch. These proportions are not, however, uniformly exact.

OF THE VESSELS OF THE HEART.

The Heart is supplied by two arteries, denominated Coronary, which are the first branches given off by the Aorta. They arise from opposite sides of the aorta just above the loose edges of the semilunar valves. One of them, named the Right, or Anterior Coronary Artery, proceeds transversely between the right auricle and ventricle, and round the flattened surface of the heart, until it reaches the groove between the ventricles. It then turns downwards along the groove to the apex of the heart. The other, denominated the LEFT, or POSTERIOR CORONARY ARTERY, passes between the pulmonary artery and left auricle to the groove between the ventricles on the convex surface of the heart, and descends along this groove to the apex. It sends off a branch which passes round the heart in the groove between the left auricle and ventricle to the flattened surface.

The VEINS of the heart for the most part accompany the arteries. Their terminations in the Right Auricle have been mentioned.

It has been occasionally found that injection forced into the coronary vessels has escaped through numerous minute orifices into the cavities of the heart. These orifices, which are not easily discovered, are the FORAMINA THEBESII.

The NERVES of the Heart are described in the dissection of the thorax.

CHAP. XXIV.

DISSECTION OF THE LARYNX.

In order to make a complete examination of the structure and connexions of the larynx, it will be necessary to remove it from the body with the os hyoides and the upper part of the trachea attached to it.

In the dissection of the neck, we have described the form of the os hyoides, and its connexions with the root of the tongue. The os hyoides is further fixed above, to the basis of the skull, by two Ligaments, which descend from the styloid process forwards and inwards, to the lesser cornua of the bone; and below, it is fixed by ligaments, and by membrane to the larynx. The Ligaments are two in number, of a considerable length and rounded form. They proceed from the extremities of the os hyoides directly downwards to the superior cornua of the thyroid cartilage. The membrane occupies the space between the ligaments, and descends from the os hyoides to the upper border of the thyroid cartilage. It is of a soft cellular nature, and is thicker in front than at the sides.

The larynx is formed of Cartilages, from which the organ derives its form and solidity; of Ligaments, by which the cartilages are connected together; of Muscles moving the cartilages; of Mucous Glands; and lastly, of a Membranous Lining. The cartilages are five in number; the Thyroid, Cricoid, two Arytænoid cartilages, and the Epiglottis. The Thyroid and Cricoid cartilages have been described in the dissection of the neck. The first of these forms the front and sides of the larynx. The second is situated at its lower part. The Arytænoid cartilages are situated at the back part of the larynx, upon the upper border of the cricoid. They are of a pyramidal and triangular figure. Their points incline a little backwards, or towards the pharynx. Their bases are articulated to the cricoid cartilage, and their internal flattened sides are turned towards each other. The Epiglottis is flattened, and somewhat of an oval form. One of its surfaces is turned towards the tongue, and the other towards the superior opening of the larynx. Its upper border is rounded, and turned forwards towards the mouth; and when the cartilage is completely detached from its connexions, its lower border is seen to have a pointed form.

The Thyroid cartilage is connected with the Cricoid in front, by a membrane extended between their opposite borders, and at the sides, by two distinct articulations, formed between the inferior cornua of the thyroid cartilage, and the lateral surfaces of the cricoid. These articulations are covered by synovial membrane, and secured by ligaments passing over them. Distinct articulations are formed between the bases of the arytænoid cartilages and the upper border of the cricoid. The Arytænoid cartilages are further connected with the Thyroid by the ligaments of the glottis, which will be presently described. The Epiglottis is fixed to the larynx by a band of fibrous substance, which proceeds from its inferior pointed extremity, to the angle on the inside of the thyroïd cartilage, at the junction of the alæ.

OF THE MUSCLES SITUATED UPON THE CARTILAGES OF THE LARYNX.

The Crico-Thyroideus is described in the dissection of the neck. At the back part of the larynx, and covered by the mucous membrane of the pharynx, is

The Crico-Arytænoideus Posticus, which arises from the posterior surface of the cricoid cartilage, and proceeding obliquely upwards and outwards, is inserted into the external and posterior part of the basis of the arytænoid cartilage.

By separating the ala of the thyroid cartilage from the side of the cricoid, we bring into view,

The Crico-Arytænoideus Lateralis, which arises from the upper border of the cricoid cartilage, and proceeding obliquely upwards and backwards, is inserted into the outer and front part of the basis of the arytænoid cartilage.

Closely connected with the preceding is,

The THYRO-ARYTÆNOIDEUS, which arises from the lower part of the inside of the thyroid cartilage, near the angle formed by the junction of the alæ, and proceeding backwards and outwards, is inserted into the front of the arytænoid cartilage.

The interval between the arytænoid cartilages is filled by muscular fibres which arise from the posterior concave surface of one cartilage, and are inserted into the corresponding surface of the other. Some of these fibres are oblique, and others transverse. Hence they are described as two muscles, by the names of ARYTÆNOIDEUS OBLIQUUS and TRANSVERSUS. The oblique fibres are superficial, and cross obliquely from the basis of one cartilage to the apex of the other, so that they decussate.

Other muscular fibres, which are not always to be found, are described by the names of THYRO-EPIGLOTTICUS and ARYTÆNO-EPIGLOTTICUS.

The mucous glands of the larynx are found in two distinct situations. Between the lower part of the epiglottis and the membrane uniting the os hyoides to the thyroid cartilage, there is a triangular space which is occupied by a mass of mucous glands imbedded in fat. The ducts from these glands pass through numerous apertures in the epiglottis. Other glands are found within the folds of the mucous membrane, which will be presently described as passing between the sides of the epiglottis and the arytænoid cartilages.

The Larynx is lined throughout by a mucous membrane, which is continuous above, with the mucous membrane of the mouth and pharynx, and below, with the mucous lining of the trachea.

When we look into the Larynx from its upper part, we see its superior opening, by which it communicates with the Pharynx, and this opening is denominated, although improperly, the GLOTTIS, or RIMA GLOTTIDIS. It is of a triangular form, with its broadest part turned forwards. In front, it is bounded by the epiglottis, behind, by the arytænoid cartilages, and at the sides, by two horizontal folds of the mucous membrane, which are extended between the lateral edges of the epiglottis and the arytænoid cartilages. At about half an inch below the superior opening of the larynx, we see two other horizontal folds of the mucous membrane, within which are placed the LIGAMENTS of the GLOTTIS, or CHORDÆ VOCALES. These ligaments are immediately exposed by the reflection of the mucous membrane covering them. They arise from the front parts of the bases of the arytænoid cartilages, and thence proceeding forwards and inwards, are inserted close together into the angle of the thyroid cartilage. The interval between them has a slit-like appearance, and is more correctly termed the Glottis. It is of a triangular form, with its broadest part backwards. The space which is left on each side between the superior and inferior membranous folds, is the Ventricle of the Larynx, or the Sacculus Laryngis.

THE END.

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