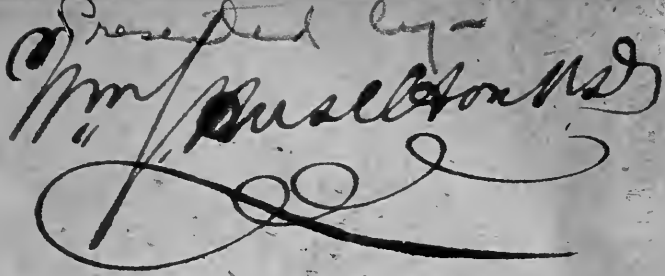
ANATOMICAL REMEMBRANCER



THE

ANATOMICAL REMEMBRANCER;

OR

COMPLETE POCKET ANATOMIST.

THE

ANATOMICAL REMEMBRANCER;

OR

COMPLETE POCKET ANATOMIST:

CONTAINING

A CONCISE DESCRIPTION OF THE BONES, LIGAMENTS, MUSCLES, AND VISCERA;

THE DISTRIBUTION

OF THE NERVES, BLOOD-VESSELS, AND ABSORBENTS;

THE ARRANGEMENT OF THE SEVERAL FASCIÆ;

THE ORGANS OF

Generation in the Male and Female;

AND THE ORGANS OF THE SENSES.

From the second London edition, revised.

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PREFACE TO THE FIRST EDITION.

THE sole object of this little Manual, is to recall to the mind of the Student in Anatomy, the information he may have acquired either by actual dissection, or by the perusal of works which profess to treat more fully on the subject. The Author, therefore, presumes it will be found highly useful to those who are preparing for examination at the Royal Colleges of Surgeons and Societies of Apothecaries.

PREFACE TO THE SECOND EDITION.

THE rapid sale of a book is the best practical test the public can give of its value. The Author of the Anatomical Remembrancer has little further to add to this, the Second Edition of his Manual, than his thanks to the Students of Anatomy, and the Medical Press, for the favorable manner in which they have received it.

Recommendations of the Medical Press.

"The Anatomy is correctly given, and the descriptions, though condensed to the very highest degree, still remain clear and intelligible."—*Lancet.*

"It contains but two hundred and fifty pages, and is really an Anatomical multum in parvo."—*London Med. and Surg. Journal.*

INDEX.

OSTEOLOGY.

THE COMPLETE

POCKET ANATOMIST.

OSTEOLOGY.

THE assemblage of bones composing the human body, constitutes the skeleton, which is divided into head, trunk, and extremities.

The Trunk consists of three parts, the spine or vertebral column, the chest or thorax, and the pelvis.

The Spinal or Vertebral Column, situate in the posterior part of the trunk, supports the head, and is itself supported by the pelvis. The bones which enter into its formation are called vertebræ, of which there are two classes, the *true* and the *false*.

The true vertebræ are twenty-four in number, and are subdivided into three classes, viz: seven *cervical*, twelve *dorsal*, and five *lumbar*.

The false vertebræ are nine, five in the os sacrum, and four in the os coccyx, both of which bones enter into the formation of the pelvis.

COMMON CHARACTERS OF A TRUE VERTEBRA.

A ring of bone, the opening of which is called the spinal or vertebral foramen.

The Body, a mass of bone placed anterior to the ring, thick, spongy, and presenting many small holes for blood-vessels.

Laminæ, two lateral processes which pass backwards from the posterior part of the body, forming the sides of the ring, and terminating posteriorly in the *spinous process*, from the exisence of which the vertebral column has been called *spine*.

Two transverse processes, which pass outwards from the sides of the laminæ.

Four articular processes, two upon the upper and two upon the lower surface of each vertebra, which arise from the roots of the transverse processes, and articulate with the vertebra above and below.

All these processes differ from the body in being formed of a more compact bony texture.

Four notches, two above and two below, which are formed by the laminæ being grooved out where they join the body. Each of these, with the corresponding notch above and below, forms a lateral hole for the exit of the spinal nerves and the entrance of blood-vessels, and is called the *intervertebral foramen*.

CHARACTERS OF THE LUMBAR VERTEBRÆ.

1*st*. They are the *largest* of the three classes.

2*d*. *The bodies* are very broad transversely, of an oval form, deepened upon their upper and lower surfaces by a more compact lamina of bone, which, projecting beyond their bodies, render them concave from above downwards upon their fore part.

3*d*. *The laminæ* and *spinous processes* are broad, thick, and short.

4*th*. *The transverse processes* are long, thin, and horizontal.

5*th*. *The superior articulating surfaces* are oval, concave, and look inwards and backwards; *the inferior* being oval, and convex, directed outwards and forwards.

6*th*. *The spinal foramina* are of a triangular shape, and larger than in the dorsal vertebræ.

7*th*. *The notches*, particularly the inferior, are very large, and form larger foramina than at any other part of the spine.

DEVIATIONS.

The last lumbar vertebra has its body cut off obliquely upon its sacral aspect, so that it is much thicker before than behind. Its transverse processes also are short and rounded.

CHARACTERS OF THE DORSAL VERTEBRÆ.

1*st*. They are intermediate in size between the cervical and lumbar vertebræ.

2*d*. *Their bodies* are thicker behind than before, and more convex transversely, assuming

upon their surfaces a triangular rather than an oval form. On either side at the upper and inferior margins each body presents two small depressions, the upper being the larger, which, with the intervertebral cartilage and the contiguous vertebræ form depressions for lodging the heads of the ribs.

3*d*. *The laminæ* are broad and strong.

4*th*. *The spinous processes* are long, prismatic, tuberculated at their extremities, and directed obliquely downwards.

5*th*. *The transverse processes* are long, and directed backwards; on the extremity and anterior aspect of each is an oval articular surface for the tubercle of the rib.

6*th*. *The articular processes* are nearly vertical, the superior looking backwards, the inferior forwards.

7*th*. *The spinal foramen* is smaller than in the cervical or lumbar vertebræ, and is of an oval shape.

8*th*. *The notches* are situated anterior to the articular processes.

DEVIATIONS.

The *first dorsal vertebra* has a full depression for the head of the first rib, besides the half depression for the second; its body is longer in the transverse direction, its spinous process is strong and horizontal, and its articular processes are oblique.

The 10th, 11th, and 12th, have each a full

depression upon the body for the corresponding rib, but want the depression on the transverse processes: the 12th resembles a lumbar vertebra in the shape of its body, and of its inferior articulating processes.

CHARACTERS OF THE CERVICAL VERTEBRÆ.

1*st.* They are the *smallest* of the three classes.

2*d.* *Their bodies*, deeper before than behind, and long transversely, are concave from side to side upon their upper surface, and concave from before backwards upon their lower.

3*d.* *The laminæ* are broad and thin.

4*th.* *The spinous processes* are short, horizontal and bifid.

5*th.* *The transverse processes* also bifid and short, are grooved upon their upper surface for the spinal nerves, and perforated by a round hole at their bases for the vertebral artery, the direction of which is upwards.

6*th.* *The articular processes* are oval in shape, the superior being convex, and directed obliquely backwards and upwards; the inferior being concave, and directed obliquely forwards and downwards.

7*th.* *The notches*, nearly of equal size, are small, and anterior to the articular processes.

8*th.* *The spinal foramen* is large and triangular.

DEVIATIONS.

The first, or atlas, consists of a large bony

ring, enclosing an irregular hole; instead of a body, the anterior arch of the ring of bone presents a small tubercle before, and a smooth oval articular surface behind, for the odontoid process of the second vertebra. From the extremities of this arch the ring acquires great density and thickness, and presents upon its upper and lower aspects the articular processes, the superior of which, horizontal and oval from before backwards, look upwards and inwards, and articulate with the condyles of the occipital bone; the inferior circular, slightly oval, and directed downwards and inwards, to articulate with the second vertebra. The transverse processes are not bifid, but are pierced at their bases by the foramen for the vertebral artery, the direction of which is upwards and backwards, and behind the superior articular surface is a groove, which marks the continued course of this vessel. The spinous process is represented by a small tubercle upon the posterior surface of the ring; corresponding to the articular surfaces, are two small tubercles, to afford attachment to the transverse ligament, which ligament separates the ring into two, the anterior being for the odontoid process, the posterior for the commencement of the spinal chord.

The second, or axis, is distinguished by the great length of its body, from the upper edge of which arises its large tooth-like, or odontoid, process. This process presents anteriorly a

small articular surface for articulation with the ring of the atlas, and posteriorly a second, which moves against the transverse ligament, whilst its apex presents an acuminated top, to which the check ligaments are attached. The laminæ are very thick and strong, and terminate behind in the spinous process, which is likewise strong and bifid; the vertebral foramen is heart shaped, the apex being behind. The superior articular surfaces are convex, and directed a little outwards, whilst the inferior, looking downwards and forwards, are smaller and flat.

The transverse processes, not bifid, are short and directed downwards, the aspect of the foramen for the vertebral artery, being directed obliquely upwards and outwards; the superior notches are behind the superior articular processes, whilst the inferior notches are before the inferior processes.

The seventh cervical vertebra is larger than the others; its spinous process is long, not bifid and prominent, and the foramina, when they exist in the transverse processes, give passage to the vertebral veins.

In examining the peculiar characters of the different vertebræ, it is best to select one from near the centre of each class: thus, the third Lumbar, the sixth or seventh Dorsal, and the fourth or fifth Cervical, offer the best examples of the class to which each belongs; for as the

cervical vertebræ approach the dorsal, they begin to assume more or less the characters of the latter, and the last dorsal vertebra, upon its under surface, presents the characters of a lumbar vertebra.

FALSE VERTEBRÆ.

Os Sacrum.

Figure, triangular, *the base* resembling a lumbar vertebra; *the apex* presenting a small oval surface to articulate with the os coccyx; *the sides* presenting two surfaces; the superior, large and irregular for articulation with the ilium; the inferior thin, for the attachment of the sacro-sciatic ligaments.

Pelvic surface, anterior smooth, concave from above downwards, traversed by four transverse lines, and presenting on either side of the median line four holes, called *anterior sacral*, for the transmission of the anterior sacral nerves.

Dorsal surface, irregularly convex, rough, presenting in the median line irregular processes of bone (spinous processes,) and more externally on either side tubercles of bone analagous to the articular processes of the true vertebræ. On either side of the median line are the *posterior sacral foramina*, for the transmission of the posterior sacral nerves.

Spinal canal, at the base is large, and of a triangular form, runs at the dorsal aspect of the bone, and terminates in a triangular fossa at the

apex of the bone, where it is bounded on either side by two tubercles, which are in general prolonged to join the base of the os coccyx.

Os Coccyx.

Figure, triangular, the base articulating with the sacrum.

Anterior surface, smooth, and supports the extremity of the rectum.

Posterior surface, rough, for attachment of ligaments and muscles.

Cornua, are two, placed superiorly, which unite with the last tubercles of the sacrum.

THE THORAX,

is formed by the dorsal vertebræ posteriorly, the ribs laterally, and the sternum anteriorly.

THE RIBS,

twelve in number, are divided into *seven true*, and *five false;* the lowest two of the false being called *abdominal*, or *floating ribs.*

The true ribs are each attached to the sternum by separate cartilages.

The three superior of the false ribs have their cartilages attached to each other and to the cartilage of the seventh rib.

The false or floating ribs have their cartilages free.

Common Characters of a Rib.

The head, round, and divided by a ridge into

two articular surfaces, which are received into the depressions on the sides of the bodies of the dorsal vertebræ, the ridge affording attachment to an inter-articular ligament.

The neck, narrow and round; at its union with the shaft is

The tubercle, a prominence of bone, with an articular surface looking backwards and downwards to articulate with the transverse process of the vertebra beneath.

The angle, is marked by a rough line, and is the point where the rib makes its great turn to circumscribe the thorax.

The shaft,—that portion of the rib which extends from the angle to its sternal end, presents an external smooth convex surface, and an internal concave one; its upper edge being round and smooth, its lower edge thin, and grooved for the intercostal vessels, and its sternal extremity offering an oval pit for the reception of the costal cartilage.

DEVIATIONS.

First Rib,

Has no angle, is very short and flat, a round head with no ridge, and but one articular surface, its extremity being thick and strong; one surface is directed upwards, the other downwards; the superior presenting a ridge for the attachment of the anterior scalenus muscle,

which separates two grooves, one for the subclavian artery, the other for the subclavian vein.

Eleventh and Twelfth Ribs,

have neither angle, tubercle, nor groove, are very short, and the head resembles that of the first.

THE STERNUM.

Figure, flat, elongated, broad above, narrower in the centre, and pointed inferiorly.

Anterior surface, is marked by four transverse lines, and is rather convex.

Posterior surface, smooth and concave.

Upper piece, quadrilateral and thick, is concave from side to side upon its upper edge, and presents at each superior angle two semilunar depressions for articulation with the clavicles; its lower edge is united to the second piece; its lateral edges receive on either side the cartilage of the first rib and half that of the second.

Lower piece, long and narrow; receives by five depressions upon its lateral edges, the cartilages of the five inferior true ribs, and by a notch at its superior angle half the cartilage of the second rib, its inferior extremity being long and thin, and ending in a cartilaginous epiphysis, called the

Ensiform cartilage, which is generally bifid, and pierced by a foramen, its direction being variable.

THE PELVIS,

Is formed of the os sacrum, os coccyx, (both of which bones have been already described) and the two ossa innominata.

OS INNOMINATUM,

Consists in early life of three bones, the ilium, ischium, and pubis. We shall describe each of these bones separately.

OS ILIUM.

Situation, upwards and outwards in regard to the pelvis, forming the upper part of the acetabulum, and the lower lateral part of the abdomen.

Body, constricted, forms the upper and outer part of the acetabulum, joining the pubis anteriorly, and ischium posteriorly.

Ala, expanded, offers four aspects, viz., the dorsum, which is rough posteriorly for the gluteus maximus, and presents two semicircular lines for the gluteus medius and minimus muscles; also a nutritious foramen—the venter which forms the iliac fossa, in which also is a nutritious foramen—the rough articular surface for connection with the side of the sacrum, and a small portion smooth and immediately above the sciatic notch, which enters into the formation of the true pelvis.

Processes.

The *Crest* which forms the upper border of the ala.

The *anterior superior spine*, which terminates the crest anteriorly.

The *anterior inferior spine*, immediately above the acetabulum.

Both spines are separated by a *notch.*

The *posterior superior spine*, which terminates the crest behind.

The *posterior inferior spine*, separated from the former by a small notch.

The *Ilio-pubic eminence*, marks the union of this bone with the following,

OS PUBIS.

Situation, fore part of pelvis, and internal part of acetabulum.

Body, forms the internal and superior part of the acetabulum.

Horizontal ramus, passes inwards to meet the opposite ramus.

Symphysis pubis, is formed by the union of both horizontal rami.

The angle is formed by the horizontal ramus turning down to form the symphysis.

The tuberosity is about three-quarters of an inch external to the angle.

The crest is the small upper transverse portion of bone between the angle and tuberosity.

The obturator groove is situated upon the under surface of the horizontal ramus.

The descending ramus passes backwards and outwards to meet the ascending ramus of the ischium, it bounds the thyroid hole, and by the divarication of the two descending rami, the *arch* of the pubis is formed.

THE ISCHIUM.

Situation, lower, outer and back part of the pelvis.

Body, forms the outer and back part of the acetabulum; immediately beneath this cavity is a groove for the tendon of the obturator externus muscle. The anterior thin edge of the body assists to form the thyroid hole, the posterior to form the sciatic notch.

Spine, projects backwards and inwards, and bounds the great sciatic notch inferiorly.

Tuberosity, the thickest part of the bone, on which we rest when sitting. Between this process and the spinal is a pully-like surface, for the tendon of the obturator internus muscle.

Ascending ramus, turns forwards, upwards, and inwards, and joins the descending ramus of the pubis; it bounds the thyroid hole by its outer thin edge, and the lower aperture of the pelvis, by its thick one.

ACETABULUM,

Is formed by the union of the bodies of the

ilium, ischium, and pubis; the ilium forming less than two-fifths; the ischium more than two-fifths; and the pubis the smallest part. It presents an articular surface for the head of the femur, and a rough surface inferiorly and internally for the ligamentum teres, where also this cavity is shallowest, and its border deficient.

SUPERIOR EXTREMITY,

Consists of the shoulder, the arm, the fore-arm, the wrist, and the hand.

THE SHOULDER,

Is formed of the clavicle and the scapula.

THE CLAVICLE.

Situation, from the semilunar notch in the upper piece of the sternum, to the acromion process of the scapula.

Figure, curved like the italic *f*.

Sternal end, thick, presenting a triangular articular surface; its edge is rough for ligaments.

Body, cylindrical towards sternum, flat and expanded towards its acromial end. Upon its under surface are a ridge for the rhomboid ligament, a rough tubercle for the coraco-clavicular ligaments, and between both a groove for the subclavian muscle, in which groove is found the nutritious foramen.

Acromial end, rough and flattened, passes over the coracoid process to meet the acromion scapulæ, with which it articulates by a small oval surface.

SCAPULA.

Situation, upper and back part of thorax, extending from the second to the seventh rib.

Figure, triangular.

Costæ or edges. The superior or cervical is the shortest and is interrupted by a notch for the supra-scapular nerve; the inferior or axillary is next in size, and is the thickest; the posterior or vertebral is the longest, and is also called the base of the scapula.

Angles. The superior posterior angle is acute and prominent, the inferior angle is thicker and rounded, and the anterior angle has connected to it the neck of the bone.

Costal surface, or *sub-scapular fossa*, is slightly concave and divided by three or four lines, which run from above obliquely downwards and inwards.

Dorsal surface is divided unequally by the spine, which thus gives rise to the fossæ.

Spine arises at the vertebral margin, and proceeds forwards, becoming more elevated, and terminates in the acromion, which surmounts the shoulder joint and articulates with the acromial end of the clavicle by a small oval surface.

Supra-spinous fossa, situated above the spine, is deep, and presents a nutritious foramen; it lodges the supra-spinatus muscle.

Infra-spinous fossa, larger, irregularly concave and convex, affords attachment to the infra-spinatus muscle, the teres minor muscle, and by an inferior rough surface, to the teres major muscle.

Coracoid process overhangs the inner and upper part of the glenoid cavity. This process has a crooked appearance, and gives attachment to the pectoralis minor, the short head of the biceps and the coraco-brachialis muscles, also to ligaments.

Glenoid cavity, articulates with the head of the humerus, is shallow and oval form, being broader below, and giving attachment by its upper narrow part to the long head of the biceps muscle.

Neck is the contracted portion of the scapula immediately behind the glenoid cavity; it gives attachment to the capsular ligament of the joint.

OS HUMERI.

Connections to the scapula above and radius and ulna below.

Head forms a small section of a large sphere, is smooth and covered with cartilage in the recent state.

Neck, a slight contracted line, rough for the

attachment of the capsular ligament. It is united to the shaft by an obtuse angle.

Tuberosities exist at the junction of the shaft with the neck. The largest is posterior, and affords attachments to the supra-spinatus, infra-spinatus, and teres minor muscles; the smallest being anterior, more prominent, and giving attachment to the sub-scapular muscle.

Bicipital groove is between both tuberosities, lodges the long biceps tendon, and affords attachment by its anterior margin to the pectoralis major muscle, and by its posterior margin to the latissimus dorsi and teres major muscles.

Shaft is rather twisted, the upper extremity cylindrical, the lower flattened; upon its external and central aspect, is a rough portion for insertion of the deltoid muscle and upon the inner side of the bicipital groove is a slight rough line for the insertion of the coraco-brachialis muscle. The nutritious foramen is directed downwards towards the elbow joint.

Internal condyle is prominent and sharp, affording attachment to the pronator and flexor muscles, and to the internal lateral ligament.

External condyle is less prominent, but descends nearer the elbow joint, and gives attachment to the supinator and extensor muscles, and to the external lateral ligament.

Articulating surfaces. First, a small round *head*, situated externally and nearer the anterior than the posterior part of the bone, for the ra-

dius. Second, the *trochlea* or pully-like surface placed internally for the ulna; being much below the level of the *head*, so as to give the articular surfaces an oblique direction from above downwards and inwards.

Coronoid fossa at the fore part of the trochlea to receive the coronoid process in the bent position of the forearm.

Olecranoid fossa at the back part of the trochlea, to receive the coronoid process in the extended position of the forearm.

ULNA.

Situation at the inner side of the forearm.

Upper extremity articulates with the humerus and radius.

Olecranon process, posterior forming the projection of the elbow, is the highest point of the bone, and by its superior border gives attachment to the triceps muscle; beneath this it is smooth for a bursa mucosa.

Coronoid process, anterior and inferior to the olecranon, is smaller than it, and gives attachment to the brachialis anticus muscle, the flexors and pronators of the forearm and to the internal lateral ligament.

Lesser sigmoid cavity, oval and receives the side of the head of the radius.

Greater sigmoid cavity has its long axis from before backwards, is divided in the centre by a transverse line, and by a vertical ridge into two

lateral portions, is bounded above by the olecranon process, and below by the coronoid process.

Shaft presents three surfaces and three edges; the anterior surface affords attachment to the flexor profundus muscle, and is pierced by the nutritious foramen, which is directed upwards. The posterior gives attachment to the anconeus muscle and to the extensor muscles of the thumb; the internal is subcutaneous for its greatest extent. Of the edges, the external is the best marked, and gives attachment to the inter-osseous ligament.

Carpal extremity slender and rounded, presents the *head*, which by its side articulates with the radius, and by its carpal aspect with the fibro-cartilage of the wrist-joint; also the *styloid process* at its inner margin, which by its apex gives attachment to the internal lateral ligament of the carpus, by a depression at its root, to the fibro-cartilage; and posteriorly it presents a groove for the tendon of the flexor carpi ulnaris muscle.

RADIUS.

Situation, external to the ulna; it is also shorter than that bone.

Head, a superficial circular cavity articulating above with the humerus and laterally with the ulna.

Neck an inch in length, narrow and rounded, and terminating in the

Tubercle, a prominent process into which the tendon of the biceps muscle is inserted.

Shaft, triangular, by its anterior surface affording attachment to the flexor pollicis proprius, and pronator quadratus muscles, by its posterior convex surface to the supinator brevis muscle, and extensor muscles of the thumb; its external surface being round and convex, and rough near its centre for the pronator teres muscle. The inner edge of the shaft is sharp for the attachment of the inter-osseous ligament, and the nutritious foramen upon the anterior surface of the shaft is directed upwards.

Carpal extremity expanded, gives attachment by its anterior edge to the anterior carpal ligament; upon its posterior edge is a shallow groove at its ulnar side for the extensor communis digitorum and indicator muscles, a second more externally, narrow and oblique for the tendon of the extensor secundi internodii pollicis muscle, and a third more external than the last for the tendons of the extensores carpi radialis longior and brevior. Upon the radial edge of this extremity is the mark of the passage of the extensor ossis metacarpi and the extensor primi internodii pollicis muscles.

Styloid process, prolonged on the outer side of the bone downwards, giving attachment to the external lateral ligament of the carpus.

Sigmoid cavity on the inner border of the carpal extremity for articulation with the ulna.

Carpal aspect presents two articular surfaces, divided by a slight elevation; the external being triangular for articulation with the os scaphoides, the internal square for the os lunare.

CARPUS.

This part consists of two rows of small bones, four bones in each row, placed between the forearm and metacarpus. It is convex and rough upon its dorsal aspect, and concave upon its palmar aspect, where the vessels, nerves, and tendons of the flexor muscles are situated; towards the radius and interarticular cartilage of the wrist, it is convex; towards the metacarpus it presents articular surfaces for the metacarpal bones.

FIRST ROW.

Os Scaphoides.

Situation, on outer and upper part of the carpus, next the styloid process of the radius.

Articulations, with the radius above, with the trapezium and trapezoides below, and with the lunare and magnum internally.

Os Lunare.

Situation, between the scaphoides and cuneiforme.

Articulations, with the radius above, with

the magnum and unciforme below, with the scaphoid externally, and with the cuneiforme internally.

Os Cuneiforme.

Situation, at the internal and upper part of the carpus between the lunare and pisiforme.

Articulations, with the lunare externally, with the carpal fibro-cartilage above, with the unciforme below, and upon its palmar aspect with the pisiforme.

Os Pisiforme.

Situation, upon the inner and palmar aspect of the cuneiforme.

Articulation, by a circular small surface with the cuneiforme.

SECOND ROW.

Os Trapezium.

Situation, between the scaphoides and metacarpal bone of the thumb.

Articulations, with the scaphoides above, with the metacarpal bone of thumb below, and internally with the trapezoides and side of the metacarpal bone of the index finger.

Groove, upon its palmar aspect for lodging the tendon of the flexor carpi ulnaris muscle.

Os Trapezoides.

Situation, between the trapezium, magnum,

scaphoides, and metacarpal bone of the index finger.

Articulations, with the scaphoides above, the trapezium externally, the magnum internally, and below with the metacarpal bone of the index finger.

Os Magnum.

Processes, head, neck, and body.

Situation, between the scaphoides and lunare, and the second, third, and fourth metacarpal bones.

Articulations, by its head with the scaphoides and lunare above, by its base with the second, third, and fourth metacarpal bones below, externally with the trapezoides, and internally with the unciforme.

Os Unciforme.

Situation, between the cuneiforme and metacarpal bones of the ring and little fingers.

Articulations, with the lunare above, the magnum externally, the cuneiforme internally, and below with the fourth and fifth metacarpal bones.

Process, a hook-like process upon its palmar aspect.

METACARPUS.

This part consists of five long bones placed between the carpus and the fingers.

Bases, irregularly flattened for articulation with the second row of carpal bones, with rough surfaces for the attachment of ligaments.

Heads, convex, and rounded for articulation with the first bones of the fingers, and affording attachments for the capsular, transverse, and lateral ligaments.

Bodies.—The *first*, for the thumb is the thickest and shortest; the *second*, *third*, and *fourth* present on the dorsal aspect of each a prominent line, which bifurcates towards the head; the *fifth* presents an oblique line on its dorsal aspect, which divides it into two surfaces. The third is the longest.

FINGERS.

The fingers are composed of three phalanges, except the thumb, which has only two.

The metacarpal, or first Phalanges, are five in number, their bases presenting oval concavities for the heads of the metacarpal bones; their anterior extremities are convex from before backwards, and concave from side to side, to articulate with the second phalanges.

The Middle, or second Phalanges, are four in number, and smaller than the first; their bases present pully-like surfaces, to form a ginglymoid joint with the first phalanges, and at their anterior extremities resemble the first.

The Ungual, or third Phalanges, are five in number, and the smallest. By their bases they

form a ginglymoid joint with the middle phalanges; and their extremities are convex upon their dorsal aspects for the support of the nail, whilst their palmar aspects are irregularly tuberculated for the extremities of the fingers.

The Sesamoid Bones are sometimes absent. In general two are to be found between the metacarpal bone of the thumb and its first phalanx, and one or two at the corresponding joint of the index finger.

LOWER EXTREMITY.

The bones proper to the lower extremity are the femur, the tibia, the fibula, the patella, seven tarsal bones, five metatarsal bones, and fourteen phalanges.

THE FEMUR.

Head, forms nearly two-thirds of a sphere, and is received into the acetabulum, being directed forwards, upwards, and inwards; below its centre is a rough pit for the ligamentum teres, and its junction with the neck is marked by a rough line. With the exception of these parts it is covered by cartilage in the recent state.

Neck, extends obliquely downwards and outwards from the head to the shaft, which it joins at an obtuse angle; it is flattened anteriorly and posteriorly, and its lower edge is much longer than its upper.

Great trochanter, is continued upwards from the shaft, but does not extend as high as the head, is situated externally, and gives attachment to the glutæus medius, glutæus minimus, and quadratus femoris muscles.

Digital fossa, is situated at the root of the great trochanter, and affords insertion to the external rotator muscles.

Lesser trochanter, is situated posterior and internal to the shaft, and has inserted into it the psoas and iliac muscles.

Inter-trochanteric lines, are two in number, one anterior, the other posterior; as their name implies, they pass (obliquely) from one trochanter to the other.

Shaft, is broad at either extremity, particularly towards the knee, and is narrow and triangular in the centre; it is arched and smooth anteriorly; at its posterior part it is concave, and presents a rough line called linea aspera, about the centre of which, and directed downwards, is the foramen for the nutritious vessels.

Linea aspera, is best marked for the central third of the shaft; towards the upper third it bifurcates, one ridge running to each trochanter; inferiorly it also divides into two ridges, which pass to either condyle, the inner one being interrupted where the popliteal vessels pass over it. By these inferior ridges a flat triangular

surface of the femur is bounded laterally, which receives the name of popliteal surface.

External condyle, is larger and projects more upon the anterior surface of the femur than the internal, it is also broader and ascends higher upon the shaft.

Internal condyle, narrower than the external; it also descends lower, in order that both condyles should rest upon the tibia in the natural oblique direction of the femur.

External tuberosity, above the external condyle for the attachment of the external lateral ligament of the knee-joint.

Internal tuberosity, above the internal condyle, and more prominent than the external, for the internal lateral ligament and the insertion of the great adductor tendon.

Popliteal groove, between the external tuberosity, and the external condyle; it lodges the popliteal tendon in the flexed position of the joint.

Trochlea, between the condyles on their anterior aspect, supports the patella when the leg is extended.

Inter-condyloid fossa, is situated posteriorly between the condyles.

PATELLA.

Shape, triangular, the base superiorly having the extensor muscles inserted into it, the apex

below to which is attached the ligamentum patellæ.

External surface, presents a fibrous appearance, and is convex.

Internal surface, presents two articular surfaces, divided by a prominent edge; the internal surface is the deepest, whilst the external is broad and shallow.

TIBIA.

Shaft, is triangular, presenting three surfaces, separated by corresponding edges. The inner surface is subcutaneous, except at its upper part, where the tendons of the sartorius, gracilis and semitendinosus muscles pass over it, it terminates in the inner malleolus; the external surface is covered by the belly of the tibialis anticus muscle for its upper extent, and is here concave; inferiorly it is convex, and anterior to support the tendons of the extensor muscles of the toes; the posterior surface presents an oblique line directed upwards and outwards for the attachment of the solæus, poplitæus, and deep flexor muscles; the nutritious foramen, which is the largest in the body, is a little below this line, and directed downwards. Of the edges, the anterior is most prominent and subcutaneous; the inner is less defined, and the outer is well marked, affording attachment to the interosseous ligament.

Upper or femoral extremity, expanded to ar-

ticulate with the femur, is convex upon its sides and anterior aspect, being grooved posteriorly.

Tuberosities, are three in number, two laterally, and one anteriorly; the anterior is most prominent for the insertion of the ligament of the patella; the inner is less so, and affords attachment to the internal lateral ligament of the knee-joint, and the semimembranosus muscle, and the outer is the least developed.

Superior articular surfaces, are three in number, two for the femur, and one for the head of the fibula; those for the femur are separated by the spine, the internal being oval and deep; the external, circular, shallow, and inclined downwards and outwards; that for the fibula is behind the external tuberosity, and looks downwards.

Spine, placed between the articular surfaces for the femur, projects upwards, and is bifid at its apex.

Lower or tarsal extremity, is much smaller than the upper and quadrilateral, the anterior edge being convex for the passage of the extensor tendons; the posterior marked by a groove, for the passage of the tendon of the flexor pollicis proprius muscle; the external presenting a rough triangular surface for the fibula, and the internal terminating in the internal malleolus.

Internal malleolus, is convex and sub-cutaneous internally, its external or articular

aspect being smooth, to articulate with the astragalus, besides giving attachment to the internal lateral ligament of the ankle-joint, by its inferior edge it affords a groove posteriorly for the tendons of the flexor communis and tibialis posticus muscles.

Inferior articular surface, rests upon the crown of the astragalus; it is quadrilateral and concave from before backwards, and joins the small articular surface of the internal malleolus at a right angle.

FIBULA.

Situation, on the outer side of the tibia.

Shaft, triangular and twisted, gives attachment to the peronæi muscles by its external surface, to the solæus and flexor pollicis muscles by its posterior surface, and to the extensor muscles by its anterior surface. Its inner edge is well developed to afford attachment to the inter-osseous ligament, and the nutritious foramen, directed upwards, is placed upon the posterior aspect of the bone.

Head, articulates with the tibia by a small circular surface directed upwards and inwards, and affords attachment to the external lateral ligament of the knee-joint, and the biceps flexor muscle by a rough projection situated posteriorly.

Neck, is the small constricted part by which the head is united to the shaft.

Tarsal extremity, presents a large oval process called the external malleolus, about two inches and a half above which the shaft is constricted.

External malleolus, is larger than the internal on a line posterior to which it is situated; by its edge it affords attachments to the external lateral ligaments of the ankle-joint. Its outer surface is convex and subcutaneous, the inner or articular being smooth to articulate with the outer side of the astragalus; above this surface is a triangular rough aspect for the inferior connection of the bone with the tibia.

TARSUS.

Forms the posterior part of the foot, the bones which compose it are seven in number, which articulate with each other. It is connected above to the tibia and fibula, below it is hollow, and anteriorly it unites by articular surfaces with the five metatarsal bones. The seven tarsal bones are the calcaneum, astragalus, navicular, cuboid, and three cuneiform.

CALCANEUM, OR OS CALCIS.

Situation at the posterior and under part of the tarsus.

Posterior aspect, elongated to form the heel, presents a smoothness above for a bursa mucosa, and a rough surface below for the insertion of the tendo achillis.

Anterior aspect articulates by a smooth surface with the cuboid bone.

Superior aspect presents two articular surfaces, which support the astragalus; these are separated by a groove, into which ligaments are inserted.

Inferior aspect is irregular, presenting two small tubercles, and two lines for the attachment of muscles and ligaments.

External aspect presents a small tubercle for the insertion of the middle external lateral ligament of the ankle joint; it is also slightly grooved for the passage of the peronæi tendons.

Internal aspect presents a projection for the internal lateral ligament, and a fossa for the lodgment of posterior tibial vessels and nerve and tendons of muscles.

ASTRAGALUS.

Situation, at the upper and middle part of the tarsus, between the malleoli at either side: the tibia above, and the os calcis below.

Crown, broader anteriorly than posteriorly, presents three articular surfaces; one, large superiorly, to articulate with the tibia; the others, one on either side, to articulate with the malleoli.

Head, convex and smooth, is directed forwards and inwards, and is larger than the concavity of the navicular bone with which it articulates.

Neck, the contracted portion between the crown and the head, is rough for the attachment of ligaments.

Inferior aspect presents two articular surfaces for connection with the os calcis; these are also separated by a groove, from which ligaments pass to the groove in the os calcis.

Posterior aspect is narrow, and presents a groove for the tendon of the flexor pollicis longus muscle, and a pointed eminence for the posterior external lateral ligament of the ankle joint.

NAVICULARE.

Situation, middle of the tarsus.

Posterior aspect is smooth and concave, to articulate with the head of the astragalus.

Anterior aspect presents two vertical lines, which divides it into three smooth surfaces for articulation with the three cuneiform bones, and, in general, a small articular surface, externally, where it touches the cuboid bone.

Tubercle, situated inferiorly for the insertion of the tendon of the tibialis posticus muscle.

CUBOIDES.

Situation, outer and anterior part of the tarsus.

Upper surface, flat and rough for ligaments.

Lower surface, tubercular behind, for the calcaneo-cuboid ligament, and presenting a groove

anteriorly for the tendon of the peronæus longus muscle.

Posterior surface, smooth and concave transversely, to articulate with the os calcis.

Anterior surface presents two articular surfaces; the external triangular to articulate with the metatarsal bone of the little toe, the inner square for the fourth metatarsal bone.

External surface narrow and free.

Internal surface presents posteriorly a small articular surface for the naviculare, and anteriorly another, which is larger, to articulate with the outer side of the external cuneiform bone.

INTERNAL CUNEIFORM BONE.

The largest of the three, articulates behind with the scaphoid; before, with the first metatarsal bone; externally, with the middle cuneiform and side of the second metatarsal bone.

Tubercle is situated inferiorly for the insertion of the tendon of the tibialis anticus muscle, and part of the tendon of the tibialis posticus.

MIDDLE CUNEIFORM BONE.

The smallest articulates behind with the scaphoid bone; before, with the second metatarsal bone; externally, with the external cuneiform; and internally, with the internal cuneiform.

EXTERNAL CUNEIFORM BONE.

Articulates behind with the scaphoid bone; before, with the third metatarsal bone; internally, with the middle cuneiform and side of the second metatarsal bone; and externally, with the cuboid and fourth metatarsal bone.

METATARSUS

is the middle part of the foot, and is composed of five long bones placed between the tarsus and the toes.

FIRST METATARSAL BONE,

the shortest and thickest, is convex above and concave below.

Posterior extremity is smooth and oval, to articulate with the internal cuneiform bone.

Anterior extremity, round, to articulate with the great toe. The under surface of this extremity articulates with two sesamoid bones, and receives the insertion of the tendon of the peronæus longus.

SECOND METATARSAL BONE,

the longest.

Posterior extremity articulates with the three cuneiform bones, and also with the third metatarsal bone.

Anterior extremity presents a round head, for articulation with the second toe; it is separated from the shaft of the bone by a groove.

THIRD METATARSAL BONE.

Posterior extremity articulates with the third cuneiform bone.

Anterior extremity resembles the second, and articulates with the third toe.

FOURTH METATARSAL BONE.

Posterior extremity articulates with the cuboid bone, and by its inner side with the third cuneiform.

Anterior extremity resembles the second, and articulates with the fourth toe.

FIFTH METATARSAL BONE.

Posterior extremity articulates with the cuboid bone by a surface directed obliquely upwards and outwards.

Anterior extremity resembles the second, and articulates with the fifth toe.

PHALANGES, OR TOES,

are composed of fourteen bones, three to each toe, except the first, which has only two.

FIRST PHALANGES.

Shape, convex above, concave below, and the longest.

Anterior extremities, convex from above downwards, and concave laterally; form ginglymoid articulations with the second phalanges.

Posterior extremities are large, and present

rounded concavities for the heads of the metatarsal bones.

SECOND PHALANGES.

Anterior extremities resemble those of the first phalanges.

Posterior extremities, concave from above downwards, and convex transversely; articulate with the first phalanges.

THIRD PHALANGES.

Anterior extremities, pyramidal in form, support the nails on their upper surface, and are tubercular and porous on their under surface.

Posterior extremities resemble the posterior extremities of the middle phalanges.

SESAMOID BONES

are uncertain in development; two are generally found at the base of the first phalanx of the great toe, and one at that of the fifth toe. They are also frequently developed in the tendons which cross the sole of the foot in those situations where they are subjected to much pressure.

THE SKULL,

consists of eight bones, four of which are symmetrical, viz: the frontal, the ethmoid, the sphenoid, and the occipital; and four arranged in pairs, viz: two parietal, and two temporal.

FRONTAL BONE.

Situation, upper and anterior part of the skull.

External, or frontal aspect, is convex and arched, and presents a median vertical depression, which marks the original division of the bone into two.

Nasal spine, at the inferior part of the median depression or line.

Frontal eminences, on either side of the median line marking the points of ossification of the bone.

Superciliary arches, two convexities which extend for about an inch on either side of the median line inferiorly.

Eminence of frontal sinuses, between, but a little above the superciliary arches.

Orbitar arches, form the upper edges of the orbits, and present towards their inner thirds the supra-orbital holes or notches, for the passage of the frontal nerve and artery.

External angular processes, at the outer terminations of the orbitar arches.

Internal angular processes, at the inner termination of the orbitar arches.

Temporal ridges, extend backwards and upwards from the external angular processes.

Internal or cerebral aspect, is concave, and presents in the median line a groove which corresponds to the longitudinal sinus.

Crest, at the commencement of the median groove, gives attachment to the falx.

Foramen cœcum, at the root of crest, gives passage to a vein from the nose, which opens into the longitudinal sinus.

Eminences and depressions, on either side of the median line, correspond to the convolutions of the brain.

Orbito-ethmoidal aspect, is irregular, forming on either side part of the orbits, and in the median line part of the nose.

Ethmoidal notch, quadrilateral, articulates with the ethmoidal bone by a serrated margin; its edges being cellular to unite with the ethmoidal cells.

Anterior and posterior ethmoidal holes, along the margins of the ethmoidal notch, giving passage to the nasal twig of the opthalmic nerve and the ethmoidal arteries.

Orbital processes, triangular, and on either side of the ethmoidal notch, form the roofs of the orbits by their smooth concave surface, and on their convex surface are marked by the convolutions of the brain. Towards the external angular process of each is the fossa for lodging the lachrymal gland, and at the nasal margin is a depression for the reflected tendon of the superior oblique muscle.

Frontal sinuses, at the antero-inferior part of the bone, and between its two tables; they open at either side of the nasal process.

PARIETAL BONES.

Situation, upper and lateral parts of cranium, being quadrilateral.

External surface, convex, and marked by a semicircular ridge, which is continued from the temporal ridge of the frontal bone. In the centre of the bone is the parietal eminence, and about one-third from the superior posterior angle is the parietal foramen.

Four edges.—The upper is the longest, and joins its fellow,—the anterior joins the frontal bone,—the posterior is very irregular, and joins the occipital,—and the inferior is thin and semicircular, and joins the temporal bone.

Four angles.—The anterior inferior is long and curved, and joins the sphenoid bone; upon its cerebral aspect a canal or a groove exists for the trunk of the middle-meningeal artery. The posterior inferior angle is grooved upon its cerebral aspect to lodge part of the lateral sinus. The superior angles are rather rounded.

Internal surface, concave, and marked by the convolutions of the brain and the ramifications of the middle meningeal artery, presents along its upper edge a shallow groove, which, with its fellow, accommodates the superior longitudinal sinus; external to this groove are depressions marking where the glandulæ Pacchioni externæ were situated.

OCCIPITAL BONE.

Situation, posterior and inferior part of cranium.

Tuberosity, near the centre of external surface.

Superior tranverse ridge, leads from either side of the spine transversely outwards.

Inferior transverse ridge, midway between tuberosity and foramen magnum.

Spine, leads from tuberosity down to the foramen magnum.

Foramen magnum, larger internally than externally, it is of an oval form, and transmits the medulla spinalis, vertebral arteries, and sub-occipital nerves.

Basilar process, passes forwards and upwards to join the sphenoid bone, is rough inferiorly for the attachment of the pharynx; and upon its cerebral aspect is smooth and concave from side to side to support the pons variolii and basilar artery.

Condyles, smooth and oblong, look downwards, outwards, and backwards, each presents a roughness internally for the moderator ligaments.

Anterior condyloid foramina, situated before the condyle for the passage for the ninth pair of nerves.

Posterior condyloid foramina, behind the

condyles for the passage of veins and twigs of arteries. These are sometimes absent.

Jugular eminences, external to either condyle.

Crucial spine, on the cerebral aspect, and formed by a transverse and vertical line, gives attachment to the falx major by the upper half of the vertical line, in which is a groove for the termination of the longitudinal sinus, and to the falx minor by its lower half; the transverse ridge gives attachment to the tentorium, and also presents a groove on either side for the lateral sinuses.

Four fossæ, two superior for the posterior lobes of the cerebrum, and two inferior and deeper for the cerebellum.

Grooves for inferior petrosal sinuses, one on either side of the cerebral aspect of the basilar process.

Grooves for the termination of the lateral sinuses on each side of the foramen magnum above the jugular eminences.

TEMPORAL BONE.

Situation, at the lateral, middle, and inferior part of the skull.

Squamous portion, semicircular, flat, and thin, forming part of the side of the skull and of the temporal fossa.

Zygomatic process, arises by two roots, one anterior bounding the front of the glenoid cavity, the other posterior, which is bifurcated;

the process then passes forwards, and presents a serrated edge to unite with the malar bone.

Zygomatic tubercle is situated at the union of the zygomatic roots.

Trochlea, between the posterior root of the zygomatic process and the squamous plate, for the passage of the posterior fibres of the temporal muscle.

Glenoid cavity, transversely oval, deep anteriorly for the reception of the maxillary condyle, and shallow behind, where it lodges a portion of the parotid gland.

Glasserian fissure, crosses the glenoid cavity in a direction obliquely forwards and inwards.

Auditory process, commences by the external meatus, and leads inwards and forwards to the membrana tympani, and presents externally a rugged edge for the attachment of the cartilage of the ear.

Internal surface of squamous plate, is marked by the convolutions of the brain and blood vessels.

Mastoid process, at the posterior and inferior aspect of the bone.

Mastoid grooves internal to the mastoid process for the occipital artery and posterior belly of the digastric muscle.

Mastoid foramen, posterior to mastoid process for the transmission of a vein.

Mastoid fossa, in the cerebral aspect for the lateral sinus.

Mastoid cells, in the interior of mastoid process.

Petrous portion, extends forwards and inwards, and presents three aspects, being of a prismatic form.

Aqueduct of the cochlea, a minute foramen on the under surface, posterior to the styloid process.

Styloid process, long and tapering, descends obliquely forwards and inwards.

Vaginal process, a plate of bone between the glenoid cavity and the carotid foramen.

Stylo-mastoid foramen, between the styloid and mastoid processes for the exit of the portio dura nerve.

Carotid canal, commences in front of the styloid process, turns forwards, upwards, and inwards, and terminates by the side of the body of the sphenoid bone.

Processus cochleariformis, a thin plate of bone separating two canals, which are situated in the angle between the petrous and squamous portions; the superior of which transmits the tensor tympani muscle; the inferior forming the bony part of the eustachian tube.

Superior petrosal ridge, separates the anterior from the posterior surface, and gives attachment to the tentorium.

Depression for Gasserian ganglion, on the anterior extremity of the superior surface.

Hiatus Fallopii, a foramen on the superior surface for the passage of the vidian nerve.

Meatus auditorius internus, on the posterior surface, for the transmission of the seventh pair of nerves.

Aqueduct of the vestibule, a small slit-like opening posterior to the meatus internus.

The superior semicircular canal, forms an eminence on the superior petrosal surface.

ÆTHMOID BONE.

Situation, in the æthmoidal notch.

Crista galli, an angular process which divides the cerebral aspect into two equal portions, to which is attached the commencement of the falx.

Cribriform plate, on either side of the crista galli, concave, to lodge the olfactory bulbs, and perforated with holes, for the passage of the filaments of the olfactory nerves, the nasal division of the ophthalmic nerve, and some small blood vessels.

Nasal plate, descends from the under surface of the crista galli, joins the sphenoid bone posteriorly, the vomer and nasal cartilage inferiorly, and the os frontis and nasal bones anteriorly.

Orbital plate, a smooth square plate of bone situated externally, and forming part of the orbit; in its upper edge are two notches, which,

with those in the frontal bone, form the internal orbital foramina.

Æthmoidal cells, between the orbital plate and the nasal plate, being ten or twelve in number.

Superior spongy bone, descends in a curved manner outwards from the upper and posterior part of the bone, forming a short channel, called the superior meatus of the nose.

Middle spongy bone, larger and more curved, descends outwards, forming the middle meatus of the nose.

Infundibulum, a smooth groove leading from the anterior ethmoidal cells to the middle meatus.

SPHENOID BONE.

Body, corresponds to the median line, and presents six aspects.

Posterior aspect, is rough for connection with the basilar process of occipital bone.

Anterior aspect, presents the openings of the sphenoidal sinus.

Inferior aspect, presents the *azygos process*, which articulates with the vomer.

Superior or cerebral aspect, presents a fossa, called sella turcica.

Lateral aspects, join the great alæ.

Sella turcica, a deep fossa on the cerebral aspect of the body for lodging the pituitary gland.

Posterior clinoid processes, two rounded eminences posterior to the sella turcica.

Anterior clinoid processes, two rounded eminences situated external and anterior to the sella turcica.

Olivary process, an eminence between the anterior clinoid processes, and anterior to the sella turcica, on which the optic commissure rests.

Carotid grooves, one on either side of the sella turcica for the internal carotid arteries.

Transverse spines or lesser wings, two thin plates of bone extending forwards and outwards from the anterior clinoid processes, presenting anteriorly a spine in the median line, to unite with the ethmoid bone, and a serrated margin on either side to unite with the frontal bone. Their posterior free edges afford attachment to the sphenoidal folds of the dura mater. The external extremity of each terminates in an acute point, their cerebral aspect being smooth to support the anterior lobes of the brain.

Great wings, extend laterally from the sides of the body; each presents three aspects, one anterior and smooth to assist in forming the outer part of the orbit, the second posterior, concave, and marked by cerebral convolutions, to assist in forming the middle cranial fossa, and the third external, being divided by a crest; the portion above which forms part of the temporal

fossa, and the portion below, part of the zygomatic fossa.

Spinous processes, extend backwards and outwards from the posterior termination of each great wing.

Pterygoid processes, two on either side, descend from the angle of junction of each great ala and the body. The external is broad and irregular; the internal is long and narrow, and terminates in a hook called the hamular process.

Pterygoid fossa, is the hollow between the pterygoid processes posteriorly.

Foramina lacera, on either side of the sella turcica, are placed between the greater and lesser wings; each gives transmission to the third, fourth, first branch of the fifth, and the sixth pairs of nerves, and to the ophthalmic vein.

Foramina optica, at the roots of the lesser wings, give passage to the optic nerves and ophthalmic arteries.

Foramina rotunda, posterior, and a little external to the bases of the foramina lacera, give passage to the second division of the fifth.

Foramina ovalia, near the posterior terminations of the great wings, give passage to the third division of the fifth.

Foramina spinosa, in the spinous processes, give passage to the middle meningeal artery of either side.

Foramina pterygoidea, at the roots of the

pterygoid processes, for the passage of the vidian nerves.

BONES OF THE FACE.

MALAR BONE.

Situation, at the outer and under part of the orbit, forming the cheek.

External surface, convex, and of an irregular quadrilateral form.

External angular process, at the upper and outer edge, joins the frontal bone.

Maxillary process, serrated and at inner edge, rests on the superior maxillary bone.

Zygomatic process, passes backwards, and supports the zygomatic process of the temporal bone by a serrated edge.

Upper edge, forms the outer and inferior margin of the orbit.

Orbital process, a thin plate of bone, which passes from the upper edge backwards and inwards.

Lower edge thick and uneven for the attachment of the masseter muscle.

Temporal aspect, behind the zygomatic process, is smooth for the lodgment of the temporal muscle.

Foramina, two or three in number on its cutaneous aspect, for vessels and branches of lachrymal nerves.

Body, quadrilateral, presents anteriorly the canine fossa.

Malar process, externally and superiorly, presents a rough surface which supports the malar bone.

Nasal process, internally and superiorly, is serrated above to join the frontal bone, and also presents a groove to support the nasal bone. Its cutaneous aspect is perforated by two or three small holes for blood vessels, its posterior aspect is deeply grooved to assist in forming the fossa for the lodgment of the lachrymal sac and duct, and its internal or nasal aspect is divided by a ridge, which supports the inferior spongy bone.

Orbital plate, triangular, assists to form the floor of the orbit.

Infra-orbital canal, passes from behind forwards between the plates of the orbital process, and terminates in the *infra-orbital foramen*.

Temporal aspect, presents behind the malar process a smooth depression for the temporal muscle and more posteriorly and inferiorly a *tuberosity* which corresponds to the dens sapientia.

Posterior dental foramina are three or four small holes which give passage to the posterior dental nerves; and are found near the tuberosity.

Palatine process is thick internally and rough where it joins its fellow, its circumference corresponds to the alveolar processes, and its posterior edge is thin and serrated where it joins the palate bone; its upper surface is smooth and concave from side to side, forming part of the floor of the nose, and its under surface is rough, forming with the gum, part of the hard palate.

Nasal crest, at the union of the palatine processes, projects upwards to receive the vomer.

Nasal spine projects forwards, above and between the central incisor teeth.

Foramen incisivum, is common to both bones, and exists inferiorly at the anterior union of their palatine plates; superiorly it bifurcates and opens by two foramina, one to each nostril.

Antrum maxillare a large cavity in the body of the bone, bounded above by the orbital plate, below by the alveoli of the molar teeth, anteriorly by the canine fossa, and posteriorly by the temporal aspect: externally it corresponds to the malar process, and internally it presents a large irregular opening.

PALATE BONE.

Horizontal or palate plate, quadrilateral, is concave and smooth above, and completes the floor of the nose, and rough below where it completes the hard palate. Its anterior edge is serrated to join the superior maxillary bone, its posterior edge is concave, and gives attachment

to the soft palate, its inner edge is serrated where it joins with its fellow and sends a *crest* upwards to support the vomer; its outer edge joins the nasal plate.

Nasal spine projects backwards from the union of the palate plates.

Nasal process, broad and thin, its inner surface is divided into two by a ridge which supports the inferior spongy bone: above and below this ridge the process is slightly concave to assist in forming the inferior and middle meatuses: its external surface is rough and marked by the posterior palatine vessels and nerves; its anterior thin edge assists to close the antrum and the posterior edge joins the pterygoid processes of ophenoid bone.

Pterygoid process, the thickest part of the bone, of a wedge shape, inclines backwards and outwards; it presents three grooves, a central one smooth which completes the pterygoid fossa, and a rough one on either side to articulate with the extremities of the pterygoid processes.

Palatine foramina, at the junction of pterygoid and palatine processes give passage to the palatine nerve and vessels.

Orbital process, surmounting the nasal process, is divided into two by a notch, which forms with the sphenoid bone the *spheno-palatine hole.*

Anterior orbital process, is large and hollow,

and of a triangular form; it forms the posterior part of the floor of the orbit by its upper smooth surface; joins the orbital plate of the superior maxillary bone and the os planum of the ethmoid bone by its two serrated edges; and its smooth edge looks towards the spheno-maxillary fissure.

Posterior orbital process, articulates with the body and spongy plate of the sphenoid bone and is also hollow.

INFERIOR SPONGY BONE.

Rough and convex towards the septum of the nose and concave externally, presents a free margin inferiorly and is attached above to the os unguis, and to the ridge on the superior maxillary and palate bones. It perfects the nasal duct inferiorly.

OS UNGUIS.

Situation, inner and anterior part of orbit.

Edges serrated to join the os frontis above, the maxillary bone below, the nasal bone anteriorly, and the ethmoid bone behind.

External surface, divided by a perpendicular ridge, presents a groove anteriorly for the lachrymal sac, and a smooth surface behind to assist in forming the orbit.

Internal surface, covers the anterior ethmoidal cells.

NASAL BONES.

Situation, beneath the nasal process of frontal bone, and between the nasal processes of superior maxillary bones.

External surface, convex and presents small foramina for blood vessels.

Internal surface, concave and grooved by the nasal nerves.

Superior edge, thick and serrated to join the frontal bone.

Inferior edge, thin and expanded, joins the lateral nasal cartilages.

External edge is the longest, and is serrated to join the superior maxillary bone.

Internal edge is flat and joins its fellow.

VOMER.

Situation, in the median line of nose.

Superior edge grooved to receive the azygos process of the sphenoid bone.

Anterior edge slightly grooved to receive the ethmoidal plate and nasal cartilage.

Posterior edge free, looks towards the pharynx.

Inferior edge the longest, is received into the nasal crest of the superior maxillary and palate bones.

INFERIOR MAXILLARY BONE.

Body, the anterior portion, projects inferiorly into *mental process or chin*—superiorly is sur-

mounted by alveoli of four incisor teeth—anteriorly has on each side a depression for muscles, and posteriorly, eminences and depressions for muscles.

Symphysis a vertical ridge in the centre of body.

Horizontal rami.—On the outer surface of each is an oblique ridge for muscles; on the inner is the mylo-hyoidean ridge, above which is a depression for the sub-lingual gland and another below for the sub-maxillary gland. The lower edge is rounded and grooved for the facial artery, and upon the upper edge are alveolar processes.

Angle obtuse and rough for muscles.

Ascending rami are thick and round posteriorly—externally smooth—internally grooved.

Coronoid process passes upwards from anterior part of ascending ramus.

Condyle transversely oblong to articulate with temporal bone.

Neck constricted part below condyle.

Semilunar notch between condyle and coronoid process.

Inferior dental foramen situated at internal surface of ascending ramus and surmounted by a *spine*.

Mental foramen situated at anterior surface of bone external to body.

Dental canal traverses bone between the two foramina, and communicates with each alveoli.

OS HYOIDES.

Situation in the anterior part of the neck between the chin and larynx.

Body square, is rough anteriorly for muscles, and smooth behind where it corresponds to the epiglottidean gland.

Greater cornua, pass obliquely upwards and outwards from the sides of the body.

Lesser cornua are very small, and pass obliquely backwards and upwards from the point of junction of the great cornua and body.

The bones of the ear are described in connection with the organ of hearing.

SUTURES OF THE CRANIUM AND FACE.

Frontal suture, commences a little behind the external angular process of the frontal bone, at the upper termination of the great wing of the sphenoid bone, and, inclining backwards, extends across the cranium to the opposite corresponding point, connecting in its course the frontal to the parietal bones.

Lambdoidal suture, commences at the union of the petrous portion of the temporal bone with the parietal and occipital bones, and extending across the posterior part of the cranium to the opposite corresponding point, connects the occipital to the parietal bones.

Sagittal suture, extends from the angle of the occipital bone forwards, connecting in its course

the parietal bones and corresponding to the median line; it generally terminates in the coronal suture, but is occasionally prolonged to the nasal bones, dividing the frontal bone.

Squamous suture, corresponds to the semicircular edge of the squamous portion of the temporal bone, and connects it to the great wing of the sphenoid bones, and to the parietal bone.

Additamentum suturæ lambdoidalis, extends from the termination of the lambdoidal suture to the foramen lacerum posterious, and unites the mastoid process of the temporal bone to the occipital.

Additamentum suturæ squamosæ, extends nearly horizontally backwards from the posterior termination of the squamous suture to the lambdoidal suture, connecting the upper extremity of the mastoid portion of the temporal bone to the parietal bone.

Sphenoidal suture, extends around the irregular margins of the sphenoid bone, connecting it to all the bones of the head, and to the malar, superior maxillary, and palate bones.

Ethmoidal suture, surrounds the ethmoid bone, connecting it to the frontal, nasal, superior maxillary, lachrymal, and palatine bones, and to the vomer.

Transverse suture, connects the bones of the face to those of the head.

Zygomatic suture, corresponds to the junction of the temporal with the malar bone.

ORBITS.

The orbits are two pyramidal cavities, the bases of which look outwards and forwards and their apices in the contrary direction; so that two lines passing through their axes if prolonged posteriorly would decussate at the sella turcica. Each orbit is formed of seven bones, three of which, viz. the frontal, sphenoid, and ethmoid, are common to both orbits; the other four, viz. the lachrymal, superior maxillary, malar, and palate bones belonging to the orbit of their corresponding side. The foramina in the base of the orbit are, the supra-orbital, the infra-orbital, and the upper orifice of the nasal duct: within the orbit are the optic-foramen, the superior lacerated foramen, the spheno-maxillary fissure and the two internal orbital foramina.

TEMPORAL FOSSA,

Placed on the side of the cranium, is bounded by the frontal, sphenoid, parietal, and temporal bones, and lodges the temporal muscle.

ZYGOMATIC FOSSA,

Extends from the temporal fossa downwards, and is bounded by the zygomatic arch, the superior maxillary bone and the portion of the great wing of the sphenoid bone below its crest.

PTERYGO MAXILLARY FISSURE,

Lies deep in the zygomatic fossa, is bounded by the pterygoid processes, the tuberosity of the superior maxilla and the nasal process of the palate bone; and communicates with the spheno-maxillary fissure.

ARTICULATIONS.

TEMPORO-MAXILLARY ARTICULATION.

Bony formation.—Glenoid cavity of temporal bone and condyle of inferior maxillary bone.

External lateral ligament.—*Origin*, zygomatic process and tubercle of temporal bone. *Insertion*, outer side of the neck of condyle of lower jaw.

Internal lateral ligament.—*Origin*, spinous process of sphenoid bone. *Insertion*, margin of orifice of inferior dental canal.

Stylo-maxillary ligament.—*Origin*, styloid process of temporal bone. *Insertion*, angle of inferior maxillary.

Synovial membranes, one is reflected from the cartilaginous surface of zygomatic eminence and glenoid cavity over the superior surface of the fibro-cartilage. The other covers the under surface of the fibro-cartilage and is reflected over the condyle.

Inter-articular, or fibro-cartilage, of an oval figure, thick in its circumference, thin in the centre. Divides the joint into two.

Capsular ligament.—Origin, zygomatic eminence, and glenoid fissure. *Insertion*, neck of lower jaw.

OCCIPITO-ATLANTOID ARTICULATION.

Bony formation, condyles of occipital bone and superior oblique processes of atlas.

Capsular ligament, imperfect.

Synovial membranes, cover the opposed cartilaginous surfaces.

Anterior ligament.—Origin, anterior edge of foramen magnum. *Insertion*, upper edge of atlas anterior to its articular processes.

Posterior ligament.—Origin, posterior edge of foramen magnum. *Insertion*, upper edge of atlas behind its articular processes.

OCCIPITO-AXOID ARTICULATION.

Moderator, or oblique ligaments.—Origin, from each side of odontoid process. *Insertion*, inner side of each condyle.

Apparatus ligamentosus.—Origin, lower part of cuneiform process, being posterior to odontoid process. *Insertion*, superior part of transverse ligament of atlas and bodies of second and third vertebræ.

ATLANTO-AXOID ARTICULATION.

Bony formation.—The anterior portion of

the spinal hole of the atlas, and the odontoid process of axis.

Anterior and posterior ligaments, as in all the other vertebræ.

Transverse ligament, attached on each side to inner edge of oblique process of axis, and by means of apparatus ligamentosus to cuneiform process above, and body of axis below.

Synovial membranes. One between posterior surface of odontoid process, and anterior surface of transverse ligament. Another covers the opposed cartilaginous surfaces of the atlas and odontoid process.

COMMON VERTEBRAL ARTICULATION.

Bony formation.—Opposed surfaces of the bodies and oblique process of the vertebræ.

Anterior vertebral ligament extends from axis to sacrum adhering to the bones and the inter-vertebral substances.

Posterior vertebral ligament, extends along the posterior part of bodies of vertebræ in front of spinal canal.

Inter-vertebral ligaments, or fibro-cartilages, are placed between the bodies of all the vertebræ, except the atlas and dentata, and united to their flat surface above and below. They are thicker in front than behind in the neck and loins, and the contrary in the back.

Synovial membranes and ligamentous fibres connect the oblique processes.

Ligamenta sub-flava, are situated between the laminæ of the vertebræ from the second to the sacrum, completing the posterior part of the spinal canal.

Supra-spinous and inter-spinous ligaments, connect the spinous processes of the vertebræ.

Inter-transverse ligaments connect the transverse processes.

COSTO-SPINAL ARTICULATIONS.

Bony formation.—Heads, and tubercles of ribs, and bodies and transverse processes of vertebræ.

Anterior ligament,—origin, front of head of rib. *Insertion*, side of the vertebræ above and below, and to the inter-vertebral substance.

Inter-articular ligaments,—origin, projecting ridge in the articular surface of each rib. *Insertion*, cavity in the inter-vertebral substance in which the head is received. The upper and lower divisions of this joint have distinct synovial membranes.

Inferior costo-transverse ligament,— origin, neck of each rib. *Insertion*, transverse process of the vertebræ above.

Posterior and external costo transverse ligaments connect the tubercle of each rib to the corresponding transverse process.

Synovial membranes are between the tubercles and transverse processes.

COSTO-STERNAL ARTICULATION.

The ribs are connected to the sternum through the intervention of their cartilages, which are secured anteriorly and posteriorly by ligamentous fibres.

LUMBO-SACRAL ARTICULATION.

Bony formation.—Last lumbar vertebra and sacrum. These are joined together in the same manner as the other vertebræ.

Ilio lumbar ligament—origin, transverse processes of fourth and fifth lumbar vertebræ and back part of the sacrum, *Insertion,* posterior superior spinous processes and crest of ilium.

ILIO-SACRAL ARTICULATION.

The ilium and sacrum are connected anteriorly and posteriorly by short ligamentous fibres.

Great sacro-sciatic ligament,—origin, lower and back part of posterior inferior spine of ilium and back part of sacrum and coccyx. *Insertion,* lower edge of tuber ischii.

Lesser sacro-sciatic ligament,—origin, side of sacrum and coccyx. *Insertion,* spine of ischium.

SACRO-COCCYGEAL ARTICULATION.

The sacrum and coccyx are united together by a similar substance to the inter-vertebral, and by ligamentous bands anteriorly and posteriorly.

PUBIC ARTICULATION.

Fibro-cartilage, attaches closely the bones of the pubis, also ligamentous fibres.

Sub-pubic ligament passes from the ramus of one bone to the other, and rounds off the angle formed by their union.

Obturator ligament, attached to the circumference of obturator foramen, except superiorly, where the thyroid nerve and vessels pass through.

STERNO-CLAVICULAR ARTICULATION.

Anterior ligament,—origin, anterior surface of sternal end of clavicle. *Insertion*, anterior surface of sternum.

Posterior ligament,—origin, posterior surface of sternal end of clavicle. *Insertion*, back part of sternum.

Costo-clavicular ligament,—origin, lower surface of sternal end of clavicle. *Insertion*, cartilage of first rib.

Inter-clavicular ligament, extends from the posterior surface of one clavicle to the other.

Inter-articular cartilage, thin below and attached to sternum; thick above and attached to clavicle; having a synovial membrane connected to each surface and its corresponding bone.

SCAPULO-CLAVICULAR ARTICULATION.

Superior acromio-clavicular ligaments,—ori-

gin, upper surface of acromion. *Insertion*, upper part of clavicle.

Inferior acromio-clavicular ligament.—Attached to under surface of each bone.

CORACO-CLAVICULAR ARTICULATION.

Conoid ligament, triangular; base connected to the tubercle on inferior surface of clavicle, apex at the broad part of coracoid process.

Trapezoid ligament, attached above to an oblique line on the clavicle; below to upper part of the coracoid process.

LIGAMENTS OF THE SCAPULA.

Coraco-acromial ligament,—origin, broad from coracoid process. *Insertion*, narrow into point of acromion.

Posterior or coracoid ligament,—origin, superior costa of scapula behind the notch. *Insertion*, base of coracoid process. This ligament converts the notch into a foramen.

HUMERO-SCAPULAR ARTICULATION.

Bony formation.—Head of humerus and glenoid cavity of scapula.

Capsular ligament,—origin, circumference of neck of scapula. *Insertion*, around the neck of humerus.

Coraco-humaral ligament,—origin, coracoid process. *Insertion*, anterior part of great tuberosity.

Synovial membrane is reflected over the surface of the glenoid cavity around the glenoid ligament; lines the capsular ligament, head of humerus, and becipital groove.

HUMERO-CUBITAL ARTICULATION.

Bony formation, articular processes of humerus, great sigmoid cavity of ulna head of radius.

External lateral ligament—origin, external condyle of humerus. *Insertion*, annular ligament of radius.

Internal lateral ligament—origin, internal condyle. *Insertion*, inner edge of olecranon and coranoid processes.

Anterior ligament consists of thin fibres—*origin*, principally from above internal condyle and depression on fore part of humerus, *insertion*, annular ligament of radius and synovial membrane.

Posterior ligament is composed of fibres which extend from one condyle to the other, and are attached to the synovial membrane.

Synovial membrane is reflected from behind the anterior ligament to neck of radius and annular ligament; it then lines the sigmoid cavities of the ulna and is reflected to the lateral ligaments and tendon of the triceps muscle, which conducts it to the posterior depression of the humerus; it is then expanded over its articular processes.

SUPERIOR RADIO-ULNAR ARTICULATION.

Bony formation, lesser sigmoid cavity of ulna and inner side of head of radius.

Annular ligament—origin, anterior border of lesser sigmoid cavity of ulna, *insertion* posterior border of the same cavity. It encircles the neck of radius.

Oblique ligament—origin, coranoid process of ulna. *Insertion*, radius below its tubercle.

Inter-osseous ligament connects the opposed edges of radius and ulna, its fibres descending obliquely inwards from the former bone to the latter.

INFERIOR RADIO-ULNAR ARTICULATION.

Bony formation round head of ulna, and sigmoid cavity of radius.

Sacciform ligament passes from radius to the ulna, forming a sac above the following

Fibro-cartilage—origin, styloid process of ulna. *Insertion*, inner edge of radius below the ulna.

RADIO-CARPAL ARTICULATION.

Bony formation, lower end of radius; scaphoid, lunar, and cuneiform bones.

External lateral ligament—origin, styloid process of radius. *Insertion*, scaphoid bone, and by some fibres into annular ligament and trapezium.

Internal lateral ligament—origin, styloid process of ulna. *Insertion*, cuneiform bone.

Posterior ligament—origin, posterior part of radius and fibro-cartilage. *Insertion*, back part of superior row of carpus.

Anterior ligament—origin, anterior part of radius and fibro-cartilage. *Insertion*, fore part of first row of carpus.

CARPAL ARTICULATIONS.

The bones of carpus are articulated by ligamentous bands, both anteriorly, and posteriorly.

An *internal* and *external lateral ligament* attach the two rows.

Synovial membrane extends between the two rows and sends processes between the bones.

Annular ligament—origin, trapezium, and scaphoid bones. *Insertion*, cuneiform and unciform bones.

CARPO-METACARPAL ARTICULATION.

The carpus and metacarpus are secured by fibrous bands which pass in different directions, and cover the synovial membrane.

METACARPO-PHALANGEAL ARTICULATIONS.

The heads of the metacarpus and first phalanges are secured by *lateral ligaments*, and are lined by *synovial membranes*.

INTER-PHALANGEAL ARTICULATIONS.

The phalanges are connected to each other by means of lateral ligaments, and between each of their joints is a synovial membrane.

ILIO-FEMORAL ARTICULATION.

Bony formation, acetabulum and head and part of neck of femur.

Cotyloid ligament, a fibro-cartilaginous circular band adhering to the edge of the acetabulum.

Transverse ligament, attached to the opposite points of the notch, and partly filling it up.

Capsular ligament—origin, circumference of acetabulum. *Insertion*, below root of trochanter major, and the two inter-trochanteric lines.

Accessory ligament—origin, anterior inferior spinous process of ilium. *Insertion*, fore part of lesser trochanter.

Synovial membrane, reflected from inside of capsule upon periosteum of neck, and cartilaginous surface of head; is continued over inter-articular ligament, and thence is reflected upon the cartilaginous surface of the acetabulum.

Inter-articular ligament or *ligamentum teres —origin*, depression on head of femur. *Insertion* by two bands into the extremities of the notch, and by synovial membrane into the fatty substance at the bottom of the cavity.

FEMORO-TIBIAL ARTICULATION.

Bony formation condyles of femur and head of tibia.

Ligamentum patellæ—origin, lower angle of patella. *Insertion*, tubercle of tibia.

Posterior ligament—origin, tendon of semi-membranosus muscle at internal and posterior part of tibia. *Insertion*, external condyle of femur.

Internal lateral ligament—origin, internal condyle of femur. *Insertion*, internal condyle of tibia and semilunar cartilage.

External lateral ligament—origin, external condyle. *Insertion*, head of fibula. This ligament is often divided into two by the tendon of the biceps muscle.

Synovial membrane lines the back part of the patella, from which it is reflected two or three inches on the fore part of the femur, and on its condyles; from thence it is conducted by the crucial ligaments to the semi-lunar cartilages, and head of tibia.

Alar ligaments arise from each side of patella and unite below that bone. They are mere folds of synovial membrane.

Ligamentum mucosum—origin, fatty substance behind ligamentum patellæ. *Insertion*, hollow between the condyles. It also is a fold of synovial membrane.

Transverse ligament, attached to the anterior portion of each semi-lunar cartilage.

Anterior crucial ligament—origin, inner side of external condyle. *Insertion*, near the fore part of head of tibia.

Posterior crucial ligament—origin, outer side of internal condyle. *Insertion*, depression on back part of head of tibia, and external semi-lunar cartilage.

Semi-lunar cartilages, thick externally, thin internally; concave above, flat below. Their outer convex edges are attached to the lateral ligaments: their inner edges are free: the anterior and posterior extremities of each are attached to the head of the tibia. The outer cartilage is circular, the inner is oval.

TIBIO-FIBULAR ARTICULATION.

The head of the fibula is attached to the tibia by *anterior* and *posterior fibrous bands* and synovial membrane.

Inter-osseous membrane extends from one bone to the other, nearly the whole length.

The lower extremities of the tibia and fibula are connected together by anterior and posterior ligaments.

ARTICULATION OF THE ANKLE.

Bony formation, lower ends of tibia, fibula, and astragulus

Internal lateral ligament—origin, internal malleolus. *Insertion*, astragulus, naviculare and calcis.

External lateral ligaments are three; all take their *origin* from the external malleolus. *Insertion* of *anterior*, upper and outer part of astragulus. *Insertion* of *middle*, os calcis. *Insertion* of *posterior*, ridge on the back of astragulus.

Anterior ligament—origin, anterior edge of tibia. *Insertion*, upper and outer part of astragulus.

ARTICULATION OF THE TARSUS.

The astragulus and os calcis have two articular surfaces, covered by synovial membranes.

Inter-osseous ligament passes nearly perpendicularly from the groove which separates the inferior articular surfaces of the astragulus, to the corresponding groove in the os calcis.

Posterior ligament is attached to the posterior edges of the astragulus and os calcis.

The bones of the tarsus are connected on their dorsal and plantar aspects by numerous ligamentous bands.

Calcaneo-navicular ligament—origin, inferior surface of os calcis. *Insertion*, inferior surface of os naviculare.

Calcaneo-cuboid ligament—origin, posterior

inferior part of os calcis. *Insertion*, under part of cuboid bone, and third and fourth metatarsal bones.

Synovial membranes line the several articulations of the tarsus.

TARSO-METATARSAL ARTICULATIONS.

These joints are secured by dorsal and plantar ligaments, and are lined by synovial membranes. The metatarsal bones are secured to the phalanges, and the phalanges to each other by lateral ligaments and synovial membranes.

MUSCLES.

HEAD.

Occipito-frontalis. *Origin*, two external thirds of superior transverse ridge of occipital bone and posterior external part of mastoid process of temporal bone. *Insertion*, integuments of eyebrows, nasal bones and angular processes of the os frontis.

MUSCLES OF EXTERNAL EAR.

Superior Auris. *O.* cranial aponeurosis above external ear. *I.* upper and anterior part of cartilage of ear.

Anterior Auris. *O.* posterior part of zygomatic process and cranial aponeurosis. *I.* anterior part of helix.

Posterior Auris. *O.* mastoid process. *I.* back part of concha.

Orbicularis palpebrarum. *O.* internal angular process of os frontis and upper edge of tendo oculi. *I.* nasal process of superior maxillary bone and inferior edge of tendo oculi.

Tensor tarsi. *O.* posterior edge of os unguis. *I.* lachrymal ducts as far as puncta.

Corrugator supercilii. *O.* internal angular process of os frontis. *I.* middle of eyebrow,

Pyramidalis nasi. *O.* occipito-frontalis muscle, descends along nasal bones. *I.* compressor nasi muscle.

Compressor nasi. *O.* canine fossa in superior maxilla. *I.* dorsum of nose.

Levator labii superioris alæque nasi. *O.* upper extremity of nasal process of superior maxilla, and from edge of orbit above infra-orbital hole. *I.* ala nasi, upper lip and orbicularis oris muscle.

Zygomaticus minor. *O.* upper part of malar bone. *I.* upper lip, near commissure. Sometimes wanting.

Zygomaticus major. *O.* lower part of malar bone, near zygomatic suture. *I.* angle of mouth.

Levator anguli oris. *O.* canine fossa above aveola of first molar tooth. *I.* commissure of lips and orbicularis oris.

Depressor labii superioris alæque nasi. *O.* alveoli of canine and incisor teeth, of superior

maxilla. *I.* integuments of upper lip and fibro-cartilage of septum and ala nasi.

Depressor anguli oris. *O.* external oblique line on lower jaw, extending from anterior edge of masseter muscle to mental foramen. *I.* commissure of lips.

Depressor labii inferioris. *O.* side and front of lower maxilla, above its base. *I.* half of lower lip and orbicularis oris.

Levator labii inferioris. *O.* alveoli of incisor teeth of lower jaw. *I.* integuments of chin.

Orbicularis oris surrounds mouth by two fleshy fasciculi.

Buccinator. *O.* two last alveoli of superior maxilla and external surface of posterior alveoli of lower maxilla, also inter-maxillary ligament. *I.* commissure of lips.

MUSCLES OF LOWER JAW.

Masseter consists of two portions: *Anterior portion.* *O.* superior maxilla where it joins malar bone, and inferior edge of latter. *I.* outer surface of angle of lower jaw.

Posterior portion. *O.* edge of malar bone and zygomatic arch, as far as glenoid cavity. *I.* external side of angle and ramus of lower jaw.

Temporal. *O.* side of cranium, beneath semicircular ridge on parietal bone, temporal fossa, and aponeurosis. *I.* coronoid process of inferior maxilla to last molar tooth.

Pterygoideus internus. *O.* inner side of external pterygoid plate and pterygoid process of palate bone. *I.* inner side of angle of jaw and rough surface above.

Pterygoideus externus. *O.* outer side of external pterygoid plate, crest on great ala of sphenoid bone and tuberosity of superior maxilla. *I.* anterior and internal part of neck of lower jaw, inter-articular cartilage, and inferior synovial membrane.

MUSCLES ON ANTERIOR AND LATERAL PARTS OF NECK.

Platysma-myodes. *O.* cellular membrane covering upper and outer part of deltoid and great pectoral muscles. *I.* chin; fascia along side of lower jaw; and fascia covering parotid gland.

Sterno-cleido mastoideus. *O.* upper and anterior part of first bone of sternum and sternal third, sometimes half, of clavicle. *I.* upper part of mastoid process and external third of superior transverse ridge of occipital bone.

Sterno-hyoideus. *O.* posterior surface of first bone of sternum, cartilage of first rib, sternal end of clavicle, and sterno-clavicular capsule. *I.* lower border of body of os hyoides.

Sterno-thyroideus. *O.* posterior surface of first bone of sternum and cartilage of second rib. *I.* oblique line on ala of thyroid cartilage.

Omo-hyoideus. *O.* behind semilunar notch in scapula, from the ligament which passes over the notch, and from base of coracoid process. *I.* lower border of os hyoides, at the junction of its body and great cornu.

Digastric. *O.* groove, internal to mastoid process. *I.* rough depression on inner side of base of jaw, near its symphysis.

Mylo-hyoideus. *O.* mylo-hyoid ridge of inferior maxilla. *I.* base of os hyoides, chin, and middle tendinous line common to it and its fellow.

Genio-hyoideus. *O.* inner side of chin, above the digastricus. *I.* base of os hyoides.

Hyo-glossus. *O.* cornu and part of body of os hyoides. *I.* side of tongue.

Genio-hyo-glossus. *O.* eminence inside chin, below frœnum linguæ. *I.* mesial line of tongue from apex to base, and body and lesser cornu of os hyoides.

Lingualis consists of fasciculi of fibres, running from base to apex of tongue, and lying between the genio-hyo-glossus, and the hyo and stylo glossi.

Stylo-hyoideus. *O.* outer side of styloid process near its base. *I.* cornu and body of os hyoides.

Stylo-glossus. *O.* styloid process, near its tip and the stylo-maxillary ligament. *I.* side of tongue, as far as the tip.

Stylo-pharyngeus. *O.* back part of root of

styloid process. *I.* side of pharynx, cornu of os hyoides, and thyroid cartilage.

MUSCLES OF THE PHARYNX.

Constrictor pharyngis inferior. *O.* side of cricoid cartilage, inferior cornu, and posterior part of ala of thyroid cartilage. *I.* with its fellow, along mesial line on back of pharynx.

Constrictor pharyngis medius. *O.* cornu and appendix of os hyoides, also stylo-hyoid and thyro-hyoid ligaments. *I.* mesial tendinous line, and cuneiform process of occipital bone.

Constrictor pharyngis superior. *O.* petrous portion of temporal bone, lower part of internal pterygoid plate and hamular process of sphenoid bone, also intermaxillary ligament, posterior third of mylo-hyoid, and side of base of tongue. *I.* cuneiform process of occipital bone and mesial line of pharynx.

MUSCLES OF THE PALATE.

Levator palati. *O.* petrous portion of temporal bone in front of foramen caroticum. *I.* broad, into the velum.

Tensor, vel circumflexus palati. *O.* depression at root of internal pterygoid plate, spinous process of sphenoid bone and fore part of Eustachian tube: tendon turns round hamular process, *I.* into velum, meeting its fellow in the mesial line.

Motores uvulæ, *O.* posterior extremity of

spine of palate bones. *I.* cellular tissue of uvula.

Palato-glossus. *O.* inferior surface of velum. *I.* side of tongue.

Palato-pharyngeus. *O.* inferior surface of palate. *I.* side and back of pharynx, and superior cornu of thyroid cartilage.

LARYNX.

Thyro-hyoideus. *O.* oblique ridge on ala of thyroid cartilage. *I.* lower edge of cornu of os hyoides.

Crico-thyroideus. *O.* fore part of cricoid cartilage. *I.* lower border of thyroid cartilage.

Thyro-arytenoideus. *O.* posterior surface of thyroid cartilage, near its angle. *I.* anterior edge of arytenoid cartilage.

Crico-arytenoideus lateralis. *O.* upper edge of side of crocoid cartilage. *I.* base of arytenoid cartilage.

Crico-arytenoideus posticus. *O.* depression on posterior surface of cricoid cartilage. *I.* outer side of base of arytenoid cartilage.

Arytenoideus fills the interval between arytenoid cartilages, and consists of two arrangements of fibres: *oblique*, run from apex of one cartilage to base of opposite one; *transverse*, are attached to posterior surface of each cartilage.

DEEP MUSCLES ON ANTERIOR AND LATERAL PARTS OF THE NECK.

Longus colli. *O.* bodies of three superior dorsal and four inferior cervical vertebræ, intervertebral ligaments, head of first rib, and anterior tubercles of transverse processes of the four inferior cervical vertebræ. *I.* fore part of first, second, and third cervical vertebræ.

Rectus capitis anticus major. *O.* anterior tubercles of transverse processes of four inferior cervical vertebræ. *I.* cuneiform process of occipital bone.

Rectus capitis anticus minor. *O.* transverse process of atlas. *I.* cuneiform process of occipital bone.

Rectus capitis lateralis. *O.* transverse process of atlas. *I.* jugular process of occipital bone.

Scalenus anticus. *O.* anterior tubercles of transverse processes of third, fourth, fifth, and sixth cervical vertebræ. *I.* upper surface of first rib, near its cartilage.

Scalenus medius. *O.* posterior tubercles of transverse processes of four or five inferior cervical vertebræ. *I.* upper edge of second rib.

Scalenus posticus. *O.* posterior tubercles of two or three inferior cervical vertebræ. *I.* upper edge of second rib between its tubercle and angle.

Pectoralis major. *O.* sternal half of clavicle, anterior surface of sternum, cartilages of third, fourth, fifth, and sixth ribs, and aponeurosis common to it and external oblique muscle. *I.* by a flat tendon into anterior edge of bicipital groove, and by an aponeurosis into fascia of forearm.

Pectoralis minor. *O.* external surfaces and upper edges of third, fourth, and fifth ribs, sometimes from second. *I.* inner and upper surface of coracoid process of scapula.

Subclavius. *O.* cartilage of first rib. *I.* external half of inferior surface of clavicle.

Serratus magnus. *O.* by eight or nine fleshy slips, from eight or nine superior ribs. *I.* base of scapula.

Intercostales, are twenty-two in number on each side: eleven *internal* and eleven *external*.

External. *O.* inferior edge of each rib commencing at transverse processes of vertebræ. *I.* external lip of superior edge of rib beneath, extending to behind costal extremities of cartilages.

Internal. *O.* at sternum from the inner lip of lower edge of each cartilage and rib as far as angle. *I.* inner lip of superior edge of cartilage and rib beneath.

Levatores costarum. *O.* extremity of each

dorsal transverse process. *I.* upper edge of rib below, between tubercle and angle.

Triangularis sterni. *O.* posterior surface and edge of lower part of sternum and ensiform cartilage. *I.* cartilages of fourth, fifth, and sixth ribs.

MUSCLES OF THE BACK.

First Layer.

Trapezius. *O.* internal third of superior transverse ridge of occipital bone, ligamentum nuchæ, and spinous process of last cervical and dorsal vertebræ. *I.* posterior border of external third of clavicle and acromion process, also superior edge of spine of scapula.

Latissimus dorsi. *O.* six inferior dorsal spines, and by lumbar fascia from all lumbar spines, from back of sacrum, posterior third of crest of ilium, and from three to four inferior ribs. *I.* posterior edge of bicipital groove of humerus.

Second Layer.

Rhomboideus minor. *O.* lower part of ligamentum nuchæ and two last cervical spinous processes. *I.* base of scapula, opposite to and above its spine.

Rhomboideus major. *O.* four or five superior dorsal spines. *I.* base of scapula from spine to inferior angle.

Levator anguli scapulæ. *O.* posterior tuber-

cles of transverse processes of four or five superior cervical vertebræ. *I.* vertebral margin of scapula, between spine and superior angle.

Serratus posticus superior. *O.* ligamentum nuchæ, and two or three dorsal spines. *I.* second, third, and fourth ribs, external to angles.

Serratus posticus inferior. *O.* two last dorsal and two superior lumbar spines. *I.* lower edges of four inferior ribs anterior to angles.

Splenius colli. *O.* spines of third, fourth, fifth, and sixth dorsal vertebræ. *I.* transverse processes of three or four superior cervical vertebræ.

Splenius capitis. *O.* spines of two superior dorsal, and three inferior cervical vertebræ and ligamentum nuchæ. *I.* posterior part of mastoid process, and occipital bone, below its superior transverse ridge.

Third Layer.

Sacro-lumbalis. *O.* posterior third of crest of ilium, oblique and transverse processes of sacrum, sacro-iliac ligaments, and transverse and oblique processes of lumbar vertebræ. *I.* all the ribs, near their angles.

Longissimus dorsi. *O.* posterior surface of sacrum, and transverse and oblique processes of lumbar vertebræ. *I.* all dorsal vertebræ, and ribs between tubercles and angles.

Spinalis dorsi. *O.* two superior lumbar and

three inferior dorsal spines. *I.* nine superior dorsal spines.

Musculi accessorii. *O.* superior edge of each rib. *I.* tendons of sacro-lumbalis.

Cervicalis descendens. *O.* from four or five superior ribs between tubercles and angles. *I.* transverse processes of fourth, fifth, and sixth cervical vertebræ.

Transversalis colli. *O.* transverse processes of five or six superior dorsal vertebræ. *I.* transverse processes of three or four inferior cervical vertebræ.

Trachelo-mastoideus. *O.* transverse processes of three or four superior dorsal vertebræ, and as many inferior cervical. *I.* inner and back part of mastoid process.

Complexus. *O.* transverse and oblique processes of three or four inferior cervical and five or six superior dorsal vertebræ. *I.* into occipital bone, between its two transverse ridges.

Fourth Layer.

Spinalis colli. *O.* extremities of transverse processes of five or six superior dorsal vertebræ. *I.* by four heads into spines of second, third, fourth, and fifth cervical vertebræ.

Semi-spinalis dorsi. *O.* by five or six tendons, from transverse processes of dorsal vertebræ, from fifth to eleventh. *I.* extremity of spines of two inferior cervical and three or four superior dorsal vertebræ.

Multifidus spinæ. *O.* first fasciculus arises from spine of vertebra dentata, and is inserted into transverse process of third, each successively in a similar manner down to the last, which arises from the spine of last lumbar vertebra, and is inserted into false transverse process of sacrum.

Inter-spinales—are situated between spinous processes of vertebræ.

Inter-transversales—attached and situated as their name implies.

Rectus capitis posticus major. *O.* spinous process of second vertebræ. *I.* inferior transverse ridge of os occipitis.

Rectus capitis posticus minor. *O.* posterior part of atlas. *I.* occipital bone, behind foramen magnum.

Obliquus capitis inferior. *O.* spinous process of second vertebra. *I.* extremity of transverse process of atlas.

Obliquus capitis superior. *O.* upper part of transverse process of atlas. *I.* occipital bone, between its transverse ridges, posterior to mastoid process.

UPPER EXTREMITY.

Shoulder Arm.

Deltoideus. *O.* lower edge of spine of scapula, anterior edge of acromion, and external third of clavicle. *I.* rough surface on outer side of humerus, near its centre.

Supra-spinatus. *O.* all scapula above the spine, which forms supra-spinous fossa, and from fascia covering muscle. *I.* upper and fore part of great tuberosity of humerus.

Infra-spinatus. *O.* inferior surface of spine and dorsum of scapula beneath, as low down as posterior ridge on inferior costa. *I.* middle of great tuberosity of humerus.

Teres minor. *O.* depression between the two ridges on inferior costa of scapula, from fascia covering it, and ligamentous septa. *I.* inferior depression on great tuberosity of humerus.

Sub-scapularis. *O.* all the surface and circumference of sub-scapular fossa. *I.* lesser tubercle of humerus.

Teres major. *O.* rough surface on inferior angle of scapula, below infra-spinatus. *I.* posterior edge of bicipital groove.

Coraco-brachialis. *O.* coracoid process and tendon of short head of biceps. *I.* internal side of humerus, about its middle, and by an aponeurosis, into ridge leading to internal condyle.

Biceps. *O.* short head, from coracoid process, long head from upper edge of glenoid cavity. *I.* back part of tubercle of radius.

Brachialis-anticus. *O.* centre of humerus by two slips on either side of insertion of deltoid, and fore part of humerus to its condyles. *I.* coronoid process of ulna and rough surface beneath.

Triceps extensor cubiti. *O.* long head, from lower part of neck of scapula and inferior costa. Second head, from ridge on humerus, below insertion of teres minor. Third head, from ridge below insertion of teres major, leading to the internal condyle, and from internal inter-muscular ligament. *I.* olecranon process of ulna, and fascia of forearm.

Forearm and Hand.

Palmaris brevis. *O.* annular ligament and palmar fascia. *I.* integuments on inner side of palm.

Pronator radii teres. *O.* anterior part of internal condyle, fascia of forearm, inter-muscular septa, and coronoid process of ulna. *I.* outer and back part of radius, about its centre.

Flexor carpi radialis. *O.* inner condyle and inter-muscular septa. *I.* base of metacarpal bone of index finger.

Palmaris longus. *O.* inner condyle and fascia of forearm. *I.* Annular ligament and palmar aponeurosis, near root of thumb.

Flexor carpi ulnaris. *O.* inner condyle, inner side of olecranon, inner edge of nearly whole length of ulna and forearm. *I.* os pisiforme and base of fifth metacarpal bone.

Flexor digitorum sublimis perforatus. *O.* inner condyle, internal lateral ligament, coronoid process, and radius below tubercle. *I.*

anterior part of second phalanges of each finger.

Flexor digitorum profundus perforans. *O.* three upper fourths of anterior surface of ulna, internal half of inter-osseous ligament, sometimes from radius below its tubercle. *I.* last phalanx of each finger.

Flexor pollicis longus. *O.* fore part of radius below the tubercle, and from inter-osseous membrane to within two inches of carpus, sometimes from coronoid process. *I.* last phalanx of thumb.

Pronator quadratus. *O.* inferior fifth of anterior surface of ulna. *I.* anterior part of inferior fourth of radius.

Supinator radii longus. *O.* external ridge of humerus to within two inches of outer condyle, and from inter-muscular ligament. *I.* rough surface on the outer side of radius, near its styloid process.

Extensor carpi radialis longior. *O.* ridge of humerus, between supinator longus and external condyle. *I.* back part of carpal extremity of metacarpal bone of index finger.

Extensor carpi radialis brevior. *O.* inferior and posterior part of external condyle, and external lateral ligament. *I.* carpal extremity of third metacarpal bone.

Extensor digitorum communis. *O.* External condyle, fascia of forearm and its inter-muscu-

lar septa, and from ulna. *I.* posterior aspect of all the phalanges of four fingers.

Extensor carpi ulnaris. *O.* external condyle, fascia, and septa, from ulna. *I.* carpal end of fifth metacarpal bone.

Anonæus. *O.* posterior and inferior part of external condyle, and lateral ligament. *I.* external surface of olecranon, and superior fifth of posterior surface of ulna.

Extensor minimi digiti. *O.* in common with and between extensor digitorum communis and extensor carpi ulnaris. *I.* posterior part of phalanges of little finger.

Supinator radii brevis. *O.* External condyle, external lateral, and coronary ligaments, and from a ridge on outer side of ulna, which commences below its lesser sigmoid cavity. *I.* upper third of external and anterior surface of radius, from above its tubercle to the insertion of pronator radii teres.

Extensor ossis metacarpi pollicis. *O.* middle of posterior part of ulna, below the anconæus, inter-osseous ligament, and posterior surface of radius. *I.* os trapezium and upper and back part of metacarpal bone of thumb.

Extensor primi internodii pollicis. *O.* back part of ulna, below its middle, inter-osseous ligament, and radius. *I.* posterior part of first phalanx, and often the second.

Extensor secundi internodii pollicis. *O.* posterior surface of ulna, above its centre, and

from inter-osseous ligament. *I.* posterior part of last phalanx.

Extensor indicis. *O.* middle of posterior surface of ulna, and inter-osseous ligament. *I.* second and third phalanges.

Abductor pollicis. *O.* anterior aspect of annular ligament, os naviculare, and trapezium. *I.* outside of base of first phalanx, and by an expansion into both phalanges.

Opponens pollicis. *O.* annular ligament and os naviculare. *I.* anterior extremity of metacarpal bone of thumb.

Flexor pollicis brevis. *O. external head,* from inside of annular ligament and trapezium and scaphoid bones. *I.* external sesamoid bone and base of first phalanx of thumb. *Internal head.* *O.* from os magnum and base of metacarpal bone of middle finger. *I.* internal sesamoid bone and base of first phalanx.

Abductor pollicis. *O.* three-fourths of anterior surface of the third metacarpal bone. *I.* inner side of root of first phalanx of thumb.

Abductor indicis. *O.* metacarpal bone of forefinger and one-half of that of thumb. *I.* outer side of base of first phalanx.

Lumbricales. *O.* outer side of the tendons of flexor profundis, near the carpus, a little beyond annular ligament. *I.* middle of first phalanx into tendinous expansion covering the back of each finger.

Abductor minimi digiti. *O.* annular ligament and os pisiforme. *I.* ulnar side of first phalanx.

Flexor brevis minimi digiti. *O.* annular ligament and unciform bone. *I.* base of first phalanx of little finger.

Adductor minimi digiti. *O.* internal to last, and overlapped by it. *I.* all the metacarpal bone of little finger.

Inter-ossei antici, vel interni, vel palmares. *O.* sides of metacarpal bones. *I.* first phalanges and tendinous expansion, covering the dorsum of each finger.

1st, *vel prior, vel externus indicis.* *O.* radial side of second metacarpal bone. *I.* external side of first phalanx of forefinger.

2d, *vel posterior, vel internus, vel adductor indicis.* *O.* ulnar side of second metacarpal bone. *I.* inner side of first phalanx of ring finger.

3d, *vel prior, vel externus, vel adductor annularis.* *O.* radial side of fourth metacarpal bone. *I.* external side of phalanx of forefinger.

4th, *vel abductor minimi digiti.* *O.* radial side of fifth metacarpal bone. *I.* outside of first phalanx of little finger.

Inter-ossei posteriores. *O.* opposed sides of two metacarpal bones, *I.* base of first phalanx of each finger and posterior tendinous expansion.

1st, *prior vel externus medii.* *O.* second and third metacarpal bones. *I.* outer side of base of first phalanx of middle finger.

2d, *vel internus medii.* *O.* between the metacarpal bones of middle and ring fingers. *I.* inner side of first phalanx of middle finger.

3d, *vel externus annularis.* *O.* between fourth and fifth metacarpal bones. *I.* inner side of ring finger.

ABDOMEN.

Obliquus externus vel descendens. *O.* external surfaces of eight or nine inferior ribs at a little distance from their cartilages. *I.* ensiform cartilage, linea alba, os pubis, Poupart's ligament, anterior superior spinous process of ilium, and outer edge of two anterior thirds of crista ilii.

Obliquus internus vel ascendens. *O.* fascia lumborum, all the crista ilii, and external third or fourth of Poupart's ligament. *I.* cartilages of seven inferior ribs, ensiform cartilage, linea alba, also by conjoined tendons into symphysis and upper edge of pubis, and into linea ileo pectinea.

Cremaster. This muscle, deriving part of its origin from internal oblique, is here described, though being a muscle of the testicle. *O.* inner surface of external third of Poupart's ligament, and from lower edge of obliquus internus, and sometimes from transversalis; it often has an

attachment to the pubis. *I.* tunica vaginalis and scrotum.

Transversalis. *O.* fascia lumborum, posterior part of crista ilii, iliac third of Poupart's ligament, and inner side of seven inferior ribs. *I.* along with posterior lamina of obliquus internus, into the whole length of linea alba, upper edge of pubis and the linea innominata.

Rectus. *O.* upper and anterior part of pubis. *I.* ensiform cartilage, costo-xiphoid ligament, and cartilages of sixth and seventh ribs.

Pyramidalis. *O.* broad from pubis. *I.* linea alba, mid-way to umbilicus; sometimes wanting.

DEEP MUSCLES OF THE ABDOMEN.

Diaphragm is divided into two portions; a superior broad or true diaphragm; and an inferior lesser portion, or crura of the diaphragm.

True Diaphragm. *O.* posterior surface of xiphoid cartilage, internal surfaces of cartilages of the last true and all the false ribs, external or false ligament arcuatum, and convex edge of true ligamentum arcuatum. *I.* cordiform tendon.

False or lesser diaphragm, or crura. *O.* right crus, from fore part of bodies of four superior lumbar vertebræ. Left crus from the sides of the two or three superior lumbar vertebræ. *I.* posterior border of cordiform tendon.

Quadratus lumborum. *O.* posterior fourth of spine of ilium, and from ilio-lumbar ligament.

I. extremity of transverse processes of four superior lumbar and last dorsal vertebræ, also inner surface of posterior half of last rib.

Psoas parvus. *O.* side of last dorsal and first lumbar vertebræ. *I.* linea ileo-pectinea, fascia iliaca, and fascia lata, behind the femoral vessels; sometimes wanting.

Psoas magnus. *O.* sides of bodies of two last dorsal, and from bodies and transverse processes of all the lumbar vertebræ, also from inter-vertebral ligaments. *I.* inferior part of lesser trochanter and ridge below that process.

Iliacus internus. *O.* transverse processes of last lumbar vertebra, inner margin of three anterior fourths of crista ilii, and its two anterior spinous processes and intervening notch, brim of acetabulum, capsular ligament, iliac fossa, and iliac fascia. *I.* into psoas magnus; the inferior fibres are inserted into anterior and inner surface of femur, below trochanter minor.

MUSCLES OF MALE PERINÆUM.

Sphincter ani. *O.* ano-coccygeal ligament. *I.* into raphe, superficial fascia, and common central point of perinæum.

Sphincter internus encircles the lower part of rectum.

Erector penis. *O.* inner surface of tuber ischii, and from insertion of great or inferior sciatic ligament. *I.* fibrous membrane of crus penis.

Accelerator urinæ. *O.* 1st, triangular liga-

ment of the urethra; 2d, by a broad tendon common to opposite muscles, which lies above urethra, between it and pubis; 3d, by a tendinous expansion from the side of crus penis. *I.* middle tendinous line or raphe of perinæum.

Transversalis perinæi. *O.* inside of tuber ischii. *I.* central point of perinæum.

Levator ani. *O.* posterior part of symphysis pubis, obturator fascia, ilium above thyroid foramen, inner surface of ischium, and its spinous process. *I.* anterior fibres into central point of perinæum and fore part of rectum; middle fibres into side of rectum, posterior fibres into back part of rectum, os coccygis, and last bones of sacrum.

Compressor urethræ. *O.* by a tendon from the inside of symphysis pubis. *I.* below membranous portion of urethra, into the narrow tendinous line, which becomes lost in central point of perinæum.

Coccygeus. *O.* inner surface of spine of ischium. *I.* extremity of sacrum and side of coccyx.

MUSCLES OF FEMALE PERINÆUM.

Sphincter ani. *O.* ano-coccygeal ligament. *I.* raphe, superficial fascia, and common central point of perinæum.

Levator ani. *O.* posterior part of symphysis pubis, below true ligaments of bladder, obturator fascia, ilium above thyroid foramen, inner

surface, and spine of ischium. *I.* the same as in the male.

Coccygeus, as in the male.

Transversalis perinæi, as in the male.

Erector clitoridis. *O.* inner surface of tuber ischii, and insertion of great sciatic ligament. *I.* fibrous membrane of crus clitoridis.

Sphincter vaginæ, extends from clitoris superiorly, around each side of vagina to central point of perinæum, in front of anus.

MUSCLES OF THE INFERIOR EXTREMITY.

Fore Part and Sides of the Thigh.

Tensor vaginæ femoris. *O.* external part of anterior superior spine of ilium. *I.* fascia lata about three inches below the great trochanter.

Sartorius. *O.* anterior superior spine of ilium and notch beneath it. *I.* inner side of upper end of tibia, below its tubercle.

Rectus femoris. O. anterior inferior spinous process of ilium, acetabulum, capsular ligament. *I.* upper edge of patella.

Vastus externus. *O.* root and anterior part of great trochanter, outer edge of linea aspera, oblique ridge leading to external condyle, external surface of femur, and fascia lata. *I.* external edge of tendon of rectus, side of patella, and head of tibia.

Vastus internus. *O.* anterior part of femur, linea inter-trochanterica, inner edge of linea as-

pera, and inside of femur. *I.* inner edge of tendon of rectus, patella, and head of tibia.

Crurœus. *O.* anterior and external part of femur, commencing at linea inter-trochanterica, and extending along three-fourths of the bone, as far outwards as linea aspera. *I.* upper and outer edge of patella, and synovial membrane of knee joint.

Subcrurœus or capsularis. *O.* inferior fourth of anterior surface of femur. *I.* synovial membrane of knee joint.

Gracilis. *O.* lower half of symphysis, and inner edge of descending ramus of os pubis. *I.* superior part of internal surface of tibia.

Pectinœus. *O.* linea innominata on horizontal ramus of pubis. *I.* rough ridge leading from lesser trochanter to linea aspera.

Triceps adductor femoris.

1st. *adductor longus.* *O.* anterior surface of pubis, between spine and symphysis. *I.* middle third of linea aspera.

2d. *adductor brevis.* *O.* anterior inferior surface of pubis, between symphysis and thyroid foramen. *I.* superior third of internal root of linea aspera to three inches below lesser trochanter.

3d. *adductor magnus.* *O.* anterior surface of descending ramus of pubis, ramus of ischium, and external border of its tuberosity. *I.* rough ridge leading from great trochanter to linea as-

pera, linea aspera, and internal condyle of femur.

MUSCLES OF HIP.

Glutæus maximus. *O.* posterior fifth of crista illii, the rough surface between it, and superior semi-circular ridge, posterior ilio-sacral ligaments, lumbar fascia, spines of sacrum, side of coccyx, and great sciatic ligament. *I.* rough ridge leading from great trochanter to linea aspera, upper third of linea aspera, and fascia lata.

Glutæus medius. *O.* deep surface of fascia covering it, three anterior fourths of crista ilii, superior semicircular ridge, and surface of ilium above and below it. *I.* upper and outer part of great trochanter.

Glutæus minimus. *O.* inferior semicircular ridge on dorsum of ilium, rough surface between it, and edge of acetabulum. *I.* upper and anterior part of great trochanter.

Pyriformis. *O.* concave aspect of 2d, 3d, and 4th divisions of sacrum, upper and back part of ilium, and anterior surface of great sciatic ligament. *I.* upper part of digital fossa.

Gemellus superior. *O.* spine of ischium. *I.* upper part of digital fossa.

Gemellus inferior. *O.* upper part of tuber ischii, and great sciatic ligament. *I.* digital fossa.

Obturator internus. *O.* pelvic surface of ob-

turator ligament, circumference of obturator foramen, and obturator fascia. *I.* digital fossa.

Quadratus femoris. *O.* external surface of tuber ischii. *I.* Inferior and posterior part of great trochanter and posterior inter-trochanteric line.

Obturator externus. *O.* inferior surface of obturator ligament and surrounding surfaces of pubis and ischium. *I.* digital fossa.

MUSCLES ON BACK PART OF THIGH.

Biceps flexor cruris. *Long head.* *O.* outer and back part of tuber ischii. *Short head.* *O.* linea aspera, from below insertion of glutæus maximus to within two inches of external condyle. *I.* head of fibula.

Semitendinosus. *O.* tuberosity of ischium, and from three inches of the tendon of the long head of biceps. *I.* anterior angle of tibia, below tubercle.

Semimembranosus. *O.* upper and outer part of tuber ischii. *I.* internal condyle of tibia and posterior part of external condyle of femur, crossing the knee joint, and thus forming the ligament of Winslow.

MUSCLES ON ANTERIOR AND EXTERNAL PART OF LEG.

Tibialis anticus. *O.* outer part of two superior thirds of tibia head of fibula, inner half of interosseous ligament, fascia of leg, and in-

termuscular septa. *I.* inner side of internal cuneiform bone and base of first metatarsal bone.

Extensor digitorum longus. *O.* external part of head of tibia, head and three-fourths of fibula, part of interosseous ligament, fascia of leg, and intermuscular septa. *I.* last phalanges of four external toes.

Extensor pollicis proprius. *O.* inner edge of middle third of fibula, interosseous ligament, and lower part of tibia. *I.* bases of first and second phalanges of great toe.

Peronæus tertius. *O.* anterior surface of lower half of fibula. *I.* base of fifth metatarsal bone.

Extensor digitorum brevis. *O.* upper and anterior part of os calcis, cuboid bone, astragalus and annular ligament. *I.* internal tendon into base of first phalanx of great toe, the three others join the outer edges of corresponding tendons of extensor digitorum longus.

MUSCLES ON OUTER PART OF LEG.

Peronæus longus. *O.* around head of fibula, adjacent surface of tibia, upper half of external angle of fibula, fascia and intermuscular septa. *I.* outer side of metatarsal bone of great toe, adjacent sesamoid bone, internal cuneiform bone and base of second metatarsal bone.

Peronæus brevis. *O.* outer and back part of

lower half of fibula, and intermuscular septa. *I.* os cuboides and base of metatarsal bone of little toe.

MUSCLES OF BACK OF LEG.

Superficial Layer.

Gastrocnemius. *O. internal head,* upper and back part of internal condyle of femur, and oblique ridge above it; *external head,* from above external condyle. *I.* lower and back part of os calcis.

Plantaris. *O.* back part of femur above external condyle, and posterior ligament of knee. *I.* posterior part of os calcis.

Solæus. *O. external head,* from back part of head and superior third of fibula; *internal head,* from middle third of tibia, unites with gastrocnemius to form tendo Achillis. *I.* lower and back part of os calcis.

Poplitæus. *O.* depression on outer condyle of femur. *I.* flat triangular surface, occupying the superior posterior fifth of tibia.

Flexor digitorum perforans. *O.* posterior flat surface of tibia, from below poplitæus to within three inches of ankle, fascia, and intermuscular septa. *I.* last phalanges of four lesser toes.

Tibialis posticus. *O.* posterior internal part of fibula, upper part of tibia, and nearly whole length of interosseous ligament. *I.* inferior and internal tuberosity on os naviculare, inter-

nal cuneiform and cuboid bones, and second and third metatarsal bones.

Flexor pollicis longus. *O.* two inferior thirds of fibula. *I.* last phalanx of great toe.

MUSCLES OF FOOT.

First Layer.

Abductor pollicis. *O.* lower and inner part of os calcis, internal annular ligament, plantar aponeurosis, and internal intermuscular septum. *I.* internal sesamoid, and internal side of base of first phalanx of great toe.

Flexor digitorum brevis perforatus. *O.* inferior and internal part of os calcis, internal annular ligament, plantar aponeurosis, and intermuscular septa. *I.* second phalanges of four lesser toes.

Abductor minimi digiti. *O.* outer side of os calcis, ligament extending from os calcis to outer side of fifth metatarsal bone, plantar fascia, external intermuscular septum, and base of fifth metatarsal bone. *I.* outer side of base of first phalanx of little toe.

Second Layer.

Musculus accessorius. *O.* inferior and internal part of os calcis. *I.* outer part of tendon of flexor digitorum longus.

Lumbricales. *O.* tendons of flexor digitorum longus. *I.* internal side of first phalanges of four lesser toes.

Third Layer.

Flexor pollicis brevis. *O.* lower and anterior part of os calcis and external cuneiform bone. *I.* sesamoid bones, beneath first phalanx of great toe.

Adductor pollicis. *O.* calceo-cuboid ligament and base of second and third metatarsal bones. *I.* external sesamoid bone.

Transversalis pedis. *O.* anterior extremities of four external metatarsal bones. *I.* external sesamoid bone of great toe.

Flexor brevis minimi digiti. *O.* cuboid and fifth metatarsal bones, and sheath of tendon of peronæus longus. *I.* inner side of base of first phalanx of little toe.

Fourth Layer.

Seven interossei muscles. Three on sole of foot, and four upon its dorsum.

Inferiores, vel interossei interni.

1st. *adductor medii digiti.* *O.* inner side of third metatarsal bone. *I.* base of first phalanx of fourth toe.

2d. *adductor quarti digiti.* *O.* inner side of fourth metatarsal bone. *I.* inner side of first phalanx of third toe.

3d. *adductor minimi digiti.* *O.* fifth metatarsal bone. *I.* inner side of base of first phalanx of little toe.

Superiores, vel interossei externi.

1st. *O.* intersal side of second metatarsal bone and outer side of first. *I.* inner side of base of first phalanx of second toe.

2d. *O.* opposite sides of second and third metatarsal bones. *I.* outer side of first phalanx of second toe.

3d. *O.* opposite sides of third and fourth metatarsal bones. *I.* outer side of first phalanx of middle toe.

4th. *O.* opposite sides of fourth and fifth metatarsal bones. *I.* outer side of first phalanx of fourth toe.

THE MUSCLES OF THE ORBIT.

1. *Levator palpebræ superioris.* *O.* upper edge of foramen opticum. *I.* superior border of tarsal cartilage.

2. *Obliquus superior.* *O.* foramen opticum. *I.* sclerotic coat between superior and external rectus.

3. *Obliquus inferior.* *O.* orbital edge of superior maxillary bone. *I.* sclerotic coat between it and external rectus muscle.

4. *Rectus superior.*

5. *Rectus inferior.*

6. *Rectus internus.*

7. *Rectus externus.*

[All arise round optic foramen, the external rectus being also attached to margin of sphenoidal fissure, and they are inserted about a quarter of an inch behind cornea.]

Stapedius. *O.* within pyramid. *I.* neck of stapes.

Tensor tympani. *O.* canal in petrous portion of temporal bone, above Eustachian tube. *I.* short process below neck of malleus.

Laxator tympani. *O.* spinous process of sphenoid bone and Eustachian tube. *I.* processes gracilis of malleus.

BRAIN AND ITS MEMBRANES.

DURA MATER.

A firm dense fibrous membrane, adhering by its outer surface to the bones of the cranium, its inner surface being intimately connected with the arachnoid membrane. It defends the brain, acts as an internal periosteum to the bones of the skull, forms the sinuses, and sends envelopes upon the several nerves as they pass through the cranial holes. It sends off the following processes.

Falx cerebri commences narrow at crista galli, and arches backwards between the lobes of the cerebrum, becoming deeper until it meets the tentorium, with which process it is continuous on either side. Its convex edge corresponds to the median groove of the os frontis, the sagittal edges of the parietal bones and the upper half of the perpendicular ridge of the occipital bone. The great longitudinal sinus

is in its upper edge, and the lesser longitudinal sinus in its inferior free concave edge.

Tentorium extends in a horizontal manner above the cerebellum and below the posterior lobes of the cerebrum. Its convex edges contain the lateral sinuses, and correspond to the transverse ridges of the occipital bone, the inferior posterior angles of the parietal bones, the superior angles of the petrous portion of the temporal bones, and to the clinoid processes of the sphenoid bone.

Falx cerebelli is attached to the lower half of the perpendicular ridge of the occipital bone, and extends between the lobes of the cerebellum towards the foramen magnum.

Sphenoidal folds are attached to the lesser wings of the sphenoid bone.

SINUSES.

Great longitudinal sinus, of a triangular form, extends along the convex margin of the falx cerebri. It commences by a small vein in the foramen cœcum, and increasing in size as it proceeds backwards and pours its blood into the torcular Herophili. Its interior is crossed by small bands called *chordæ Willisii*, and presents the openings of the veins which course upon the upper surface of the cerebral hemispheres, and a number of small whitish granules called *glandulæ Pacchioni mediæ*. Upon the outer surface of the upper wall of the si-

nus, between it and the cranium, are situated the *glandulæ Pacchioni externæ*.

Inferior longitudinal sinus is very small, runs along the concave edge of the falx cerebri, and terminates in the straight sinus.

Straight sinus passes from the termination of the inferior longitudinal sinus downwards and backwards, receiving the blood of the venæ Galeni, and empties itself into the torcular Herophili.

Lateral sinuses, each corresponds to the transverse groove in the occipital bone, the groove in the posterior inferior angle of the parietal bone, the mastoid fossa of the temporal bone, and the groove in the occipital bone in either side of the foramen magnum; when it passes through the foramen lacerum posterious and terminates in the jugular vein.

Torcular Herophili corresponds to the centre of the crucial spine of the occipital bone; six sinuses communicate with it, viz: the two lateral, the great longitudinal, the straight, and the two occipital.

Cavernous sinuses, each extends from the anterior clinoid process, to the petrous portion of the occipital bone; and upon being cut into presents a cellular appearance. The internal carotid artery, the sixth nerve, and branches of the sympathetic nerve, are found within each, but separated from the blood by the reflected venous lining membrane. In the outer wall of

each run the third and fourth nerves, and the first branch of the fifth; the sinus of either side presents the openings of the ophthalmic vein, of the two petrosal sinuses, and of the circular sinus.

Circular sinus surrounds the pituitary body, and is formed of an anterior and posterior transverse vein which extends from one cavernous sinus to the other.

Superior petrosal sinuses, each passes from the cavernous sinus along the upper angle of the petrous portion of the temporal bone, to the lateral sinus.

Inferior petrosal sinuses, each passes from the cavernous sinus downwards and backwards, along the line of contact of the petrosal portion of the temporal bone, and the occipital to the lateral sinus.

Transverse sinus crosses the cuneiform process of the occipital bone, and connects the inferior petrosal sinuses.

Occipital sinuses, two in number, are contained in the falx cerebelli, and open into the torcular Herophili.

TUNICA ARACHNOIDEA

Belongs to the class of serous membranes, is spread over the surface of the brain without penetrating between its convolutions, and is reflected upon the dura mater, in those situations where the nerves and veins pierce this

fibrous membrane, thus, after the manner of all serous membranes, forming a shut sac, and consisting of a parietal and a visceral layer. It also gains access to the interior of the brain by the arachnoid canal, and lines the free surfaces of the ventricles.

PIA MATER.

The vascular covering of the brain lines its entire surface, dipping between its convolutions and sending numerous blood-vessels into its substance, it is intimately connected to the arachnoid membrane by its outer surface, except at the base and sulci of brain; and entering the ventricles by the great transverse fissure at the base of the brain, presents the choroid plexuses and the choroid membrane.

THE BRAIN.

The brain is subdivided into three portions, viz: the cerebrum, the cerebellum, and the medulla oblongata.

THE CEREBRUM.

This is the largest of the three divisions, is of an oval form, and is divided into two equal portions called hemispheres, by a fissure which extends along the median line upon its upper surface, and contains the falx cerebri and the arteries of the corpus callosum. At the base

of the brain the cerebrum is also divided at each extremity by the median fissure, but in the centre both hemispheres are united.

Hemispheres, right and left, are convex superiorly and externally, and flat towards each other, where they correspond to the falx.

Lobes. Each hemisphere is divided into three lobes upon its under surface; the anterior, which is the smallest, rests upon the roof of the orbit and presents a groove for the lodgement of the olfactory nerve; the middle, prominent and convex, lies in the middle fossa, in the base of the cranium; and the posterior rests upon the tentorium.

Fissura Sylvii separates the anterior from the middle lobe, and corresponds to the lesser wing of the sphenoid bone and its fold of dura mater. The cerebral roof of this fissure is pierced by small arteries, branches of the middle cerebral artery.

Convolutions, or gyri, are eminences longitudinal and rounded, but directed in various ways upon the surface of each hemisphere.

Sulci are the fissures which separate the convolutions from each other, over which the arachnoid membrane passes, but into which the pia mater dips.

Cineritious substance of brain is of a yellowish grey color, from three to four lines in thickness, soft and vascular, and for the most part situated upon the outer surface of the brain.

It is however found in striæ and masses in the interior of the brain, and surrounded by the medullary substance. In some situations its color assumes a dark hue, as is seen when a section of the crus cerebri is made.

Medullary substance, white, elastic and fibrous, forms the greater part of the brain.

Centrum ovale minus, an oval mass of medullary substance surrounded by cineritious substance, and rendered apparent by making a section of each hemisphere within a few lines of the corpus callosum.

Centrum ovale magnum, the large oval mass of medullary structure, which is rendered apparent by slicing both hemispheres on a level with the corpus callosum.

Corpus Callosum, unites the hemispheres to each other, is about three inches in length, and presents upon its upper surface the *raphe*, which corresponds to the anterior cerebral arteries, and from which, on either side, pass the connecting transverse fibres of the hemispheres, called linæ transversæ. It unites by its posterior extremity with the fornix and the hippocampus, major and minor; its anterior extremity being curved upon itself and continuous with the optic commissure and tuber cinereum at the base of the brain.

Septum Lucidum descends from the raphe of the corpus callosum to the fornix, separating the lateral ventricles from each other. It con-

sists of four layers, two of which are cineritious and two medullary; the medullary layers having in general a cavity between them called the *fifth ventricle:* its form is triangular, the apex corresponding to the union of the corpus callosum and the fornix, the base anterior, corresponding to the curved portion of the corpus callosum.

Lateral ventricles, each consists of a body and three cornua, the body corresponding to the centre of each cerebral hemisphere, the cornua proceeding, one to each lobe. The bodies of the ventricles are separated from each other by the septum lucidum.

Corpora striata, two pear-shaped bodies, their large bulbous extremities being contained in the anterior cornua of the lateral ventricles, their narrow stalk-like extremities being directed backwards into the bodies of the ventricles; they are cineritious on their surface, but when cut into present alternating striæ of cineritious and medullary matter, and hence their name.

Optic thalami, two large bodies placed behind and between the corpora striata, each presents upon its inferior surface two tubercles, called *copora gleniculata.* Towards the median line the optic thalami are flat and united to each other by a soft cineritious structure, called *commissura mollis;* upon their external surface they are white, but their interior is grey.

Tænia Semicircularis, a narrow medullary

band situated in the groove between the optic thalamus and corpus striatum of either side.

Fornix, placed horizontally beneath the septum lucidum and corpus callosum, and composed of medullary structure, arches above the third ventricle, and lies upon the velum interpositum and choroid plexus. It commences by its *two posterior crura*, one of which lies in the inferior cornu of either lateral ventricle; these unite in the median line and form what is called the *body* of the fornix, which passes forwards and terminates in the *anterior crura*; finally, the *anterior crura* descend to the base of the brain, where they terminate in the corpora mammillaria.

The Lyra, is the appearance presented upon the under surface of the fornix by some slight lines and depressions which correspond to the vessels of the velum interpositum.

Choroid plexus. The fold of pia mater which lies upon the optic thalamus, and which entered the body of the lateral ventricle by the inferior cornu; the choroid plexus of either side passes forwards and inwards, and both unite in the foramen commune anterius.

Velum interpositum, lying underneath the fornix, unites the choroid plexuses of either side; it is composed of arachnoid membrane and pia mater, and contains in its centre the venæ Galeni.

Venæ Galeni, contained in the velum interpo-

situm, pass from before backwards and terminate in the staight sinus. These veins return the blood from the choroid plexuses and from the parts within the ventricles.

Pineal gland, a small conical cineritious body containing in general sandy matter. It is placed upon the corpora quadrigemina and is connected with the brain by a small transverse medullary band and two peduncles.

Hippocampus minor, an oval eminence in the posterior cornu of the lateral ventricle; medullary externally, and cineritious in its interior.

Hippocampus major, a similar eminence to the minor, but larger, and placed in the inferior cornu of the lateral ventricle.

Pes hippocampi, the tuberculated appearance which the extremity of the hippocampus major presents.

Tænea hippocampi, another name for the posterior crura of the fornix, which are attached to the hippocampus major of either side by their convex margins, their concave edges being free.

Corpus denticulatum, a cineritious serrated line in the inferior cornu of the lateral ventricle, and which is exposed upon removing the tænia hippocampi, beneath which it lies.

Third ventricle, a deep fissure between the optic thalami, exposed by separating these bodies. It is bounded anteriorly by the descending crura of the fornix and the anterior com-

missure, posteriorly by the posterior commissure and the tubercula quadrigemina, laterally by the optic thalami: its floor corresponds to the locus perforatus and tuber-cinereum, and it is covered in by the velum interpositum and fornix.

Foramen commune anterius, a hole by which the choroid plexuses unite anteriorly. It forms a medium of communication for the two lateral and the third ventricle.

Infundibulum, an opening leading from the anterior and inferior part of the third ventricle to the pituitary gland.

Iter a tertio ad quartum ventriculum, an opening in the posterior part of the third ventricle, under the posterior commissure and tubercula quadrigemina, and leading obliquely backwards and downwards to the fourth ventricle.

Anterior commissure, a medullary, round cord, anterior to the crura of the fornix, and passing transversely from one corpus striatum to the other.

Posterior commissure, extends transversely from one optic thalamus to the other. It is shorter and smaller than the anterior commissure.

Tubercula quadrigemina, four eminences, called also nates and testes; situated under the posterior part of the velum interpositum, and the pineal gland; the two anterior (the nates)

are connected to the optic thalami; the posterior (the testes) being connected to the cerebellum by the following processes.

Processus a cerebello ad testes, two thin medullary plates, which pass obliquely from the cerebellum upwards and inwards to the testes.

Valve of Vieussens, a layer of cineritious substance, of a triangular form, attached by its sides to the processus a cerebello ad testes, by its base to the cerebellum, and by its apex to the testes.

Fourth ventricle, is exposed by cutting through the valve of Vieussens. It is bounded anteriorly by the pons Varolii, laterally by the processus a cerebello ad testes, superiorly by the valve of Vieussens, inferiorly by pia mater and arachnoid membrane, and posteriorly by the cerebellum.

Calamus scriptorius, the fissure seen upon the posterior surface of the pons Varolii, in the fourth ventricle; from either side of which four or five lines proceed.

Choroid plexus of fourth ventricle, a small fold of pia mater, which enters the ventricle as this membrane is passing from the cerebellum to the spinal chord.

CEREBELLUM,

Consists, like the cerebrum, of two hemispheres, united anteriorly by the pons Varolii,

and posteriorly by the superior and inferior vermiform processes.

Hemispheres, are flat superiorly, where they correspond to the tentorium, and convex inferiorly where they rest in the inferior occipital fossa: the surface of each presents semicircular narrow lines, arising from the laminated arrangement of the cineritious portion of the organ; between these lamina the pia mater enters, but the arachnoid passes over them.

Crura cerebelli, two medullary chords which pass from either hemisphere and unite in the pons Varolii.

Superior vermiform process, a small conical eminence corresponding to the superior and central part of the cerebellum.

Inferior vermiform process, larger than the superior and corresponding to the inferior and central part of the cerebellum and the commencement of the spinal chord.

Arbor vitæ, the branching of the medullary substance of the cerebellum, exposed by making a vertical section of it.

Corpus dentatum, a small oval mass of cineritious substance, surrounded by medullary, and exposed upon making a section of the cerebellum parallel to, but an inch distant from, the median line.

MEDULLA OBLONGATA,

A large conical process of medullary structure,

extending from the lower margin of the pons Varolii to the commencement of the spinal chord. It is rather more than an inch in length, and presents the following six bodies, which are separated from each other by distinct grooves.

Corpora pyramidalia, the two anterior eminences of the medulla oblongata.

Corpora olivaria, smaller than the pyramidal bodies, are situated laterally.

Corpora restiformia are large, and situated posteriorly.

BASE OF THE BRAIN

Presents on either side of the median line, the anterior and middle lobe of the cerebrum, separated from each other by the fissure of Sylvius, and a lobe of the cerebellum resting upon the posterior lobe of the cerebrum. In the median line, proceeding from before backwards, is the anterior extremity of the median fissure, the lower extremity of the corpus callosum, the optic commissure, the tuber cinereum, the pituitary gland and infundibulum, the corpora albicantia, the locus perforatus, (on either side of this is the crus cerebri,) the pons Varolii, and lastly the posterior extremity of the median fissure.

ORIGIN OF THE CEREBRAL NERVES.

First pair (olfactory), each arises by three

roots, the external, long and white from the fissure of Sylvius; the internal, also white from the posterior internal surface of the under part of the anterior lobe and the middle, short and cineritious, from the posterior edge of the anterior lobe.

Second pair (optic), each arises by two roots from the corresponding natis and testis; that from the natis joins the corpus geniculatum externum; the other the corpus geniculatum internum; the roots then unite and form the tractus opticus, which passes around the crus cerebri, and to which it is united by fine cellular tissue; the tracts, one from either side, then unite in the optic commissure, having previously sent a few fibres into the tuber-cinereum and from the anterior part of this commissure, proceed the optic nerves.

Third pair (oculo-muscular), each arises from the inner side of the crus cerebri, near the pons Varolii, and from the corpus pyramidale, as this body passes through the pons.

Fourth pair (inner oculo-muscular), each arises from the processus é cerebello or its corresponding side by two or three fine filaments.

Fifth pair (trigeminal), consists of two portions, one for sensation, the other for motion. *The motor division* arises from the corpus pyramidale, in the substance of the pons Varolii, and the sensory division from the angle between the crus cerebelli and the pons Varolii.

Sixth pair (abducentes), each arises from the corpus pyramidale near its junction with the pons Varolii.

Seventh pair consists of the *portio dura*, or facial, and the *portio mollis*, or auditory. *The portio dura* arises from the groove between the corpus pyramidale and olivare, a little below the pons Varolii. *The portio mollis* arises by three or four white lines from the calamus scriptorius in the fourth ventricle.

Eighth pair consists of the *glosso-pharyngeal*, *pneumo-gastric* and *spinal accessory*. *The glosso-pharyngeal* arises from the groove between corpus olivare and corpus resitiforme, by four or five filaments. The *pneumo-gastric* arises in the same groove, but below the glosso-pharyngeal, by eight or ten filaments, and the *spinal accessory* arises from the side of the cervical spinal chord, about its middle, by several filaments.

The *ninth* (linguales) each arises by seven or eight filaments from the groove between the pyramidal and olivary bodies, about half an inch below the origin of the sixth.

CEREBRAL NERVES.

First pair (or olfactory), sends off three sets of branches. *Internal branches* to septum nasi; *middle branches* to mucous membrane of roof of each nostril; and *external branches* to spongy bone.

Second pair (or optic), pierce the sclerotic coat of the eye, and form the retina.

Third pair (or motores oculorum). *Superior, or smaller branch*, supplies the superior rectus, and the levator palpebræ. *Inferior, or larger branch*, supplies the internal rectus, the inferior rectus, and the inferior oblique; and also sends a branch to the lenticular ganglion.

Fourth pair (or pathetici), are distributed to superior oblique muscles of eye.

Fifth pair (or trigemini), first form the Gasserian ganglion and divide into three main branches.

Ophthalmic division.—1. Descending branches to unite with the sympathetic. 2. Lachrymal nerve, which sends a branch through the spheno-maxillary fissure, to unite with the superior maxillary nerve and a branch through the malar bone to the cheek, the terminal branches being distributed to the lachrymal gland, and the conjunctiva. 3. Frontal nerve, sends a branch to unite with the infra-trochlear branch of the nasal; a supra-trochlear branch, which becomes the internal frontal, and the proper frontal, which passes over the frontal bone to the forehead. 4. Naso-ocular nerve, sends a branch to communicate with the sympathetic—a branch to the third pair—two long ciliary nerves—a branch to the lenticular ganglion—the infra-trochlear branch, and the nasal branch.

Superior maxillary division. — 1. Orbital

branch which sends off a malar twig and a temporal twig. 2. Two branches to Meckel's ganglion. 3. Posterior dental, which sends off an anterior branch to the buccinator muscle and gums, and a posterior branch to the molar teeth. 4. Anterior dental, to the antrum and teeth. 5. Infra-orbital, distributed to the face.

Inferior maxillary division.—1. The superior or external branch sends off deep temporal twigs—a masseteric branch to massetur muscle and temporo-maxillary articulation—a buccal branch to the buccinator and temporal muscles, and a pterygoid branch to the pterygoid and palatine muscles. 2. Inferior or internal branch, sends off the temporo-auricular, which goes to the cartilages of the ear and temple and the inferior dental, which gives off the mylo-hyoid nerve, and the mental nerve. 3. The gustatory, which goes to the muscles, glands, and papillæ of the tongue, and is joined by the chorda tympani nerve.

GANGLIONS IN CONNECTION WITH THE FIFTH PAIR.

Gasserian Ganglion.—A large grey semilunar body, placed in the middle fossa of the base of the cranium, concave posteriorly, where it receives the fifth nerve, and convex anteriorly and externally, from which part proceed the three main divisions of the fifth, just described.

Meckel's Ganglion.—A litte red body of a triangular shape, situated deep in the fat and cel-

lular tissue of the pterygo-maxillary fossa; it communicates superiorly by two small nervous twigs with the second divison of the fifth, and sends off—1. Spheno-palatine nerve to the mucous membrane of the superior and middle spongy bones, from which proceeds the naso-palatine branch, which runs along the septum nasi, and terminates in the foramen incisivum. 2. Palatine nerve, descends in the palatine canal, and divides into anterior branches which supply the teeth, and posterior and middle branches, which supply the amygdalæ soft palate and uvula. 3. Vidian nerve, passes backwards through the vidian canal, enters the cranium by the foramen lacerum anterius, and divides into an inferior and a superior branch, having first sent filaments to the sphenoidal sinus; the inferior branch enters the cavernous sinus, and unites with the branches of the sympathetic, whilst the superior branch runs beneath the gasserian ganglion on the petrous portion of the temporal bone, enters the hiatus Fallopii, attaches itself to the portio dura nerve, again leaves it, and enters the tympanum a little below the pyramid, and is here called chorda tympani. It then passes between the long crus of the incus and the handle of the malleus, emerges from the tympanum by the glenoid fissure, unites with the gustatory nerve, and at the submaxillary gland it terminates in a small ganglion named after Boch.

The lenticular ganglion is situated between

sympathetic. 5. Inferior laryngeal or recurrent nerve which sends off cardiac filaments—branches to the forepart of the trachea and thyroid gland, and branches to the pharynx, laryngeal muscles, and mucous membrane, on which they communicate with branches of the superior laryngeal. 6. Pulmonary branches which send off branches in front of the bronchial tubes to form the anterior or lesser pulmonic plexus; this plexus sends filaments to the pulmonary vessels, also to the lungs and pericardium, and to the posterior pulmonic plexus. 7. Posterior, or greater pulmonic plexus, is formed by the pneumo-gastric nerves which increase in size at the root of each lung, and subdivide and unite in an areolar manner. This plexus is joined by several branches of the sympathetic nerve, and its branches accompany the bronchial tubes through the substance of the lung. 8. Œsophageal plexus or plexus gulæ, is formed by the communications of both nerves, encircling the œsophagus in their course along this tube. 9. Cardiac, or gastric plexus, is formed by both nerves dividing, subdividing, and uniting upon the stomach. The left pneumo-gastric nerve is anterior upon the stomach, and sends branches to the lesser omentum and liver; the right is posterior.

Nervus accessorius, or third branch of the eighth. 1. Branches to communicate with the eighth, ninth, and sympathetic nerves. 2.

Branches to the sterno-cleido-mastoid muscle, which muscle it then perforates. 3. Terminal branches to the trapezius muscle and skin.

Ninth pair, or lingual.—1. Descendeus noni receives a filament from the pneumo-gastric, and unites with the internal descending branches of the cervical plexus, forming a small triangular plexus, the branches of which pass to the omo and sterno-hyoid and thyroid muscles. 2. Branches to the constrictors of the pharynx and thyro-hyoid muscle. 3. Branches to the hyo-glossus and surrounding muscles, and to the gustatory branch of the fifth pair. 4. Terminal branches to the geniohyo-glossus muscle.

SPINAL NERVES.

Symmetrical, 30 pairs,* viz :—8 cervical, 12 dorsal, 5 lumbar, and 5 sacral. Each spinal nerve has two roots, an anterior and a posterior. The anterior is small, and is the motor division. The posterior large, with a ganglion upon it, and is for sensation. These roots are separated by the chord itself, and by the ligamenta denticulata. The anterior root is connected to the surface of the ganglion of the posterior root. On the outer side of the ganglion both nerves unite in a single chord, which after a short course, divides into an anterior and posterior branch.

* Some describe 31 pairs, making 6 sacral.

The posterior branches of this division are the smaller, (except that of the second cervical,) and are distributed to the dorsal muscles and integuments. The anterior branches form the several plexuses, and supply the muscles and integuments anterior to the spine, and also the extremities.

DISTRIBUTION OF THE EIGHT CERVICAL NERVES AND FIRST DORSAL NERVES.

Posterior branches are small, except the second cervical, which accompanies the occipital artery; the rest are lost in the neighboring muscles and integuments.

Anterior branches.—The first, or sub-occipital, twists round the atlas, to unite with the second, forming the nervous loop of the atlas; and the second, having received the first, descends to unite with the third. The third unites in like manner with the fourth, and thus is formed, by the anterior branches of the four first cervical nerves, the

CERVICAL PLEXUS.

From this plexus proceed:—

1. *Ascending superficial branches* to the platysma, integuments, parotid gland, ear, and back of the head. One of these is called *ascendens colli*, which arising chiefly from the third cervical, is distributed to the ear; it accompanies the external jugular vein.

2. *Ascending deep branches*, which supply sterno-cleido-mastoid, digastric, splenius, and adjacent muscles.

3. *Descending internal branches*, which send a superficial branch to join the descendens noni and the deep or *phrenic*, or *internal respiratory*, which comes chiefly from the fourth cervical, and often receives a filament from the brachial plexus, having sent small filaments to the liver, œsophagus, inferior cava, and stomach; it ultimately distributes itself to the diaphragm.

4. *Descending external branches.*—The superficial branches of this set are distributed to the clavicle, acromion, pectoral, and deltoid muscles and integuments; and the deep branches to muscles of the neck and scapula, one of which (the largest) is given to the serratus magnus muscle, and is the *external respiratory nerve.*

THE BRACHIAL PLEXUS,

Is formed by the union of the anterior branches of the four inferior cervical and first dorsal nerves. From this plexus proceed—

Thoracic nerves; they are four or five in number, and come off from the upper part of the plexus; they divide into anterior thoracic branches, which descend behind the clavicle, in front of the axillary artery, and supply the pectoral muscles, and posterior thoracic branches, which pass behind the axillary vessels to the serratus magnus and rhomboid muscles.

2. *Supra-scapular nerve* passes through the notch in the scapula, and supplies the supra-spinatus, infra-spinatus, and teres muscles.

3. *Subscapular nerves*, are three or four in number, and descend behind the vessels to the subscapular, latissimus dorsi, and teres major muscles.

4. *Internal cutaneous nerve*, sends an external branch, which descends over the bend of the elbow, as low as the wrist, and an internal branch which descends towards inner condyle, and sends branches to inner and posterior part of the forearm.

5. *External cutaneous*, musculo-cutaneous or perforans casserii, which sends branches to the coraco-brachialis biceps and brachiæus anticus; an anterior branch to the ball of the thumb and palm of the hand; and a posterior branch to the dorsum of the hand.

6. *Median nerve*, or brachial nerve, sends branches to the superficial and deep pronators and flexors—the anterior interosseal nerve, which supplies the deep flexors, and sends a branch to the pronator quadratus, and another to the dorsum of the hand—a superficial branch which is given off above the wrist, and which runs to the palm of the hand, and five digital branches, which supply the thumb, index, and fore fingers, and the radial edge of the ring finger.

7. *Ulnar nerve*, sends muscular branches to

triceps, flexor sublimis, and flexor lunaris muscles—the nervus dorsalis carpi ulnaris to the integuments on the dorsum of the hand and the three inner fingers—the superficial palmar branch which divides into three digital branches which supply the little finger and the ulnar edge of the ring finger, and the deep palmar branch to form the deep palmar arch, which supplies the interossei muscles.

8. *Musculo-spiral*, or radial nerve, branches to the triceps—a long cutaneous branch to the thumb—branches to the supinators and extensors—the anterior or radial branch which runs along the inner side of the supinator radii longus, which it supplies, and sends a branch to the integuments of the thumb, and another to the dorsum of the hand, which supplies the index and middle fingers, and communicates with the dorsalis ulnaris; and a deep branch, or posterior interosseal, which supplies by superficial and deep branches the extensor muscles.

9. *Circumflex, or articular nerve*, sends branches to the subscapular and adjacent muscles, and is principally distributed to the deltoid muscle.

TWELVE PAIR OF DORSAL NERVES.

Posterior branches are small, and pass backwards to the muscles and integuments of the back and loins.

Anterior branches, or *Intercostals*.—First

is the largest; it contributes to the formation of the brachial plexus. Second and third run backwards and outwards, and at the angle of the ribs pass between the intercostal muscles, and running along the lower edge of each rib, supply the surrounding muscles: opposite the axilla they send off the *nerves of Weisberg*, or cutaneous nerves of the arm, and the terminal branches supply the muscles and skin upon the lateral and forepart of the thorax. Fourth to twelfth, inclusive, are similar to the second and third in distribution, supplying the intercostal and adjacent muscles; the two last go chiefly to the diaphragm, and the 12th sends a branch to join the first lumbar. [All the intercostals are connected by two short branches to the ganglions of the sympathetic.]

FIVE PAIR OF LUMBAR NERVES.

They are larger than the dorsal, and like them divide into posterior and anterior branches.

Posterior branches are distributed to the lumbar muscles.

Anterior branches unite in the substance of the psoas muscle, to form the lumbar plexus.

LUMBAR PLEXUS.

1. *External inguino-cutaneous*, sends branches to the abdominal muscles, a cutaneous branch to the integuments on the outer part of the thigh, and the external spermatic nerve.

2. *Middle inguino-cutaneous* to the skin, on the outer part of the thigh.

3. *Internal inguino-cutaneous*, sends a branch to the spermatic chord, which accompanies the spermatic vessels, and a branch to the integuments and glands of the groin.

4. *Anterior crural nerve* formed by the four superior nerves, passes beneath Poupart's ligament, and divides into two fasciculi. The superior fasciculus sends four or five long branches, which pierce the fascia lata, and descend to the knee, some of them accompany the saphena vein; and the deep fasciculus sends external muscular branches to the vastus internus, rectus, iliacus internus, and tensor vaginæ femoris muscles, and internal branches to the sartorius, vastus internus, and cruræus: branches also accompany the femoral artery, near to the knee, and the *internal saphenus nerve*, which joins the saphena vein at the knee, lying between the tendons of the gracilis and sartorius, goes on to the inner side of the foot, sending off numerous branches to the integuments.

5. *Obturator nerve* sends branches to the obturator internus, an anterior branch to the adductor brevis, pectinæus, and vastus internus muscles; and a posterior branch to the gracilis and the adductor magnus and longus muscles.

6. *Lumbo-sacral nerve* proceeds from the fourth and and fifth lumbar into the pelvis, and divides into the superior glutæal and the com-

municating nerve; the superior glutæal is distributed to the glutæus medius and minimus muscles; and the communicating branch joins the first sacral nerve.

FIVE PAIR OF SACRAL NERVES.

Posterior branches very small, to muscles and integuments.

Anterior branches very large, particularly the three superior: these five, with the communicating branch of the lumbo-sacral, form the sacral plexus.

SACRAL PLEXUS,

Sends off internal or pelvic branches, which are named hæmorrhoidal, vesical, uterine and vaginal. External branches.

1. *Lesser Sciatic nerve*, sends off superficial branches, these pass over the hamstring muscles, with the posterior cutaneous nerve, and are lost in these muscles; the deep branches go to the quadratus femoris, the abductor muscles, and to the hip joint.

2. *Inferior glutæal nerve*, to the glutæus maximus, perinæum, and the inner side of the thigh.

3. *Posterior cutaneous nerve*, to the back part of the thigh and leg.

4. *Pudic nerve*, sends an inferior branch to the muscles of the perinæum and to the scro-

tum; and a superior branch which passes along the dorsum of the penis to its glans.

5. *Grand Sciatic nerve*, or *Posterior Crural*, sends off several cutaneous branches to supply the hamstring, the gracilis, and the adductor muscles; it divides at the upper and outer part of the popliteal space into two branches, viz., the peroneal nerve and the posterior tibial nerve. The peroneal nerve first sends off the external cutaneous nerves of the leg, which communicate with the external saphenus nerve; it next gives off the musculo-cutaneous nerve, which divides into an internal and an external branch, the former being distributed to the integuments of the first and second toes, and the latter to the integuments of the third, fourth, and fifth toes; and its last branch, the anterior tibial, supplies the integuments on the anterior part of the leg and the tibialis anticus, the extensor digitorum longus, the extensor pollicis, and the extensor digitorum brevis muscles, and terminates at the first interosseal space by communicating with the plantar nerves, having first supplied the inner interosseal muscle. The posterior tibial division of the great sciatic first sends off the external saphenus nerve, which is distributed to the gastrocnemius solœus, plantaris and deep muscles, and small branches to the anterior and posterior tibial arteries; it finally divides into the internal and external plantar nerves; the former sending branches to

the plantar muscles and skin, and four digital branches to supply the 1st, 2d, 3d toes, and inner side of the 4th toe, and the latter a superficial branch to the little toe and outer side of the 4th toe, and a deep branch to the plantar and interossei muscles.

SYMPATHETIC OR GANGLIONIC SYSTEM OF NERVES.

The sympathetic nerves communicate by their superior extremities with several of the cerebral nerves by fine filaments, also with all the spinal nerves; by one filament with each cervical, and by two filaments with each dorsal, lumbar, and sacral.

THE CERVICAL GANGLIONS,

Are three in number.

Superior cervical ganglion extends from the first to the third cervical vertebra, and sends off, 1. Two superior branches, which ascend along with the carotid artery in the carotid canal to the cavernous sinus, where they communicate with the sixth or abducens nerve, and with the vidian nerve. 2. Descending or inferior filaments which join the laryngeal and pneumo-gastric nerves, the superior cardiac nerve, and the middle cervical ganglion, if it exists; if not, they join the inferior ganglion. 3. Internal branches which unite with the pharyngeal plexus. 4. External branches to join the superior cervical nerves. 5. Anterior branches which unite with the pneumo-gastric and facial

nerves, and form a plexus around the carotid artery, from which branches proceed along the external carotid and its divisions.

Middle cervical ganglion is sometimes absent; when present it sends branches to unite with the vagus and cervical nerves, and branches to join the cardiac nerves.

Inferior cervical ganglion is situated between the transverse process of the last cervical vertebra and the neck of the first rib; it sends branches to the phrenic nerve, brachial plexus, subclavian artery, and its ramifications, and branches to the inferior cardiac nerve.

Cardiac Nerves are three in number, and are named superior, middle, and inferior. 1. Superior Cardiac Nerves, arise by two or three filaments from the superior cervical ganglion, communicate with the vagus and laryngeal nerves, and with the middle and inferior cervical ganglia, pass along the coats of the arteria innominata on the right side, and between the left carotid and left subclavian on the left side to the aorta, and here communicate with the recurrent nerves, and with the middle and inferior cardiac nerves, and the cardiac ganglion or plexus. 2. Middle Cardiac Nerves. That of the right side is generally the largest; on the left side it is something wanting. They enter the thorax anterior to the subclavian artery, are joined by branches from the pneumo-gastric and recurrent nerves, and, passing along

the arteria innominata, terminate in the cardiac ganglion and plexus. 3. Inferior Cardiac Branches. The right descend along the arteria innominata to the fore part of the arch of the aorta, and terminate in the anterior cardiac plexus: some branches pass between the aorta and pulmonary artery to the cardiac ganglion; on the left these nerves accompany the subclavian artery, and partly join the middle cardiac nerve, and partly the cardiac plexus.

Cardiac Plexus, or Cardiac Ganglion, is situated behind the ascending aorta, near its origin, in front of the trachea and right pulmonary artery; it consists of a plexus of nerves formed by the cardiac nerves of the opposite sides and branches of the eighth pair and recurrent. In the meshes of this plexus several small ganglions are enclosed, and to these conjointly the term cardiac ganglion is applied. Branches proceed from this plexus to the coronary and pulmonary vessels, to the aorta and vena cava, and to the substance of the heart itself.

Thoracic Ganglions are twelve on each side, sometimes only eleven, the last cervical and first dorsal being united. 1. Branches to the mediastinum, which ramify on the aorta and adjacent vessels, and communicate with the pulmonary plexus. 2. Great Splanchnic Nerve is formed by distinct roots, from the 6th, 7th, 8th, 9th, and 10th ganglions, which unite on the 10th

dorsal vertebra into one chord, which chord entering the abdomen along with the aorta, or separated from it by a fasciculus of the diaphragm, expands into the semilunar ganglion. 3. Lesser Splanchnic Nerve arises by two roots from the 10th and 11th ganglions, and uniting on the side of the last dorsal vertebra, enters the abdomen through the crus of the diaphragm, and ends in the renal plexus.

Semilunar Ganglia are situated on the diaphragm, partly on the aorta, and on either side of the cœliac axis, and above and behind the supra-renal capsule. They are the largest ganglia of the sympathetic; several nervous filaments, on which small ganglia are placed, pass from one to the other surrounding the cœliac axis, forming a plexus, called the

Solar Plexus, which is situated behind the stomach, above the pancreas, and in front of the aorta. 1. Branches in various directions, accompanying the blood-vessels, forming plexuses around each, and named accordingly, as hepatic, splenic, and gastric, and these communicate with the eighth pair. 2. Branches descending in front of the aorta, which subdivide at the renal and mesenteric arteries, accompanying them, and forming plexuses, named accordingly, viz: renal, superior, and inferior mesenteric, and into each of these branches the lumbar ganglions enter.

Renal Plexus receives the lesser splanchnic

nerves; from it descends 1. Spermatic Plexus, which goes to the testicle in the male, and to the ovarium and uterus in the female.

Inferior Mesenteric Plexus sends branches which descend to the brim of the pelvis, unite with others from the lumbar ganglions, and form a plexus around the internal iliac artery and its branches, named hypogastric plexus. It is joined by numerous filaments from the lumbar and sacral ganglions of the sympathetic, and communicates with the pelvic branches of the sacral plexus.

Lumbar Ganglions are five on each side, sometimes only three or four. 1. Branches to anterior branches of lumbar spinal nerves. 2. Branches to assist in forming the several abdominal plexuses.

Sacral Ganglions are three or four in number. 1. Branches to sacral nerves. 2. Filaments to hypogastric and pelvic plexuses. 3. A small branch from the last ganglion, which passes in front of the coccyx, there forming with its fellow the

Ganglion Impar, which sends branches to the coccygæus, levator, and sphincter ani muscles.

THE THORAX AND ITS CONTENTS.

The thorax is bounded anteriorly by the sternum and cartilages of the ribs, posteriorly by the vertebræ and lesser circle of the ribs, and on either

side by the shafts of the ribs and the intercostal muscles. Its upper orifice is transversely oval, and allows the exit and entrance of vessels, nerves, and muscles to and from its cavity; its inferior orifice, or circumference, being much larger, and closed by the diaphragm.

The thorax contains the heart and lungs, and also several vessels, nerves, glands, &c., to be noticed as we proceed.

THE PLEURÆ

Are two serous membranes, one on either side, which cover the inner surface of the thorax, and are reflected upon the outer surfaces of the parts contained in its cavity. That portion of the pleura which lines the thorax, is called the *parietal* layer, and that which lines the contained parts the *visceral layer*. Each pleura can be traced in the following manner:—From the posterior surface of the sternum it passses backwards until it meets with the anterior surface of the pericardium, along the side of which it passes to the anterior surface of the root of the lung; from this it passes upon the lung, and is reflected over the entire surface of the organ, until it arrives at the posterior surface of its root and of the pericardium, from whence it passes upon the sides of the bodies of the vertebræ, reaching as high as the transverse process of the sixth cervical vertebra on the right side, the seventh on the left, and descending to

the diaphragm; the thoracic aspect of which it covers; it finally lines the ribs and intercostal muscles, until it arrives at the portion which was opened, and which corresponds to the posterior aspect of the sternum.

Ligamentum latum pulmonis (one on either side) is merely a triangular fold of pleura, formed by the reflection of the membrane from the lower edge of the root of the lung upon the diaphragm.

ANTERIOR MEDIASTINUM.

A triangular cavity formed by tearing through the cellular tissue, which connects the right and left pleura behind the sternum; the base is formed by the sternum, the sides by the separated pleura, and the apex corresponds to the anterior surface of the pericardium, where the pleuræ separate to enclose this bag. Thus formed, it contains the origins of the sterno-hyoid and sterno-thyroid muscles, branches of the descendens noni nerve, the remains of the thymus gland, lymphatic glands and absorbents, the mammary vessels, the triangulares sterni muscles, and loose cellular tissue.

MIDDLE MEDIASTINUM.

Is of an oval shape, and is formed by the reflection of the pleuræ upon the sides of the pericardium; it consequently contains this bag and its contents.

POSTERIOR MEDIASTINUM.

Is formed by the reflection of the pleuræ upon the sides of the bodies of the vertebræ; it is of a triangular form, the apex anterior corresponding to the posterior surface of the pericardium, the sides formed by the pleuræ, and the base represented by the anterior surfaces of the bodies of the vertebræ; it extends from the third to the tenth dorsal vertebra, and contains the following parts:—the bifurcation of the trachea, the œsophagus and pneumo-gastric nerves, the thoracic duct, the vena azygos, the thoracic aorta, the splanchnic nerves, lymphatic glands, absorbents and loose cellular tissue.

THE LUNGS

Are two soft, spongy, vascular bodies, one contained on each side of the cavity of the chest. Each lung resembles a cone, with that side corresponding to the median line truncated; the base concave corresponds to the diaphragm, the obtuse rounded apex rises in the neck, a little above the level of the first rib; the external convex surface corresponds to the internal concave surface of the thoracic parietes, and the flat or truncated surface corresponds to the mediastina. The posterior edge of the lung is thick and rounded, whilst the anterior is thin and irregular. Each lung is distinguished into lobes, which are separated

from each other by fissures; a little above the centre of each is the *root* formed by the pulmonary vessels and bronchial tube, connected to each other by cellular tissue, and invested by the pleura. The bronchial tube is situated posterior and superior to the pulmonary vessels; the two pulmonary veins are placed anterior and inferior to the artery and bronchus, and the pulmonary artery is placed between the bronchus and the pulmonary veins, but behind the pulmonary veins and before the bronchus. The *root* of each lung has anterior to it the phrenic nerve and filaments of the pneumogastric nerve, posterior to it the pulmonic plexus, and inferior the ligamentum latum. The root of the right lung has the vena azygos arching over it.

The right and left lungs differ from each other in some important particulars: the right lung is broader and shorter than the left, and consists of three lobes, separated by two fissures; the right also ascends higher in the neck, and the anterior edge of the left presents a notch where it corresponds to the apex of the heart.

The intimate structure of the lungs consists of the ultimate ramifications of the bronchial tubes, which are the continuations of the trachea, and the branches of the pulmonary artery and veins; they also receive bronchial arteries for their nutrition.

TRACHEA AND ITS RAMIFICATIONS.

The wind-pipe, or trachea, is a cylindrical tube, extending from the crycoid cartilage of the larynx to the level of the third dorsal vertebra. It consists of from seventeen to twenty fibro-cartilaginous rings, truncated behind, and connected to each other by an elastic membrane; about the posterior fourth of each ring is deficient, and its place is supplied by fibrous membrane.

Opposite the third dorsal vertebra the trachea divides into the right and left bronchial tubes; the right bronchus is larger than the left, and runs transversely into the root of the lung and divides into three branches; the left bronchus passes through the arch of the aorta to the root of the left lung, and divides into two branches.

The bronchi consist of cartilaginous rings, but as these tubes advance into the substance of the lung they diminish in size and firmness, until their place is supplied by fibrous tissue, or transverse circular fibres, which tissue also disappears, and at length nothing remains but the mucous membrane, which terminates in the air-cells, upon which ramify the ultimate ramifications of the pulmonary artery and the commencing radicles of the pulmonary veins.

The ramifications of the pulmonary artery communicate with those of the pulmonary veins, beneath the mucous membrane of the

air-cells, and are enveloped in fine cellular tissue; and except this cellular tissue the lung has no proper parenchyma, its structure being entirely filaments-vascular. The lungs are supplied with blood by the *bronchial arteries*, derived from the thoracic aorta; these vessels run along the bronchial tubes, subdivide as they proceed, and form a minute net-work on the attached surface of the bronchial mucous membrane; the blood they convey to the lungs is *returned* to the vena azygos, or superior cava. The nerves distributed to the lungs are derived from the eighth pair, and a few filaments from the sympathetic.

HEART AND PERICARDIUM.

The pericardium consists of two layers, an outer or proper fibrous layer and an internal or serous layer. It is of a conical form, the base below connected to the central division of the cordiform tendon of the diaphragm; the apex above corresponding to the great vessels at the base of the heart, along the outer coats of which the fibrous layer is gradually lost; it is connected laterally to the pleura and to the pulmonary vessels, and the phrenic nerves, one on each side, run in close contact with it to the diaphragm. Upon laying open the pericardium, the cavity of the serous layer is exposed, and, like all serous membranes, consists of two portions—a parietal

layer, which lines the inner surface of the fibrous pericardium, and a visceral layer which lines the outer surfaces of the heart and great vessels. Covered by the serous membrane, when the pericardium is fully opened, we bring into view the right auricle, the venæ cavæ, the left auricular appendix, the right ventricle, the tip of the left ventricle, which forms the apex of the heart, the aorta, the pulmonary artery and the anterior branches of the coronary vessels, with the ramifications of the cardiac nerves. Upon turning up the heart its posterior surface will be brought into view, presenting the left auricle, proceeding to which, on either side, are the pulmonary veins, and the left ventricle.

The serous membrane may be traced in the following manner:—after having lined the fibrous pericardium it is reflected on the superior cava, and the aorta, and the pulmonary artery, as these vessels are passing through the fibrous membrane, ascending highest, however, upon the aorta; inferiorly it is partly reflected around the inferior cava, as this vessel pierces the fibrous pericardium to enter the right auricle, and laterally it is reflected upon the pulmonary veins as these vessels pierce the fibrous pericardium to enter the left auricle; from these different points it reaches the surface of the heart, which it completely covers.

The heart, of a conical shape, is situate obliquely between the lungs, its base being

superior, posterior, and to the right side, its apex pointing towards the cartilage of the sixth rib of the left side. The axis of the heart is obliquely from right to left, and from behind forwards. It is retained in its situation by the great vessels and the reflections of the serous membrane.

The heart consists of four cavities, two auricles and two ventricles; the auricles are separated from each other by a partition, called septum auricularum, the ventricles by the septum ventriculorum. We shall examine these cavities in the order of the circulation.

The right auricle is placed between the two venæ cavæ, the blood conveyed by which it receives and transmits to the right ventricle; the small loose portion is called the *auricular appendix*, and the portion between the cavæ the *sinus of the auricle*. Upon laying open this auricle, by a perpendicular cut from the superior cava to within a few lines of the entrance of the inferior cava, and by a second cut from the centre of this, at right angles towards the auricular appendix, the following parts present themselves.

Tuberculum Loweri, an eminence upon the under surface of the sinus of the auricle and placed between the orifices of entrance or the venæ cavæ.

Septum auricularum, a membrano-muscular partition separating this auricle from the left.

Fossa Ovalis, an oval depression in the septum which marks the situation of the foramen ovale, or the oval communication which existed between both auricles in the fœtus. The edges of this fossa present a thickened margin, the anterior part of which is named the left or anterior limbus of the fossa ovalis, and the posterior, the right or posterior limbus. This fossa and its limbi exist in the right aspect of the septum on account of the valve in the fœtus, which is destined to close the opening between the two auricles when the pulmonic circulation is established, being situated in the left auricle and being applied to the foramen on its left aspect. We accordingly find the left aspect of the septum auricularum perfectly smooth.

Valvula Nobilis or *Eustachian valve*, a semilunar fold of the lining membrane attached by one cornu to the anterior limbus of the fossa ovalis, and continued around the anterior aspect of the inferior vena cava, to reach the posterior limbus of the fossa ovalis, to which it is attached by its inferior cornu.

Musculi Pectinanti, the muscular bands situated in the auricular appendix.

Openings of the Venæ Cavæ. The superior cava opens at the upper and back part of the auricle, its direction being downwards, forwards, and inwards; the inferior cava opens beneath, in a direction upwards, backwards, and inwards.

Opening of the Coronary Vein is situated

between the Eustachian valve and the right ventricle, and is guarded by a semilunar valve (the valve of the coronary vein.)

Opening of the Auricular Appendix, is small and circular, and exists where this portion of the auricle joins the sinus.

Foramina Thesebii, small orifices on different parts of the auricle, supposed to be the openings of veins.

Right Auriculo-ventricular opening, the large opening by which the auricle communicates with the ventricle, the boundaries of each cavity being marked by a white line.

Right ventricle, of a conical form, is joined by its basis to the right auricle, its apex being above the apex of the heart, in consequence of the apex of this organ being formed by the left ventricle.

Septum ventriculorum, a thick muscular partition which separates one ventricle from the other.

Carnæ Columnæ, the muscular projections in the interior of the ventricle, which give it its irregular appearance.

Chordæ tendineæ, the delicate but strong tendinous cords which are connected by one extremity to the carneæ columnæ, and by the other to the tricuspid valve.

Tricuspid valve, three triangular duplicatures of the lining membrane of the heart, strengthened by the chordæ tendineæ which

pass from their apices to their bases. These triangular valves are attached by their bases to the right auriculo-ventricular opening, and by their apices to the chordæ tendineæ, and prevent the regurgitation of the blood from the ventricle into the auricle by closing the opening of communication between both cavities when the ventricle contracts.

Orifice of the Pulmonary Artery is situated at the left extremity of the base of the ventricle, close to the right auriculo-ventricular opening, which is situated inferior, posterior and to its right, and separated from the mouth of the artery by the largest triangular division of the tricuspid valve.

Pars Planum is a name given to that smooth portion of the ventricle, which leads to the mouth of the pulmonary artery.

Pulmonic Semilunar Valves extend from the line of junction of the pulmonary artery and right ventricle into the cavity of the former. These three valves are duplicatures of the lining membrane, and are attached by their convex edges to the roots of the pulmonary artery; their free concave margins presenting in their centre a small tubercle, called *corpus sesamoideum.* These valves, when the blood passes from this ventricle into the pulmonary artery, are thrown down, and thus, by closing the opening, prevent a reflux of the blood back again into the ventricle.

Left Auricle is placed at the upper and back part of the heart, and is of a quadrilateral form. It is smaller than the right auricle, and receives, at its four angles, the opening of the pulmonary veins; its parietes are much thicker than the right; its auricular appendix smaller, but the musculi pectinati are the stronger; with the exception of the auricular appendix its inner surface is smooth, and it communicates with its corresponding ventricle by the left auriculo-ventricular opening, which is situated inferior to the opening of the auricular appendix, and marked by a whitish line. The septum auricularum presents towards this auricle asmooth aspect, from circumstances already explained.

Left Ventricle is longer, stronger, and smaller than the right; from its greater length it forms the apex of the heart; from its greater strength it is of power sufficient to propel the arterial blood through the aorta and its ramifications. We consequently find the carneæ columnæ, the chordæ tendineæ, the bicuspid, or mitral valve, the parietes of the cavity, the aorta, which arises from it, and the semilunar valves, with their corpora sesamoidea, which guard the opening of this vessel, much stronger than in the right division of the heart.

The left auriculo-ventricular opening, and the mouth of the aorta, are situated at the base of this cavity, and are close to each other, the aortic opening being anterior, and both being

separated, as in the right ventricle, by the larger division of the bicuspid valve. With the exception of the peculiarities just mentioned, the left auricle and ventricle are, in their anatomical configuration, similar to the right, and the several valves, muscular eminences, tendons, cords, &c. serve similar purposes.

ARTERIES.

THE AORTA,

Is divided into three portions, viz., the arch of the aorta, the thoracic aorta, and the abdominal aorta.

THE ARCH OF THE AORTA

Sends off five branches.

A. *Arteria coronaria dextra,* which sends a branch to the right auricle, a branch to the anterior part of the right ventricle, and a branch to the posterior part of the right ventricle.

B. *Arteria coronaria sinistra,* which sends a branch to the left auricle and a branch to the left ventricle.

C. *Arteria innominata,* which divides into the right carotid and right subclavian arteries.

D. *Left carotid artery.*

E. *Left subclavian artery.*

THE COMMON CAROTIDS

Divide into two branches.

A. *External carotid artery.*

B. *Internal carotid artery.*

sends off ten branches, viz.—

A. *Superior thyroid*, which sends off 1st, a hyoidean branch; 2d, a superficial branch; 3d, a laryngeal branch; and 4th, a thyroidean branch.

B. *Lingual*, which sends off, 1st, a hyoidean branch; 2d, the dorsalis linguæ artery; 3d, the sublingual artery; and 4th, the ranine artery.

C. *Facial*, which sends off, 1st, the inferior palatine; 2d, the tonsillar; 3d, the glandular; 4th, the submental; 5th, the inferior labial; 6th, the inferior coronary; 7th, masseteric; 8th, superior coronary; 9th, the lateral nasal; and 10th, the angular.

D. *Muscular*.

E. *Occipital*, which gives off the cervicalis descendens, the inferior meningeal, and the superficial.

F. *Posterior auris*, which gives off the muscular, the glandular, and the stylo-mastoid.

G. *Ascending pharyngeal*, which gives off the pharyngeal branches, and the meningeal branches.

H. *Transverse facial*.

I. *Superficial temporal*, which gives off, 1st, the anterior auris; 2d, the capsular branches; 3d, the middle temporal; 4th, the posterior temporal; and 5th, the anterior temporal.

K. *Internal maxillary*, which gives off 1st. the meningea media; 2d, the inferior maxillary; 3d, the pterigoid; 4th, the deep temporal; 5th, the masseteric; 6th, the buccal; 7th, the dental; 8th, the infra-orbital; 9th, the descending palatine; and 10th, the nasal.

THE INTERNAL CAROTID

sends off five branches.

A. *Arteriæ tympani.*

B. *Arteriæ receptaculi.*

C. *Ophthalmic artery*, which sends off, 1st, the lachrymal; 2d, the centralis retinæ; 3d, the supra-orbital; 4th, the ciliary branches; 5th, the muscular; 6th, the posterior ethmoidal; 7th, the anterior ethmoidal; 8th, the palpebral; 9th, the nasal; and 10th, the frontal.

D. *Posterior communicating artery.*

E. *Anterior cerebral*, which sends off, 1st, the anterior communicans; 2d, the arteria corporis callosi; and 3d, the middle cerebral, which furnishes the arteria choroidea.

THE SUBCLAVIAN ARTERY

sends of five branches.

A. *Vertebral*, which gives off, 1st, the arteriæ medullæ spinalis transversæ; 2d, the meningeal; 3d, the inferior cerebellar; 4th, the arteriæ medullæ spinalis; and 5th, the arteria basilaris: from this artery arises the superior

cerebellar artery, and the posterior cerebral, two in number.

B. *Internal mammary*, which gives off, 1st, the anterior intercostal; 2d, the mediastinal; 3d, the comes nervi phrenici; 4th, the musculo-phrenic; and 5th, the superior epigastric.

C. *Thyroid axis*, which gives off, 1st, the inferior thyroid; 2d, the cervicalis ascendens; 3d, the supra-scapular; from which arises the superior acromial, the supra-spinal, and the infra-spinal; 4th, the posterior scapularis, which gives off the glandular, the superficial cervical, and the posterior scapular.

D. *Cervicalis profunda.*

E. *Superior intercostal.*

THE AXILLARY ARTERY.

sends off seven branches.

A. *Acromial thoracic.*

B. *Thoracica suprema.*

C. *Thoracica alaris.*

D. *External mammary.*

E. *Subscapular*, which sends off an anterior and a posterior branch.

F. *Posterior circumflex.*

G. *Anterior circumflex.*

THE BRACHIAL ARTERY

sends off four branches.

A. *Profunda superior*, which sends off, 1st,

an ascending branch; and 2d, the musculo-spiral branch.

B. *Nutritia humeri.*
C. *Profunda inferior.*
D. *Anastomatica magna.*

THE RADIAL ARTERY

sends off ten branches.

A. *Recurrent radial.*
B. *Masculär.*
C. *Superficialis volæ.*
D. *Anterior carpi radialis.*
E. *Dorsalis carpi radialis.*
F. *Dorsalis pollicis.*
G. *Dorsalis indicis.*
H. *Princeps pollicis.*
I. *Radialis indicis.*
K. *Palmaris profunda.*

THE ULNAR ARTERY

sends off eight branches.

A. *Anterior recurrent.*
B. *Posterior recurrent.*
C. *Interosseous*, which sends off, 1st, the anterior recurrent; 2d, the anterior interosseous; 3rd, the posterior interosseous; 4th, the posterior recurrent; and 5th, the posterior descending branch.
D. *Muscular.*
E. *Carpi ulnaris anterior.*
F. *Ulnaris posterior.*

G. *Arteria communicans.*
H. *Palmaris superficialis.*

PALMAR ARCHES.

The deep palmar arch is formed by the palmaris profunda of the radial, uniting with the arteria communicans from the ulnar; it sends off five small branches to supply the interossei muscles.

THE SUPERFICIAL PALMAR ARCH

is formed by the arteria palmaris of the ulnar, uniting with the superficialis volæ from the radial. It sends off four branches.

A. *Branches to ulnar edge of little finger.*
B. *Branch to cleft between little and ring fingers.*
C. *Branch to cleft between ring and middle fingers.*
D. *Branch to cleft between middle and index fingers.*

THE THORACIC AORTA

sends off five sets of branches.

A. *Pericardiac.*
B. *Mediastinal.*
C. *Bronchial.*
D. *Œsophageal.*
E. *Intercostals*, each divides into, 1st, the posterior branches; and 2d, the anterior branches.

sends off the following branches:—

A. *The two phrenic arteries.*

B. *The cœliac axis.* From this axis arise—1st, the superior gastric artery, which divides into a superior and an inferior branch; 2d, the hepatic artery, which gives off the superior pyloric artery, the gastro-duodenal artery, which divides into the arteria pancreatica duodenalis, and the arteria gastro-epiploica dextra. The hepatic artery then divides into the left hepatic and right hepatic arteries, from the last of which proceeds a small branch to the gall-bladder, called arteria cystica; 3d, the splenic artery, which sends off the pancreaticæ parvæ, the pancreatica magna, the vasa brevia, splenic branches, and the gastro-epiploica sinistra.

C. *The superior mesenteric artery,* which gives off, 1st, the colica dextra, which divides into a superior and an inferior branch; 2d, the colica media, which divides into a right and left branch; 3d, the ileo-colica, which divides into a superior branch, a middle branch, and an inferior branch, and, lastly, the mesenteric branches, from fifteen to twenty in number.

D. *Two capsular.*

E. *Two renal.*

F. *Two spermatic.*

G. *Inferior mesenteric,* which sends off, 1st, the colica sinistra, which divides into an ascend-

ing branch and a descending branch; 2d, the sigmoid artery, and 3d, the superior hæmorrhoidal artery.

H. *Ureteric arteries.*

I. *Lumbar arteries.*

K. *Sacra media.*

THE COMMON ILIAC ARTERIES

divide into two branches, viz:

The internal and

External iliac arteries.

THE INTERNAL ILIAC ARTERY

sends off eleven branches in the female.

A. *Arteria ilio-lumbalis*, which sends off, 1st, ascending branches; 2d, external branches; and 3d, descending branches.

B. *Lateral sacral.*

C. *Middle hæmorrhoidal.*

D. *Vesical.*

E. *Umbilical.*

F. *Uterine.*

G. *Vaginal.*

H. *Obturator*, which sends off, 1st, the branches within the pelvis; and 2d, branches without the pelvis.

I. *Gluteal*, which sends off, 1st, a superficial branch; and 2d, a deep branch.

K. *Ischiatic*, which sends off, 1st, the coccygeal branch; 2d, the arteria comes nervi ischiatici; and 3d, the muscular branches.

L. *Pudic*, which sends off, 1st, the external

hemorrhoidal arteries; 2d, the perinæal; 3d, the transversalis perinei; 4th, the arteria corporis bulbosi, which gives a branch to Cowper's gland, and a branch to the corpus spongiosum; 5th, the arteria corporis cavernosi penis; and 6th, arteria dorsalis penis.

THE EXTERNAL ILIAC

sends off two branches.

A. *Epigastric*, which sends off, 1st, the spermatic artery; and 2d, the muscular artery.

B. *Circumflexa ilii.*

THE FEMORAL ARTERY

sends off the following branches.

A. *Superficial epigastric.*

B. *Pudendæ superficialis.*

C. *Circumflexa ilii superficialis.*

D. *Profunda femoris*, which sends off, 1st, the circumflexa externa, from which arise the ascending branches, the circumflex branches, and descending branches; 2d, the circumflexa interna, from which arise arterial branches to the muscles of the hip joint, and a branch to the interior of the hip joint; 3d, the arteria perforans prima; 4th, the perforans secunda; 5th, the perforans tertia.

E. *Anastomotica magna.*

THE POPLITEAL ARTERY

sends off seven branches.

A. *Superior muscular.*

A. *Articularis superior externa*, which sends off a superficial branch, and a deep branch.

C. *Articularis superior interna*, which sends off a superficial branch, and a deep branch.

D. *Azygos branch.*

E. *Articularis inferior externa.*

F. *Articularis inferior interna.*

G. *Inferior muscular.*

THE TIBIALIS POSTICA

sends off

A. *Muscular.*

B. *Peronæal*, which sends off, 1st, the nutritia fibulæ; 2d, the muscular; 3d, the anterior peronæal; and 4th, the posterior peronæal.

C. *Nutritia tibiæ.*

D. *Internal plantar.*

E. *External plantar.*

THE TIBIALIS ANTICA

sends off the following branches.

A. *Muscular.*

B. *Recurrent.*

C. *Internal malleolar.*

D. *External malleolar.*

E. *Tarsal branch.*

F. *Metatarsal branches.*

G. *Arteria pollicis.*

H. *Arteria communicans.*

THE PLANTAR ARCH

is formed by the external plantar artery uniting with the arteria communicans of the anterior tibial: it sends off two sets of branches.

A. *Arteriæ perforantes.*
B. *Arteriæ digitales.*

THE PULMONARY ARTERY

divides into two branches.

A. *Right pulmonary.*
B. *Left pulmonary.*

VEINS.

The veins are not so uniform in their distribution as the arteries. Besides the numerous superficial veins which ramify on the skin, one or two are found to accompany each artery. In the extremities there are generally two to each artery, and in these situations they receive the name of *venæ comites.* When, however, an artery is of great size, as the femoral or the axillary, it is accompanied but by one vein, which receives the same name as the artery.

VEINS OF THE HEAD AND NECK.

The Parietal and Temporal veins unite behind the angle of the jaw, and here receive the *internal maxillary vein;* by their union is formed the

External jugular vein. This vessel descends obliquely backwards, and joins the subclavian vein. A little after its formation it receives the trunk of the *facial vein*, and in its course down the neck it receives several superficial veins.

Internal jugular vein commences at the termination of the lateral sinus, descends along the outer side of the common carotid artery, and joins the subclavian vein at the sternal extremity of the clavicle. It receives the laryngeal and some muscular veins.

VEINS OF THE SUPERIOR EXTREMITY.

The Cephalic vein is formed by the union of several veins from the back of the hand. It ascends along the radial side of the extremity, and terminates in the *axillary vein.*

The Basilic vein commences by a small vein from the little finger (*vena salvatella*) ascends along the inner side of the extremity, and terminates in the axilliary vein, or joins one of the *venæ comites*, which accompany the brachial artery.

The Median vein commences at the fore-part of the wrist and hand, ascends along the anterior aspect of the forearm, and at the elbow terminates, by dividing into two branches. One of these joins the basilic vein, and is named the *median basilic;* the other joins the cephalic vein, and is named *median cephalic.*

The Axillary vein, formed by the union of

the veins just described, and by the *brachial venæ comites*, ascends in front of the axillary artery, receiving the *thoracic veins*, and passes beneath the clavicle, where it terminates in the subclavian vein.

The Subclavian vein passes inwards over the anterior scalenus muscle, receives numerous veins from the neck and shoulder; also the *external jugular* and *vertebral veins*, and joins the internal jugular vein behind the sternal extremity of the clavicle.

Vena innominata, formed by the union of the internal jugular and subclavian veins, on the right side is very short and descends into the thorax; the left vena innominata, which is much longer, enters the thorax in a transverse direction in front of the trachea, to join the right vein, and in its course it receives the *thyroid veins* and veins from the anterior mediastinum. By the union of the venæ innominatæ is formed the

Vena cava superior, which descends in front of the right pulmonary vessels, enters the pericardium, and opens into the right auricle.

VENA AZYGOS

commences on the first lumbar vertebra by one or two small veins, gains the posterior mediastinum, by passing through the aortic opening of the diaphragm, ascends along the right side of the bodies of the dorsal vertebræ, curves for-

wards over the root of the right lung, and terminates at the posterior aspect of the superior vena cava, as this vessel is entering the pericardium. In its course it receives the *intercostal veins* of each side, and the *œsophageal veins*.

VEINS OF THE INFERIOR EXTREMITY.

Internal saphena vein commences at the inner part of the foot, ascends along the inner side of the leg and knee, behind the inner condyle, becomes more anterior upon the thigh, and reaching to within about two inches of Poupart's ligament, passes through the saphenic opening of the fascia lata, and joins the femoral vein.

External saphena vein commences at the outer part of the foot, ascends along the back part of the leg and ham, and joins the popliteal vein.

Both these veins are superficial, and in their course receive several veins from the integuments.

Deep veins of the leg, two veins (venæ comites) accompany each artery in the leg, and terminate in the following—

Popliteal vein, this vessel accompanies the artery of the same name, and having received the external saphena vein, and the veins of the knee, terminates in the femoral vein.

Femoral vein accompanies the femoral artery, and having received the profunda vein, the internal saphena vein, and a few muscular

veins, passes beneath the crural arch and ends in the external iliac vein.

External Iliac vein accompanies the external iliac artery.

Internal Iliac vein is formed by the union of the veins which accompany the internal iliac artery and join the external iliac vein at the sacro-iliac symphysis.

Common Iliac vein, formed by the union of the internal and external iliac veins, joins its fellow at the right side of the body of the fourth lumbar vertebra to form the inferior vena cava.

Inferior vena cava ascends along the right side of the bodies of the lumbar vertebræ, behind the liver, and passes through the quadrilateral opening in the diaphragm, and opens into the right auricle at its lower and back part. It receives the middle sacral, one and sometimes both spermatic veins, the emulgent and capsular veins, the venæ cavæ hepaticæ, and the phrenic veins.

VENA PORTÆ

commences on the back of the rectum by one of the *hœmorrhoidal* veins, ascends towards the meso-colon and unites with the *inferior mesenteric vein;* this trunk next unites with the *superior mesenteric vein*, and behind the pancreas it unites with the *great splenic vein* and receives veins from the stomach, duodenum and pancreas. The vena portæ thus formed ascends

to the right side, enclosed in the capsule of Glisson, and reaches the transverse fissure of the liver, where it divides into two branches; these enter the liver, ramify through its substance like an artery, and its blood is returned to the inferior vena cava by the venæ cavæ hepaticæ, which are three or four in number, and open into the cava as this vessel is entering its opening in the diaphragm.

THE DIGESTIVE APPARATUS.

THE MOUTH.

This cavity is bounded superiorly by the hard and soft palate, inferiorly by the tongue and the reflections of mucous membrane from it to the gums, and laterally by the cheeks. Its anterior opening, which forms the commencement of the digestive canal, corresponds to the lips; and posteriorly it communicates with the pharynx through the opening called isthmus faucium, the boundaries of which are the soft palate and uvula superiorly, the tongue inferiorly, and the pillars of the palate and tonsils laterally. Within the mouth we observe the opening of the three salivary glands and follicles, and the teeth of either side. The parotid gland opens by a single orifice opposite the second superior molar tooth; the sub-maxillary gland of either side, by a single orifice at the anterior part of the tongue, by the side of

the reflection of mucous membrane called frenum linguæ, and the third salivary gland or sublingual by several small orifices (eight or ten) on either side of the tongue.

THE TEETH.

The number of teeth in the adult is thirty-two, sixteen in each jaw; and to distinguish them from the teeth of the child they are called *permanent.* They are divided into eight *incisors,* four *canine,* eight *bicuspids,* and twelve *multicuspids* or *molars.* The last four molars do not appear until late in life, and hence have been called the *wisdom* teeth. They are, however, sometimes wanting.

In the child the number of teeth is only twenty, and are called milk, deciduous, or temporary teeth. They are divided into eight *incisors,* four *canine,* and eight *molars.*

THE PHARYNX

Is a musculo-membranous bag of a conical shape extending by its base from the posterior part of the mylo-hyoid ridge and base of the skull, to the posterior aspect of the cricoid cartilage, where it terminates in the œsophagus. It is connected by its posterior wall to the vertebræ by loose cellular tissue, and interiorly it coresponds to the mouth and larynx.

On laying open the cavity of the pharynx by

a perpendicular incision along its posterior median line, the internal mucous lining of the bag will be exposed, and the following openings, viz: superiorly, one on either side of the medial line, the openings of the posterior nares; more externally, one on either side the openings of the Eustachian tubes; inferior to these is the opening of the mouth into the pharynx, or the isthmus faucium; posterior and inferior to the tongue is the glottis, and lastly the opening of the pharynx into the œsophagus.

THE ŒSOPHAGUS

Extends from the termination of the pharynx to the stomach: it is placed, above, between the vertebræ and the trachea, inclines at the inferior part of that tube to the left side, and passes behind its left bifurcation to reach the posterior mediastinum. In the mediastinum it descends forwards, passes through the oval aperture of the diaphragm, and terminates in the stomach. The mucous membrane of the mouth, pharynx and œsophagus is covered by epidermis.

THE STOMACH.

A large pyriform musculo-membranous bag, situate in the epigastric and left hypochondriac regions, communicating at one extremity with the œsophagus, and at the other with the duodenum.

Connections.—Its large extremity, or *fundus*, to the spleen by the gastro-splenic omentum; its upper concave, small edge to the liver by the gastro-hepatic omentum; and its lower, convex large edge to the colon by the gastro-colic omentum. Its œsophagus, or cardiac orifice, situated between the fundus and lesser curve, connects it to the diaphragm, and its pyloric orifice to the duodenum. The superior anterior surface of the stomach looks towards the diaphragm, ribs, and left lobe of the liver; the posterior inferior surface towards the meso-colon.

The stomach is composed of three tunics, connected by cellular tissue, an external peritoneal coat, and internal mucous coat, and between both the muscular coat. The muscular fibres of the stomach observe three directions; the longitudinal are seen along the edges or curves, the oblique on the fundus, and the circular are well developed at the centre of the organ, and at its pyloric orifice. The mucous coat presents minute piles (*villi*), it is thrown into wrinkles (*rugæ*), or folds (*plicæ*), which intersect each other, enclosing irregular quadrilateral spaces. Numerous mucous glands are found along the curves, and at the pylorus; in the fundus small glands exist, which have been supposed to secrete the gastric juice. At the pyloric orifice the mucous membrane is thrown into a circular fold, which forms an imperfect

valve between the stomach and duodenum; and at the œsophageal opening the epidermic lining is observed to terminate in a fringed edge.

SMALL INTESTINES,

Are divided into duodenum, jejunum and ileum.

Duodenum, the shortest portion of the small intestines, forms a curve in the concavity of which is situated the head of the pancreas; it is divided into a superior transverse portion, a middle perpendicular portion, and an inferior transverse portion. The superior part is covered by peritoneum on both its surfaces, and on this account is more moveable than the perpendicular or inferior portions, which are only covered on their anterior surface by this membrane.

Besides the numerous mucous glands called *Brunner's glands*, which open on its interior surface, the apertures of the pancreatic duct, and of the common biliary duct enter at its perpendicular division. This intestine differs not only in these particulars from the rest of the small intestines, but also in being much larger, more dilatable, more fixed to its position, in having a greater number of valvulæ conniventes (or circular folds of the mucous membrane), and in its muscular fibres being much stronger.

The duodenum has also been called *ventriculus succenturiatus.*

Jejunum and Ileum form the longest part of the intestinal tube, being in general from 28 to 30 feet in length; the upper two-fifths are given to the jejunum, and the remainder to the ileum, but there is no anatomical foundation for this arbitrary boundary, as the intestines run into each other insensibly, and from the duodenum the remainder of the small intestinal tube gradually diminishes in thickness, has fewer valvulæ conniventes and exhibits less vascularity; so much so that the termination of the ileum is much thinner and paler than the upper part of the jejunum, and it is in these situations only that the differences between both are marked and striking. The mucous membrane of the small intestine is studded with glands of two orders, viz: the *glandulæ solitariæ* and the *glandulæ agminatæ* or *Peyer's glands.* The solitariæ are disseminated like granules over the mucous membrane, and the agminatæ are placed in oval clusters. The fibres of the muscular coat of the small intestines take a circular and longitudinal direction, the latter being placed externally.

LARGE INTESTINE,

divided into the cœcum, colon, and rectum, forms about one-fifth of the intestinal canal. It differs from the small intestine in its great size, in being sacculated, in having small processes along its entire course called *appendices epi-*

ploicæ, in presenting three well defined longitudinal bands, and in being thinner. It is composed of an external serous coat, an internal mucous coat, and between both, a muscular coat. The fibres of the musclar coat take a circular direction, and some have contended that the longitudinal bands are also muscular; but, in addition to their anatomical structure, the use these bands serve in throwing the intestine into a permanent sacculated condition renders it very probable they are of an aponeurotic nature.

Cæcum or *caput coli*, placed in the right iliac fossa and connected to the iliac and psoas muscles, is fixed in its situation by the peritoneum, which only covers it anteriorly and somewhat laterally; it receives at its inner side the ileum, which terminates in its cavity by a slit-like opening, and which is guarded by two valves; these, in health, allow the transit of alimentary and excremental matter from the ileum to the colon, but not in the converse direction. The inferior valve or *ileo-cæcal* is the larger and placed obliquely; the superior or *ileo-colic* is smaller and rather horizontal; both are united at their extremities, forming the *commissures*, from each of which proceeds a permanent fold of mucous membrane called *retinaculum*. The *appendix vermiformis* is a small diverticulum which proceeds from the posterior part of the cœcum, it

is the size of a goose-quill in diameter, and from three to five inches in length, its orifice of entrance into the cœcum is guarded by a small valve, and is thrown into irregular sacculi by the three longitudinal bands.

The colon extends from the cœcum to the rectum, and is divided into four portions, viz: the right or *ascending* colon, the middle or *transverse*, the left or *descending*, and the *sigmoid flexure*.

The rectum extends from the sigmoid flexure of the colon to the anus; its upper third is covered by peritoneum, its middle third is only covered by this membrane upon its anterior aspect and sides, and its inferior third has no peritoneal covering. In the male subject the antero-inferior aspect of the rectum is connected to the inferior fundus of the bladder, the vesiculæ seminales, and the prostate gland, and in the female to the uterus and vagina. The rectum has no longitudinal bands and is not sacculated like the other parts of the large intestine.

SALIVARY GLANDS

are three in number, viz: the Parotid, the Submaxillary, and the Sublingual.

Parotid gland, the largest of the three, is bounded superiorly by the zygoma, posteriorly by the mastoid process and sterno-mastoid

muscle, and advances on the side of the face partly resting upon the masseter muscle. It sends off deep processes, which fill the posterior part of the glenoid cavity, the fossa between the ear and perpendicular process of the lower jaw, and the intervals between the pterygoid, digastric, and styloid muscles; it often unites with the sub-maxillary gland. Its duct (*duct of Steno*) passes across the masseter muscle, pierces the buccinator muscle, and opens into the mouth opposite the second superior molar tooth.

A small gland (*socia parotidis*) occasionally is found between Steno's duct and the zygoma, the duct of which unites with that of the parotid gland.

Sub-maxillary gland, placed in the digastric space, and covered by the skin, platysma-myoides muscle, and deep cervical superficial fascia, is of an oval figure and much smaller than the parotid. Its duct (*Whartonian*) turns round the posterior edge of the mylo-hyoid muscle, and runs forwards and inwards towards the *frænum linguæ* at the side of which it opens into the mouth.

Sublingual gland, is placed between the mucous membrane of the mouth and the mylo-hyoid muscle, is the smallest of the salivary glands, and opens by several small ducts (*Rivinian*), which perforate the mucous membrane, reflected from the side of the tongue.

LIVER.

Situated in the right hypochondriac, the epigastric, and partly in the left hypochondriac regions, is the largest gland in the body. It presents an upper convex surface, a lower irregularly concave surface, a posterior thick margin attached to the diaphragm, and an anterior inferior margin which is free. The upper surface is unequally divided by the falciform ligament into a right and left lobe. The inferior surface presents the following fissures and depressions.

1. *Horizontal fissure* extends from a notch in the anterior thin edge of the liver backwards and upwards, defining the boundary between the right and left lobes of the organ; it is crossed at right angles by the transverse fissure, which thus divides it into an anterior and posterior portion, the former containing the obliterated remains of the umbilical vein, the latter the obliterated ductus venosus.

2. *Transverse fissure* extends from the horizontal fissure into the right lobe of the liver, it contains the trunks of the right and left hepatic arteries, the trunk of the portal vein, the hepatic extremities of the biliary ducts, the hepatic plexus of nerves and absorbents.

3. *Fissure of the vena cava,* situated to the right of the horizontal fissure and behind the transverse fissure, forms the right boundary of the lobulus Spigelii.

external cortical substance, the apices towards the inner concave edge of the gland.

Papillæ is the name given to the nipple-like apices of the conical fasciculi. Each papilla presents numerous minute tubes, the apertures of the tubes of which the cones are composed; these apertures are not so numerous as the tubes, several of which are united in one common orifice.

The Calyces are small membranous sacs which surround one or more papillæ.

The Infundibula are three funnel-shaped tubes formed by the union of the calyces.

The Pelvis is the membranous reservoir formed by the union of the three infundibula.

The Ureters extend from the termination of the pelvis of either kidney to the bladder. Each ureter, about eighteen inches long and of the diameter of a moderate sized quill, passes behind the peritoneum, lying anterior to the psoas magnus muscles and to the iliac vessels, and gaining the interior and posterior part of the bladder, passes obliquely between its coats, and perforates its interior at the outer angle of its trigone.*

THE URINARY BLADDER.

This musculo-membranous viscus when moderately distended is of an ovoid figure and oc-

* To gain a view of the parts just described, a perpendicular section of the gland should be made from its convex to its concave margin.

cupies the lower region of the pelvis, behind the pubal symphysis, and anterior and superior to the rectum in the male, and the uterus and vagina in the female.

Ligaments of the bladder are divided into *true* and *false*. The true ligaments are four in number, viz: two anterior and two lateral. These, being nothing more than reflections of the vesical layer of the pelvic fascia, will be noticed when this structure is described. The false ligaments are five in number, viz: two posterior, two lateral, and one superior, and are formed by the reflections of the peritoneum.

The regions of the bladder are divided into six. 1st. *The superior region*, to which are attached the urachus and obliterated umbilical arteries. 2d. and 3d. *The lateral regions*, on which the vesical fascia of either side passes. 4th. *The anterior region*, the aspect of which looks towards the recti muscles, the pubes, and the triangular ligament of the urethra or the deep perineal fascia. 5th. *The posterior region*, the aspect of which looks towards the rectum in the male and the uterus in the female. 6th. *The inferior region* or *fundus* which rests on the vesiculæ seminales, the prostate gland, and the rectum in the male, and on the uterus and vagina in the female.

Coats of the bladder. Besides the partial peritoneal covering which invests all the posterior region and the posterior parts of the upper,

lower, and lateral regions, there are also three *proper* coats. 1st. *The muscular*, placed externally, the fleshy fibres of which take two directions; the external run longitudinally, the anterior and superior fibres being stronger have been distinguished by the name of *detrusor urinæ*, and the deep circular fibres immediately in connection with the mucous coat, which are best developed around the neck of the bladder. 2d. *The cellular coat*, and 3d. *The mucous*, which is exposed on opening the bladder. This coat is in general thrown into rugæ by the projection of the muscular fibres.

The trigone or *vesical triangle* is the name given to a smooth space enclosed between the openings of the ureters into the bladder and the vesical orifice of the urethra.

The uvula is a small duplicature of the mucous membrane on the under surface of the vesical orifice of the urethra, and corresponds to the third lobe of the prostate gland.

The urethra which terminates the urinary apparatus being in the male more connected with the reproductive organs, we shall defer its consideration until those organs are being described.

THE PERITONEUM,

The largest serous membrane in the body, lines the parietes of the abdomen, and invests almost all the abdominal viscera; like all se-

rous membranes, it is distinguished into two layers, a *parietal* and a *visceral*. The abdominal parietes being divided by a transverse incision, corresponding to the umbilicus, the uninterrupted continuity of the peritoneum, and the different productions it forms in its course may be thus demonstrated :—lining the inner surface of the upper section of the abdominal parietes, it ascends to the margin of the thorax, and lines the inferior surface of the diaphragm; from this muscle it is reflected on the spleen on the left side, on the stomach in the centre, and on the liver on the right side, forming its ligaments (*vide ligaments of liver*). From the transverse fissure of the liver the two layers which cover the convex and concave aspects of this gland meet, and are conducted by the hepatic vessels to the lesser curvature of the stomach, thus forming the *gastro-hepatic omentum*, which is also called the *capsule of Glisson*, and between the two layers of which are contained the hepatic artery to the left, the ductus communis choledochus lying to the right, and the vena porta, lying behind and between both. At the lesser curve of the stomach the two laminæ of the gastro-hepatic omentum separate and enclose this organ, passing from its left extremity to the spleen, thus forming the gastro-splenic omentum, and at the great curve of the stomach, and lower extremity of the spleen, the two laminæ again meet and descend

in front of the colon, and the small intestines, to the lower part of the abdomen ; these two layers then turn upon themselves backwards, and ascend to the transverse arch of the colon, where they separate to enclose this intestine, thus forming the *great omentum*. Having enclosed the colon, the ascending layers again unite and form the transverse meso-colon, which passes backwards to the spine ; having arrived at the spine, the two laminæ again separate into a descending and an ascending layer ; the descending layer passes into the lumbar regions where it is reflected upon the ascending and descending colon, forming the right and left lumbar meso-colon, and attaching itself to the left sides of the bodies of the lumbar vertebræ forms the anterior lamina of the root of the mesentery ; from this fixed point it is continued around the jejunum and ileum, forming the peritoneal coat of these intestines, and returns again to the spine, forming the posterior lamina of the root of the mesentery. This descending layer of the transverse meso-colon, having thus formed the mesentery, still pursues its descending course, aud passes into either iliac region, and into the pelvis ; on the right it attaches the cœcum to the right iliac fossa, thus forming the meso-cœcum, on the left side it attaches the sigmoid flexure of the colon to the left iliac fossa, forming the sigmoid meso-colon, and in the midddle it connects the upper portion of the

rectum to the upper and anterior part of the sacrum, forming the meso-rectum; still pursuing its course downwards, and covering the upper and anterior aspect of the middle third of the rectum, it is at length reflected on the posterior surface and sides of the bladder, to the superior region of this viscus, from which, and from the iliac fossa, it is reflected on the inner surface of the lower section of the abdominal parietes to the transverse incision, from the upper edge of which the description was commenced. Having thus traced the descending layer of the transverse meso-colon, the continuity of the ascending layer remains to be noticed:—ascending in front of the inferior and middle portions of the duodenum and of the pancreas, it is conducted to the liver by the vena cava on the right of the Spigelian lobe, of which gland it becomes continuous with the peritoneum, which has been reflected from the diaphragm on the posterior aspect of the liver.

Foramen of Winslow.—By this opening the cavity which is between the layers of the great omentum, communicates with the general peritoneal cavity of the abdomen. It is of an oval form, being bounded anteriorly by the gastro-hepatic omentum, posteriorly by the ascending layer of the meso-colon, superiorly by the liver, and inferiorly by the duodenum.

Inguinal Pouches.—As the peritoneum is ascending on the lower part of the abdominal

parietes, it is thrown into four pouches, two on either side, by the obliterated hypo-gastric artery. The *external* pouch, between the ilium and hypo-gastric artery, is the largest, and corresponds to the internal abdominal and the femoral rings ; the *internal* corresponding to the external ring.

In the female the peritoneum passes from the rectum on the upper and back part of the vagina, from which it ascends on the uterus, forming on each side its broad ligaments, and is reflected from the anterior part of the uterus to the back of the bladder.

MALE ORGANS OF GENERATION.

THE TESTICLES

Are two in number, of an oval form, are contained in the scrotum, and are likewise enveloped by proper tunics.

Tubuli seminiferi are numerous capillary tubes, which form the body of each testicle. They are very long and tortuous, and are arranged in conical fasciculi, which are separated from each other by fibrous bands, derived from the tunica albuginea.

Tubuli recti are from sixteen to twenty in number, are formed by the union of the tubuli seminiferi, and are contained between the layers of the corpus Highmorianum.

Vasa efferentia are five or six in number,

and are formed by the union of the tubuli recti. These tortuous vessels pierce the tunica albuginea, arrive at the head of the epididymis, and by their union form the vas deferens.

Vas deferens, or *seminal excretory duct*, is of great length, and is folded on itself by innumerable turns for the first part of its course. By its convolutions it, and the vasa efferentia, form the *globus major*, or head of the *epididymis*, which is situated at the upper part of the body of the testicle; still convoluted, it passes downwards, forming the body of the epididymis, which is narrow and placed at the posterior part of the body of the testicle, and arriving at the inferior part of the gland, it forms the *globus minor*, or tail of the epididymis. The vas deferens, having thus formed the epididymis, escapes from the globus minor, and having increased in size and density ascends along the inner aspect of this body, until it becomes connected to the spermatic vessels and cremaster muscle; it then passes through the external abdominal ring and the inguinal canal, and having passed through the internal abdominal ring, it separates from the spermatic vessels, and is conducted by the false lateral ligaments of the bladder to this viscus, along the side and inferior fundus of which it runs, lying internal to its corresponding vesicula seminalis. It here approaches its fellow of the opposite side, and both ducts becoming flattened arrive at the base

of the prostate gland, where they are joined by the ducts of the vesicula seminalis, their union forming the *common ejaculatory ducts;* these run through the prostate gland, and open into the prostatic portion of the urethra, at the side of the verumontanum.

PROPER COATS OF EACH TESTICLE.

Tunica albuginea.—A strong fibrous investment, of an opaque white color, which forms the proper capsule of the gland. From its inner surface it sends two laminæ, which project into the back part of the testicle for about two lines, thus forming the body called *corpus Highmorianum;* from the free edge of which proceed the fibrous bands, already mentioned as separating the conical bundles of tubuli seminiferi, to be attached to the opposite surface of the tunica albuginea.

Tunica vaginalis.—A serous membrane, consisting of two layers, one covering the testicle called *tunica vaginalis testis,* the other lining the scrotum called *tunica vaginalis scroti.* When the tunica vaginalis scroti is divided, its continuity with the glandular layer may be demonstrated by tracing the membrane, when it will be found to be reflected on the side and fore part of the epididymis and testicle, forming a pouch between these bodies, and also for a short distance on the fore part of the chord.

Tunica communis, formed by the fibres of the

cremaster muscle and cellular membrane, surrounds the chord and the fore part and sides of the testicle.

COMMON COVERINGS OF BOTH TESTICLES.

The scrotum, a production of the common integument, is of a brownish color, slightly studded with hairs and sebaceous follicles, presenting in the median line a hard ridge, called the *raphe*, from either side of which it is thrown into rugæ.

The dartos, supposed by some to be muscular, is formed by the subcutaneous cellular tissue and the ramifications of numerous blood-vessels, which give this coat a reddish appearance.

The superficial fascia lies immediately under the dartos, is derived from the superficial fascia of the abdomen, and is continuous with the superficial fascia of the perineum.

Septum scroti.—This partition, which divides the scrotum into two, is formed by the dartos and superficial fascia, these membranes being attached to the raphe, and from thence ascending between the testicles, to the urethra.

BLOOD-VESSELS AND NERVES OF THE TESTICLES.

Each testicle is supplied with blood by the spermatic artery, the blood of which is returned by the spermatic veins; it receives nerves from the spermatic plexus, which is formed by

branches from the lumbar ganglions of the sympathetic, from the splanchnic nerves, and from the renal plexus.

Rete testis.—Upon separating the laminæ of the tunica albuginea, which form the corpus Highmorianum, the arteries, veins and nerves of the testicle, together with its vasa recti, will be seen to pass to and from the gland. The reticular appearance these present is called *rete testis.*

The spermatic chord is composed of the vas deferens, the spermatic arteries, veins and nerves, and absorbents; all of which are connected to each other by fine cellular tissue, and are enveloped by fascia and the cremaster muscle. The chord, thus formed, extends from the epididymis to the internal abdominal ring, where its constituents separate from each other.

Corpus pampiniforme is the name given to the venous plexus, formed by the spermatic veins after these vessels have escaped from the testicles.

The vesiculæ seminales are two oblong flattened bodies situated at the inferior fundus of the bladder, behind the prostate gland, and on the outer side of the vasa deferentia. Each seminal vesicle is about two inches long, and consists of a long tortuous membranous tube convoluted on itself, the small excretory duct of which joins its corresponding vas deferens.

The prostate gland is a flat conoidal body, the

base being posterior corresponding to the vesiculæ seminales, the apex anterior corresponding to the vesical extremity of the urethra. It is distinguished into three lobes: two lateral, large, and united in the medial line, their union being marked by a slight groove; and a third or small lobe situated in the angle between the two lateral lobes, towards the base of the gland. The prostate gland is firm and resisting to the touch, and composed of numerous follicles, with minute ducts, which unite to form larger tubes, the openings of which, ten or twelve in number, are on the under surface of the urethra, on either side of the verumontanum.

Cowper's glands are two small oblong-round bodies placed before the prostate gland (hence also called anti-prostatic glands), and contained between the layers of the triangular ligament of the urethra. The duct of each gland having run a course of about an inch, opens into the urethra a little anterior to its bulb.

THE PENIS.

This organ, the shape of which is familiar, consists of two cylindrical bodies, named corpora cavernosa; and a body named corpus spongiosum which contains the urethra, all these parts being connected together and surrounded by the superficial fascia and the common integuments.

The corpora cavernosa, are two cylindrical bodies, united to each other in the mesial line; they are composed of a cellular structure containing several veins and the arteries of the corpora cavernosa, derived from the pudic artery, all of which are enclosed in a strong fibrous investment.

Each *corpus cavernosum* commences by the *crus penis*, which is the narrowest part, and which is attached to the rami of the ischium and pubis. At the symphysis pubis both crura unite, forming the chief part of the body of the penis, and terminate anteriorly in an obtuse point, to which is intimately attached the glans penis.

Septum pectiniforme, a partition, imperfect as its name implies, which corresponds to the mesial line, and marks the division of the corpora cavernosa.

The urethra is a membranous canal, extending from the neck of the bladder to the extremity of the glans penis, its length and width varying according to the erect or collapsed state of the organ. In the latter condition its length is from seven to eight inches, and its calibre about three or four lines. It is lined by mucous membrane, and is distinguished into, 1st, the prostatic portion, which is from an inch and a quarter to an inch and a half in length: 2d, the membranous portion, which is about half an inch long; 3d, the bulbous portion, which is scarcely

an inch, and 4th, the spongy portion, which occupies the remainder of its length.

The corpus spongiosum urethræ is a cellulo-vascular tube surrounding the urethra and occupying the under mesial line of union of the corpora cavernosa; it commences in the bulb of the urethra and extends along the canal to its extremity, where it terminates in the glans penis, the bulb and glans penis being merely expansions of this structure.

Upon exposing the mucous surface of the urethra by an incision, we observe, 1st, a slit-like contraction at the orifice; 2d, behind this a dilatation, called *fossa navicularis;* 3d, the constant diameter of the canal until we arrive at the bulb where it is again dilated, forming, 4th, the *sinus of the bulb;* 5th, the narrowest part of the canal which corresponds to the membranous portion; 6th, the dilatation corresponding to prostate gland, and 7th, a contracted orifice at its termination in the bladder. In the prostatic portion of the urethra a prominent fold of mucous membrane, called *verumontanum,* projects from its under surface, and presents in its centre a large lacuna, the *sinus pocularis,* the orifice of which is directed forwards. On either side of the verumontanum the prostatic sinuses are situated. Upon the upper surface of the urethra, from the orifice to the bulb, are the openings of numerous mucous follicles, directed forwards, the largest of which

is about an inch from the orifice, and is called, from its size, *lacuna magna*. The ducts of the seminal glands already described in connection with the genito-urinary organs open on the under surface of the urethra. The orifices of Cowper's glands open a little anterior to the sinus of the bulb, the common ejaculatory ducts on either side of the verumontanum, and the ducts of the prostate in the prostatic sinuses.

The superficial fascia, which envelopes the penis, is derived from that of the abdomen, and terminates at the corona glandis. It is strong where it passes from the linea alba upon the dorsum of the penis, forming the *suspensory ligament*, but is exceedingly delicate and loose upon the body of the organ.

The skin of the penis is remarkably thin and loose, and extending for an indefinite length beyond the organ, is reflected inwards, and is intimately attached to the corona glandis; the loose fold thus formed is called the *prepuce*. From the corona glandis it is continued along the glans until it becomes identified with the mucous membrane at the orifice of the urethra, having first formed a fold which lies posterior and inferior to this opening, and is called *frœnum preputii*.

Glandulæ odoriferæ are a number of small sebaceous glands which surround the corona glandis, and which lie beneath the skin.

THE FEMALE ORGANS OF GENERATION.

The ovaries are two ovoidal bodies placed, one on either side of the womb, in the duplicatures of the peritoneum called the broad ligaments of the uterus. Each ovary, enveloped by a white fibrous membrane, consists of a pulpy brownish-grey substance, highly vascular, and containing from fifteen to twenty minute vesicles, each of which is composed of a thin membrane containing a viscid yellowish fluid; these are called the *Graafian vesicles.*

The Fallopian tubes are the excretory ducts of the ovaries; each is about four inches in length, and is contained in the broad ligament, one extremity being attached to the superior angle of the uterus into which it opens by a small orifice (*orificium uterinum*), the other being free and surrounded by a fringed slip of peritoneum (*corpus fimbriatum*), in the centre of which is the peritoneal aperture (*orificium superius.*)

The uterus is a hollow organ of a pyriform shape, and is distinguished into the *fundus*, the *body*, and the *cervix*. The fundus is superior and posterior and receives at either angle the Fallopian tube: the body is intermediate between the fundus and the neck, the latter being inferior and anterior and surrounded by the vagina: at the

extremity of the neck is a small elliptical opening surrounded by a thick margin, which from its resemblance to the mouth of a tench, has been called *os tincæ* as well as *os uteri*. The cavity of the uterus is small compared to the thickness of its walls, and is of a triangular shape; its superior and outer angles presenting the orifices of the Fallopian tubes, the inferior presenting the os tincæ. The uterus is placed between the bladder and rectum.

The vagina is a membrano-vascular tube, extending from the neck of the uterus to the external outlet, where it is continuous with the surface. It is composed of mucous membrane surrounded by cellular tissue, a vascular network, and the sphincter vaginæ muscle; its length is about four inches, its breadth one, but being very distensible these measurements vary. Its mucous membrane is thrown into transverse rugæ on its anterior and posterior surface, and is studded with the orifices of numerous mucous follicles. The color of the mucous membrane varies, at the external orifice being red, and of a grey and sometimes marbled color as it approaches the uterus.

The mons veneris is a soft adipose eminence, situate on the upper and anterior part of the pubes, covered by common integument, which, in the adult, is thickly set with hairs.

The vulva is the fissure extending from the mons veneris to the perineum.

The labia magna are large folds of the integuments which bound the vulva on either side, and unite below in a crescentic edge (*the fourchette.*)

The clitoris, a small oblong conical body, placed between the upper extremities of the labia. It consists of a structure similar to the corpus spongiosum urethræ in the males, and arises by two crura from the pubes; these unite to form its body, at the extremity of which is placed a red protuberance, called the *glans clitoridis*, over which is thrown a loose fold of integuments (*the prepuce*).

Meatus urinarius is about half an inch below the clitoris.

Labia parva, or nymphæ, are two red crescentic folds of mucous membrane, enclosing numerous erectile vessels; they descend, one on each side, from the prepuce of the clitoris, and are lost about the centre of the vulva.

The hymen, when it exists, is a crescentic fold of mucous membrane, surrounding the sides and inferior orifice of the vagina.

The carunculæ myrtiformes are small reddish bodies surrounding the orifice of the vagina, and which are the remains of the hymen.

THE MAMMÆ

are two in number, situated at the anterior and superior part of the thorax, and connected to the great pectoral muscles by a capsule of

condensed cellular tissue. Each of these conglomerate glands, of a hemispherical shape, consists of numerous acini, very small and united together so as to form lobules. From the acini proceed minute tubes, named lactiferous; these unite, forming larger ducts, all of which converge towards the root of the nipple, and expand into conical sacs from which smaller ducts proceed and open on the surface. The *nipple* is a conical process, surrounded by a brownish areola, and composed externally of the integuments, which are very thin, and internally of the lactiferous tubes, together with numerous blood-vessels, from which the nipple derives its property of occasional erection.

ORGANS OF THE SENSES.

THE ORGAN OF TOUCH.

The skin is composed of the cuticle, or epidermis, the rete mucosum, and the corion, or cutis vera.

The cuticle is a transparent inorganic layer of membrane, extending over the corion. Its thickness varies, being thinnest in those parts least exposed to pressure and friction, and thickest in the soles and palms.

The rete mucosum is a thin membrane attached to the outer surface of the corion, highly vascular, and gives the color to the skin, being

black in the negro, and white, brown, or yellow in the European.

The corion is a dense strong membrane, consisting of fibres, interwoven with each other, which are more firmly compacted the nearer they are to its outer surface. Its internal surface is cellular, its external very vascular, and presenting numerous small conical papillæ; at the extremities of the fingers these papillæ are best developed, are furnished with minute nervous filaments, and covered with very thin cuticle; thus affording a delicacy of organization necessary for the greater perfection of the sense of touch.

THE ORGAN OF SMELL.

The nose is bounded superiorly by the nasal, frontal, ethmoid, and sphenoid bones; inferiorly by the palatine plates of the superior maxillary and palate bones; externally on either side by the superior maxillary, lachrymal, inferior spongy, ethmoid and palate bones, and by the internal pterygoid plates of the sphenoid bone. It is divided into the *two nares* by the *septum nasi*, which is formed by the azygos process of the sphenoid bone, the nasal plate of the ethmoid bone, the vomer and the mesial spines of the superior maxillary and palate bones. Besides the bony boundaries, the nose presents, anteriorly, five cartilages, which form the *anterior nares*, or the nostrils. The middle vertical car-

tilage is of a triangular form, and rests in the fissure of the vomer inferiorly, is attached to the vertical plate of the ethmoid bone above, and presents anteriorly a subcutaneous, free, thick edge, and thus completes the septum nasi. The lateral cartilages which form the wings of the nose, are also triangular, are attached to the superior maxillary and nasal bones, and in the median line to the vertical cartilage. The inferior lateral fibro-cartilages, are attached to the three cartilages just described, are thick and semi-circular, forming, with the vertical cartilage, the anterior inferior oval openings of the nostrils.

The posterior nares are of an oval shape, and open into the upper part of the pharynx; they are separated from each other by the posterior free edge of the vomer, are bounded superiorly by the body of the sphenoid bone, inferiorly by the palate bones, and externally by the internal pterygoid plates of the sphenoid bone. The external lateral wall of each naris, from the arrangement of the spongy bones, form three fossæ, called *meatuses*, with which several orifices communicate.

In the inferior meatus, at the junction of its anterior with its middle third, is the opening of the *nasal duct*, and posteriorly, on a level with the inferior spongy bone, is the opening of the Eustachian tube. In the middle meatus is the slit-like opening of the antrum maxillare, ante-

rior to which is the groove called *infundibulum*, which leads from the frontal sinus, and into which open the anterior ethmoidal cells.

Into the superior meatus, the posterior ethmoidal cells and the sphenoidal sinus open. The interior of the nose is lined with the Schneiderian membrane, which is highly vascular and sensible, and consists of two layers, a fibrous layer, which is the periosteum, or the perichondrium of the nasal cavities, and a mucous membrane. The nerves which supply the nasal cavities are the olfactory, the internal nasal of the ophthalmic, and branches derived from Meckel's ganglion.

THE ORGAN OF TASTE.

The tongue presents several papillæ covered by mucous membrane. It is of a triangular form, is connected by its base to the os hyoides, by folds of mucous membrane to the epiglottis and palate, and by muscles to the lower jaw. It is highly vascular, and receives six nerves, three on either side, viz: the gustatory branch of the fifth for taste, the ninth, or lingual, for motion, and the glosso-pharyngeal to connect it in sympathy with the pharynx.

THE ORGANS OF VISION.

The eyes are distinguished into the globes of the eyes and their appendages. The eye-ball

is composed of membranes and fluids, called humours.

The sclerotic coat, occupying about four-fifths of the globe, is of a strong fibrous structure, is thicker behind and anteriorly than in its centre. Its outer surface is in contact with the adipose tissue of the orbit, the tendinous expansions of the orbital muscles, and anteriorly with the conjunctiva, its inner surface being lined by the choroid coat. It presents posteriorly a small aperture for the transmission of the optic nerves, and an anterior large one, about six or seven lines in diameter, for the cornea.

The cornea, which forms the anterior fifth of the globe, is smooth and transparent. It consists of three layers, viz: the conjunctival layer externally, the elastic cornea internally, and, between both, the proper cornea, which is composed of laminæ, connected together by fine cellular tissue.

The *choroid coat* is a thin vascular membrane, situated between the sclerotic coat and the retina; it extends from the entrance of the optic nerve to the ciliary ligament, to which it is firmly connected; it then is directed inwards, and forms the folds called ciliary processes. Its internal surface is covered by a dark brownish secretion, called *nigrum pigmentum*, its outer surface being connected to the sclerotic coat by fine cellular tissue, and by the ciliary vessels and nerves; on this surface the veins observe

an arched arrangement, and are called *vasa vorticosa.*

The *ciliary ligament* is about a line and a half in breadth, of a greyish white cellular structure, and corresponds to the circle of junction of the cornea and sclerotic coat externally, and of the choroid and iris internally.

The *ciliary processes* vary in number from sixty to seventy, and are productions or continuations of the choroid coat; each ciliary process is of a triangular figure, the anterior edge being attached to the ciliary ligament, the posterior to the hyaloid membrane, and the internal free projecting into the posterior chamber of the aqueous humour, towards the lens but not attached to this body.

The *Iris* is a circular membrane placed in a transverse vertical position, attached by its larger circumference to the ciliary ligament, floating in the aqueous humour, and presenting a circular opening in the centre called the *pupil.* It divides the space between the anterior surface of the capsule of the lens, and the posterior surface of the cornea, unequally into what are termed the *chambers of the aqueous humour,* the anterior chamber being much the largest; both chambers, however, communicate through the pupil. The anterior surface of the iris presents a radiated appearance, and varies in color in different individuals; the posterior surface is covered by nigrum pigmentum, and has re-

ceived the name of *uvea*. The iris is supplied by the ciliary nerves and vessels.

The *retina*, placed between the choroid coat and vitreous humour, consists of three layers, an external or *serous layer*, called from its discoverer *membrana Jacobi*, an internal or vascular layer, and between both the nervous layer. About two lines on the temporal side of the entrance of the optic nerve the retina presents a small hole surrounded by a yellow margin, called *the foramen of Sœmmering*, round which the retina is thrown into a fold.

The *aqueous humour* is contained in the anterior and posterior chambers of the eye, is perfectly transparent, and is from four to five grains in quantity.

The *vitreous humour* occupies about the three posterior fourths of the eye ; it is contained in the *hyaloid membrane*, which not only envelopes it, but sends numerous partitions from its inner surface to form cells in which this transparent fluid is deposited. The vitreous humor thus contained in its capsule is convex posteriorly and on its lateral circumference, but presents anteriorly a concavity for the reception of the crystalline lens ; around the circumference of this cavity the vitreous humour presents a striated appearance, caused by the marks of the ciliary processes, to which the term *corona ciliaris* is applied.

The *crystalline lens*, enclosed in its capsule

and placed in the anterior depression of the vitreous humour, is a transparent body, presenting an anterior and a posterior convex surface, the latter being more prominent, and corresponding to the vitreous humour. Its external surface is soft and pulpy, gradually increasing in density towards its centre.

The *capsule* of this body, like the lens itself, is transparent, and from its thickness, strength, and elasticity, is considered by Dr. Jacob as being cartilaginous.

The lens and its capsule derive their nutriment from the vessels of the hyaloid membrane.

Liquor Morgani is a fluid which is found some hours after death, between the lens and its capsule. It is the effect of transudation.

Canal of Petit.—The lens is retained in its situation by the hyaloid membrane, which, splitting into two laminæ at its circumference, pass one anterior the other posterior to its capsule; a triangular canal is thus formed, and is intersected by minute septa; this is the canal of Petit, and may be demonstrated by distending it with air, when it will present a vesicular appearance.

THE APPENDAGES OF THE EYE.

The *lachrymal gland*, placed in the upper and outer part of the orbit, behind the external angular process of the os frontis, and about the size of a small almond, is of a greyish color,

consists of numerous granules, united by an imperfect capsule, and pours forth its secretion of tears by means of ten or twelve minute ducts, which open behind the upper eyelid, in the angle formed by the reflection of the conjunctiva.

Tunica Conjunctiva, a mucous membrane which lines the interior of each eyelid, and is reflected on the anterior part of the globe of the eye. At the inner angle of the eye it forms a small fold called *plica semilunaris*, covers the *caruncula lachrymalis*, and having lined the lachrymal sac and duct becomes continuous with the mucous membrane of the nose.

This membrame, where it passes over the cornea, is perfectly transparent.

Caruncula lachrymalis, a small vascular body composed of mucous glands and cellular tissue situated in the nasal angle of the eye, and covered by the membrana conjunctiva.

The *palpebræ* or *eyelids*, semicircular in form, are composed of skin externally, which is very fine, the tunica conjunctiva internally, and between both the orbicularis palpebrarum muscle, the tarsal cartilages and their ligaments, and the Miebomian glands, together with blood-vessels, nerves, and absorbents.

The superior eyelid, besides being the largest, has peculiar to it the levator palpebræ superioris muscle.

The *tarsal cartilages* are thin cartilaginous

plates of a semicircular form, the superior being the largest; to their convex margins are attached the *palpebral ligaments*, which are continuations of the orbital periosteum.

The *Miebomian glands*, of a yellow color, are very numerous, particularly in the upper eyelid, and are arranged in vertical rows.

The opposed edges of the eyelids are thick, and are bevelled off obliquely towards the eye, so that when closed they only touch at their anterior edges, thus leaving a triangular canal, the base of which is formed by the tunica conjunctiva, along which the tears are conducted to the puncta lachrymalia.

The *ciliæ* or *eyelashes*, attached by their roots to the opposed margins of the eyelids, observe a curved arrangement, their convexities looking towards each other.

The *puncta lachrymalia* are the two minute orifices of the lachrymal canals, placed within two or three lines of the nasal terminations of the eyelids, and upon their opposed edges.

The *lachrymal canals*, the superior of which is longer and curved, the inferior being nearly straight, lead from the puncta lachrymalia to the lachrymal sac.

The *lachrymal sac*, placed in the fossa formed by the lachrymal and superior maxillary bones, is of an oval form, receives the lachrymal secretion by the puncta lachrymalia and trans-

mits it to the nasal duct with which it is connected inferiorly.

The *nasal duct*, enclosed in a bony canal formed by the lachrymal, superior maxillary, and inferior spongy bones, passes obliquely downwards, backwards, and outwards, and terminates in the inferior meatus of the nose.

THE ORGAN OF HEARING.

This organ consists of the external ear, including the auricle and meatus auditorius externus; the middle ear, including the cavity of the tympanum and its appendages, and the internal ear or labyrinth, including the vestibule, semicircular canals, and cochlea.

The *external ear* consists of a fibro-cartilaginous plate covered by skin, and so moulded as to form different elevations and depressions, which have been described with more minuteness than they deserve.

The *helix* is the semicircular eminence which forms the outline of the external ear.

The *anti-helix* commences superiorly by two roots, which enclose a fossa (*fossa navicularis*), and is situated inferior to the helix.

The *tragus* is an eminence placed anterior and inferior to the meatus externus.

The *anti-tragus* is a smaller eminence posterior to the meatus externus.

The *lobule* is a pendulous body placed underneath the anti-tragus.

The *concha*, a deep conoidal cavity which leads to the meatus externus and in which the several depressions, formed by the eminences just described, terminate.

The *meatus externus* is a curved canal which leads from the concha to the membrana tympani; it is lined by skin, beneath which are placed small glands (*glandulæ ceruminosæ*), which secrete the ear-wax (cerumen). The inner half of this canal is surrounded by bone.

The *membrana tympani*, separating the external from the middle ear, is of an oval form and consists of three layers, viz: the external or cuticular, the internal or mucous, and between both a fibrous layer, which some have supposed to be muscular. To its inner aspect is attached the crus of the malleus, which, by drawing it towards the inner ear, gives it a concave aspect externally.

The *middle ear* consists of the cavity of the tympanum and the small bones of the ear and their muscles.

The *cavity of the tympanum* is an irregular cylindrical space, closed externally by the membrana tympani, and bounded posteriorly by a bony partition which separates it from the labyrinth. It presents the following eminences and foramina, viz: the *promontory*, a convex eminence situated on its internal side and which marks the situation of the vestibule; the *foramen ovale*, placed above the promontory and to

which the base of the stapes is affixed; the *foramen rotundum*, below the promontory, closed by a membrane (*lesser tympanum*), which separates the scala tympani of the cochlea from the cavity of the tympanum; *the opening of the mastoid cells*, situated posteriorly and superiorly; the *pyramid*, a bony projection placed below the opening of the mastoid cells, hollow within and containing the stapedius muscle; a *small foramen* below the pyramid for the transmission of the chorda tympani nerve; anteriorly the openings of the two bony canals, the superior of which lodges the tensor tympani muscle, the inferior forming the bony part of the Eustachian tube; inferiorly is the opening of the Glasserian fissure, and superiorly are several small foramina for blood-vessels.

The *bones of the ear* are three in number, very small and contained within the cavity of the tympanum.

The *malleus* is divided into the head, which is smooth and articulates with the incus; the neck, which is small and connects the head to the shaft; the *handle or shaft*, which descends from the neck, and is attached to the membrana tympani, and the *processus gracillis*, which passes from the neck to the Glasserian fissure.

The *Incus* is divided into its body, which presents a cup-like cavity for the head of the malleus; a superior crus, which is short and

lies in the mastoid cells, and a long crus, to the extremity of which is attached a small process of bone, considered by some as a distinct bone and called *os orbiculare*.

The *Stapes* presents a small head, which is attached to the orbicular process, a short neck, two curved crura, which terminate in the base, and the base itself, which is of an oval shape and connected to the foramen ovale.

The *internal ear or labyrinth*.

The *vestibule*, placed behind the cochlea and before the semicircular canals, is a small oval cavity lined by a membrane common to the labyrinth, contains a watery fluid, and presents the following openings, viz: The foramen ovale, the five orifices of the semicircular canals, the orifice of the scala vestibuli of the cochlea, and the orifice of the aqueduct of the vestibule.

The *semicircular canals*, placed behind the vestibule, arethree in number, two vertical and one horizontal; of the former, one is superior and the other posterior. The openings of these canals are only five in number, in consequence of one opening of the vertical canals being common to both.

The *Cochlea*, of a conical form, the base towards the internal meatus, the apex towards the carotid canal, is composed of a bony tube which makes two turns and a half round a central pillar called *the mediolus*. This tube is

divided longitudinally by a thin plate, half bony, half membranous, called *lamina spiralis*, into two independent cavities: the two tubes thus formed are called the scalæ of the cochlea, they both unite at the apex in a cavity called *infundibulum*, and at the base of the cochlea they separate, one called *scala vestibuli*, which opens into the vestibule, the other called *scala tympani*, which opens into the tympanum by the foramen rotundum. From the scala tympani proceeds a narrow bony canal called *the aqueduct of the cochlea*, which terminates in a slit-like opening in the petrous bone, a little inferior to the meatus auditorius internus.

The *auditory nerve* gains the internal ear by the minute foramina at the base of the meatus auditorius internus, and is expanded in the form of soft pulpy filaments in the cochlea and vestibule.

THE ABSORBENT SYSTEM

comprehends, 1st, the vessels which convey the lymph and chyle into the veins; and 2dly, the enlargements which occur in their course called glands or ganglia.

The *Lacteal or Chyliferous vessels* commence on the mucous surface of the intestines, pass through the mesenteric glands backwards towards the spine, where they terminate in the thoracic duct.

The *lymphatic vessels* are found in most situations of the body, and generally observe a deep and superficial arrangement.

Lymphatics of the lower extremities. The superficial set accompany the external and internal saphena veins; they communicate freely in their course with the deep lymphatic trunks which accompany the deep vessels. Those which accompany the external saphena vein enter the glands in the popliteal space, whilst those accompanying the internal saphena vein ascend to the groin and pass through the inguinal glands, having formed numerous connections with the superficial lymphatics of the abdomen, the perineum, and the genitals. The deep lymphatics of the hip and perineum are conducted by the branches of the internal iliac vessels into the pelvis, and pass through the pelvic glands. From the inguinal and pelvic glands the lymphatics pass along the primitive iliac vessels to the receptaculum chyli.

The *Thoracic Duct.* This canal commences by a dilatation called *receptaculum chyli*, placed on the body of the 2d or 3d lumbar vertebra: passing between the crura of the diaphragm it gains the posterior mediastinum, where it lies between the aorta and the vena azygos; at the fifth dorsal vertebra it crosses the spine obliquely to the left side, passing behind the œsophagus and arch of the aorta, and placed behind the left pleura and between

the left carotid and left subclavian arteries; it is then conducted by the œsophagus to the left side of the neck as high as the sixth cervical vertebra, where, making a slight curve downwards and outwards, it opens close to the external angle formed by the left subclavian and jugular veins.

Lymphatics of the upper extremities.—The superficial set accompany the superficial veins, and pass through two or three glands situated at the inner condyle; having joined the deep lymphatics which accompany the venæ comites, they proceed onwards to the axilla, and pass through the axillary glands; following the course of the axillary vein, they pass beneath the clavicle, join the lymphatics of the neck, and terminate in the thoracic duct. The lymphatics of the right upper extremity and right side of the neck unite to form the *right* or *lesser thoracic duct*, which opens into the right vena innominata.

The lymphatics of the trunk consist of a deep and superficial set; in the chest the former are seated between the muscles and pleura, in the abdomen between the muscles and peritoneum, the superficial being subcutaneous. The viscera contained in the chest and abdomen also have a superficial and deep layer of lymphatics, the deep being distributed through the peculiar tissue of each organ, the superficial running beneath the membranous envelope.

Lymphatics have been denied to the brain and spinal chord, and to the ear, eye, and placenta.

PECULIARITIES OF THE FŒTUS.

The principal anatomical peculiarities of the fœtus, by which it is distinguished from the adult, are the following:

The *Thymus gland* occupies the anterior mediastinum,—the *kidneys* are lobulated, and each is covered by a cellulo-vascular body called *renal capsule*, which is larger than the kidney itself,—the *liver* is very large, particularly its left lobe,—the *lungs* are compact, and of a deep red color, and sink in water, the bronchial tubes and their ramifications being void of air,—the auricles of the heart communicate by the *foramen ovale*,—at the bifurcation of the pulmonary artery an arterial trunk about nine lines in length, called *ductus arteriosus*, proceeds to the aorta, into which vessel it opens,—the *umbilical vein* proceeds to the liver, where, having distributed some branches to its left lobe, it divides into the *communicating branch*, which unites with the portal vein, and the ductus venosus, which opens into the vena cava inferior—the *internal iliac arteries*, under the name of *umbilical* or *hypogastric*, turn upwards and forwards along the sides of the bladder, pass through the umbilicus, and run a tortuous

course along the umbilical vein to the placenta, and the urinary bladder is in the abdominal part of the pelvis, from the summit of which a ligamentous chord, called *urachus*, passes to the umbilicus. Until the seventh month the pupil is closed by a membrane, called *membrana pupillaris*, and in the male the *testes* are contained in the abdomen.

THE FASCIÆ.

CERVICAL FASCIA

consists of a superficial and a deep layer. *The superficial layer*, which is in intimate union with the fibres of the platysma-myoides muscle, is in connection superiorly with the lower jaw and parotid gland, and the cartilage of the ear of either side; and, extending over the anterior and lateral parts of the neck, is continued downwards over the forepart of the thorax, where it becomes thin and continuous with the common subcutaneous cellular tissue. *The deep layer* passes behind the sterno-mastoid and omo-hyoid muscles; adheres to the upper part of the sternum, the inter-clavicular ligament and the sheath of the carotid vessels, and behind the angle of the jaw, it adheres to the styloid process and stylo-maxillary ligament.

SUPERFICIAL FASCIA OF THE ABDOMEN

passes downwards from the thorax over the

abdominal muscles, and Poupart's ligament to the thigh. In the median line it passes off the pubis upon the penis, forming its suspensory ligament, and in the female it descends into the labia. In the male it passes on either side round the spermatic chord into the scrotum, and becomes continuous with the fascia of the perinæum. After having passed over Poupart's ligament it forms envelopes for the inguinal glands and adheres to the fascia lata, presenting a cribriform appearance (vide fascia lata); and continuing its course downwards becomes identified with the subcutaneous cellular tissue of the lower extremity.

FASCIA TRANSVERSALIS AND FASCIA ILIACA.

The *fascia transversalis* is a layer of condensed cellular tissue, placed between the transversalis muscle and the peritoneum; it is very strong inferiorly, and is connected to the internal lip of the ilium, and to the whole length of Poupart's ligament, and is continuous, behind the rectus muscle, with the fascia of the opposite side. As the external iliac vessels are passing beneath Poupart's ligament, a production of this fascia extends along the anterior aspect of their sheath, and becomes identified with the cribriform fascia in the groin. The spermatic chord in the male, and the round ligament in the female, receive a covering from this fascia about half an inch above Poupart's liga-

ment, and midway between the spine of the ilium and the symphysis pubis; this opening is the internal abdominal ring.

The *fascia iliaca* is much stronger than the fascia transversalis, it is connected to the inner lip of the ilium, passes over the iliacus internus muscle, adheres to Poupart's ligament, from which it passes behind the sheath of the femoral vessels into the thigh, and is connected with the capsular ligament of the hip-joint, and the pectineal portion of the fascia lata. When the fascia iliaca arrives at the outer aspect of the external iliac artery, it sends off a layer of fascia which passes anterior to the external iliac vessels to Poupart's ligament, and from this crosses the femoral ring to become continuous with the fascia transversalis. This layer of fascia forms the *fascia propria* of a femoral hernia. Having sent off this layer the fascia iliaca continues its course behind the external iliac vessels as far as the brim of the pelvis; it here takes the name of *pelvic fascia*. The *pelvic fascia*, from the brim of the pelvis, lines the parietes of this cavity as far as the upper origin of the levator ani muscle, where it divides into two layers; one layer (the outer) is called the *obturator fascia*, which descends between the obturator internus muscle and the levator ani, and is inserted into the great sciatic ligament, the tuberosity of the ischium and pubis. The ligaments of opposite sides become continuous

with each other, by extending across the arch of the pelvis, formed by the rami of opposite sides, and thus form the *triangular ligament* of the urethra, or the deep perineal fascia. The *internal* layer of the pelvic fascia, called also *vesical fascia*, passes downwards along the inner surface of the levator ani muscle to the inferior margin of the symphysis pubis from which it is reflected on the prostate gland and neck of the bladder, forming the *anterior true ligament* of the bladder, and laterally it is reflected on the side of this viscus, forming its *true lateral ligaments.*

SUPERFICIAL PERINÆAL FASCIA

adheres to the rami of the ischium and pubis of either side, and extends across the perinæum, being continuous anteriorly with the superficial fascia of the scrotum derived from the superficial fascia of the abdomen.

DEEP PERINÆAL FASCIA OR TRIANGULAR LIGAMENT OF THE URETHRA,

is connected, on either side, to the rami of the ischium and pubis, its base looking towards the rectum, its apex towards the sub-pubic ligament, and is pierced by the membranous portion of the urethra, which passes through the ligament about three-quarters of an inch below the pubes. It consists of two layers, between which are situated the artery of the

bulb and Cowper's glands; one layer (*the anterior*) is expanded on the bulb keeping that body in its situation; the other (*the posterior*) is continued along the membranous portion of the urethra to the prostate gland, forms its capsule, and becomes continuous on the bladder with the vesical layer of the fascia iliaca.

FASCIA OF UPPER EXTREMITY

consists of tendinous fibres, which are stronger in some situations than others; it invests the entire arm, and sends partitions between the several muscles. It takes its origin superiorly from the spine of the scapula, adheres to the condyles of the humerus, and to the ridges which lead to them; passes from thence on the forearm, where it is very strong, particularly at its posterior part, and, binding down the several muscles, reaches the wrist-joint, to the annular ligaments of which it is connected.

The *Palmar fascia*, of a triangular form, is very strong, and takes its origin from the anterior annular ligament; from this it expands over the palm, and near the fingers divides into four fasciculi, each of which is forked and inserted into either side of the sheaths of the flexor tendons, and into the ligaments of the first phalanges.

FASCIA LATA.

This fascia takes its origin from the crest of

the ilium, the spines of the sacrum, the os coccygis, Poupart's ligament, the tuberosity of the ischium, and the rami of the ischium and pubis. From this extensive connection it extends down the thigh, confining the different muscles in their situation, and also sending partitions between them. At the posterior part of the thigh it adheres intimately to the linea aspera, and at the knee-joint to the condyles of the femur and the capsular ligament; it is then continued over the heads of the tibia and fibula, to which it adheres and forms the fascia of the leg.

Upon the anterior and upper part of the thigh, the fascia lata, from its special arrangement, has been divided into the iliac and pubic portions, and about an inch and a half below Poupart's ligament, and between the iliac and pubic portions, it presents the opening for the saphena vein. This opening is semi-lunar, the concavity being directed towards Poupart's ligament; it presents an internal and external cornu, and its edge, turning inwards on itself, becomes continuous with the sheath of the femoral vessels.

The *pubic portion* of the fascia lata covers the pectinæus muscle, adheres to the spine of the pubis and the linea ileo-pectinea, passes behind the sheath of the femoral vessels, and becomes continuous with the fascia iliaca.

The *iliac portion* of the fascia lata covers the

sartorius, tensor vaginæ femoris, rectus and iliac muscles, and presents, towards the pubic portion, a *crescentic* or *falciform edge*, the aspect of which is directed upwards and inwards; the inferior cornu of this edge is continuous with the outer corner of the saphenic opening, and its superior cornu extends along Poupart's ligament, crosses the femoral vessels, and is inserted into the linea ileo-pectinea.

The *cribriform fascia.* The superficial fascia, in passing over Poupart's ligament to the groin, adheres to the crescentic edge of the fascia lata, and to the edge of the saphenic opening, and is attached to that layer of the fascia transversalis, which passes anterior to the sheath of the femoral vessels; this portion of the superficial fascia is perforated by numerous small blood-vessels, and by the anterior superficial absorbents of the limb, which gives it, when dissected, a cribriform appearance, from which it derives its name.

The *fascia of the leg* adheres to the heads of the tibia and fibula, and to the spine of the tibia, to the annular ligaments of the ankle-joint, and to the malleoli; it binds down the muscles, sends partitions between them, which pass from its posterior surface to the bones of the leg and inter-osseous membrane, and from the anterior annular ligament it is continued thin upon the dorsum of the foot.

The *Plantar fascia* is very strong, and arises

from the under aspect of the os calcis, is attached to the sides of tarsus and metatarsus, and sends two processes between the muscles of the sole of the foot, dividing them into an internal, a middle, and an external set. At the base of the toes it divides into five portions, each of which bifurcates, and is inserted between two fasciculi into the lateral ligaments of the joints, and into the sheaths of the flexor tendons. This fascia is strengthened by transverse fibres.

THE LARYNX.

Besides the muscles, vessels, nerves, and mucous membrane which enter into the formation of the larynx, there are four cartilages and one fibro-cartilage.

The *thyroid cartilage*, the largest, presents anteriorly a prominent angle called *pomum Adami*, which is formed by the meeting of its alæ. Each *alæ* is of a quadrilateral form, and presents posteriorly two cornua; the superior cornu is the longest, and is connected to the great cornu of the os hyoides by the thyro-hyoid ligament; the lesser or inferior cornu being connected to the side of the cricoid cartilage by synovial membrane and ligaments.

The upper margin of each alæ is connected to the os hyoides by the thyro-hyoid membrane, the inferior margin being connected to the cricoid cartilage by the crico-thyroid membrane, which is of a yellow color and elastic; the

outer surface of each is rough and divided unequally by an oblique ridge, the inner surface being smooth and covered by mucous membrane.

The *cricoid cartilage* is next in size, and forms a ring; it is narrow before and deep behind, its inferior edge is connected to the first ring of the trachea, its superior edge, anteriorly, is connected by the crico-thyroid ligament to the thyroid cartilage, and posteriorly it supports the arytenoid cartilages; its inner surface is covered by mucous membrane, and its outer surface is rough and presents posteriorly a vertical ridge for the attachment of muscles.

The *arytenoid cartilages*, two in number, are the smallest and of a triangular shape; the apex of each is surmounted by a small moveable cartilaginous appendix, the base concave, moves upon the cricoid cartilage; the posterior surface concave lodges on the arytenoid muscles, the external edge is convex for the attachment of muscles, and the inner edge is flat. The apex of each is connected to the epiglottis by a fold of mucous membrane called the *aryteno-epiglottidean fold*, and the base is connected to the cricoid cartilage by synovial membrane and ligaments.

The epiglottis, resembling in form an artichoke leaf, is connected by a stalk-like process to the angle of the thyroid cartilage; anteriorly to the body of the os hyoides by cellular tissue and mucous membrane, and to the base of the

tongue by three folds of mucous membrane, the central one of which is called *frænum epiglottidis*, and posteriorly by the aryteno-epiglottidean folds of mucous membrane.

The *glottis* is the superior opening of the larynx, and is of a triangular form, its base being anterior, formed by the epiglottis, its apex posterior and inferior, formed by the appendices of the arytenoid cartilages, and its sides formed by the aryteno-epiglottidean folds.

The *rima glottidis* is also of a triangular form, and placed beneath the glottis; the base is posterior, formed by the bases of the arytenoid cartilages, the apex anterior corresponding to the angle formed by the alæ of the thyroid cartilage, and the sides are formed by the chordæ vocales.

The *chordæ vocales*, two on either side, arise from the anterior aspect of the arytenoid cartilages, and approaching each other, are inserted into the angle formed by alæ of the thyroid cartilage; the superior is semilunar, the inferior horizontal, and between the vocal chords of either side is a small oval fossa, called the *ventricle* of the larynx.

THE THYROID BODY,

Of a reddish-brown color, consists of two lateral lobes and a connecting middle lobe. The lateral lobes are placed by the sides of the trachea and larynx, and the middle lobe rests

upon the anterior aspect of the second, third and fourth rings of the trachea. Each lateral lobe is of a pyriform shape, the base inferior, and the apex ascending to the thyroid cartilage; both lateral lobes overlap the carotid vessels, the thyroid artery, and the recurrent nerve; and are covered by the sterno-hyoid, sterno-thyroid, omo-hyoid, and platysma-myoides muscles, the cervical fascia, and the integuments. This body or gland is supplied with blood by the superior thyroid arteries from the external carotid, the inferior thyroid arteries from the thyroid axis, which is a branch of the subclavian artery, and sometimes by an artery from the arteria innominata, or from the aorta itself called the middle thyroid artery; its blood is returned by the thyroid veins, which descending on the anterior aspect of the trachea empty themselves into the left vena innominata. No excretory duct has been discovered emerging from this body.

FINIS.