

A description of the distribution of the nerves of the human body; with elementary physiological and surgical observations: including Mr. Brookes's nomenclature of the nervous system ... / by G.D. Dermott.

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A DESCRIPTION
OF THE
Distribution
OF THE
NERVES OF THE HUMAN BODY ;
WITH
ELEMENTARY PHYSIOLOGICAL AND SURGICAL OBSERVATIONS :
INCLUDING
MR. BROOKES'S NOMENCLATURE OF THE NERVOUS SYSTEM,
Late Lecturer on Anatomy in Blenheim Street.

By G. D. DERMOTT,
LECTURER ON ANATOMY AND SURGERY.

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ADVERTISEMENT.

THE system adopted by the celebrated Lecturer Mr. Brookes, in the Nomenclature is as follows :

The primary Nerves and those of the first magnitude are termed NERVI: Branches produced from them, RAMI: And the Productions or Divisions of them, SURCULI.

As the *description* is the Author's, whatever merit or demerit it may possess, must be attributed to him.



PREFACE,

OR

AN INTRODUCTORY EPITOME

OF THE

PHYSIOLOGY OF THE NERVOUS SYSTEM.*

THE CEREBRAL NERVES.

THERE are nine pair of Cerebral Nerves, or Nerves which arise from the Base of the Brain.

The 1st pair, or OLFACTORY, are Nerves of a *Peculiar Sense*, giving the Sense of Smell to the Schneiderian Membrane of the Nose.

2nd pair, or OPTIC NERVES, are nerves of a *Peculiar Sense*, giving the Sense of Sight to the Eye, in the form of the Membranous Retina, which is the expanded termination of the Optic Nerve, and the very seat of Vision.

3rd pair, or MOTORES OCULORUM, are voluntary nerves, bestowing *Volition* to all the muscles of the Orbit which move the

eye-ball, with the exception of the Obliquus Superior and Abductor Oculi muscles.

4th pair, or NERVI PATHETICI, are the smallest of the Cerebral Nerves; they are supposed to be *Respiratory Nerves*, and to give Respiratory Action to the Obliquus Superior Oculi or Trochlearis muscle, which the Pathetic Nerve supplies, by which means the Eye-ball is said to sympathize in its movements with the laboured movements of the Respiratory Muscles of the Chest in distressed respiration; hence the anxious expression of the Eye in that state.

The 5th pair, or THE NERVI TRIGEMINI seu PAR TRIGEMINI, two of the largest Cerebral Nerves: the three largest pair of Ce-

* The Nervous System consists of the Brain, Spinal Marrow, and Nerves.

The Nerves are tracts of medullary matter which extend in a tree-like manner between the Brain or Spinal Marrow, and the more remote parts of the Body; arborescently pervading (perhaps) all parts of the frame.

Nerves are fibrous; and the component Fibres of nerves, when examined, are found to be composed of fibres, i. e. are Bundles or Fasciculi of smaller Fibres; and this division, or analysis, can be carried as far as the reach of ocular observation will permit us. Each of these fibres are invested by a delicate Sheath of Cellular Membrane: these Sheaths connect the Fibres together into Primary Fasciculi, which are also individually covered by a Sheath of their own; these Sheaths of the Primary Fasciculi connect them together, so as to form the Nerve itself, that is also covered externally by a Cellular Sheath, which constitutes its Out-

ward Surface, and which is primarily produced from the Dura Mater, where the Nerve perforates it; it is also supposed that the Tunica Arachnoides forms a general, but a more delicate covering to the Nerve under that of the Dura Mater; whilst the Cellular Substance, forming the above described Sheaths to the individual Fasciculi and Fibres, is a direct continuation of the Pia Mater. The whole of this Cellular Thecal Structure of the nerves is termed the *Neuralema*, distinguishing it from the Medullary Substance of the Nerves which the Sheaths contain. The *Neuralema* is the vehicle to the vessels organizing the Nerves and secreting the Medullary Substance.

When Nerves divide into Filaments, the Medullary Substance does not split, but the Fasciculi with their Sheaths only separate and turn aside from each other. When Nerves join, the junction is only established by the

rebral Nerves are, the Olfactory, the Optic, and the Par Trigemini. The Par Trigemini are composed, each of them, of a fasciculus conveying *Volition*, and another fasciculus conveying *Common Sensation*, so as to impart both Volition and Common Sensation to the muscles and soft parts which they supply, situated on and about the Head; and on account of their bestowing this double function to the soft parts of the Head they are called, in contradistinction to the Simple Nerves,* *Compound Nerves*, or, the *Spinal Nerves of the Head*.

The 6th pair, or NERVI ABDUCENTES, are nerves of *Volition*, giving voluntary motion to the Abductor Oculi Muscle.

The 7th pair consists of *two nerves* quite different in function or nature; one is called PORTIO DURA or NERVUS COMMUNICANS FACIEI, having rather a hard structure, and is the *Great Respiratory Nerve of the Face*, supplying the voluntary muscles of the face in an intermixture of filaments with the Par Trigemini, and making these muscles respiratory muscles. The respiratory muscles of the face by this means are connected in constitutional nervous sympathy with the muscles of the chest and other organs of respiration, so that the actions of these two sets of muscles justly correspond in the acts of drinking, eating, singing, laughing, crying, smelling, speaking, &c. The other portion of the 7th pair is called,

on account of its softness of structure, the PORTIO MOLLIS, or on account of its being a nerve of peculiar sense, the NERVUS ACOUSTICUS; it endues with the *Peculiar Sense of Hearing* the membranous Labyrinth of the Internal Ear, by which means the latter is sensible to the impressions produced upon it by the waves of sound.

The 8th pair, or the PAR VAGUM, with the two subsidiary branches, the GLOSSOPHARYNGEAL and NERVUS SPINALIS ACCESSORIUS VELLERII, are *respiratory nerves*, supplying the Muscles of the Neck, Larynx, the Trachea, the Pharynx, the Æsophagus, the Lungs, the Heart partially, and the Stomach: making all these respiratory organs. The actions of the muscles of the Larynx are immediately implicated with the function of Respiration in all its states; the muscles of the Pharynx are also implicated, like the muscles of the Face, with Respiration during Deglutition; as well as the action of the Æsophagus; the Lungs are the *primary* organs of respiration; and the Heart is also implicated. We see how the actions of the latter are immediately implicated with, and in a great degree depending upon, the function of the Lungs; Respiration is quickened, the action of the Heart is correspondingly accelerated; Respiration is oppressed and slow, the pulse of both the Heart and Arteries is correspondingly

Sheaths of their Fasciculi cohering, i. e., the Medullary Substance of the two is unblended.

By this uninterrupted continuity and oneness of each Nervous Filament, extending from the Brain, or Spinal Marrow, to its destination—first, as a component filament of a trunk—next, that of a branch—and subsequently in form of a separate filament, each particular sensation made upon a particular part of the body is conveyed to the Sensorium by the filaments which supply that particular part; whereby the mind has the faculty of referring the sensation to the particular spot thus affected; and the power of conveying the commands of volition to a particular muscle or muscles, by the continuity of the filaments which are appropriated for their supply; for a continuity of substance must possess a continuity of action.

The nerves consist of two classes, the GANGLIONIC SYSTEM, and the CEREBRO-SPINAL SYSTEM.

The *Ganglionic System* (called commonly the *Sympathetici Maximi*), or the nerves which supply involuntary parts, unite with each other, and with other nerves in the form of *Ganglia* or knots. These *Ganglia*, besides connecting the sensibility of parts, I believe, have a specific influence in the nervous system, in modifying the sensibilities of certain parts.

The *Cerebro-Spinal System* of nerves, is those arising from the Brain and Spinal Marrow; when these unite they form a *Plexus*, or a net-work, previously to their distribution: observe, the Plexuses in the roots of the limbs—the Axillary—and the Lumbar Plexuses.

The Nerves endue parts with various kinds of sensibilities—both *Common* and *Peculiar* sensibilities: i. e. they make parts sensible to the mechanical and chemical impression of substances, (see the nerves of common sensation,) which impressions if very severe produce pain—pain may be said to be a high degree of sensation, conjoined in many instances with a deranged state of sensation: the nerves convey the influence of the mind to the voluntary muscles, by (many suppose) making the principle of contraction in the muscle sensible to the stimulus of volition (see nerves of volition): they also endue, I believe, involuntary muscles, and peculiar organs, with peculiar sensibilities, making them sensible to their peculiar stimuli (see the Sympatheticus Maximus and the Nerves of Peculiar Senses). In fine, they are the sentient strings of connection between all sensible parts of the Frame and the Brain.

* When nerves convey only one function they may be called *Simple Nerves*.

laboured and slow; in the natural process of dying Respiration stops, and the action of the Heart subsequently ceases as a natural consequence; we see that the stomach is partially a Respiratory Organ, or that its nervous sensibility is one with the Lungs and Respiratory Muscles; for irritation of the Stomach by nervous connection or sympathy, occasions convulsive action of the Diaphragm, constituting *Hick-up*; a still greater irritation of the Stomach produces by sympathy a still greater degree of irritation of the Diaphragm, and also of the Abdominal Muscles, which excites these into strong action, whereby the Stomach is forcibly compressed and its contents are ejected, constituting the act of *vomiting*.

9th pair, or *MOTORES LINGUÆ*, are voluntary nerves, which carry *Volition* to the tongue; the tongue has great mobility, particularly in females.

All the Nerves of *Peculiar Senses* arise from some *Specific Masses* of the Medullary Substance of the Brain. All the Cerebral Nerves conveying *Volition*, arise from one *certain tract* of Medullary Matter in the Base of the Brain. The Cerebral Nerves conveying *Common Sensation*, (*Nervi Trigemini*), arise from another cer-

tain tract of Medullary Matter in the Base of the Brain. The *Respiratory Cerebral Nerves* arise from another *certain tract* of Medullary Matter in the Base of the Brain.

All these Nerves are, individually, Nerves conveying only one *Single Function*, except the *Nervi Trigemini*, which arise by one *Fasciculus* from the Tract of Voluntary Motion, and by another *Fasciculus* from the Tract of Common Sensation; thereby conveying a Double Function, or, speaking more technically, it is a *Compound Nerve*.*

THE SPINAL MARROW AND SPINAL NERVES.

Continuations of the two † Tracts of Medullary Matter, which give rise to the Cerebral Voluntary Nerves, extend downwards through the Foramen Magnum, so as to constitute the *two Anterior or Larger Columns of the Spinal Marrow*. Continuations of the two ‡ Tracts of Medullary Matter which give rise to parts of those cerebral nerves which convey Common Sensation (*Nervi Trigemini*) extend downwards through the Foramen Magnum, and constitute the *two Posterior and Lesser Columns of the Spinal Marrow*. §

* Above these Tracts of Medullary Matter, we have the Mass of Cerebral Substance, which contains the Intellectual or Mental powers, and which is continuous, or one in substance with these Tracts and Masses, that give origin to the Nerves, constitute the Base of the Brain, and Parts near to the Base.

† One in each side of the Base of the Brain.

‡ One in each side of the Base of the Brain.

§ It will be here necessary for me to explain some particulars connected with the *Anatomy of the Spinal Marrow*. The Spinal Marrow, like the Brain, is contained in an Osseous Cavity, which is a Canal, formed by the aggregation of all the vertebræ when they are in an articulated state. This canal is called the *Specus Vertebrarum*. The contents of it, consist of the Spinal Marrow (as it is termed), its Membranes, the two *Sinus Venosi*, and the Commencements of the Nerves.

The Spinal Marrow is continuous with the Medulla Oblongata, within the Foramen Magnum Occipitale; and, as it is continued through the *Specus Vertebrarum*, it is large, like the *Specus*, in the Cervical Vertebræ; it becomes like the *Specus*, considerably smaller in the Dorsal Vertebræ; and again enlarging like the *Specus* in the lower Dorsal Vertebræ, it subsequently terminates within the *Specus* of the first Lumbar Vertebræ, in the adult, by tapering into the *Cauda Equina*.

This is composed of two primary *Large Anterior Columns* of medullary matter, and two *Smaller Posterior Columns* of medullary mat-

ter; and the Anterior and Posterior Columns of medullary matter are separated at each side of the Medulla Spinalis by a *longitudinal interstice*, extending downwards throughout the whole length of the side of the Medulla Spinalis; whilst the two Anterior Columns are separated from each other by a similar *longitudinal interstice* in front of the Medulla Spinalis; and the two smaller Posterior Columns are also separated from each other by a similar *longitudinal interstice* in the posterior side of the Medulla Spinalis. Thus the Medulla Spinalis is composed of four Columns of Medullary or Nervous Matter; and is broad before (formed by the two anterior columns), and narrow behind (formed by the two posterior columns); so as to be adapted to the form of the transverse area of the *Specus Vertebrarum*. These columns, too, are made up of *Medullary Fibres*, or *Fasciculi*, which have the same longitudinal, zigzag, arrangement as those of the nerves.

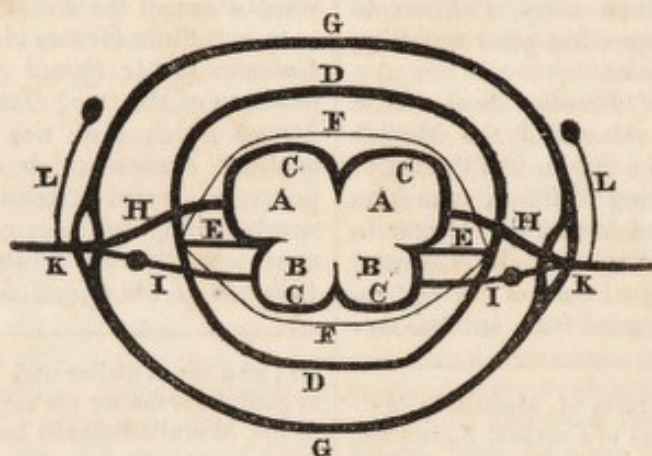
The interior of each of these columns is formed of a peculiar Cineritious-like Substance; and the Cineritious Centres of each are continuous—by which means, alone, the four Medullary Columns are united together in substance; so that the interstices separating the Columns pass as deep as this Cineritious Centre of Decussation, common to the substance of the four Columns; and this Cineritious Centre must be continued, in the form of a Crucial Lamella, through the whole length of the Spinal Marrow: thus, this Crucial-like Decussation of the Cineritious Centres unites the substance of the four Columns

All the Nervous Fasciculi which arise from the two Anterior Columns of the Spinal marrow must be Fasciculi of Volition, by partaking of a sameness of function with the Anterior Columns of the Spinal Marrow, whence they arise. All the Fasciculi arising from the Posterior Columns of the Spinal Marrow must be Fasciculi of Common Sensation, partaking of the Functions of the Posterior Columns of the Spinal Marrow, whence they arise.

There are thirty pair of Spinal Nerves, or nerves arising from the Spinal Marrow, conveying both Common Sensation and Volition. Each Spinal nerve is a double nerve, or arises by a fasciculus from the

Anterior Column, and by another fasciculus from the Posterior Column of the Spinal Marrow. These fasciculi pass outwards, the first anteriorly, the latter posteriorly, to the Ligamentum Denticulatum; perforate the Theca Vertebrarum, gradually converging (the posterior fasciculus always having a small Ganglion in its substance after escaping from the Theca); and then unite together in close lateral cohesion by cellular tissue, so as to constitute the double nerve, which emerges from the corresponding Foramen Intervertebrale, and immediately obtains its connection with the corresponding Ganglion of the Sympathetic Nerve, previously to its distribution.

A transverse section of the spinal marrow and its membranes, to shew the manner in which the spinal nerves arise.



AA The anterior columns of the spinal marrow. BB The two posterior columns. CCCC The pia mater, or surface of the spinal marrow. DD The theca vertebrarum, or dura mater. EE Ligamenta denticulata. FF The tunica arachnoides. GG The specus vertebrarum. HH The anterior fasciculi of the spinal nerves. II The posterior ganglionic fasciculi. KK The emergence of the spinal nerves from the foramina intervertebralia. LL The connections of the spinal nerves with the ganglia of the sympathetici maximi.

together,—and, creates, it is supposed, a connection of their functions.

The *Pia Mater* is in close adhesion to the external surface of the Spinal Marrow; it contains its nourishing vessels, and invests it in the same manner as the *Pia Mater* invests the brain.

It is also loosely surrounded, in a web-like manner, by the *Tunica Arachnoides*;—and still more distantly and distinctly by the *Theca Vertebrarum* or *Dura Mater*.

The *Theca Vertebrarum* is continuous with the *Dura Mater* within the *Foramen Magnum Occipitale*—and descending, adheres to the inner side of the circumference of the *Foramen Magnum* and *Atlas Vertebra*; afterwards it forms a Strong Sheath, surrounding the *Medulla Spinalis*, its whole length, and also the *Cauda Equina*; being situated distantly from the *Specus*, as it is smaller than that; also at a distance from the Spinal Marrow, in as much as it is larger than the latter; and

ends in the form of a *cul de sac*, which, closing in the extremity of the *Cauda Equina*, in the extremity of the *Specus Vertebrarum* of the *Sacrum*, is covered over by a *Ligamentous Membrane*. Within the *Theca Vertebrarum*, and between the *Theca* and *Pia Mater*, upon the Spinal Marrow there are the two *Ligamenta Denticulata*,—each *Ligamentum Denticulatum*, is a narrow ribbon-like slip of very thin membrane, which commences by the side of the Spinal Marrow, within the *Foramen Magnum Occipitale*, and descends in a longitudinal direction along the sides of the Spinal Marrow,—its internal straight edge is attached by fine cellular membrane to the *Pia Mater* opposite to the lateral interstice which parts the Anterior from the Posterior Column; whilst the external side, which is denticulated, or scolloped, is attached by its denticuli to the side of the *Theca Vertebrarum*, (the intermediate scollops being unattached): at the extremity of the Spinal Marrow, the two Li-

There are eight pair of Spinal Nerves which arise from the Spinal Marrow in the Neck, called the *Cervical Spinal Nerves*. The first pair emerges from between the side of the Foramen Magnum and the upper side of the Posterior Arch of the Atlas; and is therefore called the *Sub-Occipital Nerve*; but it is properly the First *Cervical*: this used to be reckoned the Tenth Cerebral Nerve (so that ten pair of Cerebral Nerves were formerly enumerated); it afterwards became a disputed and doubtful point, whether this pair were actually Cerebral Nerves and arose from the Medulla Oblongata, or Spinal Nerves, and arose from Medulla Spinalis; but the fact of their arising by two distinct origins like the Spinal Nerves, sets the matter completely at rest, and stamps them indisputably *Spinal*. The Cervical Nerves below the sub-occipital are named numerically, as the *First*, the *Second*, the *Third*, the *Fourth*, *Fifth*, *Sixth*, and *Seventh Cervical Nerves*; but considering the Sub-occipital to be one, the Sub-occipital must be called the First Cervical, the First should be called the Second, the Second the Third Cervical Nerve, and so on.

There are twelve pair of Spinal Nerves, arising from the Spinal Marrow in the region of the back, called *Intercostal*, on account of their passing outwards and forwards in the intercostal spaces betwixt the ribs and also betwixt the intercostal muscles; or *Dorsal Nerves*, because they emerge from the Foramina Intervertebralia formed betwixt the Dorsal Vertebrae.

There are five pair of the Spinal Nerves, which emerge from the Foramina Intervertebralia, between the Lumbar Vertebrae,

and are called the *Lumbar Nerves*.

Lastly: there are five pair of Spinal Nerves which emerge from the Anterior Sacral Foramina, (i. e. from the False Vertebrae) and which are denominated *Sacral Nerves*.

A continuation of the Tract of Medullary Matter which gives off the Respiratory Cerebral Nerves, descends through the Spinal Marrow between the Anterior and Posterior Columns, giving off the Respiratory Nerves which arise from the Spinal Marrow in the Neck, viz.—The *Nervus Spinalis accessorius Willesii*, (a portion of the eighth pair).—The *Proper Phrenic* or *Diaphragmatic Nerve*, sometimes called the *Internal Diaphragmatic Nerve*, which is appropriated to the Diaphragm to give its Respiratory action; the origins of this nerve cling to, and as it were form one, with the origins of the Cervical Nerves, and the origins of the Phrenic, subsequently to their emergence from the Foramina Intervertebralia, peel off from the anterior sides of the Cervical Nerves as they are about to form the axillary plexus.—The *External Respiratory Nerve*, arises from the Respiratory Column, has its origins coming out of the Foramina Intervertebralia, in close cohesion to the same Cervical Nerves as the origins of the Phrenic are connected with, and it turns off from the posterior sides of these nerves, as the Phrenic turns off from their anterior sides, and as they are about to form the axillary plexus;—so that the former nerve descends in front of the axillary plexus,—and this behind the axillary plexus into the axilla, conveying respiratory action to the Serratus Major Anticus muscle.

The lower continuation of the respira-

gamenta Denticulata taper and coalesce, and also unite with a process of the Pia Mater, to form the *Ligamentum Pie Matris*; this is a narrow process of membrane, which passes downwards from the extremity of the Medulla Spinalis, through the middle of the Cauda Equina, perforates the cul de sac of the Theca Vertebrarum, and expands upon the Base of the Os Coccygis.

All these additional appendages of membrane may be considered to be to keep the Medulla Spinalis as well as the Nerves steady, or in a state of balancement.

In the space between the Theca et Specus Vertebrarum is some Cellular Membrane, and the two Sinus Venosi. The Cellular Membrane is very much beslimed by its serous secretion; and suspended in it, are the two Sinus Venosi. The Sinus Venosi commence by veins which communicate through the Foramen Magnum Occipitale, with the lower parts of the two Lateral Sinuses, and with the two Inferior Petrosal Sinuses; they descend along

the sides of the Theca Vertebrarum, in the form of two Plexuses of Veins suspended in the slimy cellular tissue; and during this descent—are connected with each other by veins which pass across the Anterior and Posterior sides of the Theca Vertebrarum—receive the veins from the Medulla Spinalis—and give out small veins promiscuously through the Foramina Intervertebralia, which terminate in the Vertebral Veins of the Neck, in the terminations of the Intercostal Veins, and in the terminations of the Lumbar Veins; by which means, the two Sinus Venosi are ultimately expended. Thus the Sinus Venosi receive the blood from the substance of the Spinal Marrow; and also convey some of the blood from the Latera Sinuses through the Specus Vertebrarum into the Vena Azygos, (for the Intercostal and upper Lumbar Veins, into which the Sinus Venosi open, terminate in the Vena Azygos): some of the blood thus returning from the head in this circuitous route (through the Sinus Venosi and Vena Azygos) to the heart.

tory column, descending through the *Dorsal part of the Spinal Marrow*, is said to be consumed by giving off fasciculi in the origins of the *Intercostal or Dorsal Nerves*, making these latter *Triple Compound Nerves*, i. e. nerves of Common Sensation, nerves of Volition, and nerves of Respiratory or mixed actions. We see why all the parts of the Respiratory System sympathize; because they are nerves which arise from one tract of Medullary Matter, consequently their sensibility is one.*

In addition to this Cerebro-Spinal System of Nerves, there is the *Ganglionic System*, or the *Sympatheticus Maximus*, which is a distinct and peculiar Tract of Medullary Substance, descending through the whole length of the posterior part of the Trunk, from immediately below the Base of the Cranium through the whole length of the posterior part of the Trunk laterally to the Spine, to the lowest part of the Rump. The *First Cervical Ganglion* is its highest part, or it may be said, for the sake of description, to be its commencement, the upper extremity of which is connected by *Communicating Filaments* that pass through the *Canalis Caroticus* upon the *Internal Carotid Artery* with the *Nervus Abducens* and the *Par Trigemini* (or *Spinal Nerve of the Head*;) as the *Sympathetic* descends opposite to the *Foramina*

Intervertebralia, its *Ganglia* are there connected with the corresponding spinal nerves (as the latter are emerging from the *Foramina Intervertebralia*) by *Communicating Filaments*.

The *Sympathetic* also gives off filaments and branches that supply the *Thoracic*, *Abdominal*, and *Pelvic Viscera* with involuntary action.

Observe, that the filaments in the *Canalis Caroticus* are only *Communicating Filaments* between the *Sympatheticus Maximus* and the *Spinal (Nervi Trigemini)* and other Nerves (*Nervus Abducens*, &c.) of the Head; and are between the *Sympathetic* and them, what the *Communicating Filaments* are between the other *Ganglia* of the *Sympatheticus Maximus* and the other *Spinal Nerves* of the Body.

From this account, the two great offices of the *Sympatheticus Maximus*, may be set down as follows; to give a proper kind of Sensibility and an Involuntary Action to the Involuntary Vital Organs; and to connect also the actions and sensibility of these Involuntary Organs with the *Spinal Nerves*, or rather the Parts which the *Spinal Nerves* supply, viz. all the muscles endued with voluntary action, and all the parts possessed with common sensation.

* The highest *Spinal Nerves*, pass off from the *Spinal Marrow* to emerge through the *Foramina Intervertebralia* of the *Cervical Vertebrae*, nearly transversely; but as the nerves arise lower or nearer to the inferior part of the *Spinal Marrow*, they in a ratio, descend more obliquely through the *Specus* to their respective *Foramina Intervertebralia*; so that the nerves which emerge from the lower *Dorsal* and the *Lumbar Intervertebral Foramina*, arise from the *Spinal Marrow* much higher up than their emergence, whilst the fasciculi, or nerves which arise from the lowest part of the *Spinal Marrow* (within the inferior *Dorsal Vertebrae* and the first *Lumbar*), descend almost perpendicularly through the *Specus* of the lower *Lumbar Vertebrae* and that of the *Sacrum*, being held together in lateral co-

hesion by the prolongations of the *Pia Mater* from the *Spinal Marrow* which cover them; as they are thus situated, in consequence of their presenting the appearance, when separated, of a horse's tail, they bear the name of *Cauda Equina*: as the *Cauda Equina* thus descends through the *Specus* of the lower part of the *Spine*, the *Ligamentum Pia Matris* descends perpendicularly through its centre in the midst of its fasciculi; and the component fasciculi of the *Cauda Equina* are gradually given off in the form of the *Large Sacral Nerves* through the *Anterior Sacral Foramina*; the last pair of *Spinal Nerves* being only filaments in size, and emerging between the extremity of the *Sacrum* and the *Base* of the *Os Coccygis*, by which the *Cauda Equina* is completely exhausted.

THE CEREBRAL NERVES.

These consist of Nine Pairs or Sets.

First pair,—THE OLFACTORY NERVES, arise by three medullary pedunculi, or roots, from the posterior parts of the Corpora Striata, and Posterior and inferior parts of the Anterior Lobes of the Cerebrum. The nerves emerge from the Interstice between the Anterior and Middle Lobes of the Cerebrum called the Fissura Magna Sylvii, in the form of three pedunculi or roots, and as they emerge, the pedunculi unite in substance. The nerves are then continued forwards, inclining a little inwards, in a *plano-convex form*; the upper convex sides being lodged in superficial sulci in the under surface of the Anterior Lobes of the Cerebrum; and their flat under-sides, being supported, first, upon the Alæ Minores of the Sphenoid Bone, and subsequently upon the Cribriform Plate of the Æthmoid Bone: as they are converging they gradually enlarge in form; and each ultimately ends in an oval-shaped and somewhat flattened extremity; these extremities of the nerves, termed their *Bulbous-shaped extremities*, lie upon the Cribriform Plate of the Æthmoid Bone, laterally to the Processus Cristatus, also to the anterior extremity of the Falx Major which is attached to the Processus Cristatus. From the under surfaces of these Oval or Bulbous-shaped Extremities, *slender fasciculi* or processes of their medullary substance, descend through the Foramina Cribrosa of the Cribriform Plate, where they pierce the Dura Mater, from which the fasciculi receive sheaths or external coats, so as to assume the structure of filaments; and then descend in the form of *two series of diverging filaments*, between the Periosteum and the Schneiderian Membrane of the Nose; *one series* upon the superior part of the Septum Nasi, or, upon the Nasal process of the Æthmoid Bone; *the other* upon the Superior Turbinate Bone; and as the filaments descend and gradually diverge, so they are insensibly lessened in size, until they are ultimately lost in the very substance of the Schneiderian Membrane, in which they lose their coats so as to be reduced altogether to a medullary condition, whereby the medullary substance of the Olfactory Nerves in the seat of sense, is nearly in mechanical contact with the odoriferous particles floating in the Nares; the outward surface of the Schneiderian Membrane being the only interception or

intervening pelicle. As these filaments descend, they are insensibly diminished, by sending off innumerable and most minute filaments in lateral directions and in different degrees of obliquity, so as to intersect and to constitute a most delicate Rete Nervosum, or what may be termed, a *Nasal Pes-Anserinus*, situated intermediately to the primary divergent filaments.

Second pair—THE NERVI OPTICI,

Are usually described to arise from the posterior and inferior part of the Thalami Nervorum Opticorum; they turn obliquely downwards, forwards, and inwards, around the under-sides of the commencements of the Crura Cerebri; and so as to emerge at the Base of the Brain, from the interstice between the Crura Cerebri and the under-sides of the Middle Lobes. They are subsequently continued, obliquely forwards and inwards, across the Sphenoidal Folds of the Dura Mater, which immediately cover the Cavernous Sinuses. They then meet together anteriorly to the Olivary process, and *become united in substance, by an interchange or a decussation of the fibres constituting their internal sides*. The course of the two Optic Nerves from their commencements to their point of decussation, is termed the *Tractus Nervorum Opticorum*. The Optic Nerves then pass obliquely forwards and outwards, through the Foramina Optica, so as to enter the Cavities of the Orbits; they are subsequently continued, obliquely forwards, inclining outwards and also downwards, deeply immersed in the Fat which fills the posterior part of the Orbit, and surrounded by the diverging direction of the Recti Muscles. Each then touches the posterior part of the Ball of its respective Eye, and the Component Fasciculi becoming suddenly separated, pierce the *Pars Cribrosa* of the Tunica Sclerotica one sixth of an inch internally to the Axis of Vision, and then, in a similar condition, the corresponding part of the Tunica Choroides. The Fasciculi becoming reunited in substance, form, upon the internal side of the Tunica Choroides, a small Medullary Tubercle or Papilla; whence the continued substance of the Optic Nerve expands in the form of a thin, Semi-transparent, or Greyish coloured Stratum of Nervous Substance, termed the *Retina*; which spreads forwards over the Posterior Convex Surface of the Vitreous Humour, between the Tunica Hyaloidea Externa and the Tunica

Jacobi. Which latter is a transparent membrane intercepting it from the Tunica Choroides. The Retina may be considered as consisting in itself,—of an External Stratum of Nervous Substance, which is in contact with the Tunica Jacobi, and intercepted by it from the Tunica Choroides—and a more Internal Stratum, which is a thin membrane, the vehicle to the vessels which nourish the nervous substance of the Retina, and termed the Tunica Vasculosa Retinæ. The *External Medullary Lamina of the Retina* ends upon the surface of the Canalis Petitianus, under the attachment of the Striæ Ciliares, being impressed with the form of the Striæ Ciliares; so as to lose itself in a striated form upon the surface of the Petitian Canal. The *Tunica Vasculosa Retinæ* coursing forwards over the Petitian Canal, blends with the substance of the Tunica Chrystallina, just anteriorly to the Circumference of the lens.

Third pair—OR MOTORES OCULORUM,

Properly so called, arise from the internal and posterior parts of the two Crura Cerebri, immediately in front of the Pons Varolii. They pass directly forwards, so as to perforate the Dura Mater laterally to the Posterior Ehippial Processes. They are then continued through the External side of the region of the Cavernous Sinus in close cellular adhesion to the internal surface of the outer lamina of the Sphenoidal Fold of the Dura Mater.—They are subsequently continued into the Orbits through the Foramina Lacerata Orbitaria Superiora, and then part into Filaments, so as to supply the Levator Palpebræ Superioris: the Rectus Superior: Rectus Inferior: Rectus Internus: and the Obliquus Inferior: bestowing volition to these muscles; a filament being appropriated to each. It also gives a filament to the Lenticular Ganglion.

Fourth pair—OR NERVI PATHETICI.

These are the smallest Cerebral Nerves; and they have erroneously been said to be composed, individually, of a single filament of nervous substance. They arise from the posterior sides of the Testes, just above the attachment of the Valvula Magna Vieussensii; being supposed to take up their substance from the continuation of the Respiratory Tract of Nervous Matter.* They wind outwards around the posterior sides of the Testes, just above the attachment of the Valvula Magna Vieussensii:

they then slant obliquely downwards and forwards, by the side of the Iter a Tertio ad Quartam Ventriculam; and emerge at the Base of the Brain, laterally to the side of the Pons Varolii (which forms the floor of the passage:) they are then continued forwards, and emerge from beneath the Anterior Semicircular Edge of the Tentorium: they pierce the Dura Mater laterally to the Posterior Ehippial Processes, a little more laterally than the Third Pair, and immediately beneath the Cornua, or the sides of the Anterior Edge of the Tentorium. Each is subsequently continued forwards with the Motor Oculi of the third Pair, through the outer side of the Region of the Cavernous Sinus, and in close adhesion to the internal surface of the outer layer of the Sphenoidal Fold, like the Motor Oculi; but ranging superiorly to it. It then inclining obliquely inwards, crosses over the Motor Oculi, (in the region of the Cavernous Sinus,) next passes through the Foramen Lacerum Orbitale Superius, and plunges abruptly into the substance of the Obliquus Superior, or Trochlearis Muscle; being supposed to impart Respiratory Action to that muscle.

Fifth pair—OR NERVI TRIGEMINI, OR PAR TRIGEMINI.

These and the Optic Nerves, are the largest of the Cerebral Nerves. They are of a flat tape-worm-like figure; and they are termed the *Spinal Nerves of the Head*. They individually come off in the form of a double root;—one portion of which is derived from the Tract of Medullary Substance in the Base of the Brain, which is a continuation of the Medullary Column of the Spinal Marrow imparting Common Sensation;—the other from a Tract, a similar continuation of the Column of the Spinal Marrow which imparts Volition: and so that this is represented as a Compound Nerve; or as being for the purpose of imparting Common Sensation and Volition to the soft and muscular parts of the head; just as the Spinal Nerves are Compound Nerves, and are for the purpose of imparting Common Sensation and Volition to the soft and muscular parts of the Frame at large. These nerves pass off from the outer side of the union of the Pons Varolii with the Crura Cerebelli: they course obliquely forwards and outwards, and pierce the Dura Mater some distance laterally to the Posterior Ehippial Processes, more laterally than the Third or Fourth Pair of Nerves and beneath the edge of the Tentorium. Each then expands upon the extremity of the Petrous Portion of the Temporal Bone into a flat Semilunar-shaped Ganglion, termed the *GANGLION GASSE-*

* Their origins are seen when the Valvula Magna Vieussensii is first exposed, by the removal of the united parts of the Lobes Cerebelli lying over the Valve of Vieussens.

it; this is situated between two laminae of the Dura Mater; the internal thicker layer, which constitutes the true serous surface of the Dura Mater, intercepts it from the cavity of the Recent Skull: the external thinner and periosteal lamina supports it, and intercepts it from being in contact with the Bone. The Ganglion is immersed in a quantity of cineritious-like substance, which is of a semi-lunar form, and which gives the peculiar form to the Ganglion. The fasciculus of *common sensation* is the only part of the nerve which *actually expands* to form the Ganglion, whilst the fasciculus conveying voluntary motion, courses forwards in an unintermixed state by the side of the Ganglion. The anterior edge of the Ganglion, which is directed in concordance with the obliquity of the upper surface of the Petrous Process of the Temporal Bone obliquely downwards and forwards, sends off the *triple continuation of the nerve*, under the form of three Great Branches, which are each compressed or flattened in form, like the Trunk and Ganglion of the Nerve.

BRANCHES.

The first branch is the *RAMUS OPHTHALMICUS*; this passes obliquely forwards and inwards under the Dura Mater, so as to insinuate itself into the Sphenoidal Fold, which covers the Cavernous Sinus; it then passes forwards through the outer side of the Region of the Cavernous Sinus, in adhesion, like the Third and Fourth Pairs of Nerves, to the internal surface of the outer layer of the Sphenoidal Fold of the Dura Mater, and intervening, like them, between the outer layer of this fold of the Dura Mater and the Veins of the Cavernous Sinus: it gradually inclines inwards, and crosses, (in the Cavernous Sinus), like the Fourth Pair of Nerves, obliquely over the Third Pair, and is joined to the Fourth Pair immediately over the Third Pair by a *short Transverse Fasciculus of Medullary Substance*. It then passes into the Foramen Lacerum Orbitale Superius, and in this Foramen it *trifurcates* into—

Firstly, the *Surculus Frontalis*; this courses forwards under the Orbital Process of the Frontal Bone and the Periosteum, or immediately above the Levator Palpebrae Superioris. It then emerges from the Orbit through the Foramen Supra Orbitale, and subsequently ascends upon the Forehead in the form of two leading divisions, one of which is more especially bestowed to the Integuments, the other ascends in the substance of the Frontal belly of the Occipito Frontalis Muscle, and towards the Vertex of the Head, these two divisions become totally lost in a promiscuous dispersion of filaments to the substance of the

Scalp, communicating through the medium of that with the terminations of the other nerves concerned in supplying the substance of the Scalp, viz.—the Ascending branch of the Pes Anserinus—the Auricular Branch of the Second Cervical Nerve—and the Occipital Branch of the First. Immediately after, it emerges from the Foramen Supra Orbitale, it throws inwards a *small branch* called *Surculus Trochlearis*, which supplies the parts constituting the inner Canthus of the Eye, and immediately covering the Lachrymal Sac.

Secondly, the *Surculus Nasalis*. Before describing the course of this Nerve, observe the relative position of the Foramen Lacerum Orbitale Superius with the Foramen Opticum—the Foramen Lacerum Orbitale Superius is situated externally to the Foramen Opticum—and consequently the entrance of this nerve into the cavity of the Orbit, as well as all the other nerves passing through the Foramen Lacerum Orbitale Superius, must be situated *more outwardly* than the Optic Nerve in the cavity of the Orbit.—Hence, as this (the Nasal Twig) is destined to the Nose and the internal side of the Orbit, it courses obliquely of the Optic Nerve, or between the Optic Nerve and the Rectus Superior Oculi. It forwards and inwards *across* the upper side subsequently passes through the Foramen Orbitarium Internum Anticum, then emerges from the Cranial aspect of the line of junction between the Orbital Process of the Frontal bone and the anterior part of the Cribriform plate of the Ethmoid Bone, so as to gain the Cavity of the Cranium. It subsequently passes inwards across the foremost part of the Cribriform Plate of the Ethmoid Bone, frequently impressing it by a slight Sulcus. It afterwards descends through one of the most anterior and largest of the Foramina Cribrosa, so as to pass the boundary line between the region of the Cranium and the region of the Nose. It then descends upon the superior part of the Septum Nasi, between the Periosteum and the Schneiderian Membrane, parting into filaments, which supply the Schneiderian Membrane, and which are lost towards the tip of the Nose. So that this supplies the Schneiderian Membrane upon the upper and anterior part of the Septum, or upon the Nasal Process of the Ethmoid Bone, with Common Sensation. At the internal side of the Orbit, it gives off a *Small Branch*, which is thrown inwards to the Lachrymal Sac and the parts immediately about it. Just before it passes across the Optic Nerve, it gives downwards a *filament to the Lenticular Ganglion*.—The Lenticular Ganglion is said to be the smallest ganglion in the body—it is of a

lenticular shape, and seems like a minute piece of pale-coloured red wax; and it is deeply immersed amidst the Fat and Cellular Membrane, in the Orbit, behind the ball of the eye, and between the Optic Nerve and the Rectus Externus Muscle; being united by a filament with the Nervus Motor Oculi, and by another filament (the last described) with the Surculus Nasalis e Ramo Ophthalmico Nervi Trigemini. The Lenticular Ganglion gives off the *Nervi Ciliares*. These are minute filaments which pass forwards in the form of two series of diverging filaments laterally to the sides of the Optic Nerve; one of these series perforates the Tunica Sclerotica by either side of the Optic Nerve, and then dips into the Choroid Coat. They subsequently course forwards through the superficial surface of the Choroid Coat concomitantly with the Ciliary Arteries and Vorticosae veins in the form of so many straight, minute filaments, the largest of these being very evident, and with the assistance of a microscope, the smaller ones; then under the Ligamentum Ciliare they individually split into pencils of minute filaments—the most lateral filaments of which pencils, unite, so as to constitute a *Circulus Nervosus Iridis*, which is situated contiguous to the *Circulus Arteriosus Iridis*. These filaments pass inwards through the substance of the Iris concomitantly with its Arteries and Veins, and approaching towards the Pupillary Margin of the Iris, they again split into diverging filaments; which are dispersed and lost near to its Pupillary Edge.

Thirdly, the *Surculus Lachrymalis*, passes obliquely forwards and outwards, from the division of the Ophthalmic Branch along the outside of the Abductor Oculi Muscle, and is dispersed in filaments to the substance of the Lachrymal Gland, adjacent Periosteum, and parts immediately around it.

2. *RAMUS MAXILLARIS SUPERIOR*, is larger than the Ophthalmic Branch; it passes from the anterior edge of the Ganglion Gasserii, obliquely downwards and forwards, through the Foramen Rotundum into the upper part of the Pterygo-palatine Fissure—when it comes beneath the back-most part of the Floor of the Orbit and the posterior part of the Sphæno Maxillary Fissure, and against the posterior side of the Tuberosae Process of the superior Maxillary Bone. Here it is enlarged into the *Ganglion Meckeli*, which is rather of a heart-like or conical shape, the apex presenting downwards:—whence the nerve is widely distributed to various parts of the Head. The more remarkable branches are four, which may be rated as branches of importance: and there are also three branches which are smaller, and of less importance.

1st. *Surculus Pterygo-Palatinus*, a large branch which descends from the inferior part of the Ganglion Meckeli through the Canalis Pterygo-Palatinus, emerges upon the Palate from the Foramen Palatinum Posticum; and subsequently courses forwards in the form of two leading branches upon the surface of the Palatine Process of the Superior Maxillary Bone, and by the inner side of the Alveolar Process, covered by the Mucous Membrane of the Mouth—and as it courses forwards, it supplies the Mucous Membrane constituting the arches of the Palate, the substance of the internal side of the Gum, and by filaments which pierce the posterior part of the Alveolar Process, the large Molar Teeth. The small extremity of the nerve then turns upwards into the Foramen Incisivum, and communicates in that, with the termination of the *Surculus Sphæno Palatinus* in the form of a small ganglion, called *Ganglion Incisivum*, which is suspended in the Foramen Incisivum, within a small process of the Mucous Membrane from the Palate, that blocks up the Foramen Incisivum.

2d. The *Surculus Sphæno-Palatinus*, is a large branch, which passes from the Ganglion Meckeli horizontally inwards through the Foramen Sphæno-Palatinum, so as to enter the side of the Nose; and then suddenly spreads in a wide arborescent form over the whole of the side of the Nose, (the branches coursing, as in every other part of the Nose, between the Periosteum and the Schneiderian Membrane,) and enduing the Schneiderian Membrane with common sensation; the higher filaments extend upwards through the Ethmoidal Cells, so as to reach the Frontal Sinuses;—and one of the largest of the inferior divisions descends obliquely forwards, and sometimes perforates the Inferior Turbinate Bone; then glides by the lower part of the Septum Nasi; and ultimately ends in the Foramen Incisivum, in union with the termination of the *Surculus Pterygo Palatinus*, under the form of the *Ganglion Incisivum*.

3d. The *Surculus Vidianus*, is a small branch; is given off, not from the Ganglion Meckeli, but from the commencement of the *Surculus Sphæno-Palatinus*, as the latter is passing horizontally inwards through the Foramen Sphæno-Palatinum. (On account of its importance, and for the sake of arrangement, the Vidian Twig is mentioned among the primary branches of the Superior Maxillary Nerve.) It passes directly backwards, through the Canalis Vidianus or Foramen Pterygoideum, and emerging from the posterior extremity of that, opposite to the extremity of the Petrous Portion of the Temporal Bone, and beneath the Foramen Lacerum Posticum, it parts into two

branches, viz., a superior, and inferior. The *Superior Branch* passes upwards, and perforates the layer of cartilage filling up the Foramen Lacerum Posticum, then enters the Foramen Innominatum, and ultimately joins the Portio Dura in the Aqueductus Falopii, superiorly to the position of the Cavitas Tympani. The *Inferior Branch* passes backwards, and enters the under side of the Canalis Caroticus, in the extremity of the Petrous Portion of the Temporal Bone, by creeping between the layer of cartilage and the ragged circumference of the Foramen. It then descends through the Canalis Caroticus, upon the surface of the Internal Carotid Artery, along with Reflected Filaments from the Nervus Abducens, and which seem to form with this a slight Plexus upon the surface of the Artery. It then emerges, like them, from the commencement of the Canalis Caroticus, and becomes united with them in the substance of the First Cervical Ganglion of the Sympatheticus Maximus, behind the upper part of the Internal Carotid Artery, and on the upper part of the Rectus Capitis Anticus Major.

4th. *Surculus Infra Orbitalis*, courses forward, from the Ganglion Meckeli through the Foramen Lacerum Orbitale Inferius; then through the Canalis Infra-Orbitalis; and emerges from the Foramen Infra Orbitale with the Infra-Orbital branch of the Internal Maxillary Artery: it then descends, in the form of diverging filaments, with the branches of the artery, between the Levator Anguli Oris and the Levator Labii Superioris Proprius; being distinctly united behind the Levator Labii Superioris Proprius with the Transverse Branch of the Pes Anserinus; and becomes dispersed in its descent to those muscles and the other muscles constituting the part of the face in correspondence with the upper lip. As the nerve courses through the Canalis Infra Orbitalis, it gives downwards *filaments* through the substance of the Superior Maxillary Bone or the osseous walls of the Antrum Highmorianum, that pass into the Fangs of the Incisor, the Canine, and the Anterior Molar Teeth; are continued through the canals in the Fangs, and ultimately end in the form of the Nervous and Vascular Pulp which fills the Cavities within the Bodies of those Teeth.

The more trivial branches of the Ramus Maxillaris Superior, are,

1st, The *Surculus Lachrymalis*, which passes upwards and forwards through the Fat in the Foramen Lacerum Orbitale Inferius, and is lost in the substance of the Lachrymal Gland, and the Periosteum around it. Hence the Nerves supplying the Lachrymal Gland are the Surculus

Lachrymalis e Ramo Ophthalmico Nervi Trigemini, and also the Surculus Lachrymalis e Ramo Maxillare Superiora Nervi Trigemini. Thus we have not only seen that the Nose and the Lachrymal Gland are partially supplied with nervous sensibility by the Ophthalmic Branch of the Par Trigemini, but we also see that the whole of the Nose as well as the whole of the substance of the Lachrymal Gland receive nerves enduing them with common sensation from one original source, viz. the Gasserian Ganglion. Hence the sensibility of the Schneiderian Membrane and that of the Lachrymal Gland is intimately united by nerves, as well as by a continuity of membrane under the form of the Lachrymal Ducts and Sac.—The Lachrymal Gland cannot be stimulated much, without the stimulus being transfused to the Nose.—The Nose cannot be stimulated, without the stimulus being immediately transmitted to the Lachrymal Gland, as a provision of nature, and producing an augmented flowing of tears for the purpose of washing away the offending matter from the Nares.

2nd. The *Surculus Temporalis*, passes upwards to the deeper part of the Temporal Muscle.

3rd. The *Surculus Alveolaris*, passes downwards and forwards around the posterior side of the Tuberos Process of the Superior Maxillary Bone, with its concomitant Artery; and then passes forwards upon the outer side of the Alveolar Process, to supply the substance of the outer side of the Gum, and, by Filaments, partially, the Posterior Molar Teeth. The Posterior Molar Teeth of the upper jaw are consequently supplied partly, by Filaments from the Pterygo-Palatine Branch of the Superior Maxillary Nerve, and partly by filaments from the Alveolar Branch of the Superior Maxillary Nerve, which promiscuously pierce the Alveolar Process: these also supply the Substance of the Gum.

3. *RAMUS MAXILLARIS INFERIOR*, is the largest of the three Primary Branches of the Nervus Trigemini. It passes obliquely forwards, outwards, and downwards, from the anterior edge of the Gasserian Ganglion through the Foramen Ovale. It afterwards descends internally to the position of the Ascending Ramus of the Lower Jaw, first between the two Pterygoid Muscles; and afterwards being left between the Pterygoideus Internus and the Lower part of the Ascending Ramus, intervening in an immediate or close manner between the Ascending Ramus of the Lower Jaw and the Ligamentum Laterale Internum. It then passes through the Foramen Maxillare Posticum, and is

continued forwards through the whole length of the *Canalis Mentalis*, within the *Cancelli* of the Bone, and between its two Sides or Tables, and inferiorly to the Alveolar Sockets containing the Fangs of the Teeth. Then, being considerably diminished, it emerges from the *Foramen Maxillare Anticum*, about an inch and a quarter laterally to the *Symphysis Mentis*, half an inch above the Base of the Lower Jaw, generally inferiorly to the Partition between the two *Bicuspid Teeth*, and behind the *Depressor Anguli Oris*; where it is joined to the *Ramus Inferior* of the *Pes Anserinus*: it then divides into Filaments, which radiate forwards behind the last named Muscle and the *Depressor Labii Inferioris*, and between them and the Mucous Membrane, constituting the internal side of the lip, which Filaments become ultimately immersed and lost in the substance of these Muscles and the Mucous Membrane of the Lip.

The more remarkable branches of the Inferior Maxillary Nerve are:

1st, the *Surculus Gustatorius*. This arises from the Inferior Maxillary Nerve, just below the *Foramen Ovale*, and it is of a flat figure, like the Nerve whence it is derived. It descends between the two Pterygoid Muscles, like the Inferior Maxillary Nerve, and internally to the Ascending Ramus of the Lower Jaw; it then courses forwards, deeply, internally to the Angle of the Lower Jaw, (and more internally than the Inferior Maxillary Nerve) becoming supported upon the side of the Base of the Tongue, or upon the insertion of the *Hyo-Glossus Muscle* at the Base of the Tongue, and also covered by the posterior part of the Sub-Maxillary Gland, (which rests on the *Hyo-Glossus Muscle*).—As soon as it gains the posterior edge of the *Hyo-Glossus Muscle*, it has a Ganglionic Enlargement on its side, which gives off a number of minute filaments that constitute a fibrous net-work about the Sub-Maxillary Gland, and are ultimately consumed in its substance, making the Sub-Maxillary Gland a salivary organ; and so linking the nervous susceptibility of the Sub-Maxillary Gland with the Gustatory sense of the Tongue, as well as with the other organs appertaining to the sense of Taste, as to cause an excitement of the Sub-Maxillary Gland to be depending upon an excitement of the Gustatory Sense of the Tongue and the Mouth. The nerve then courses forwards by the side of the insertion of the *Genio Hyo-Glossus Muscle*, and between that and the Sub-lingual Gland, concomitantly with the Warthonian Duct and the *Ranine Artery*: (all these last named organs are situated internally

to the *Mylo Hyoideus Muscle*): the Nerve then inclines upwards between the *Genio-Hyo-Glossus Muscle* and the Sub-lingual Gland, and so sinks into the under side of the substance of the Tongue, its filaments ultimately ending by constituting the *Papillæ Villosæ*, which are situated upon the tip and sides of the Tongue, which are the very Organs constituting the Sense of Taste. It must be remembered, that although this Nerve bestows the peculiar sensibility of Taste to the Tongue, and links the sensibility of the Sub-Maxillary Gland in connection with it—it is derived from a nerve possessing only Common Sensation: this is as yet an inexplicable anomaly.

2d. The *Surculus Temporalis*, a small branch passing upwards and forwards from behind the Ascending Ramus of the Lower Jaw into the substance of the Temporal Muscle.

3rd. The *Surculi Pterygoidei*; filaments given off from the nerve as it is between the two Pterygoid Muscles, and supplying them.

4th. *Surculus Buccinatorius*, rather a large branch, and next to the Gustatory in size. It is given forwards from between the two Pterygoid Muscles, and from behind the Ascending Ramus of the Lower Jaw, as well as the position of the *Masseter Muscle*; it then runs forwards between the fibres constituting the superficial surface of the *Buccinator Muscle*, and is lost to the substance of that muscle posteriorly to the Angle of the Mouth.

5th. *Surculus Mylo Hyoideus* is given off from the Inferior Maxillary Nerve immediately before it enters into the *Foramen Maxillare Posticum*. It passes downwards and forwards, in a small sulcus on the inner side of the Lower Jaw, called the *Sulcus Mylo Hyoideus*, ranging between the origin of the *Mylo Hyoideus Muscle* and the position of the Sub-Maxillary Gland, and is promiscuously lost in the substance of each.

6th. As the Inferior Maxillary Nerve is coursing through the *Canalis Mentalis*, it gives upwards a succession of minute filaments, *Surculi Dentales*, that perforate the upper side of the Mental Canal, and which are singly continued through the Canal in the corresponding Alveolus of a Tooth, and which filaments subsequently become expanded and loosened in substance, so as to constitute in commixture with the minute ramifications of the Dental Arteries the Nervous and Vascular Pulp contained in the Cavity within the Body of each Tooth. A great speculation exists whether remissions of this Nervous Substance and of the Dental Arteries organize

the Osseous Substance of the Tooth, or whether the Osseous Substance of the Tooth, as well as even the Enamel itself, possesses life by some other means than by a common circulation.

7th. Just before the Nerve emerges from the Foramen Maxillare Anticum, it gives off a small Branch, called the *Surculus Incisivus*, which courses forwards in a small continuation of the Mental Canal in the mental part of the Lower Jaw, and then parts into filaments, which turn upwards into the Fangs of the Incisor Teeth.

8th. The unexpended continuation of the Nerve which may be called the *Surculus Mentalis*, subsequently emerges from the Foramen Maxillare Anticum, receives a junction from the Inferior Division of the Portia Dura, behind the Depressor Anguli Oris; and is consumed in the Muscles and Mucous Membrane concerned with the flesh of the Chin and substance of the Lower Lip.

Tic Doloieux is a diseased sensibility of the nerves of the face, more especially of the Par Trigemini, and in order to alleviate its painful symptoms, after medicine has proved ineffectual, some surgeons attempt to paralyse the branches of the Par Trigemini by dividing them.

If the *Supra-Orbital* Branch is much affected, it may be divided by raising the Eyebrow with the index finger of the left hand; and by commencing an incision about an inch or from that to an inch and a quarter distant from the Root of the Nose, carrying it horizontally outwards in correspondence with the Superciliary Ridge: dividing the Common Integuments, Subcutaneous Fat on which the Eyebrows are encushioned, and the intermixture of the three Muscles covering the Superciliary Ridge, viz., the Orbicularis Palpebrarum, the Corrugator Superciliæ, and the Occipito Frontalis. If the incision is carried directly down to the bone the *Supra-Orbital* Frontal Nerve will also be divided, or it will be exposed as it emerges from the Foramen *Supra-Orbitale*, and can be subsequently divided immediately above its exit from the Foramen.

If the *Infra-Orbital* Nerve is affected, it may be divided by feeling for the rough elevation produced by the Jugal Harmonia in the middle of the under side of the Orbital Margin; and a short incision is to be made an eighth of an inch below this directly downwards to the anterior surface of the Maxillary Bone. This incision will divide the under Side of the Orbicularis Palpebrarum Muscle, the Origin of the Levator Labii Superioris Proprius; the *Infra-Orbital* Nerve, probably the *Infra-*

Orbital Artery (which will throw out a trifling quantity of blood) as well as probably the highest part of the Levator Anguli Oris; if the incision is not made quite as deep as the Bone, the latter muscle will not be divided, and the nerve may be only exposed, which is to be subsequently divided; and if the surgeon prefers, a portion of the nerve can be cut away so as to prevent the cut ends of the nerve afterwards uniting; this suggestion may apply to any nerve which the surgeon has to divide on a similar surgical account.

If the *Inferior Maxillary* nerve is affected with this disease, it can be divided as it is emerging from the Foramen Maxillare Anticum. This Foramen is situated generally about half an inch above the Base of the Lower Jaw, from an inch to an inch and a quarter distant from the Symphysis Mentis, and inferiorly to the Partition between the two Bicuspid Teeth. A short incision must be made in correspondence with or immediately above this Foramen; the Depressor Anguli Oris will be divided, then the Nerve, and probably its small Concomitant Artery.

Tic Doloieux depends upon some exciting cause, and we sometimes find out this cause; as for instance Carious Teeth, diseases of the Gums, or diseases of the Antrum, &c., (as all these parts are supplied by the Par Trigemini) by causing nervous irritation, may be a local exciting cause of Tic Doloieux. But I believe it is also frequently occasioned by visceral irritation, probably conjoined with debility. Why do the symptoms of Tic Doloieux come on in paroxysms? May not this depend upon the state of the Stomach (as to plenitude, &c.) or the temporary state of the Liver, also the Alimentary Canal; as local exciting causes, also upon the movements of the Lower Jaw; also upon the impressions against the Teeth produced by mastication: and also in some degree upon the Brain; the expectations and thoughts of the Mind, I believe, may so act as an exciting cause as to bring on a paroxysm. The convulsive twitching of the muscles and pain, I think, depends too upon a temporary increased morbid irritability of the nerves: the paroxysm exhausts or diminishes this irritability, which abates commensurately with the exhaustion; the same degree of morbid excitability becoming again restored or reaccumulated in the nerve, another paroxysm ensues. Quere, should chronic inflammation of a nerve be confounded with Tic Doloieux? I think not: I think they are two different diseases.

Sixth pair—OR NERVI ABDUCENTES.

These are Nerves commencing with single origins from the foremost part of the Medulla Oblongata, so as to emerge from the depression existing between the Medulla Oblongata and the Pons Varolii. They course directly forwards under the sides of the Pons Varolii, so as to perforate the Dura Mater closely by the side of the Posterior Ehippial Processes, and immediately below the very termination of the Anterior Edge of the Tentorium against the corresponding Ehippial Process. Each then courses forwards through the centre of the Cavernous Sinus of the corresponding side, in close cellular cohesion to the outer side of the Internal Carotid Artery, so as to be immersed along with the Artery, amidst the Plexus of minute Veins which constitute the spongy or cellular-like structure of the Cavernous Sinus. It then courses forwards through the Foramen Lacerum Orbitale Superius into the Orbit, and then plunges into the Abductor Oculi Muscle, giving to it Volition.

One great peculiarity of this nerve is that when it is in the Cavernous Sinus, *minute filaments* are reflected back from it, which descend upon the surface of the Internal Carotid Artery through the Canalis Caroticus along with the Inferior Division of the Vidian Twig of the Par Trigemini, and become united in one with that nerve in the substance of the First Cervical Ganglion of the Sympatheticus Maximus.* The Vidian Twig and these filaments thus *unite* the Nervus Trigemini and the Nervus Abducens with the Sympatheticus Maximus, i. e. unite the common sensibility and voluntary motion of the soft parts of the Face, in a constitutional manner, with the system of parts supplied by the Sympatheticus Maximus. These filaments correspond exactly with the connecting filaments that extend between all the other Ganglia of the Sympatheticus Maximus and the Spinal Nerves, as they are emerging from the Foramina Intervertebralia, and which establish a constitutional connection or sympathy between the Vital Organs that derive their peculiar sensibility and faculty of involuntary motion from the Sympatheticus Maximus,

* These filaments are probably received by the Nervus Abducens and Par Trigemini from the Sympathetic; there are also slender connections of the Sympathetic with the Ophthalmic Branch of the Fifth Pair, and with the Motor Oculi or Third Pair, by which the Lenticular-Ganglion is conjoined with the Sympathetic.—These filaments between the Sympathetic and the Cerebral Nerves establish a sympathy between the various parts of the Head and the Viscera of the Body.

and the voluntary muscles and parts possessed of common sensibility, that constitute the limbs and the various other parts of the system which are supplied by the Spinal Nerves—the Nervus Trigemini being the Spinal Nerve of the Face.

Seventh pair—Is generally described as consisting of the NERVUS ACOUSTICUS, PORTIO MOLLIS, or the AUDITORY NERVE; and the PORTIO DURA, or NERVUS COMMUNICANS FACIEM. The NERVUS ACOUSTICUS or PORTIO MOLLIS, is the nerve which conveys and bestows the sensibility of Hearing to the Internal Ear, or Labyrinth. This nerve is usually said to commence upon the upper surface of the Medulla Oblongata, or the floor of the Fourth Ventricle, by transverse medullary lines, (called *striæ transversæ*) which pass outwards from the Crena of the Medulla Oblongata across the upper surface of the Medulla Oblongata, these and the Crena constituting those marks on the floor of the Fourth Ventricle denominated Calamus Scriptorius. These *striæ* become collected, and pass off in the form of a single nerve, or the Portio Mollis, from the fore and lateral part of the Medulla Oblongata. It is then continued obliquely backwards and outwards, being peculiarly soft in its substance, and lodging in a superficial sulcus on its fore side the Portio Dura. The two are then continued into the Foramen Auditivum Internum. On separating the Portio Dura from the Portio Mollis, we find the filament situated between them, denominated the *Portio Interpositum Duram et Mollem*, or Portio Media. This arises contiguous to the commencement of the Portio Mollis, and passing forwards for a short distance betwixt the two nerves, joins the Portio Dura, as the two nerves are about to enter the Foramen Auditivum Internum. The Nervus Acousticus, reaching the bottom of the Foramen Auditivum Internum, abruptly splits into its component filaments, which pass through all the Foraminulæ in the Fossula Parva, (a small depression constituting the upper part of the Bottom of the Foramen Auditivum Internum) with the exception of the largest and foremost of these small Foraminulæ, which is the commencement of the Aqueductus Falopii, and gives progress to the Portio Dura; and also all the Foraminulæ in the Fossula Magna (which constitutes the inferior and major portion of the bottom of the Foramen Auditivum Internum): the filaments which enter the Labyrinth by piercing the Fossula Parva, correspond to, and are dispersed upon, the Osseous Cavity of the Vestibulum

Sacculus Vestibuli, and the Membranous Ampullæ within the commencements of the Semicircular Canals. The filaments which pass through the anterior part of the Fossula Magna are continued outwards through the Modiolus of the Cochlea, and are, for the most part, insensibly expended in small filaments which promiscuously perforate the sides of the Modiolus, and are bestowed to the Membranous Scalæ of the Cochlea; the majority of which being continued outwards between the two laminae of the Lamina Spiralis, are lost in the structure of those parts of the Membranous Scalæ which correspond with the position of the Zona Cochleæ. The *unexpended portions* of these filaments in the Modiolus, perforate the delicate osseous Lamina Cribrosa which intercepts the Cavity of the Modiolus from the Cavity of the Infundibulum, and are ultimately completely lost within the mouth of the Infundibulum, which is the seat of continuity between the terminations of the two Scalæ, and is distinguished by the term *Canalis Sclarum Communis*. Lastly, the filaments which perforate the Foraminulae in the posterior part of the Fossula Magna, pass more especially (like those in the Fossula Parva) to the Sacculus Vestibuli, and to the Ampullæ within the commencements of the Semicircular Canals.

The *PORTIA DURA*, arises* and emerges from, the Medullary Interstice, which is formed between the posterior part of the Pons Varolii, the Crura Cerebelli and Medulla Oblongata: it turns downwards, outwards, and backwards beneath the Crus Cerebelli, and is received into a groove upon the fore side of the Portio Mollis, it is continued outwards and backwards upon the fore side of the Portio Mollis, through the Foramen Auditivum Internum, and passes through the Foraminula in the anterior part of the Fossula Parva, (which small Foramen is the commencement of the Aqueductus Falopii): it is then continued outwards and backwards through the Aqueductus Falopii in the Petrous Portion of the Temporal Bone, being superiorly to the Cavitas Tympani, and there receives the Superior Division of the Vidian Twig; it then turns downwards be-

hind the posterior side of the Cavitas Tympani in the continuation of the Aqueductus Falopii, and there gives forwards the *Chorda Tympani*, which perforates the posterior part of the Cavitas Tympani, is continued forwards through the Cavitas Tympani between the Manubrium Mallei and the Processus Longus Incudis, emerges from the anterior side of the Cavitas Tympani through the inner extremity of the Fissura Gasserii, by the side of the Laxator Tympani, and, internally to the articulation of the Lower Jaw, joins the Gustatory Twig of the Fifth Pair behind the Pterygoideus Externus Muscle. The Portio Dura then emerges from the termination of the Aqueductus Falopii, viz. the Foramen Stylo-Mastoideum, and enters into the substance of the Parotid Gland; being situated in the Fossa in which the Parotid Gland is situated, and is bounded like that, consequently, by the upper part of the Ascending Ramus of the Lower Jaw and posterior edge of the Masseter Muscle, anteriorly; posteriorly, by the Mastoid Process of the Temporal Bone and the insertion of the Sterno Cleido Mastoideus (expanded upon it); superiorly, by the Cartilaginous Meatus of the External Ear; inferiorly, by the Posterior Belly of the Digastricus; and superficially by the major part of the substance of the Parotid Gland: it is continued forwards through the substance of the upper part of the Parotid Gland, and across the bifurcation of the External Carotid Artery, and divides into filaments (as it crosses it) which pass forwards in a divergence, and emerge from the anterior, superior, and inferior parts of the Gland. *The principal divisions are as follow:*

The *RAMUS ASCENDENS*, which emerges from the upper side of the Gland, ascends over the root of the Zygomatic Process, in front of the Tragus of the Ear, then upon the Fascia Temporalis, along with the Superficial Temporal Artery, and becomes lost in filaments towards the vertex of the Head, which are expended to the coverings forming the scalp, these filaments communicate promiscuously with the termination of the Frontal Branch of the Ophthalmic Nerve, (from the orbit,) the Auricular Branch of the Second Cervical, and the Occipital Branch of the First Cervical Nerve:

The *RAMUS SUPERIOR*, emerges from the anterior and the superior part of the Gland, and passing upwards and forwards turns over the anterior or jugal portion of the Zygomatic Arch into the outer and lower part of the Orbicularis Palpebrarum Muscle:

The *RAMUS TRANSVERSUS*, is the larg-

* The origins of these nerves are described in complaisance with the description to be found in most elementary books, viz., to be from the parts which they appear to pass off from at the base of the brain, therefore, as this description of their origins is not the effect of my own conviction obtained by minute dissection, I will not vouch for its unqualified accuracy.

est of the divisions, and emerges from the anterior part of the Gland; is then continued transversely across the surface of the Masseter Muscle, along with the Arteria Transversalis Faciei about one-fourth of an inch above the Stenonian Duct; and passing to the Muscles which form the Upper Lip, it communicates (rather in an abrupt manner) behind the Levator Labii Superioris Proprius with the Infra-Orbital Nerve, and also more promiscuously with the filaments of the same in the substance of that and the other Muscles of the Upper Lip:

The RAMUS INFERIOR, emerges from the anterior and inferior part of the Gland; and slants downwards and forwards obliquely over the lower part of the Masseter Muscle; is then continued forwards upon the side of the Lower Jaw, communicates behind the Depressor Anguli Oris with the termination of the Inferior Maxillary Nerve, and is distributed like that to the muscles which are in the Lower Lip and upon the Lower Jaw:

The RAMUS DESCENDENS, emerges from the under side of the Gland, and splits into filaments, which are continued forwards and downwards obliquely across the upper part of the Neck, in a diverging manner, so as to supply the Superficial Coverings of the Neck, and more especially the Platysma Myoides, (these filaments must be traced by dissecting through the Platysma,)—one or two of these filaments also descends by the side of the External Jugular Vein, and becomes lost towards the lower part of the Neck. These Branches, upon the Face, give off minute and innumerable filaments, which make such innumerable intersections as to form a Rete Nervosum or Membranous Net-work of Filaments, which is expanded over the superficial surface of the Muscles upon the side of the Face, and unites together the large Branches, or talons of the web just described; on this account the distribution of the Portio Dura, is called the *Pes Anserinus*.

The eighth pair, consists of the GLOSSO-PHARYNGEAL BRANCH, the PROPER PAR VAGUM, and the NERVUS SPINALIS ACCESSORIUS WELLESII, (which last is an adventitious portion.)—The GLOSSO-PHARYNGEAL BRANCH and PAR VAGUM arise, or at least emerge, from the side of the Corpora Olivaria of the Medulla Oblongata, (the Par Vagus generally arising by filaments which gradually become collected into its trunk.) These two parts of the Eighth pair are continued outwards and backwards towards the anterior part of the Foramen Lacerum Anticum—and meet by

a convergence the NERVUS SPINALIS ACCESSORIUS WELLESII.—This arises from the upper and lateral part of the Spinal Marrow, from the Corpus Restiforme or Respiratory Column, and between the Anterior and Posterior Fasciculi of the Five or Six Superior Cervical Nerves; it passes upwards between the Anterior and Posterior Fasciculi of the Five or Six Upper Cervical Nerves, and as it ascends between the Fasciculi of each of these individual nerves, it receives an Origin or Fasciculus from the Respiratory Column, (and must consequently be against the surface of the Ligamentum Denticulatum); it passes up through the Foramen Magnum Occipitale, in the continuity between the Theca Vertebrarum and the Dura Mater of the Brain; then inclines forwards upon the root of the Basilar Process, (frequently producing a superficial sulcus,) converging towards the Par Vagus and Glosso-Pharyngeal Branch; passes out with them through the anterior part of the Foramen Lacerum Posticum, being intercepted (with them, in the Foramen,) from the commencement of the Internal Jugular Vein, by a slender process of the Dura Mater, which sometimes invests a slender bar of cartilage: when they are about to emerge from the Cranium, and as they are seen when the Brain is lifted, the Glosso-Pharyngeal Branch is situated anteriorly and superiorly; the Par Vagus in the middle; and the Nervus Spinalis Accessorius Wellesii posteriorly and inferiorly. They emerge from the Foramen into the upper part of the neck, and are then situated, in lateral juxta-position and juxta-junction, in front of the upper part of the Rectus Capitis Anticus Major; behind the posterior sides of the Internal Carotid Artery, and Internal Jugular vein; and still more deeply behind the higher part of the Ascending Ramus of the Lower Jaw. From this connection, the Glosso-Pharyngeal Branch passes obliquely downwards and forwards; the Par Vagus directly downwards; and the Nervus Spinalis Accessorius Wellesii downwards and backwards. The GLOSSO-PHARYNGEAL BRANCH slants downwards and forwards along the posterior edge of the Stylo-Pharyngeus Muscle, and consequently (like that) obliquely over the surface of the Internal Carotid artery, and behind the External, also behind the upper part of the Ascending Ramus of the Lower Jaw; and coming towards the side of the Base of the Tongue, it divides into filaments, which are distributed in a promiscuous manner to the Base of the Tongue, to the Papillæ Maximæ, (which are the salivary glands upon the Base of the Tongue,) and also to the contiguous parts of the Constrictors of

the Pharynx. There are also some filaments reflected backwards, retrograde, against the surface of the Internal Carotid Artery, which descend upon the Internal Carotid Artery, and subsequently upon the surface of the Common Carotid, so as to be distributed to the Coats of the Carotid and Large Arteries towards the Heart.

The NERVUS SPINALIS ACCESSORIUS WILLESI, emerges from its connection with the Par Vagum, slants downwards and backward from behind the upper part of the Internal Jugular Vein; then, either through the under side of the Sterno-Cleido Mastoideus Muscle, or through the whole thickness of its belly at its middle part, or else glides obliquely behind it without perforating it at all, (which is, perhaps, the most frequent occurrence); not unfrequently it is in two portions—one pierces the belly of the Sterno-Cleido Mastoideus Muscle,—and the other merely glides behind it. It is then continued through the Posterior Region of the Neck, obliquely across the surface of the Scalenus Medius Muscle, buried in the fat occupying the Posterior Region of the Neck, and splitting into filaments, is bestowed to the Muscles forming the muscular substance of the lateral, inferior, and posterior part of the neck, viz., to the outer side of the Scalenus Anticus, Scalenus Medius, Levator Scapulæ, Posterior edge of the Sterno-Cleido Mastoideus, the Anterior edge of the Trapezius, as well as to the origin of the Pectoralis Major.

The PAR VAGUM, passes downwards, through the upper part of the Neck, between the Internal Carotid Artery and Upper part of the Internal Jugular Vein; and anteriorly to the Rectus Capitis Anticus Major: being behind the Ascending Ramus of the Lower Jaw, the Parotid Gland, the Styloid Muscles, and the Posterior Belly of the Digastricus. It is subsequently continued downwards, through the lower part of the Neck, between the Common Carotid Artery and Internal Jugular Vein; in the double sheath common to these two vessels; being anteriorly to the Longus Colli: and is first, and in a more general manner, behind the Sterno-Cleido Mastoideus Muscle, subsequently, behind the Omo-Hyoideus, and commencements of the Sterno-Hyoideus and Sterno-Thyroideus Muscles. It is situated between, and rather behind, the posterior sides of the two last mentioned vessels; it is contained in the venous side of the sheath, so as to be in juxta-position with the side of the Vein, but is intercepted from the side of the Artery by the main Septum of the Sheath. (In one of my Plates, the arterial side of the Sheath is represented as opened,

and a slit has been made in this Septum, whereby the Vein and Nerve are partially seen in the other compartment or side of the Sheath.) The Par Vagum, in leaving the Neck, dives into the Thorax between the Subclavian Artery and Vein, posteriorly to the Sternal Extremity of the Clavicle, and to the Origins of the Muscles last named. Both Par Vaga are next continued downwards, through the Thorax, between the cul de sacs of the two Bags of the Pleura, (which form the upper boundary of the two Cavities of the Thorax),—and the left, descending in front of the termination of the Arch of the Aorta, passes behind the upper edge of the left Pulmonary Ligament, so as to enter the space of the Posterior Mediastinum, where it becomes attached to the fore and left side of the Oesophagus—the right Par Vagum (in its descent), gradually inclines behind the Superior Vena Cava, and consequently posteriorly to the position of the upper edge of the Right Pulmonary Ligament, so as to enter the Posterior Mediastinum, and become attached to the Posterior and right side of the Oesophagus.

Each Par Vagum then splits into separate Fasciculi, so as to be spread in their descent over their respective sides of the Oesophagus (just mentioned) in the form of the Oesophageal Plexus; which is produced by their fasciculi descending obliquely, so as to separate, unite, and separate, and subsequently rejoin in an alternate manner; which two expanded Plexuses are also united by filaments that cross the surface of the Oesophagus, before, and behind,—and the Oesophagus, thus surrounded by the two united Plexuses, is supplied from them. In the lower part of the Thorax each Par Vagum becomes ultimately re-collected into the form of a single or double nerve; then both descending through the Foramen Simistrum Diaphragmatis, still hold their respective positions upon the sides of the Oesophagus; and ultimately end, at the Cardiac Orifice of the Stomach, by splitting again into filaments, which passing off in a radiation from the Cardiac Orifice, but slightly intersecting, unitedly form a Plexus, expanded widely upon the surface of the stomach around the Cardiac Orifice, and called the Cardiac Plexus: (the nerves still bearing the same relative position to the parts of the Stomach as to the corresponding parts of the Oesophagus) the left forms that part of the Cardiac Plexus, which is in correspondence with the Anterior Surface and Left Extremity of the Stomach, and supplies those parts—the right is opposite to the Posterior Surface and lesser extremity of the Stomach, supplies those parts,

and sends filaments along the Lesser Curvature—which are ultimately spent upon the commencement of the Duodenum;—it also gives off one or two remarkable filaments, which pass across from the Cardiac Orifice through the root of the Lesser Omentum, so as to unite with the Hepatic Plexus below the Margo Obtusus of the Liver, and just before it enters the substance of the Liver at the Porta.

The Par Vagus just after it emerges from its connection with the Glosso-Pharyngeal Branch and the Nervus Spinalis Accessorius Willesii, is slightly enlarged, so as to be somewhat oviform, and this slight tumefaction has been called the Gangliform Enlargement of the Par Vagus,—immediately above this, the first branch arises, that comes off from the Par Vagus, viz. the *Pharyngeal Branch*.

BRANCHES.

The *RAMUS PHARYNGEUS*, arises partly from the Par Vagus, and by another origin from the Nervus Spinalis Accessorius Willesii; slopes downwards and forwards, more inferiorly than the course of the Glosso-Pharyngeal Nerve; and, like it, crosses obliquely over the Internal Carotid Artery, and behind the External Carotid, (being behind the middle part of the Ascending Ramus of the Lower Jaw); it comes against the sides of the Constrictors of the Pharynx, and forms a Ganglion, whence it is distributed in a radiation of filaments, which are dispersed to the surrounding parts of the Constrictors. It also gives backwards minute filaments, which form some of the *Nervi Molles*, forming a common series upon the Carotids with the *Nervi Molles* from the Glosso-Pharyngeal Branch.

It next gives off the *RAMUS LARYNGEUS SUPERIOR*, which comes off just below the gangliform enlargement; and slants downwards and forwards in the same direction as the last, but more inferiorly, behind the lower parts of *both* Carotids, and betwixt them and the Constrictors of the Pharynx, towards the side of the Larynx; being defended by the angle of the lower jaw; and opposite to the Larynx, it divides into two principal divisions,—the *anterior division* passes forwards behind the Thyreo-Hyoideus Muscle, and perforates the Ligamentum Thyreo-Hyoideum (between the Os Hyoides and Thyroid Cartilage), to be distributed to the Mucous Membrane and the parts within the Larynx,—the *posterior division* perforates the origins of the Constrictors immediately behind the Ala of the Thyroid Cartilage, and is distributed and lost to the parts at the back of the Larynx, and muscles about

the Articular Cartilages; from its contiguity also, it partially supplies, before it enters the Larynx, the Thyroid Gland.

In the lower part of the neck the Par Vagus gives off, two or three small branches, *RAMI CARDIACI*, which descend by the side of the Trunk of the Common Carotid Artery towards the heart.

The next branch that the Par Vagus gives off, is, the *RECURRENT, RAMUS RECURRENTS, vel LARYNGEUS INFERIOR*: the *right*, arises from the right Par Vagus, as the latter is descending into the Thorax *in front of the right Subclavian Artery*, and about to escape from between that and the Subclavian Vein. It first turns backwards *beneath* the commencement of the *Subclavian Artery*, and then upwards *behind* it, and thus gains the neck. The *left Recurrent* is given off from the left Par Vagus, lower than the right, and as the Par Vagus descends *in front of the termination of the Arch of the Aorta*; it bends backwards and upwards; first *under the termination of the Arch*, and then *behind* it, so as to gain the region of the Neck. Each then slants upwards and inwards, behind the lower part of the Sheath of the Common Carotid Artery, so as to become lodged in the interstice between the side of the Trachea and Oesophagus, adhering very intimately to the side of the former. It ascends in the interstice, and gives *pencil-like filaments* inwards, between the rings of the Trachea, which supply the mucous membrane of the Trachea; and getting behind the Thyroid gland, it becomes lost in filaments; some few of which supply, partially, the Thyroid gland; as the others perforate the origins of the Constrictors, and are distributed to the mucous membrane and parts within the Larynx, and the filaments predominating over those of the Superior Laryngeal: this is considered as being most essential to the organ of voice.

Just as the Par Vagus is passing behind the upper edge of the Ligamentum Pulmonale Latum, and consequently when it has but barely entered the Posterior Mediastinum, it gives off a set of filaments, called the *ANTERIOR or SUPERIOR PULMONIC PLEXUS (RAMI PULMONALES SUPERIORES)*; which pass forwards from the Posterior Mediastinum; are continued through the upper part of the Ligamentum Pulmonale Latum, along with the pulmonary vessels; and perforating the root of the Lung, are distributed to the anterior and superior part of the Lung.

Immediately below the last named, and as soon as the Par Vagus fairly passes behind the Ligamentum Pulmonale Latum, and enters the Posterior Mediastinum, it sends off the *POSTERIOR or IN-*

FERIOR PULMONIC PLEXUS, (RAMI PULMONALES POSTERIORES SEU INFERIORES); this is a more numerous set of filaments than the last, but its filaments seem almost to form one set with those of the latter; they pass forwards from the Posterior Mediastinum, and are continued between the Laminae of the Ligamentum Pulmonale Latum; perforate the root of the Lung by the side of the Bronchial Tube; and are distributed, along with its divisions, to the deeper part of the Lungs, and in a more general manner than the Superior Plexus; supplying, in a more especial manner, the mucous membrane, forming the Capillary division of the Bronchial Tubes, and the air cells—the mucous membrane is the most nervous or sensible structure in the lungs, the other parts are comparatively insensible.

The *Esophageal Plexus*, the *Cardiac Plexus*, and the *branches proceeding to the Sympathetic*, have been already described.

Ninth pair—OR MOTORES LINGUÆ. Each arises from the Corpus Pyramidale of the Medulla Oblongata. It slants obliquely forwards and outwards through the Foramen Condylloideum Anticum, its filaments being frequently separated, so as generally to pass through a Cribriform Lamina in the Foramen, and become subsequently re-collected into a single nerve. The nerve then emerging from the Foramen Condylloideum Anticum, gets into the highest part of the neck, *anteriorly* to the insertion of the Rectus Capitis Anticus Major, and *posteriorly* to the position of the Internal Carotid Artery and Internal Jugular Vein; being connected, by lateral juxta-junction, into a bunch of nerves with the other nerves, which have the same relative position with the last mentioned parts, viz., the First Cervical Ganglion of the Sympatheticus Maximus, ParVagus, Glosso-Pharyngeal Branch, and the Nervus Spinalis Accessorius Willesii. This bunch of nerves is to be exposed by separating the Parotid Gland from the Sterno-Cleido Mastoideus Muscle, turning it out of its Fossa between the last named Muscle and the Ascending Ramus of the Lower Jaw; and then separating the higher part of the Internal Jugular Vein from the Internal Carotid Artery, turning each a little aside; when this connection between the commencements of these important nerves, will be found in the highest part of the

neck, immediately behind the last named vessels, and imbedded upon the insertion of the Rectus Capitis Anticus Major. The nerve then emerges from this nervous connection, and from between the sides of the Internal Carotid Artery and Internal Jugular Vein; and slants, obliquely downwards and forwards, across the External and Internal Carotids, precisely in correspondence with the origins of the Occipital and External Maxillary Arteries; being also situated deeply behind the Angle of the Lower Jaw and the commencement of the External Jugular Vein. It then is continued, forwards, behind the Tendon of the Posterior Belly of the Digastricus, and insertion of the Stylo-Hyoideus Muscle; and across the lower part of the Hyo-Glossus Muscle, being covered, as it is on the latter, by the Posterior part of the Submaxillary Gland: and (completing its arch) turns, upwards and forwards, behind the position of the Mylo-Hyoideus Muscle, and upon the side of the Genio-Hyo-Glossus Muscle; where it splits into a pencil of diverging filaments, which dive into the under surface of the tongue between the insertion of the Genio-Hyo-Glossus Muscle, and the position of the Sublingual Gland,—also between the latter muscle and the Ranine Artery; and are dispersed through the whole of the muscular substance of the tongue, imparting the important function of volition to that organ.

As the Motor Linguæ is crossing the Internal Carotid Artery, it gives off the **RAMUS DESCENDENS NONI.** This passes downwards, first anteriorly to the Internal Carotid Artery, and subsequently upon the Sheath of the Common Carotid Artery, or otherwise immersed in the substance of the front of the Sheath: it is necessarily covered, in common with the Sheath, by the anterior edge of the Sterno-Cleido Mastoideus: and divides into filaments, which are distributed to the muscles in the anterior and inferior part of the neck, viz. the Omo-Hyoideus, Sterno-Hyoideus, Sterno-Thyroideus, and anterior and inferior part of the Sterno-Cleido Mastoideus.*

* The Ramus Descendens Nervi Noni, and the Nervus Spinalis Accessorius Willesii, are connected, during their descent, in the Neck, with the commencements of the Superior Cervical Nerves, by filaments which form communicating arches.

SPINAL NERVES.

CERVICAL NERVES.

THE SUB-OCCIPITAL NERVE

(sometimes called the First Cervical), is small; it emerges from between the side of the Foramen Magnum and the Posterior Arch of the Atlas, immediately behind the Condylod Process, and from beneath the second turn of the Vertebral Artery; is immediately united to the Par Vagum, Glosso-Pharyngeal Branch, the Nervus Spinalis Accessorius Willesii, Motor Linguae, and the First Cervical Ganglion of the Sympatheticus Maximus, by a very short fasciculus of Medullary matter—in front of the insertion of the Rectus Capitis Anticus Major—*behind* the upper parts of the Internal Carotid Artery and Internal Jugular Vein, in the highest part of the neck;* and is then thrown backwards to the small Recti and Oblique Muscles which are under the Occiput, and covered by the Complexus, being consumed in them.

THE FIRST CERVICAL NERVE,

(sometimes called the Second Cervical), is larger than the last; it emerges from the Foramen Intervertebrale, betwixt the Transverse Processes of the Atlas and Vertebra Dentata; at its emergence it is connected by a short communicating fasciculus (RAMUS COMMUNICANS) with the First Cervical Ganglion of the Sympatheticus Maximus, on the surface of the Rectus Capitis Anticus Major, and *behind* the upper parts of the Internal Carotid Artery and Internal Jugular Vein; it then slants upwards and backwards, upon the Occiput,† first by the side of the small Recti and Oblique Muscles, and then through the thick insertion of the Complexus; emerging from that by the outer edge of the origin of the Trapezius, an inch and half

* This connection is to be found, by turning out the Parotid Gland from its Fossa, or at least by separating the Parotid Gland from the Anterior Edge of the Sterno-Cleido-Mastoideus Muscle; so as to expose the superior parts of the Internal Carotid Artery and the Internal Jugular Vein; these two latter organs are to be separated, and the connection will be discovered behind them.

† Its continuation, on the Occiput, frequently bearing the name of the *Occipital Branch* of the First Cervical Nerve.

from the Tubercle of the Occipital Bone, it comes contiguous to the Occipital Artery; then ascends, with that tortuous artery, towards the back of the Vertex Capitis, and becomes promiscuously spent in the Scalp; communicating, through the substance of that, with the Frontal Branch of the Ophthalmic Nerve, the Ascending Branch of the Pes Anserinus, and Auricular Branch of the Second Cervical Nerve.

THE SECOND CERVICAL NERVE,

(sometimes called the Third Cervical); as much larger than the last, as the last is larger than the Sub-Occipital; it emerges from the Foramen Intervertebrale, between the Transverse Processes of the Vertebra Dentata and the third Cervical Vertebra; is immediately connected, by a communicating filament, (RAMUS COMMUNICANS), which either passes across or through the Rectus Capitis Anticus Major, with the First Cervical Ganglion of the Sympatheticus Maximus (sometimes this connection is with the Second Cervical Ganglion of the Sympatheticus Maximus), *behind* the Internal Carotid Artery and Internal Jugular Vein: it throws backwards a pencil of filaments (RAMI POSTERIORES), to the muscles constituting the deepest part of the back of the Neck: the large continuation of the Nerve, then bends outwards and backwards, in an abrupt turn, around the Posterior edge of the Sterno-Cleido Mastoideus, emerging from the Fat of the Posterior Region of the Neck; then splitting, it passes upwards and forwards, across the surface of the Sterno-Cleido Mastoideus, in widely diverging filaments.—The highest, and one of the largest of these filaments, termed the *AURICULAR BRANCH* of the Second Cervical Nerve, ascends behind the Concha of the External Ear, with the Posterior Auricular Artery, (beneath the continuity of the Integuments connecting the back of the Concha with the Scalp); is afterwards continued upwards, with the Artery, on the side of the Head; and communicates in the Scalp, towards the Vertex, with the Frontal Branch of the Ophthalmic Nerve, the Ascending Branch of the Pes Anserinus, and the Occipital Branch of the First Cervical. (These are all the nerves which supply the substance of the Scalp).—Other large filaments of the Second Cervical Nerve, pass-

ing upwards and forwards, dig into the inferior and posterior part of the Parotid Gland, bore through its substance with the branches of the Portio Dura, and emerging with them from the anterior side of the gland, are expended on the side of the Face anteriorly to the Gland.—The more inferior, or Cervical Branches of this nerve, pass forwards across the Neck, suspended in the Fascia, immediately covered by the Platysma Myoides, and make a connection or a sort of Rete with the Ramus Descendens of the Pes Anserinus.—The most inferior filament, descending with the External Jugular Vein, loses itself towards the lower part of the Neck.

THE THIRD CERVICAL NERVE,

(sometimes called the Fourth Cervical). Less than the last, about the size of the First Cervical Nerve; it emerges from the Foramen Intervertebrale, between the Transverse Process of the Third and Fourth Cervical Vertebrae, and is immediately connected, by a communicating branch (RAMUS COMMUNICANS), which passes either across, or through the lower part of the Rectus Capitis Anticus Major, with the Second Cervical Ganglion of the Sympathetic Nerve; the Nerve also gives filaments backwards (RAMI POSTERIORES), between the Transverse Processes of the Third and Fourth Cervical Vertebrae, to be dispersed to the Muscles of the deepest part of the back of the Neck: the continuation of the Nerve, slanting downwards and backwards, like the Nervus Spinalis Accessorius Willesii, buried in the Fat and Cellular Membrane in the Posterior Region of the Neck, parts into filaments, which are given, like the latter nerve, to the muscles forming the posterior region of the neck, viz. the outer edge of the Scalenus Anticus, Medius, the Levator Scapulæ, the Posterior edge of the Sternocleido Mastoideus, Anterior edge of the Trapezius, as well as to the origin of the Pectoralis Major.

The *Four Inferior Cervical Nerves*, and *First Dorsal*, form the Axillary Plexus, and are very large, because they supply nearly the whole of the Superior Extremity with volition and common sensibility: these Nerves forming the *Axillary Plexus*, and the Nerves forming the united *Lumbar and Sacral Plexuses*, (and supplying, in a corresponding manner, the Muscles of the Inferior Extremity); form two Series; which are the largest Spinal Nerves in the human body.

THE FOURTH CERVICAL NERVE,

(Sometimes called the Fifth Cervical), emerges from the Foramen Intervertebrale,

between the Transverse Processes of the Fourth and Fifth Cervical Vertebrae, and is immediately joined by a communicating filament, (RAMUS COMMUNICANS, which pierces the origin of the Scalenus Anticus, and passes across, or through, the lower part of the Rectus Capitis Anticus Major), with the Middle Cervical Ganglion of the Sympathetic Nerve, immediately behind the Sheath of the Common Carotid Artery and Internal Jugular Vein;* the Nerve also gives backwards a pencil of filaments (RAMI POSTERIORES), between the Transverse Processes of the Fourth and Fifth Cervical Vertebrae to the Muscles of the Back of the Neck: it then slants, downwards and outwards, so as to emerge from between the Scalenus Anticus and Medius Muscles, at some distance superiorly to the First Rib; and coalesces with the trunk of the Fifth Cervical Nerve, nearly in correspondence with the outer edge of the Scalenus Anticus.

THE FIFTH CERVICAL NERVE,

(sometimes called the Sixth), emerges from between the Transverse Processes of the Fifth and Sixth Cervical Vertebrae; and gives forwards its communicating filament (RAMUS COMMUNICANS), through the origin of the Scalenus Anticus, and across the surface of the Longus Colli Muscle, to the Second, sometimes to the Third Cervical Ganglion of the Sympatheticus Maximus (behind the Sheath of the Carotid and Jugular Vessels); gives backwards also a pencil of filaments (RAMI POSTERIORES), between the Transverse Processes of the Fifth and Sixth Cervical Vertebrae to the Muscles of the back of the Neck; then slanting, downwards and outwards, in the form of a large trunk, emerges from between the Scalenus Muscles, superiorly to the first Rib and Subclavian Artery; and in correspondence with the outer edge of the First Rib, unites into one with the Trunk of the next succeeding.

THE SIXTH CERVICAL NERVE,

(sometimes called the Seventh Cervical); emerging from the Foramen Intervertebrale, between the Transverse Processes of the Sixth and Seventh Cervical Vertebrae, it gives forwards its communicating filament (RAMUS COMMUNICANS), through the origin of the Scalenus Anticus, and across the Longus Colli Muscle, (behind the Internal Jugular Vein), to the Inferior

* LARGE PERPENDICULAR FASCICULI also connect the commencements of the Spinal Nerves together, just after their exit from the Foramina Intervertebralia.

or Third Cervical Ganglion; and backwards its pencil of filaments (*RAMI POSTERIORES*), between the Transverse Processes of the above-named Vertebrae, to the Muscles of the Back of the Neck: is then continued, obliquely downward and outwards, over the upper surface of the First Rib, above the Subclavian Artery, from between the two Scaleni Muscles, and unites mid-distance between the outer-edge of the First Rib and Clavicle, with the Seventh Cervical Nerve.

THE SEVENTH CERVICAL NERVE,

(sometimes called the Eighth Cervical); emerges from the Foramen Intervertebrale, between the Transverse Processes of the Seventh Cervical, and the First Dorsal Vertebrae; sends forwards its communicating branch (*RAMUS COMMUNICANS*), through the origin of the Scalenus Anticus, and across the Longus Colli Muscle, to the Inferior Cervical Ganglion of the Sympatheticus Maximus; and backwards, its pencil of filaments between the Transverse Processes of the Seventh Cervical and First Dorsal Vertebrae, to the Muscles of the lowest part of the back of the Neck: is continued, outwards, across the upper surface of the First Rib, and immediately behind the Subclavian Artery, emerges from between the two Scaleni Muscles; and descending towards the Axilla, behind the Clavicle and Subclavian Artery, unites with the First Dorsal Nerve.

THE FIRST DORSAL OR INTERCOSTAL NERVE,

is the largest of the Dorsal or Intercostal Nerves; it emerges from the Foramen Intervertebrale, between the First and Second Dorsal Vertebrae; in so doing, it is connected by communicating filaments (*RAMI COMMUNICANTES*), passing forwards, with the First Dorsal or Intercostal

Ganglion of the Sympatheticus Maximus; also gives backwards, a pencil of filaments (*RAMI POSTERIORES*), between the Transverse Processes of the First and Second Dorsal Vertebrae, to the Extensor Muscles of the Back: it then passes, outwards and upwards, immediately across the upper surface of the first rib, closely behind the Subclavian Artery, and between the insertions of the Scalenus Anticus and Medius Muscles; afterwards bends downwards, behind the Clavicle and Subclavian Artery, like the Cervical Nerves, towards the Axilla; and behind the Clavicle, is united with the Seventh Cervical Nerve.*

Observe that these Nerves, as they are coursing outwards, superiorly to the First Rib, and between the two Scaleni Muscles, range *superiorly*, and (the lower ones,) *posteriorly*, to the Subclavian Artery; but as these are following the bending descent of the Subclavian Artery, and plunging downwards, with it, into the Axilla—those that were situated *superiorly* to the Subclavian Artery over the First Rib, become *externally*† to it—whilst those which were situated *posteriorly* on the First Rib, still remain *posteriorly* to it: hence these Cervical Nerves first (as they are emerging from between the Scaleni Muscles,) range *superiorly* and *posteriorly* to the Subclavian Artery; but subsequently (as they are plunging behind the Clavicle,) they range *externally* and *posteriorly* to the Artery.

These organs, thus situated, are to be seen, by a clean dissection, in the lower and anterior part of the Posterior Region of the Neck; or, *i. e.*, in the angular space, between the posterior edge of the Sternocleido Mastoideus Muscle, and the upper side of the Clavicle; the Subclavian Vein being situated between the artery and the back of the Clavicle: this is where the Subclavian Artery is usually compressed, or tied.

THE NERVES OF THE SUPERIOR EXTREMITY.

THE continuation of these five last named nerves, diving downwards, behind the Clavicle, into the Axilla, by uniting, separating, and rejoining as they descend through the Axilla, constitute the AXILLARY PLEXUS; which may be said to commence, like the Axillary Artery, immediately under the edge of the Subclavius Muscle: the superior part of the Plexus descending through the *upper part of the Axilla*, is situated *externally and posteriorly to the upper part of the Axillary Artery*—here

the Axillary Artery is free from its embrace—corresponds to the inner side of the Coracoid process of the Scapula—and to the space between the under edge of the Subclavian Muscle, and the upper edge of the Pectoralis Minor; being covered by the Clavicular portion of the Pectoralis Ma-

* A filament of the first Intercostal Nerve; however, runs forwards in the first Intercostal space, beneath the First Rib.

† More laterally, or nearer the shoulder.

tor: the great Axillary Vein lies immediately in front of this Artery.

The fasciculi of the Plexus then descending *still lower* through the Axilla *in front of the Subscapularis, and behind the Pectoralis Minor Muscle*, incline forwards, and *closely embrace the Artery*. But, as the continuation of the fasciculi descend through the *lowest* part of the Axilla, *they cease to unite*; and become the commencements of the nerves of the Superior Extremity; which descending in the form of longitudinal cords closely around the lower continuation of the Axillary Artery, emerge from the Axilla with it; from between the under edge of the Pectoralis Major before, and the under edges of the Latissimus Dorsi and Teres Major Muscles behind. The great *Axillary Vein* is situated in front of the Artery and Plexus, and when fully distended with the circulating blood, conceals them: it is found, when the upper part of the Axillary Artery is to be tied, descending in the cellular membrane of the Axilla, immediately behind the upper edge of the Pectoralis Minor.*

Observe,—first, that the *superior part of the Axillary Artery* is quite free from the Axillary Plexus; that the latter being situated *externally and posteriorly* to it, this part of the artery is the most eligible part to be taken up when the operator can exercise his choice. This part is not covered by the Pectoralis Minor; but corresponds to the space between the Subclavius above, and the upper edge of the Pectoralis Minor below; the parts in front of it consisting of the Axillary Vein, and the Clavicular fasciculus of the Pectoralis Major Muscle.

Secondly, that the Plexus most intricately and *closely embraces* the middle part of the *Axillary Artery*, and which is situated behind the Axillary Vein, Pectoralis Minor, as well as the Pectoralis Major Muscles; consequently this is the last part of the artery which the operator would prefer to tie, and the part which is got at with the greatest difficulty and pain, the Axillary Plexus being necessarily injured in the operation.

Thirdly, that the Axillary Plexus does *not exist* in the lower part of the Axilla; but that the *lower part of the Axillary Artery* is surrounded by the longitudinal commencements of the nerves produced from

the Plexus. Hence this part of the artery is easily to be secured, behind the under edge of the Pectoralis Major Muscle.

Observe, that the Axillary Plexus lies just by the inner side of the head of the Os Humeri; hence, when the head of the Os Humeri is dislocated inwards, or downwards and inwards upon the Inferior Costa of the Scapula, against the Axillary Plexus, the Axillary Plexus is stretched upon the inner side of the Head of the Os Humeri, and must be more or less compressed by it. This circumstance frequently produces a paralysis, or at least a weakness of the voluntary movements of the arm, which lasts for some time subsequently to the reduction of the dislocation. This observation in case of the head of the Os Humeri being dislocated downwards and inwards upon the Inferior Costa of the Scapula, more particularly refers to the situation of the Nervus Articularis which supplies the Deltoid Muscle, for the head of the Os Humeri must be immediately on this nerve; hence *levation* of the arm is a motion which is more especially affected.

The AXILLARY PLEXUS gives off SEVEN PRINCIPAL NERVES, viz., the NERVUS SUPRA-SCAPULARIS, the NERVUS ARTICULARIS, the NERVUS CUTANEUS EXTERNUS, the NERVUS CUTANEUS INTERNUS, the NERVUS MEDIANUS, the NERVUS CUBITALIS, and the NERVUS SPIRALIS.

The MINOR ones arising from the *Axillary Plexus*, are, the NERVI THORACICI EXTERNI, the NERVUS CUTANEUS MINOR WRISBERGII, and the NERVUS INFRA-SCAPULARIS;—*not arising from the Axillary Plexus, but belonging to the Superior Extremity*, there are, the NERVUS INTERCOSTO-HUMERALIS SUPERIOR et INFERIOR.

1st. THE NERVUS SUPRA-SCAPULARIS, Arises from the posterior and outer side of the commencement of the Axillary Plexus, and passes obliquely outwards and backwards, in the superior part of the Axilla, (behind the Axillary Plexus,† deeply immersed in the fat and cellular membrane, and distantly behind the Clavicular origin of the Pectoralis Major), to the Semilunar Notch of the Scapula; next passes through the Semilunar Notch of the Scapula, always *under* the Ligamentum Posticum Scapulæ; it is then buried in the substance of the Supra Spinatus Muscle, and

* The surgeon must be careful *not to injure the Vein* as he divides the Pectoralis Major, and as he is afterwards making his way through the cellular membrane, by the outer side of the vein, to the artery.

† Look for it between, and rather behind, the Axillary Plexus and the Coracoid Process.

partially expended, with the Supra-Scapular Artery, in it; the unexpended continuance, subsequently descends beneath the Acromion Scapulæ, and is completely distributed throughout the substance of the Musculus Infra-Spinatus and Teres Minor, along with the Dorsal Branch of the Infra-Scapular Artery: thus the first part of its distribution corresponds with the Supra-Scapular Artery; and the latter, with the Dorsal Branch of the Infra-Scapular.

2nd. THE NERVUS ARTICULARIS,

Arises from the middle of the inner and posterior side of the Axillary Plexus, as the latter embraces the Axillary Artery; it descends obliquely inwards, for some distance, on the Sub-Scapularis Muscle, by the inner and posterior side of the Axillary Plexus; then turns backwards, with the Posterior Circumflex Artery, through the deep interstice between the under side of the Sub-Scapularis and the Teres Major Muscle; next winds outwards around the posterior side of the Os Humeri, just below the Tuberosities, with the continuation of the Posterior Circumflex Artery (about a quarter of an inch above it), first covered by the long head of the Triceps, then superiorly to the short head; so comes under the back of the Deltoid, pierces the under Aponeurotic surface of the Deltoid, and is given promiscuously to the whole of its substance, enduing it with volition.

3rd. NERVUS CUTANEUS EXTERNUS,

Arises from the middle of the outer side of the Axillary Plexus; it slants, outwards and downwards, first through the Coraco-Brachialis,* then between the Biceps Flexor Cubiti and Brachialis Internus; next emerges from between the lower parts of the outer sides of these, an inch above the External Condyle; and coming subcutaneous, afterwards, descends, in front of the External Condyle, immediately behind the Vena Mediana Cephalica; subsequently, in the form of two leading branches, on the radial side of the front of the fore-arm, supported on the Fascia, in correspondence with the anterior edge of the Supinator Radii Longus, and in connection with the Vena Cephalica and branches passing to it; one, of its two, leading filaments, is lost towards the lower part of the fore-arm; but the other, unexpended, losing its support upon the Supinator Radii Longus when it becomes tendonous, falls

against the lower part of the Radial Artery, and becomes connected to its sheath; afterwards descending over the outer side of the Ligamentum Carpi Annulare Anticum, like the Ramus Superficialis Volæ Manus of the Radial Artery, ends in the origins of the short muscles of the Ball of the Thumb. The contiguity of the lower part of this and another nerve (the Surculus Volaris e Ramo Superficiale Nervi Spiralis,) with the Radial Artery just above the radial side of the wrist, although the nerve is small at this situation, must be remembered—for care must be taken to exclude these nerves from the ligature, when the Radial Artery is tied here. Higher up, in the radial side of the fore-arm, the Radial Artery has no nerve contiguous to it; the nearest nerve is the Ramus Superficialis Nervi Spiralis, a half an inch more outwardly than the artery.

4th. THE NERVUS CUTANEUS INTERNUS,

Arises superficially from the inner and fore part of the Axillary Plexus, nearly opposite to the External Cutaneus; and passes downwards, upon the inner side of the sheath of the Brachial Artery, in contiguous connection with the Vena Basilica, and in correspondence with the inner edge of the Biceps Flexor Cubiti; two or three inches above the internal condyle, it bifurcates into the RAMUS ANTERIOR, and RAMUS POSTERIOR.

The RAMUS ANTERIOR, the largest, descends obliquely forwards anteriorly to the Internal Condyle,—and on the Fascia Bicipitis divides into numerous filaments, the *larger* of which usually descend *behind* the Vena Mediana Basilica, and the *minor* before it; thus the Vena Mediana Basilica is involved in the filaments of the Internal Cutaneus Nerve, on the Fascia Bicipitis, where blood is usually abstracted from it: the continuation of these filaments descend upon the Fascia on the cubital, or inner side of the front of the fore-arm, in connection with the branches of the Vena Basilica, and are gradually dispersed to the integuments, being completely lost towards the inner side of the wrist.

The RAMUS POSTERIOR, descends obliquely backwards (at an acute angle with the last) behind the Internal Condyle, splitting into filaments, which are continued downwards to supply the integuments upon the cubital side of the back of the fore-arm, and become exhausted towards the cubital part of the back of the hand.

Observe,—that the operator in proceeding to tie the Brachial Artery by the inner edge of the Biceps Muscle, may possibly see the blue line produced by the Vena Basi-

* And is concealed at its commencement behind the united sides of the Plexus and this muscle.

lica, if the patient is not very fat, or if there is not much extravasation of blood; and that in making the incision through the integuments, to expose the front of the sheath, the Internal Cutaneous Nerve and Vena Basilica must be left by the inner side of the incision.

Sometimes, instead of the larger and more numerous portions of the Ramus Anterior descending behind the Vena Mediana Basilica, they descend in front of it; hence larger or smaller, and more or less numerous filaments may be divided, or a portion of the nerve may be only partially divided, in phlebotomy. A partial division of the nerve, it is said, sometimes occasions most unpleasant and most obstinate symptoms of local nervous irritation; to remedy this, a complete division of the nerve has been advocated above the position of the puncture in the vein.

5th. NERVUS MEDIANUS,

Commences by a bifid origin, which, for the most part, constitutes the anterior side of the Axillary Plexus, embracing the anterior side of the Axillary Artery, and called by the great Scarpa, the *Plexus Brachialis Minor*. The Median Nerve is, with the Spiral and Cubital, one of the largest nerves of the Superior extremity. It descends in the anterior part of the sheath of the Brachial Artery, ranging at first anteriorly,* and generally somewhat externally, to the Artery; in its descent it insensibly inclines inwards over the Artery; so that, at the lower part of the arm, having emerged from the inner side of the sheath, it gets decidedly internally to the Artery, being supported like the Artery upon the Brachialis Internus Muscle; it afterwards descends by the inner side of its bifurcation of the Artery through the inner side of the angular hollow in front of the flexion of the elbow joint, posteriorly to the Fascia Bicipitis: it then pierces the belly of the Pronator Radii Teres splitting it into two portions;† afterwards is continued downwards deeply, through the middle of the substance of the anterior part of the forearm, half buried in the under surface of the Flexor Sublimis Perforatus, and supported (with the Flexor Sublimis) on the

* In some few cases the Nerve arises, and descends, behind the Artery; then the Axillary Plexus does not embrace the Axillary Artery, but lies behind it.

† I. e. Passing between the larger part of the muscle which arises from the Internal Condyle of the Os Humeri, and the under fasciculus which arises from the extremity of the Coronoid Process of the Ulna.

surface of the Flexor Profundus Perforans, being also situated about mid-way between the Radial and Ulnar Arteries; it shews itself by the radial side of the Tendons of the Flexor Sublimis Perforatus, immediately above the upper edge of the Ligamentum Carpi Annulare Anticum, and is immediately beneath the integuments when the tendon of the Palmaris Longus is wanting, but, when present, it is immediately covered by the latter: it descends behind the Ligamentum Carpi Annulare Anticum; then emerges from behind the under edge of the ligament with the tendons of the Flexor Sublimis, and divides into three principal branches, RAMI DIGITALES,—that descend in a diverging manner through the Palm of the hand, between the Flexor Tendons.

The FIRST or most external DIGITAL BRANCH parts into three filaments, which descend through the outer side of the palm of the hand by the inner side of the ball of the thumb; one filament descends along the radial side of the thumb; another along the cubital side of the thumb; and another along the radial side of the index finger, supplying them.

The SECOND or MIDDLE DIGITAL BRANCH, descends on the Lumbricalis Muscle, between the Flexor Tendons, passing to the Index and Middle Fingers, first behind the termination of the Superficial Palmar Arch, then concomitantly with the Ramus Digitalis Tertius, and behind the Palmar Fascia; it supplies by one filament, with the corresponding branch of the Digital Artery, the Cubital Side of the Index finger; and by another, with the corresponding branch of the Artery, the Radial Side of the Middle Finger.

The THIRD or INTERNAL DIGITAL BRANCH, descends on the Lumbricalis Muscle between the Flexor Tendons of the middle and ring fingers, first behind the Superficial Palmar Arch, then concomitantly with the Ramus Digitalis Secundus, and behind the Palmar Fascia, bifurcating like the Artery, it supplies, by a filament, the Cubital Side of the Middle Finger, and by another, the Radial Side of the Ring Finger; the Artery supplying the same.

The only difference between the bifurcations of the Digital Arteries, and these Digital Nerves, is in their locality; the Nerves bifurcating long before they emerge from beneath the Palmar Fascia, the Arteries bifurcating subsequently to their emergence, and immediately opposite to the interstices between the roots of the fingers.

The Median Nerve, as it emerges from the Pronator Radii Teres, gives off the RAMUS ARTERIOSUS; which inclines backwards,

and descends with the Ramus Anterior of the Interosseal Artery, anteriorly to the Interosseal Ligament, and between the united sides of the Flexor Profundus Perforans and the Flexor Longus Pollicis, and is lost behind the Pronator Quadratus by ending in its substance.

Observe,—that after scratching through the front of the sheath of the Brachial Artery, the Median Nerve must be turned aside, so as to expose and secure the Artery.

Observe, also, that if the Median Nerve is cut through in any part of the arm or forearm, paralysis will be produced of the thumb, the index, the middle fingers, and the radial side of the ring finger.

6th. NERVUS CUBITALIS,

Arises from the inner and lower part of the Axillary Plexus, internally and posteriorly to the origin of the Median, and behind the origin of the Internal Cutaneous; it descends obliquely backwards, upon the surface of the Triceps Extensor Brevis (vel Brachialis Externus), and on the Ramus Profundus Minor Arteriæ Brachialis, generally partially covering it in such a manner that the widest contortions of the artery shew themselves laterally to the nerve; then dives superficially through the lower part of the Triceps Extensor Brevis (with the Ramus Profundus Minor) behind the Internal Condyle, where it passes the Inosculation of the Ramus Profundus Minor with the Ramus Recurrens Arteriæ Ulnaris, and perforates the origin of the Flexor Carpi Ulnaris: it subsequently descends through the inner side of the forearm, on the Flexor Profundus Perforans, covered by the Flexor Carpi Ulnaris; it meets with the diagonal descent of the Cubital Artery in the lower part of the upper third of the forearm,* and subsequently descends in close cohesion to the Cubital Side of the Cubital Artery, through the two lower thirds of the forearm, still supported on the Flexor Profundus Perforans, and covered by the anterior edge of the Flexor Carpi Ulnaris, (the Artery being covered by the united edges of the Flexor Carpi Ulnaris and Flexor Sublimis Perforatus): the continuation of the nerve emerges, with the Artery, from between the tendinous edges of the latter Muscles, and mounts over the Ligamentum Carpi Annulare Anticum by the radial side of the Os Subrotundum, between and somewhat behind the convexity of that and the contiguous side of the Artery, and entering the

Palm splits into *three principal branches* or RAMI DIGITALES.

ONE OF THESE DIGITAL BRANCHES descends upon the cubital side of the palm or on the muscles covering the Metacarpal bone of the little finger, with the Ramus Volaris Minimi Digiti, and generally covered by the cubital edge of the Palmar Fascia; it is afterwards continued downwards, with the continuation of the Ramus Volaris Minimi Digiti, along the cubital side of the Little Finger, and expended on it.

THE SECOND DIGITAL BRANCH descends upon the Lumbricalis Muscle, between the Flexor Tendon passing to the Little, and the Flexor Tendon passing to the Ring Finger, first behind the commencement of the Superficial Palmar Arch, then with the Ramus Digitalis Primus, covered by the inner side of the Palmar Fascia; it divides into two filaments, which emerge from between the corresponding digits of the Palmar Fascia,—one supplying, concomitantly with a branch of the Ramus Digitalis Primus, the Radial side of the Little Finger,—and the other supplying, concomitantly with another branch of the Ramus Digitalis Primus, the Cubital Side of the Ring Finger.

It must be observed, however, that each of these digital filaments of the Median and Ulnar Nerves, descending on the sides of the fingers, are found to *subdivide*, so that there are *two filaments* descending on *each side* of each finger—an *anterior*, at the palmar aspect of the side of the finger—and a *posterior* one, more posteriorly situated, and nearer the dorsal aspect of the side of the finger.

THE THIRD BRANCH is the RAMUS PALMARIS PROFUNDUS, which passes backwards with the Ramus Palmaris Profundus Arteriæ Cubitalis, between the Adductor, and Flexor Brevis Minimi Digiti; sometimes between the Flexor Brevis and the Flexor Tendons of the little finger; subsequently runs outwards along the deep-seated Palmar Arch of the Radial Artery, in a retrograde direction to it, and is gradually expended, by giving filaments forwards to the Lumbricales Muscles, and backwards to the Internal Interosseal, ultimately ending in the Adductor Pollicis Muscle; so as to feed the deep-seated parts of the Palm.

The Cubital Nerve, about two inches above the cubital side of the wrist, gives off the RAMUS DORSALIS; this slants obliquely downwards and backwards, behind the tendon of the Flexor Carpi Ulnaris, and dividing, descends in diverging filaments over the Cubital Side of the back of the Hand, dispersed to, and supplying

* In the superior third, it is at a little distance internally to the Ramus Recurrens.

the Integuments of the Cubital Side of the back of the Hand and backs of the corresponding Fingers.

Observation. If the Cubital Nerve is divided in the arm or fore-arm, paralysis is produced of the Little Finger and Cubital Side of the Ring Finger, and numbness of a part of the Palm of the Hand.

7th. THE NERVUS SPIRALIS,

A very large nerve—arises from the internal and posterior part of the Axillary Plexus, immediately internally and posteriorly to the origin of the Cubital. (The Median Nerve arises from the front of the Plexus;—the Cubital Nerve internally to the Median Nerve,—having the Internal Cutaneus arising in front of it;—the Spiral arises internally and posteriorly to the Cubital;—the Articular Nerve somewhat internally, posteriorly, and rather superiorly to the Spiral.) The Spiral Nerve, slants obliquely downwards and backwards, with the Ramus Profundus Magnus Arteriæ Brachialis, into the trifurcation of the Triceps, i. e. it passes between the Triceps Extensor Brevis (internally to it), and the Triceps Extensor Brevis (outwardly to it), being covered by the Triceps Extensor Longus (the middle and larger head of the Triceps); it subsequently winds downwards and outwards in the Sulcus Spiralis,* with the continuation of the Ramus Profundus Magnus, around the posterior and outer side of the Os Humeri, in the origin of the Triceps Extensor Brevis (consequently immersed beneath its substance); it afterwards emerges from the origin of the Triceps Extensor Brevis, at the outer side of the arm, a little below the insertion of the Deltoid Muscle; and next slants obliquely downwards and forwards, in the deep interstice between the Brachialis, Internus and Supinator Radii Longus, (being separated from the lower continuation of the Ramus Profundus Magnus, which is in the external intermuscular ligament, by the origin of the Supinator Radii Longus,) into the outer side of the angular-shaped cavity in front of the bending of the elbow joint; in which, by the outer side of the tendon of the Biceps Flexor Cubiti, it bifurcates into its two final branches. We now see the organs situated in the angular cavity in front of the elbow joint, viz. the tendon of the Biceps—and internally to that the Brachial Artery, and Median Nerve—externally to it the bifurcation of this, the Spiral Nerve; all supported upon the ten-

don of the Brachialis Internus Muscle. The Spiral Nerve gives off three branches, viz. the RAMUS CUTANEUS, the RAMUS SUPERFICIALIS, and the RAMUS PROFUNDUS.

The RAMUS CUTANEUS, is given off from the Spiral Nerve, as it is about to emerge from the Triceps Extensor Brevis; it emerges from beneath the outer side of the Triceps Extensor Brevis distinctly from its parent trunk (rather above it, and an inch below the insertion of the Deltoid); next descends generally immersed in, or very near to, the External Intermuscular Ligament of the Os Humeri, with the diminished continuation of the Ramus Profundus Magnus Arteriæ Brachialis;† and divides into filaments, that, descending behind the External Condyle, and origins of the Radial Extensors, are continued downwards on the Fascia upon the radial side of the back of the fore-arm, supplying the integuments, and being exhausted on the radial side of the back of the hand.

The RAMUS SUPERFICIALIS, arises from the bifurcation of the Spiral Nerve; descends between the anterior edges of the Supinator Radii Longus and Extensor Carpi Radialis Longior, (under the former, and on the latter,) being about half an inch, more outwardly, than the descent of the Radial Artery; the nerve insensibly inclining backwards, emerges from behind the posterior side of the tendon of the Spinato-Radial Longus, some distance above the radial side of the wrist—and immediately splits into two branches, *Surculus Volaris* and *Surculus Dorsalis*.

The *Surculus Volaris*, the smaller one of the two, descends obliquely forwards, by the lower part of the Radial Artery, over the radial side of the Ligamentum Carpi Annulare Anticum, and ends in the origins of the short muscles of the ball of the thumb, like the termination of the Nervus Cutaneus Externus.

The *Surculus Dorsalis*, descends obliquely backwards, upon the radial side of the back of the hand over the radial side of the Ligamentum Carpi Annulare Posticum; splits into filaments that descend in a divergence on the radial side of the back of the hand and across the extensor tendons of the thumb (in an intermixture with the plexus of veins constituting the commencement of the Venæ Cephalica and Basilica), joining also some filaments, of the Ramus Dorsalis Arteriæ Cubitalis which supplies the cubital side of the back of the hand;

* A superficial Sulcus on the back of the Os Humeri, which is the impression made by the Spiral Nerve.

† Being separated from the continuation of the trunk by the interposition of the origins of the Supinator Radii Longus, and Extensor Carpi Radialis Longior.

supplying the *radial side* of the back of the hand, back of the thumb, and corresponding fingers, some filaments especially, digging into the Abductor Indicis. Hence the integuments upon the *radial side* of the *front* of the fore-arm, are supplied by the Nervus Cutaneus Externus; upon the *cubital side* of the *front* of the fore-arm by the anterior branch of the Internal Cutaneous Nerve; upon the *cubital side* of the *back* of the fore-arm by the posterior branch of the Internal Cutaneous Nerve; upon the *radial side* of the back of the fore-arm by the Cutaneous branch of the Spiral Nerve: upon the *radial side of the back of the hand* by the Surculus Dorsalis e Ramo Cutaneo Nervi Spiralis, and upon the *cubital side of the back of the hand* by the Ramus Dorsalis Nervi Cubitalis.

The RAMUS PROFUNDUS, the third branch of the Spiral Nerve; arises from the bifurcation of the Spiral Nerve, and descends obliquely backwards through the Supinator Radii Brevis, by the outer side of the upper part of the Radius, to gain the posterior region of the fore-arm; then splits into filaments, that descend with the Ramus Posterior of the Interosseal Artery, through the substance of the posterior part of the fore-arm, between the small deep-seated Extensor Muscles of the Thumb and the more superficial and larger Muscles of the Hand and Fingers, supplying them, and being spent as they become tendonous.

The *Ramus Cutaneus* can be found and divided, by making an incision between an inch and an inch and a half below the insertion of the Deltoid muscle. The *Ramus Superficialis* is the nearest Nerve to the three Superior fourths of the Radial Artery. When the lower part of the Radial Artery is to be tied, it must be well insulated, to exclude from the ligature the extremity of the *Nervus Cutaneus Externus*, and the *Surculus Volaris e Ramo Superficiali Nervi Spiralis*. When an incision is made upon the back of the hand, to take up the Radial Artery in the Fossa, as it is on the back of the Os Trapezium, and between the Extensor Tendons of the Thumb, the filaments of the *Surculus Dorsalis* are necessarily divided.

MINOR NERVES OF THE SUPERIOR EXTREMITY.

The smaller Nerves, supplying the Superior Extremity, consist, of some which arise from the Axillary Plexus, namely, the NERVI THORACICI SUPERIORES seu EXTERNI, the NERVUS INFRA-SCAPULARIS, and the NERVUS CUTANEUS INTERNUS MINOR WRISBERGII; the others, are two adventitious nerves, namely, the NERVUS

INTERCOSTO-HUMERALIS SUPERIOR, et INFERIOR.

THE NERVI THORACICI EXTERNI,

Are a few filaments, arising from the upper and anterior part of the Axillary Plexus, and slanting downwards, over the upper edge of the Pectoralis Minor; then in a divergence, between the Pectoralis Minor and Major muscles, with the spreading branches of the Ramus Thoracicus Supremus Arteriæ Axillaris; being for the most part taken up, with them, into the substance of the Pectoralis Major Muscle.

THE NERVUS INFRA-SCAPULARIS;

Arises from the internal side of the Axillary Plexus; descends obliquely backwards, first, upon the Subscapularis muscle; then, with the Infra-Scapular artery, in correspondence with the inferior Costa of the Scapula, and with the interstice between the Subscapularis and Teres Major muscles, towards the inferior angle of the Scapula; and is spent to the contiguous parts of these and other neighbouring muscles.

THE NERVUS CUTANEUS MINOR WRISBERGII;

Arises from the inner and lower part of the Axillary Plexus in connection with the Nervus Cubitalis, frequently, from its commencement: it descends, inclining a little backwards, on the inner side of the arm upon the surface of the Triceps Extensor Brevissimus, a little more posteriorly than the Cubital nerve; and about two or three inches below the Axilla, it parts into *two branches*. The *lesser*, courses obliquely outwards, winding round the posterior side of the arm upon the surface of the Triceps Extensor Cubiti, supplying the integuments upon the back of the arm, and becoming expended towards the External Condyle. The *other*, which may be esteemed as the *continued* nerve, continues its descent in a line with the commencement of the nerve upon the internal side of the arm, supplying the integuments, along with the Intercosto-Humeral nerves, as low as the Internal Condyle.

THE PARASITICAL MINOR NERVES—ARE THE TWO INTERCOSTO-HUMERAL.

THE INTERCOSTO-HUMERALIS SUPERIOR;

Arises from the Second Intercostal nerve, as the latter passes forwards in correspondence with the region of the Axilla: it emerges from the second Intercostal space between the second and third ribs, perforating the second Intercostalis Externus muscle, and the second primary fasciculus of the Serratus Major Anticus; then

descends obliquely outwards across the cavity of the Axilla, throwing filaments to the contents of the Axilla, viz. to the Fat, Cellular Membrane, and Lymphatic Glands, as well as to parts of the surrounding Muscles; and is afterwards continued downwards, but little diminished, along the internal side of the arm, supplying the integuments with the Nervus Cutaneus Minor as low as the Internal Condyle, and sometimes even lower.

THE NERVUS INTERCOSTO-HUMERALIS INFERIOR

Arises from the Third Intercostal nerve, as it is proceeding forwards in its third Intercostal space; it perforates the third External Intercostal Muscle, and corresponding part of the Serratus Major Anticus; then descending obliquely outwards through the cavity of the Axilla, emerges from behind the Pectoralis Minor; and then, like the Superior Intercosto-Humeral

and the Nervus Cutaneus Internus Minor Wrisbergii, descends along the internal side of the arm, to supply the integuments, generally becoming lost towards the Internal Condyle. This is generally smaller than the Superior Intercosto-Humeral; sometimes the reverse is the case, and then this extends lower than the latter.

Hence the nerves, supplying the integuments on the internal side of the arm are—the Nervus Cutaneus Minor Wrisbergii—the Nervus Intercosto-Humeralis Superior—the Nervus Intercosto-Humeralis Inferior, and minor Branches from the commencements of the other nerves.

An accumulation of water in the Thorax or Hydro-Thorax, compresses the Intercostal nerves, and produces a numbness of the internal and superior part of the arm, on account of the integuments of that part being supplied by the Nervi Intercosto-Humerales.

RESPIRATORY SPINAL NERVES OF THE PARIETES OF THE THORAX AND ABDOMEN.

THE INTERCOSTAL OR DORSAL NERVES.

These nerves impart the functions of Common Sensation, Volition, and Respiratory Action, to the parts which they supply (see the Introductory Epitome). The Intercostal or Dorsal Nerves emerge from the Foramina Intervertebralia, between the Dorsal Vertebrae—and immediately as they emerge, send forward, individually, their *connecting filaments* (RAMI COMMUNICANTES), on the surface of the corresponding intervertebral substances to their corresponding Intercostal Ganglia of the Sympatheticus Maximus—and individually, their pencil of diverging filaments backwards (RAMI POSTERIORES), to the Extensor muscles on the back of the Thorax. The continued nerves then course forwards, in the Intercostal Spaces; being first (as they are passing from the Foramina towards the angles of the ribs), *between* the Intercostales Externi and Pleura Costalis; subsequently, in the Intercostal Grooves, along with the Intercostal arteries and veins (internally to the inferior acute margins of the ribs); *between* the origins of the Intercostales Externi and Intercostales Interni; and become expended promiscuously, as they approach the front of the Thorax or Sternum, to the Intercostal muscles, origins of the Pectorales, &c.

The PECULIARITY of the SIX INFERIOR is, that they take a much longer course;

being unexpended in the Intercostal spaces; they emerge from behind the cartilages of the false ribs, or cartilaginous margin of the Thorax; and are continued, downwards and forwards, between the Transversalis and the Obliquus Internus Abdominis; supplying them, and the Obliquus Externus Abdominis; some piercing the Linea Semilunaris to reach the Rectus Abdominis.

The FIRST INTERCOSTAL NERVE which goes to the Axillary Plexus, is the largest; they diminish in relative size from the first to the middlemost; but somewhat irregularly, inasmuch as the SECOND AND THIRD INTERCOSTAL NERVES give off the Nervi Intercosto-Humerales; they also increase in size, in a more regular manner, from the middlemost to the last or twelfth Dorsal nerve.

The TWELFTH DORSAL NERVE is consequently the largest of the Dorsal Nerves, with the exception of the first. It emerges from the Foramen Intervertebrale between the twelfth Dorsal and first Lumbar Vertebrae, and from behind the commencement of the Psoas Magnus muscle; it is immediately connected by filaments which pass forwards (RAMI COMMUNICANTES), piercing the tip of the Psoas Magnus muscle, and lying upon the corresponding Intervertebral Substance with the corresponding Ganglion of the Sympatheticus Maximus; it gives backwards, also, some fila-

ments, (RAMI POSTERIORES), to the Extensors of the Trunk : then emerging from behind the commencement of the Psoas Magnus muscle, it takes subsequently rather a peculiar course, slanting obliquely downwards and outwards across the surface of the Quadratus Lumborum muscle, a little distance below the last rib, posteriorly to the Kidney and its surrounding Fat :—you raise the latter, and see the nerve in close cohesion with the surface of the Quadratus Lumborum muscle : it subsequently courses, forwards and downwards, between the Transversalis and Obliquus Internus Abdominis muscles, a little distance superiorly to the Crista Ilii and Ramus Circumflexus Cristæ Ilii ; then pierces the tendon of the External Oblique Muscle, and consumes its sensitive filaments in the Integuments upon the anterior and inferior part of the Abdomen.

By the distribution of these Intercostal nerves to the Intercostal and Abdominal Muscles, we see why these conspire, as active agents, by their sensibility and actions, in carrying on one function—Respiration.

THE PHRENIC, OR INTERNAL RESPIRATORY NERVE.

This arises from the Cervical part of the Respiratory Column, and passes out through the Foramina Intervertebralia, in combination with the Cervical Nerves, peeling off, after its exit, from the anterior sides of the Second, Third, and Fourth Cervical Nerves, in form of a separate origin from each, and sometimes from the Fifth ; its origins being first opposed to the origins of the External Respiratory Nerve, which are from the posterior sides of the same nerves, at their exit from the Foramina Intervertebralia. The origins of the Phrenic nerve uniting together, form the single commencement of the nerve. The nerve descends on the anterior surface of the *Scalenus Anticus Muscle*, laterally to the position of the Common Carotid Artery and Internal Jugular Vein (of course laterally to the Sympatheticus Maximus and Par Vagus), and behind the posterior edge of the Sternal-Cleido Mastoideus Muscle ; it dives through the superior aperture of the Thorax between the Subclavian Artery and Vein, and about half an inch more outwardly than the Par Vagus and Sympatheticus Maximus ; subsequently descends through the cavity of the Thorax between the Cul de sacs of the two Pleuræ, so as to glide downwards anteriorly to the trunks of the large Vessels, and over the side of the Pericardium anteriorly to the root of the Lung and the Ligamentum

Pulmonale Latum, being between the internal proper membrane of the Pericardium and Pleura Pericarditis—the right descending almost perpendicularly over the side of the Pericardium in correspondence with the position of the Superior Vena Cava and Right Auricle of the Heart, and just anteriorly to the root of the Lung and Ligamentum Pulmonale Latum Dextrum,—the left, taking a more circuitous and oblique descent, winds forwards over the side of the Pericardium, in correspondence with the Apex of the Heart, and at a great distance anteriorly to the root of the left Lung and Ligamentum Pulmonale Latum Sinistrum ; then the two are given into the Superior convex surface of the Diaphragm, and throughout the whole of its substance, in which they are completely consumed, with the exception of the few following branches from the Right Phrenic nerve. The Right Phrenic nerve, just before it enters the convex surface of the Diaphragm, gives a BRANCH backwards, over the convex surface of the Diaphragm, which subsequently descends by the side of the Inferior Vena Cava and behind the Margo Obtusus of the Liver, to become united under the Margo Obtusus, with the Hepatic Plexus, just before the latter perforates the Porta of the Liver. There are also some filaments which emerge from the under concave surface of the Diaphragm, and pass downwards in cellular membrane between the two laminæ of the Ligamentum Coronarium into the convex surface of the Liver, to be consumed in it.—Hence, the direct nervous connection which exists between the Liver and the Shoulder, by means of the Right Phrenic Nerve, and which occasions a disease of the Liver to produce the sympathetic pain in the shoulder.

The Phrenic nerve, being a Respiratory Nerve, bestows the power of respiratory action ; by means of this nerve the Diaphragm possesses an instinct, or a natural sense, as to the condition of the Thorax, in expiration ; so as to be excited, by the state of expiration,* to a state of subsequent contraction ;—so as to descend—to increase the longitudinal capacity of the Thorax—and to be the principal agent in inspiration. This nerve is the same to the Diaphragm, as the Intercostal Nerves are to the Intercostal and the Abdominal muscles, as the External Respiratory nerve is to the Serratus Major Anticus, &c. : and by means of the sense conveyed to the Respiratory Muscles, by the distribution

* This is what John Hunter termed the stimulus of necessity.

of the Respiratory system of nerves, such a constitutional sympathy is established between the Diaphragm, Intercostal, and all the other Muscles of Inspiration, that they contract *contemporally*, conspiring, in being conducive to enlarge the cavity of the Thorax in every direction; (the *transverse diameter* of the Thorax being increased by the ascent of the Ribs; the *Longitudinal*, by the descent of the Diaphragm): and also such a sympathy is established between the Diaphragm with the other muscles of Inspiration, and the Abdominal Muscles with the other Muscles of Expiration, that it (along with the other muscles of Inspiration) contracts *alternately* with the Abdominal (and other Expiratory) Muscles; relaxing as they contract; and so as to ascend into the cavity of the Thorax, whereby the *longitudinal diameter* of the latter is diminished; whilst its congeneric Intercostal and Serrati Muscles, are also relaxing, so as to allow of the descent of the ribs (the Abdominal Muscles drawing them downwards), whereby

the *transverse diameter* of the Thorax is diminished.

THE EXTERNAL RESPIRATORY NERVE,
Lately so named; comes off from the posterior sides of the large lower Cervical nerves, opposite to the origins of the Phrenic, and emerges in connection with the Cervical Nerves from the Foramina Intervertebralia; it descends behind the large Cervical Nerves, plunging into the Axilla deeply behind the Clavicle and Subclavius Muscle; and subsequently emerging from behind the upper part of the Axillary Plexus, descends perpendicularly in close cohesion to the surface of the Serratus Major Anticus Muscle, till it becomes insensibly, but completely expended in that, and the contiguous Respiratory Muscles. To observe it, the fat must be dissected out of the Axilla, and it will be seen descending perpendicularly in close connection to the surface of the Serratus Major Anticus, care being taken not to remove it along with the fat.

THE NERVES OF THE INFERIOR EXTREMITY; OR THE LUMBAR AND SACRAL NERVES.

THE LUMBAR NERVES

are five, and very large.

THE FIRST LUMBAR NERVE

Is the smallest; it emerges from the Foramen Intervertebrale, between the first and second Lumbar Vertebrae, immediately enters the Psoas Magnus, and gives—*communicating filaments* forwards (*RAMI COMMUNICANTES*), which emerge from the anterior side of the Psoas Magnus, to be connected with the first Lumbar Ganglion of the Sympatheticus Maximus,—a *pencil of filaments* backwards (*RAMI POSTERIORES*), which passes between the Transverse Processes to be expended in the substance of the loins,—and a *VERY LARGE FASCICULUS* which passes directly downwards, in the origin of the Psoas Magnus Muscle, to unite with the Second Lumbar, subsequently to its emergence from the Foramen Intervertebrale: the nerve then considerably diminished, inclines from behind the outer side of the Psoas Magnus Muscle, and slants like the last Dorsal Nerve, but inferiorly to it, across the Quadratus Lumborum Muscle; of course posteriorly to the Kidney, its Fat, and Capsule, and closely cohering to the surface of the Quadratus; it subsequently passes forwards, on the Crista Ilii and Circumflexus Cristae Ilii, between the origin of the Transversalis

Abdominis and Obliquus Internus; then pierces the tendon of the External Oblique Muscle, and is expended like the last Dorsal Nerve to the Integuments covering the lower and anterior part of the Abdomen, also to those covering the upper and anterior part of the Thigh or the Groin.

THE LUMBAR PLEXUS.

The *Fasciculus* given downwards from the *First Lumbar Nerve*, which unites with the *Second Lumbar Nerve*, also the latter, along with the *Third, Fourth, and Fifth, uniting in the Psoas Magnus Muscle, form the LUMBAR PLEXUS.*

THE SECOND LUMBAR NERVE.

emerges from the Foramen Intervertebrale, between the second and third Lumbar Vertebrae, immediately enters the origin of the Psoas Magnus—and gives *filaments forwards* (*RAMI COMMUNICANTES*), which emerge from the anterior side of the Psoas Magnus, and are united to the second Lumbar Ganglion—it also gives a *pencil of filaments backwards* (*RAMI POSTERIORES*), between the Transverse Processes of the second and third Lumbar Vertebrae, to be dispersed to the Extensor Muscles of the Loins: then passing downwards in the origin of the Psoas Magnus, receives the Major part of the First Lumbar Nerve, and unites also with the Third.

THE THIRD LUMBAR NERVE,

emerges from the Foramen Intervertebrale, between the third and fourth Lumbar Vertebrae, immediately enters the origin of the Psoas Magnus—gives *communicating filaments forwards* (RAMI COMMUNICANTES), which emerge from the anterior side of the Psoas Magnus, to unite with the third Lumbar Ganglion—also a *pencil of filaments backwards* (RAMI POSTERIORES), between the Transverse Processes of the third and fourth Lumbar Vertebrae to the Muscles of the Loins; then passing downwards in the Psoas Magnus Muscle, it receives the Second Lumbar Nerve, and unites with the Fourth.

THE FOURTH LUMBAR NERVE,

emerges from the Foramen Intervertebrale, between the fourth and fifth Lumbar Vertebrae, enters the Psoas Magnus—gives *filaments of communication forwards* (RAMI COMMUNICANTES), which emerge from the anterior side of the Psoas Magnus, and unite with the fourth Lumbar Ganglion of the Sympatheticus Maximus—also a *pencil of filaments backwards* (RAMI POSTERIORES), between the Transverse Processes of the fourth and fifth Lumbar Vertebrae to the flesh of the Loins;—then splitting into *two principal portions*: one passes to unite with the Third Lumbar Nerve; and another descending unites with the Fifth; *i. e.* one portion passes to the origin of the Anterior Crural Nerve, and the other to the origin of the Ischiatic.

THE FIFTH LUMBAR NERVE,

emerges from the Foramen Intervertebrale, between the fifth Lumbar Vertebra and first portion of the Sacrum—gives its *filaments forward* (RAMI COMMUNICANTES) to the fifth Lumbar Ganglion—and its *pencil of filaments backwards* (RAMI POSTERIORES) between the Transverse Process of the Fifth Lumbar Vertebra, and the first portion of the Sacrum, to the Extensor Muscles of the Loins; then descending into the posterior part of the Pelvis, emerges from behind the Internal or Pelvic side of the Psoas Magnus, and unites in front of the surface of the Pyriformis Muscle with the First Sacral Nerve, to form a part of the Ischiatic Nerve. *The union of the Lumbar Nerves thus situated in the substance of the origin of the Psoas Magnus Muscle, by the side of the bodies of the Lumbar Vertebrae, is termed the LUMBAR PLEXUS.*

SACRAL NERVES.

The three Superior Sacral Nerves are the three largest primary Spinal Nerves in the Body.

THE FIRST SACRAL NERVE,

within the Specus, a *filament turns backwards from its origin*, (RAMUS POSTERIOR), through the Posterior Sacral Foramen; which pierces the Ligamentous Membrane filling it up, and is given to the origin of the Extensors of the loins on the back of the Sacrum: the great nerve then emerges through the Anterior Sacral Foramen—gives a *filament of communication* (RAMUS COMMUNICANS), which passes inwards on the corresponding Raphe of the Sacrum, to be connected with the corresponding or first Sacral Ganglion; the nerve subsequently descending obliquely outwards, in front of the Pyriformis Muscle, receives in union, the last Lumbar Nerve: it also unites with the Second Sacral Nerve.

THE SECOND SACRAL NERVE,

in the Specus of the Sacrum, throws its *posterior filament backwards* (RAMUS POSTERIOR) through the corresponding Posterior Sacral Foramen, which pierces the Ligamentous Membrane in that, to aid in supplying the origins of the Extensor Muscles lying on the back of the Sacrum: the nerve then emerging from the second Anterior Sacral Foramen, gives *filaments of communication inwards* (RAMUS COMMUNICANS) on the corresponding Raphe of the Sacrum, to unite with the second Sacral Ganglion of the Sympatheticus Maximus: then descends obliquely outwards, in front of the Pyriformis; is united with the First Sacral; also unites with the Third.

THE THIRD SACRAL NERVE,

gives its *Posterior Filament backwards* (RAMUS POSTERIOR), through the Ligamentous Membrane filling the corresponding Posterior Sacral Foramen, to the origins of the Extensor Muscles on the back of the Sacrum; then emerging from the third Anterior Sacral Foramen, gives *Filaments of Communication* (RAMI COMMUNICANTES) inwards transversely upon the corresponding Raphe of the Sacrum, which unite with the third Sacral Ganglion of the Sympatheticus Maximus; then the nerve, slanting downwards and outwards, like the preceding, on the front of the Pyriformis, is united with the Second.

The union of these Sacral Nerves in front of the Pyriformis Muscle and Sacrum, is sometimes called the SACRAL PLEXUS, it is, however, a lower continuation of the Lumbar Plexus,—and may be termed the SACRAL PORTION OF THE LUMBAR PLEXUS. These Sacral Nerves that thus converge in front of the Pyriformis, unite, for the most part, into one nerve, (which is the commencement of) the Ischiatic—as the latter

emerges through the lower part of the great Ischiatic Notch.

The filaments which pass through the Posterior Sacral Foramina are commonly termed the POSTERIOR SACRAL NERVES, and bear a correspondence to the Pencil of Filaments given backwards to the Extensors of the Back from the Spinal Nerves more superiorly.

THE NERVES ARISING FROM THE LUMBAR PLEXUS are,—the NERVUS SPERMATICUS EXTERNUS, from the First and Second Lumbar Nerves, by small fasciculi: the NERVUS CUTANEUS EXTERNUS, by a small fasciculus from the Second, and another from the Third: the ANTERIOR CRURAL, from the Four superior Lumbar Nerves, i. e., from the union of the descending fasciculus of the First Lumbar Nerve, and the Trunks of the Second, Third, and Fourth: the OBTURATOR NERVE, by fasciculi from the Second, Third, and Fourth: the ISCHIATIC NERVE, from the two Inferior Lumbar and three superior Sacral, i. e., by the union of the descending fasciculus from the Fourth Lumbar Nerve (the part which does not go to form part of the Anterior Crural or Obturator) with the Trunks of the Fifth Lumbar, and the three Superior Sacral: the INTERNAL PUDIC by fasciculi from the same nerves as the Ischiatic: and the GLUTEAL NERVES, also, by taking small fasciculi from the same nerves as form the Ischiatic.

THE NERVUS SPERMATICUS EXTERNUS.

The External Spermatic Nerve, is small; arises from the First and Second Lumbar Nerves; and emerges from the upper part of the anterior surface of the Psoas Magnus Muscle; subsequently descends upon the anterior surface of the Psoas Magnus Muscle, a little more outwardly than the External Iliac Vessels, behind the Peritoneum lining the Posterior Parietes of the Abdomen and the anterior surface of the Psoas Magnus Muscle; being bound against the latter, in common with the External Iliac Vessels, by the Fascia Iliaca; is also crossed obliquely, on the Psoas Magnus, by the Ureter: as it approaches the anterior and inferior part of the Abdomen, it splits into two branches, viz.—

The RAMUS INTERNUS, which descends beneath Poupart's Ligament beside the common Femoral Vein, and is distributed to the Fat Cellular Membrane and Lymphatic Glands, situated under the Fascia Lata Femoris in the Groin: And the RAMUS SUPERFICIALIS, which descends through the Internal Abdominal Ring, the Abdominal Canal, and External Abdominal Ring; and is distributed to the Cremaster Muscle, upon the Chord in the

Male; * but in the Female to the Fat and Integuments of the Mons Veneris and Labium Pudendum.

THE NERVUS CUTANEUS EXTERNUS, arises from the Second and Third Lumbar Nerves; and emerges from behind the outer side of the Psoas Magnus Muscle; subsequently slants outwards, across the surface of the Iliacus Internus, suspended between the Laminæ of the Fascia Iliaca. (To see the Fascia Iliaca, of course the Peritoneum lining it must be removed.) It emerges from beneath the outer part of Poupart's Ligament, generally about half an inch internally to the Anterior Superior Spinous Process; but sometimes it arises from the Anterior Crural Nerve, and then may emerge from beneath the ligament an inch and half internally to the Process; at other times it pierces the tendon of the External Oblique, immediately above the ligament: it afterwards passes downwards, first perforating the Fascia Lata Femoris, then descending on the Fascia Lata Femoris, upon the outer and anterior part of the thigh, suspended in the Fascia Superficialis, splitting into filaments, so as to be dispersed to the integuments as it is descending, and terminates insensibly at the outer side of the knee.

THE NERVUS CRURALIS ANTERIOR, Is formed by the convergence and common coalescence of the main parts of the four superior Lumbar Nerves, so as to take up the greater portion of the Lumbar Plexus, which is situated in the origin of the Psoas Magnus Muscle; or, as commonly described, it arises from the four superior Lumbar Nerves; and emerges from behind the outer side of the Psoas Magnus Muscle—lower and less obliquely than the External Cutaneus, so as to descend in the *deep interstice* between the Psoas Magnus and Iliacus Internus Muscles, and to emerge in that position from beneath Poupart's Ligament;—as it is situated in this interstice before it passes beneath Poupart's Ligament (i. e. superiorly to Poupart's Ligament, and where it is yet in the

* This nerve is not at all appropriated to the Testicle, and may be considered as a sort of spurious Spermatic Nerve.

In consequence of its being crossed by the Ureter when on the belly of the Psoas Magnus Muscle, a calculus descending through the Ureter will compress the nerve, and the irritation produced by that mechanical pressure, will be conveyed through the nerve to the Cremaster Muscle, which occasions a spasmodic contraction of the Cremaster Muscle, that produces a retraction of the Testicle towards the External Abdominal Ring, accompanied also with a painful numbness at the internal and superior part of the thigh.

region of the Abdomen), it is covered by the Fascia Iliaca and Peritoneum lining the Fascia Iliaca, and concealed by these as we open the Peritoneal cavity of the Abdomen;—as it is situated in this interstice, where it gains the region of the thigh, *it is about half an inch more outwardly, and more deepseatedly, than the Common Femoral Artery*, and is necessarily covered, like that, by the Fascia Lata Femoris, Fascia Superficialis, and Common Integuments: a little below Poupart's ligament it gradually emerges from this interstice, *and splits into branches*; the LARGER BRANCHES dive in a divergence, anteriorly to the Hip Joint and the External Circumflex Artery, through the outer side of the Angular Cavity occupied by the Superficial Femoral Artery, and more laterally than the last-mentioned artery; then behind the Sartorius Muscle, so as to plunge into the Extensors of the Leg, constituting the front of the Thigh, viz. the Rectus Femoris, Crureus, and the two Vasti, pervading them, giving sensation, and very strong voluntary power to them.

One branch which is situated more inwardly in its descent, and rather larger than the rest, has been termed, somewhat paradoxically, the RAMUS LONGUS; it divides into a more outward branch,—the *Surculus Muscularis*, which descends into the Vastus Internus Muscle;—and a more internal, longer, and much larger branch, called SURCULUS, vel NERVUS, SAPHENUS,* which in its descent, inclining inwards, pierces the upper and outward part of the sheath of the Superficial Femoral Artery; subsequently descends through the sheath of the Femoral Artery, closely supported upon the outer side of the artery, but still continuing to incline a little inwards, gradually crosses obliquely over the artery, so as to emerge from the inner and lower part of the sheath immediately before the artery pierces the tendon of the Triceps Adductor Magnus; it subsequently escapes from between the tendon of the Triceps Adductor Magnus and lower part of the Sartorius Muscle, and gains a subcutaneous position upon the posterior part of the Internal Condyle, coming in connection with the Vena Saphena Major; it afterwards descends with the Vena Saphena Major, along the internal side of the leg, in correspondence with the Posterior Spine of the Tibia, in the form of leading branches, which are connected with the leading branches of

the Vena Saphena Major, and give filaments to the integuments covering the internal side of the leg; they are afterwards continued downwards in an extending form in front of the Maleolus Internus, then course forwards in a divergence of filaments with the *Surculus Internus e Ramo Cutaneo Nervi Peronei*, upon the internal half of the Dorsum of the Foot, which are mingled with the Plexus of Veins forming the origin of the Vena Saphena Major upon the Dorsum of the foot, and are sprinkled to the integuments covering the internal half of the Dorsum of the Foot, and backs of the corresponding Toes.

As the Anterior Crural Nerve divides into the large branches already described, it also gives off some smaller CUTANEOUS BRANCHES, viz.

The RAMUS CUTANEUS MEDIUS, which arises from the general division of the Anterior Crural Nerve; descends in front of the Sartorius Muscle; and subsequently upon the anterior part of the thigh, in correspondence with the inner edge of the Rectus Femoris, on the Fascia Lata Femoris, and in the Fascia Superficialis, supplying that and the common integuments of the front of the thigh as low as the knee.

The RAMUS CUTANEUS ANTERIOR, arises from the division of the Anterior Crural Nerve, and descends (more inwardly than the Ramus Medius) upon the Sheath of the Superficial Femoral Artery, covered by the inner edge of the Sartorius Muscle; it gradually inclines over the inner edge of the Sartorius Muscle, or else pierces its substance in a single, sometimes in a double, form; afterwards descending in front of the Sartorius, pierces the Fascia Lata Femoris, so as, subsequently to be continued downwards in the Fascia Superficialis, in correspondence with the Vastus Internus, and ends about the internal side of the knee, supplying the integuments of that, and the internal and lower part of the thigh during its descent.

The RAMUS CUTANEUS INTERNUS, arises from the division of the Anterior Crural Nerve, and descends obliquely inwards, (more inwardly than the latter, or than the Superficial Femoral Artery), and between the Triceps Adductor Longus and Sartorius Muscles; it emerges from between them; then along with the leading branch of the Obturator Nerve, pierces the Fascia Lata at the inner side of the Thigh, and is afterwards continued downwards in the Fascia Superficialis, towards the inner side of the Knee, supplying the Integuments.

These cutaneous branches generally pierce the Fascia Lata, to gain the Fascia Superficialis, at, or a little below, the middle of the thigh.

* A very important nerve; therefore put in Capitals. It would be better, were the Ramus Longus only esteemed as the commencement of the Surculus Saphenus, so that the latter could be called RAMUS SAPHENUS.

THE OBTURATOR NERVE,

Arises from the Second, Third, and Fourth Lumbar Nerves; emerges from behind the internal or Pelvic side of the Psoas Magnus, and then from beneath the forking of the Common Iliac Artery; it afterwards courses forwards through the side of the Pelvis, in correspondence with the Linea Ilio-Pectinea, in the cellular hollow beneath the Psoas Magnus Muscle and External Iliac Vessels, but excluded from the Serous Cavity of the Pelvis by the Peritoneum which lines the side of the Pelvis: this part of the Peritoneum is to be cut through inferiorly to the position of the Psoas Magnus Muscle and Iliac Vessels, then the nerve will be found, coursing forwards, suspended in cellular membrane and some fat; it emerges from the Pelvis through the Sinus Obturatorius or upper part of the Foramen Thyroideum, superiorly to the Obturator Ligament and origins of the Obturator Muscles; it afterwards descends, in diverging filaments, between the anterior surface of the Obturator Externus and posterior surface of the Pectenalis Muscle, and for the most part is given to the Pectenalis and substance of the three portions of the Triceps Adductor Femoris: but *one branch*, longer than the rest, emerges from between the portions of the Triceps, perforates the Fascia Lata, and descends in the substance of the Fascia Superficialis, like the Ramus Cutaneus Internus, supplying the integuments of the internal and lower part of the thigh, as low as the inner side of the knee.

THE ISCHIATIC NERVE,

Arises from the two Inferior Lumbar, and three Superior Sacral Nerves,—which descend obliquely in front of the Pyriformis Muscle, gradually converging, so as to unite into the commencement of this nerve—as it is about to emerge from the Pelvis through the lower part of the great Ischiatic Notch, and from beneath the underside of the Pyriformis Muscle: it next descends in the space between the Tuberosity of the Ischium and Trochanter Major; but somewhat nearer the Tuberosity than the Trochanter, being supported, in regular succession, upon the Geminus Superior, Obturator Internus, Geminus Inferior and Quadratus Femoris; and is covered by the thick substance of the lower or Ischiatic-half of the Gluteus Maximus Muscle; it subsequently descends into the upper part of the back of the thigh, becoming immediately covered by the superior part of the long head of the Biceps Flexor Cruris, before it gets from beneath the lowest part of the Gluteus Maximus: it

is then continued downwards through the posterior part of the thigh, between the posterior surface of the Triceps Adductor Magnus (anteriorly), and the long head of the Biceps Flexor Cruris (posteriorly), of course ranging in its descent more inwardly, and more perpendicularly, than the Shaft of the Os Femoris; till by the latter inclining inwards, it afterwards comes, somewhat distantly, behind the lower part of the Shaft of the Os Femoris, gets into the upper part of the ham behind the commencement of the Popliteal Artery and upper part of the Popliteal Vein; and as it is here immersed in the Fat of the Ham, and between the position of the Semi-Membranosus and the Biceps Muscles, bifurcates into—the Posterior Tibial, the more internal, perpendicular, and larger,—and the Peroneal Nerve, the more external, and lesser one.

Observe, then, that the Ischiatic Nerve is protected between two great prominences of bone, the Tuberosity of the Ischium, and Trochanter Major of the Os Femoris, but is nearest to the least moveable of these, or the one that can afford to it most protection from external pressure in the sitting position, viz. the Tuberosity of the Ischium; and that it is also encushioned here on the Rotator Muscles; and thickly covered by the Gluteus Maximus: that it subsequently descends, amidst an immense mass of flesh, which constitutes the internal part of the Thigh; and ranges more internally than the position of the Os Femoris; so that it is not subjected to be compressed between the Os Femoris and the seat, in the ordinary mode of sitting.

Sometimes the Ischiatic Nerve is double from its very commencement, part perforating the Pyriformis Muscle and splitting it into two, and the other part emerging from the under side of the Pyriformis Muscle in the usual manner, and the two subsequently descending through the back of the Thigh, as a double Ischiatic Nerve, one portion becomes the Posterior Tibial, and the other the Peroneal Nerve.

Sometimes the high bifurcation of the Ischiatic Nerve into these two latter nerves, is in the posterior part of the Thigh, and, in fact, when the Ischiatic Nerve bifurcates in the Ham, the fasciculi constituting the Posterior Tibial Nerve and the fasciculi constituting the Peroneal can be easily separated as high up as the Great Ischiatic Notch.

If the dissector wishes to expose the Great Ischiatic Nerve in the highest part of the back of the Thigh, he must make an incision through the Common Integuments obliquely across the lower edge of

the Gluteus Maximus, must raise the lower edge of the Gluteus Maximus, depressing as much, the long head of the Biceps Flexor Cruris, when the nerve will be discovered as it is passing from the region of the Nates into the region of the posterior part of the Thigh.

If the dissector wishes to expose the origins of the Ischiatic Nerve within the posterior part of the Pelvis, he must make an incision through the Anterior Parietes of the Abdomen, must turn up the convolutions of the small intestines, pressing forwards and downwards towards the Symphysis the contents of the Pelvis, viz. the Bladder, Uterus, &c.; he must then make an incision through the Peritoneum lining the back of the Pelvis by the side of the Rectum, and by dissecting this part of the Peritoneum away, he will see the Internal Iliac Artery; behind, and by the inner side of that, the vein; and behind these, the Sacral origins of the nerve, as they are descending in front of the Pyriformis Muscle, and embracing the commencement of the Gluteal Artery.

As the Nerve is descending on the Rotatory Muscles, it is accompanied by the arborescent descent of the Ischiatic Artery; as it is descending through the posterior part of the Thigh, it passes the promiscuous dispersions and inosculation of the Circumflex and Perforating branches of the Arteria Femoralis Profunda.

The RAMUS CUTANEUS POSTICUS NERVI ISCHIATICI, arises with the same origins as the Ischiatic Nerve; descends in cellular connection with the Ischiatic Nerve, first in front of the Pyriformis Muscle; then emerges with the Ischiatic Nerve through the lower part of the Great Ischiatic Notch; subsequently descends on the Geminus Superior, Obturator Internus, Geminus Inferior, and Quadratus Femoris,—still in connection with the Ischiatic Nerve,—all covered, in common with that, by the belly of the Gluteus Maximus; it then emerges from beneath the under edge of the Gluteus Maximus, and descends (perforating the Fascia Lata) along the surface of the long head of the Biceps Flexor Cruris and on the Fascia Lata, supplying the integuments upon the external and posterior part of the Thigh, as low as the outer side of the Knee.

This completes the catalogue of the principal Cutaneous Nerves of the Thigh, viz., Nervus Cutaneus Externus; Ramus Cutaneus Medius, Anterior, et Internus, Nervi Cruralis; the terminations of the Obturator, External Spermatic, and First Lumbar Nerves, the Ramus Cutaneus Posterior Nervi Ischiatic, and some branches thrown promiscuously over the Crista Ossis Ilii

to the integuments of the Nates from the Lumbar Nerves.

The Ischiatic Nerve gives off some branches to the Muscles, etc. as it descends through the back of the Thigh, but which are of no moment.

THE POSTERIOR TIBIAL NERVE,

Commences from the bifurcation of the Ischiatic, and passes downwards perpendicularly through the region of the Ham; first, *in correspondence with* the Fossa Poplitea Ossis Femoris,—*bounded laterally* by the two sets of ham-string Muscles and Condyles Ossis Femoris,—being *superficially immersed* in the fat which fills the cavity of the Ham,—*covered by* the continued Fascia Lata Femoris and Common Integuments (which stretch across the Ham, from side to side, like a Tentorium),—being also situated a little distance *posteriorly* to the Venous side of the Sheath of the Popliteal Vessels, intercepted from that by some of the Fat of the cavity of the Ham,—and *surrounded* in a promiscuous manner, in common with the latter organs, by the Popliteal Set of Lymphatic Glands (which are smaller than the Inguinal and Axillary Glands, and seldom exceed six in number): the nerve subsequently descends, *in correspondence with* the back of the Knee-joint and surface of the Popliteus Muscle,—being *crossed obliquely* (in common with the Popliteal Vessels) by the small belly of the Plantaris,—and *bounded laterally* by the two enlarging heads of the Gastrocnemius.—As the nerve thus descends into the lower, and shallower part of the Ham, behind the Knee-joint, it gradually emerges from the Fat; so as to be no longer intercepted from the posterior or venous side of the Sheath of the Popliteal vessels, but comes in contact with it; becomes covered by the approximation of the two heads of the Gastrocnemius Muscle; pierces the origin of the Soleus; and so fairly enters the region of the posterior part of the Leg, and gets beneath the substance of the Calf. It subsequently descends through the deeper part, of the inner side, of the back of the Leg; being situated by the *external side* of the Posterior Tibial Artery; and descending like the latter, first *in correspondence with* the upper part of the Tibialis Posticus Muscle, and subsequently *with* the outer side of the Flexor Longus Digitorum; being *covered by* the Fascia Solea, internal side of the belly of the Soleus, and internal belly of the Gastrocnemius Muscle; it is afterwards continued downwards *behind* the Maleolus Internus, being situated upon the posterior side of the lower extremity of the Tibia, in the space or hollow which is

bounded *internally and anteriorly* by the Maleolus Internus, and *externally and posteriorly* by the Tuberosity of the Os Calcis; being situated (in this hollow) *between* the artery and tendon of the Flexor Longus Policis; having, like the artery, the tendon of the Tibialis Posticus and Flexor Longus Digitorum internally to it, and the Flexor Longus Policis externally to it; and being covered by the Ligamentum Lancinatum: it then descends, in the Sinuosity of the Os Calcis, and, like the artery, bifurcates into the *Ramus Plantaris Internus* and *Ramus Plantaris Externus*; but, reversely to the artery, the *Ramus Plantaris Internus* is by far the *largest*, and the *External* the *smallest*: these, pass in a diverging direction, beneath the Abductor Policis Muscle, *into the Sole of the Foot*, concomitantly with the corresponding Plantar Arteries.

The *RAMUS PLANTARIS INTERNUS* subsequently passes forwards and divides into branches; these course forwards, in a divergence, beneath the inner side of the Flexor Brevis Digitorum; and which bifurcate, previously to their emergence from between the Flexor tendons and from beneath the digital portions of the Plantar Fascia; so as to supply, *the inner side of the Sole of the Foot and Great Toe, the outer side of the Great Toe, the inner side of the Second Toe, the outer side of the Second Toe, the inner side of the Third Toe, the outer side of the Third Toe, and inner side of the Fourth Toe*, under the form of single filaments passing forwards upon the sides of the last named toes, just like the corresponding divisions of the Median and Cubital Nerves on the sides of the Fingers, being accompanied also, in a similar manner, by the Digital Arteries from the External Plantar Branch of the Posterior Tibial Artery.

The *RAMUS PLANTARIS EXTERNUS* courses forwards and outwards, in a divergence from the *Ramus Plantaris Internus*, *obliquely across* the surface of the Flexor Accessorius and *beneath* the posterior part of the Flexor Brevis Digitorum, concomitantly with the External Plantar Branch of the Posterior Tibial Artery, gets along with that to the outer side of the Sole of the Foot, and divides into *three branches*: the first, passes forwards and supplies *the outer side of the Sole of the Foot, and outer side of the little Toe*; another, passes forwards under the outer side of the Flexor Brevis Digitorum, emerges from between its tendons, parts into two branches, which emerge from behind the corresponding slips of Plantar Fascia, one supplying *the inner side of the Little Toe*, the other supplying *the outer side of the Fourth Toe*; the third branch, passes inwards—along with

the continuation of the External Plantar Branch of the Posterior Tibial Artery or Arcus Plantaris Externus,—and behind the Flexor Brevis Digitorum, Tendons of the Flexor Longus and Lumbricales Muscles,—across also the under side of the Metacarpal Bones and Internal Interosseal Muscles; feeding, by small filaments, the Lumbricales and the Internal Interosseal Muscles, and being ultimately consumed behind the Adductor Policis Muscle; so that this *supplies the deeper part of the flesh of the Sole of the Foot*, and is analogous to a corresponding branch of the Cubital Nerve in the Palm of the Hand.

Sometimes the lower part of the Ischiatic Nerve, where it enters the upper part of the cavity of the Ham to bifurcate, is called Popliteal Nerve; and so that the Popliteal Nerve, is described to bifurcate into the Posterior Tibial and Peroneal: at other times the posterior Tibial Nerve, as long as it is situated in the region of the Ham, or as low down as where it perforates the origin of the Soleus Muscle, is termed the Popliteal Nerve; and so that the Ischiatic Nerve is said to bifurcate into the Popliteal and Peroneal.

When a longitudinal incision is made through the integuments, in the Ham, for the purpose of securing the Popliteal artery, the incision is to be conducted through the fat by the *inner side* of the Posterior Tibial Nerve, because the artery entering the Ham from the inner side of the Thigh, ranges somewhat more internally than the Posterior Tibial Nerve.

When an incision is made through the integuments and origin of the Soleus Muscle and Fascia, in correspondence with the internal Spine of the Tibia, for the purpose of securing the Posterior Tibial Artery, we do not find the nerve in the way of the operation, because it is lying by the External or Fibular side of the Artery.

Observe that the order of the parts behind the Maleolus Internus are, the tendon of the Tibialis Posticus most internally, the tendon of the Flexor Longus next more outwardly, then the Posterior Tibial Artery, more outwardly still the Posterior Tibial Nerve, and most outwardly the tendon of the Flexor Longus Policis.

The principal branches given off from the Posterior Tibial Nerve, besides the two Plantar Branches, are two in number.

First, the *RAMUS COMMUNICANS NERVI TIBIALÆ*. This comes off from the superior part of the Posterior Tibial Nerve, about an inch above the flexion of the Knee-joint: it passes downwards, so as to glide out from the fat of the Ham from between the two heads of the Gastrocnemius; subsequently descends, in a superficial Sulcus between

the two bellies of the Gastrocnemius Muscle, covered immediately by the Vena Saphena Minor; afterwards descends obliquely outwards across the superior part of the Tendo Achillis; and by the upper part of the outer edge of the Tendo Achillis, it unites with a corresponding branch from the Peroneal Nerve.

Second branch, *RAMUS ARTERIOSUS*, is a small branch given off from the Posterior Tibial Nerve, just after it has pierced the origin of the Soleus Muscle; which passes downwards, and rather outwards, so as to descend with the Peroneal artery; and is ultimately consumed in the lower part of the Leg; for the most part in the substance of the Flexor Longus Policis, which covers it in common with the artery.

THE PERONEAL NERVE,

Is much smaller than the Posterior Tibial, and forms the other part of the bifurcation of the Ischiatic Nerve; it passes obliquely downwards and outwards through the Fat in the outer side of the Ham, immediately inferiorly to the tendon of the Biceps Flexor Cruris; then glides forwards inferiorly to the insertion of that and upon the upper part of the outer side of the Fibula, it thus emerges from the region of the Ham, and becomes immersed in the superior part of the Peroneus Longus, in which, it bifurcates into its final branches. The principal branches of the Peroneal Nerve are three.

The *RAMUS CUTANEUS NERVI PERONEI*. This commences from the Peroneal Nerve, as the Peroneal Nerve is descending through the outer side of the Ham; it passes downwards, in the small angular interstice formed between the outer side of the Soleus Muscle and outer edge of the Gastrocnemius, following the line of the External Edge of the Gastrocnemius Muscle; by the narrowing form of that, it gradually converges towards the Ramus Communicans Nervi Tibiæ; and becomes united with that, by the upper part of the outer edge of the Tendo Achillis, three inches and a half above the Maleolus Externus, into the form of a single nerve, called—

THE NERVUS COMMUNICANS TIBIALIS.

This passes downwards, by the outer side of the Tendo Achillis, in connection with the Vena Saphena Minor, then, like that, behind the Maleolus Externus, and subsequently courses forwards in form of the continued nerve upon the under side of the Foot, and becomes connected (generally in an abrupt manner and in a single form,) with the *Surculus Externus* e *Ramo Cutaneo Nervi Peronei*, supplying along with that by a promiscuous dispersion of

filaments the outer half of the Dorsum of the Foot and backs of the contiguous Toes: these filaments, being mingled with the branches of the Venous Flexus on the Dorsum of the Foot, that constitute the origin of the Vena Saphena Minor.

The *RAMUS CUTANEUS NERVI PERONEI*, arises from the bifurcation of the Peroneal Nerve; passes downwards and forwards, so as to emerge from between the united sides of the Peroneus Longus et Extensor Longus Digitorum Muscle; and subsequently (by inclining forwards) to perforate the *Fascia of the Leg*, mid-way between the Anterior Spine of the Tibia and the External side of the Fibula, and three inches and a half above the Maleolus Externus; then descending, splits into two branches,—the *Surculus Internus*—et *Surculus Externus*; which pass downward, diverging, anteriorly to the *Ligamentum Tarsi Annulare Anticum*:—the *Surculus Internus*, splitting into filaments, that pass forwards, in a divergence, upon the internal side of the Dorsum of the Foot; and are dispersed promiscuously to the integuments covering the internal side of the Dorsum of the Foot and backs of the corresponding Toes; being mixed in a promiscuous dispersion, with the termination of the Nervus Saphenus in the same parts:—The *Surculus Externus*, passing forwards and outwards, upon the outer side of the Dorsum of the Foot, is generally connected in a single form, or by one of its principal filaments, with the Nervus Communicans Tibialis on the outer side of the Dorsum of the Foot; and then splitting into diverging filaments is given, with the latter nerve, to the integuments which cover the outer part of the Dorsum of the Foot and backs of the contiguous Toes.

The *RAMUS ANTERIOR*, (or *ANTERIOR TIBIAL NERVE*;) is the terminating branch of the trunk of the Peroneal Nerve: it comes off from the bifurcation of the Peroneal Nerve, in common with the Ramus Cutaneus; and passes downwards and inwards, so as to perforate obliquely the upper part of the Extensor Longus Digitorum Muscle; it subsequently descends, either situated on, or immersed in, the anterior side of the Sheath of the Anterior Tibial Artery, and of course descends like that, first between the Tibialis Anticus and Extensor Longus Digitorum, and subsequently between the lower part of the Tibialis Anticus and the Extensor Proprius Policis: in the lowest part of the Leg, as it is under (along with the artery) the lower part of Extensor Proprius Policis Muscle, it splits into two branches, which pass downwards in a divergence, beneath the

Ligamentum Tarsi Annulare Anticum.—The internal branch, called *Surculus Superficialis*, courses forwards with the continuation of the Anterior Tibial Artery upon the inner side of the Dorsum of the Foot, and (as the latter plunges down into the Sole) splits into filaments that pass forwards upon the outer side of the Dorsum of the great Toe, and which also dig downwards into the Interosseal Muscles between the Metatarsal Bones of the Great and Second Toes.—The outer branch, called *Surculus Profundus*, passes forwards and outwards, upon the outer side of the Dorsum of the Foot, and under the Extensor Brevis Digitorum Pedis, and branching under it, is consumed in its substance and the deeper parts of the Dorsum of the Foot.

Observations. The organs situated behind the Maleolus Externus, are five, viz., the tendons of the Peroneus Longus et Brevis; the Ramus Posterior of the Peroneal Artery; the Vena Saphena Minor; and, the Nervus Communicans Tibialis.

To cut upon and divide the Ramus Cutaneus, a longitudinal incision must be made through the integuments at the part where it perforates the Fascia. I mention the mode of cutting upon some few of these *sub-cutaneous nerves of the limbs*, because it has been stated that they are sometimes subjected to Tic Doloroux, or to a painful nervous affection, seated in a part or the whole of either of these nerves, which may or may not have been the effect of injuries, and which a complete division of the radical parts of the branches (i. e. where they are in a single form) above the seat of affection, may cure.

In securing the Anterior Tibial Artery in the front of the leg, it is to be remarked, that the Ramus Anterior Nervi Peronei must be met with, because it descends in front of the Artery, and it must be carefully excluded from the ligature. In cutting for the Anterior Tibial Artery on the Dorsum of the Foot, the Anterior Tibial Artery must be well insulated, to exclude from the ligature the *Surculus Superficialis e Ramo Anteriore Nervi Peronei* which is contiguous to it.

THE INTERNAL PUDIC NERVE;

Arises from the same nerves as the Ischiatic, in front of the Pyriformis Muscle; subsequently descends through the lower part of the Great Ischiatic Notch, beneath the Pyriformis Muscle with the Internal Pudic Artery; then winds round the superficial surface of the Spinous Process of the Ischium, with the continuation of the artery, and in correspondence with the origin of the Geminus Superior Muscle;

subsequently re-enters the Pelvis through the upper part of the lesser Ischiatic Notch, above the Obturator Externus Muscle, with the continuation of the artery; afterwards passes across the Pelvic surface of the Obturator Externus Muscle, concealed by the Fascia of the latter, so as to get with the continuation of the artery, against the internal and upper part of the Tuberosity of the Ischium; it afterwards ascends, with the continuation of the latter, behind the Ascending Ramus of the Ischium, and the Descending Ramus of the Os Pubis, posteriorly to the Crus Penis seu Crus Clitoridis (that is to say, the last-mentioned parts are between it and the Perineum); and behind the root of the Penis, and inferiorly to the Symphysis Pubis, it parts into its two last branches.

In the Perineum it gives off the RAMUS SUPERFICIALIS PERINEI, a branch which is distributed superficially to the Perineum, and to the Bulb of the Urethra. It ultimately parts into;—the RAMUS PROFUNDUS PENIS, which is distributed through the Corpus Cavernosum Penis:—and RAMUS DORSALIS SUPERFICIALIS PENIS, which passes forwards through the Ligamentum Suspensorium, under the Symphysis Pubis; then along the Dorsum Penis, between the Vena Magna Ipsius Penis and the Ramusculus Dorsalis e Ramo Pudico Interno Arteriæ Iliacæ Internæ.

THE SUPERIOR AND INFERIOR GLUTEAL NERVES,

are small, and arise from the same nerves as the Ischiatic.

The SUPERIOR GLUTEAL NERVE, passes backwards, with the Gluteal Artery, through the superior part of the Ischiatic Notch, above the Pyriformis Muscle; to be distributed with the Gluteal Artery, to the Gluteus Medius, Minimus, and the superior or Iliac portion of the Gluteus Maximus.

The INFERIOR GLUTEAL NERVE, emerges from the Pelvis with the Ischiatic Nerve and its concomitant artery, through the lower part of the great Ischiatic Notch; and descends to be distributed, with the Ischiatic Artery, in the lower portion of the Gluteus Maximus Muscle.

THE FOURTH SACRAL NERVE

is so much smaller than the third, as to bear no comparison in size with it, and is

* The organs passing through the Great Ischiatic Notch, are—the Pyriformis Muscle—above the Pyriformis, the Gluteal Artery, and Superior Gluteal Nerve—below the Pyriformis, the Ischiatic Nerve, with the Ischiatic Artery, Ramus Cutaneus Posticus Nervi Ischiatici, and Inferior Gluteal Nerve; the Internal Pudic Nerve, and Internal Pudic Artery.

not concerned in forming the Sacral Plexus; it commences from the Cauda Equina, like the other Sacral Nerves; and before emerging from the Specus of the Sacrum, gives backwards a small filament, its *Posterior Sacral Nerve*, or *RAMUS POSTERIOR*, through the corresponding Posterior Sacral Foramen, perforating its ligamentous Membrane; which filament, is consumed in the origins of the Extensor Muscles on the back of the Sacrum. The nerve then emerges from the fourth Anterior Sacral Foramen, and is immediately connected by a filament (*RAMUS COMMUNICANS*) with the fourth Sacral Ganglion upon the corresponding Raphe of the Sacrum; it then passes forwards, and becoming mixed with the meshwork of the Hypogastric Plexus* of the Sympa-

* See Hypogastric Plexus.

theticus Maximus around the Internal Iliac Artery, has its filaments subsequently more particularly determined to the lower part of the Rectum and Sphincter Ani, the lower part of the Vagina and Sphincter Vaginæ, the lower part of the Bladder and Sphincter Vesicæ: *making these parts voluntary.*

THE FIFTH SACRAL NERVE

is the last and lowest filament of the Cauda Equina; it is so small, as to be considerably less than the fourth Sacral nerve, and to be only rated as a mere filament: it emerges from between the lower extremity of the Sacrum and Base of the Os Coccyx, is connected to the fifth or lowest Ganglion of the Sympatheticus Maximus; and passing forwards, is embedded in the Coccygeus Muscle, supplying that.

THE GANGLIONIC SYSTEM,

OR

THE SYMPATHETICUS MAXIMUS;

Is a Ganglionic line of Nervous substance, descending through the whole length of the back of the Trunk, from the Base of the Cranium to the Os Coccygis; throwing off from its Ganglia, Nerves to the various Viscera;* and having connections, through the medium of filaments passing off from its Ganglia, with perhaps all the other Nerves of the body, or with every other part of the substance of the Nervous System.

THE CERVICAL PORTION OF THE SYMPATHETIC.

The highest part of the trunk of the Sympatheticus Maximus is the *First*, or *Superior, Cervical Ganglion*. This is of a long, narrow, oval shape.† It is situated in the higher part of the neck; is embedded on the fore part of the *Rectus Capitis Anticus Major*; and is behind the upper part of the *Internal Carotid Artery*. The upper part of the Ganglion is opposite to the Transverse Process of the First Cervical Vertebra; the middle part, to the Transverse Process of the Second; the

lower part, to the Transverse Process of the Third. The upper extremity of the Ganglion is continuous with filaments, which pass up through the *Canalis Caroticus* (upon the continuation of the *Internal Carotid Artery*), and which unite with the Nervous Abducens where that is in the Cavernous Sinus, and also with the Vidian Twig of the *Par Trigemini*.* From the under extremity of the Ganglion, the continuation of the Sympathetic descends, in a very slender and single form, anteriorly to the *Rectus Capitis Anticus Major*, and behind the *Internal Carotid Artery*; afterwards anteriorly to the *Longus Colli*, and behind the Sheath of the *Common Carotid Artery*; and is usually slightly enlarged opposite to the *Fourth or Fifth Cervical Vertebra*, which enlargement (when it exists), is called the—

Middle Cervical Ganglion. From the *Middle Cervical Ganglion*, the Sympathetic descends in the form of Filaments; some of which pass before, and others behind, the *Inferior Thyroid Artery* (so as to embrace it, behind the Sheath of the Carotid): which filaments forming a sort of Plexus, descend between the *Longus Colli*, behind, and the *Sheath of the Com-*

* The *Par Vagus* also supplying some partially.

† The Sympatheticus Maximus was formerly described to arise by filaments from the Nervus Abducens, and by the Vidian Twig of the Fifth Pair; but the present advanced state of physiological science does not tolerate such an ancient mode of description.

* These are the filaments alluded to in the preceding note; they are not the origin of the Sympathetic; but merely connecting filaments, establishing a sympathy between the various Viscera and many parts of the Head.

mon Carotid, before; and become united again in the substance of the—

Inferior Cervical Ganglion; which is smaller than the Superior; and situated in the lowest part of the Neck,—in the *boundary* between the Neck and the Thorax, being *opposite* to the Longus Colli and the Seventh Cervical Vertebra,—it lies also *against* the side of the root of the Vertebral Artery, and *on* the upper side of the Subclavian (whence the *former* Artery arises),—is also situated, like the Thyroid and Vertebral Arteries, *between* the situation of the Common Carotid Artery and the inner edge of the Scalenus Anticus Muscle, in *juxtaposition* with the Par Vagus, and about *half an inch more internally than the descent of the Phrenic Nerve*—is *concealed and bounded in front* (like the Par Vagus, Phrenic Nerve, the Vertebral Artery and the Inferior Thyroid) by the lower part of the Internal Jugular vein; and still *more anteriorly*, in common with all these parts, by the commencement of the Sterno-Hyoideus and Sterno-Thyroideus Muscles, and still *more substantially and superficially*, by the Sterno-Cleido Mastoideus and Clavicle (being behind the Sternal extremity of the Clavicle).

The Nerve, at this Ganglion, again assumes a filamentous form, and descending into the Thorax, forms a *ring of filaments* round the Subclavian Artery—the larger ones pass *behind*—the smaller ones *before* the Artery (for which reason the Sympathetic is frequently described as passing *behind* the Subclavian Artery into the Thorax); these filaments afterwards become re-united, under the Subclavian Artery, in the *First Intercostal Ganglion of the Sympathetic*.

THORACIC, OR INTERCOSTAL, PORTION.

The Nerve then descends, in a slender, single form, through the Thoracic portion of the Trunk, *perpendicularly across the necks of the Ribs* and the Intercostal spaces, and *laterally* to the Dorsal Vertebrae and the Laminae of the Posterior Mediastinum, being *lined anteriorly* (in common with the Parietes) by the Pleura Costalis;* and *as it is opposite to the Intercostal spaces*, it is enlarged into irregular, flat shaped *Ganglia*, called the *Intercostal* (one Ganglion in front of each Intercostal space); the circumferences of these Ganglia are somewhat irregular or

* If the Pleura is not morbidly thickened or opaque, by turning the Lungs forwards, we can see the Sympatheticus Maximus presenting a whitish irregular-shaped line, tolerably distinct, through the semi-transparent structure of the Pleura-Costalis.

stellated in shape, in consequence of the radiating manner in which the filaments pass off from them; these Ganglia are opposite to the Intercostal spaces, and are held together by the slender and intermediate continuations of the Nerve as it crosses the necks of the Ribs.

THE LUMBAR OR ABDOMINAL PORTION.

The continuation of the Nerve then emerges from the Thorax, by passing *through* the side of the *Crus Diaphragmatis*, laterally to the Foramen Posticum Diaphragmatis—and by inclining forwards as it thus passes into the Abdominal part of the Trunk, it gains the sides of the bodies of the lower Dorsal Vertebrae*; it *descends upon the sides of them*, then *upon the sides of the Lumbar Vertebrae* and the uniting *Intervertebral substances*, being (in this descent) *more internally* than the origin of the Psoas Magnus Muscle; the *left* descends by the side of the Aorta Abdominalis; the *right* laterally to, or rather behind, the side of the Inferior Vena Cava; and *upon each of the Intervertebral Substances* each is formed into a slight oval enlargement, which enlargements (five in number) are called the *Lumbar Ganglia*.

THE SACRAL OR PELVIC PORTION.

The continuation of the Nerve descends in a still more extenuated† form *behind the Arteria, et Vena, Iliaca Communis*, and then by the side of the Promontory of the Sacrum, so as to be continued into the Cavity of the Pelvis: it then continues a course *along the Anterior Concave Surface of the Sacrum*, *more internally* than the Anterior Sacral Foramina, *laterally* to (afterwards ranging somewhat behind the sides of) the Rectum, and behind the Peritoneum forming the Laminae of the Mæso-Rectum: as it is *on each of the Raphæ* (which were the original Intervertebral substances that united the Vertebrae of the Sacrum in the Fœtus) and consequently *opposite to the corresponding Sacral*, (or Fœtal Intervertebral) *Foramina*, it is slightly enlarged into a small *Ganglion*; which five Ganglia are called the *Sacral*: as the width of the Sacrum and Os Coccygis tapers, the two Sympathetics approx-

* The lower Dorsal Vertebrae are situated in the Region of the Abdomen, not in the Region of the Thorax; this is in consequence of the sloping ascent of the Crura Diaphragmatis.

† The continuations of the Sympathetic, between its Lumbar and Sacral Ganglia, frequently consist, only, of very slender filaments.

imate; and are ultimately *united* upon the Os Coccygis, by a connection called the *Ganglion Impar*: this is a semilunar-shaped, Medullary connection, the convexity of which faces downwards, towards the Nates, and the concavity upwards, towards the Head.

BRANCHES, OR RAMI, FROM THE CERVICAL PORTION OF THE SYMPATHETIC.

FROM THE FIRST CERVICAL GANGLION.

—The *upper part* of the First Cervical Ganglion is united by filaments which pass upwards through the Canalis Caroticus, RAMI COMMUNICANTES, with the Nervus Abducens, and the Vidian branch of the Par Trigemini*: the *outer side* of the Ganglion is also connected by Medullary substance, or by a very short Medullary Fasciculus (sometimes two), upon the upper part of the Rectus Capitis Anticus Major, with the commencement of the Sub-Occipital Nerve; and also by longer filaments, RAMI COMMUNICANTES, which pass outwards across the Rectus Capitis Anticus Major, with the First and Second Cervical Nerves—these filaments of connection are behind the Internal Carotid Artery and Jugular Vein. The Ganglion gives *forwards* the RAMUS CARDIACUS SUPERFICIALIS or SUPREMOUS, which descends by the side of the Common Carotid Artery, towards the Heart: a set also of fine silk-like filaments, called Nervi, Vel RAMI, MOLLES, which pass downwards upon the Internal and the Common Carotid Arteries; being blended into one series with the Nervi Molles which are given off from the distribution of the Glosso-Pharyngeal and the Superior Laryngeal branches of the Eighth Pair; a transmission of these filaments is also reflected upwards upon the External Carotid and its branches, supplying these vessels of the Head; by which the action of these Arteries thus profusely supplied by the Sympathetic, is connected through the medium of that, with the Mind or Brain; hence the action of blushing.

The MIDDLE CERVICAL GANGLION, is united by *filaments which pass outwards*, RAMI COMMUNICANTES, either across, or through, the lower part of the Rectus Capitis Anticus Major, with the commencement of the Third, Fourth and Fifth Cervical Nerves: it gives *forwards* the RAMUS CARDIACUS MAGNUS, which descends by the Trunk of the Large Carotid Artery to the

Heart: and gives *downwards*, filaments which form the continuation of the Sympathetic itself, and embrace the Inferior Thyroid Artery; from these a production is sent *inwards*, along the Inferior Thyroid Artery, to the Thyroid Gland: the nervous supplies to the Thyroid Gland, are these, as well as, filaments from the Superior and Inferior Laryngeal Nerves of the Par Vagus.

The INFERIOR CERVICAL GANGLION, gives *outwards* filaments, RAMI COMMUNICANTES, which cross the Longus Colli, behind the Jugular Vein, and perforate the origin of the Scalenus Anticus, to join the Sixth and Seventh Cervicals at their emergence from the Intervertebral Foramina: it also gives *forwards*, the RAMUS CARDIACUS MINOR, which passes down by the Trunk of the Common Carotid Artery to the Heart: and *downwards*, *filaments which form the continuation of the Nerve, encircling the Subclavian Artery.*

THE NERVES OF THE HEART ARE:—*The Cardiac Branches given off from the Par Vagus in the lower part of the Neck; and those Cardiac Branches, already mentioned, of the Sympatheticus Maximus.* These descend by the side of the Common Carotid Artery, some of them being included in its sheath (the Cardiacus Magnus and a Cardiac Branch from the Par Vagus being generally observable when the sheath is opened, descending on the Carotid); the branches subsequently descend, on the right side, behind the Arteria Innominata; on the left side, behind the Arch of the Aorta; some branches winding in front of these vessels: they are afterwards continued downwards, along the posterior side of the Sinus Aortæ, and on that they form the CARDIAC GANGLION, which is the ganglionic union of the Cardiac Nerves. The Cardiac Ganglion gives off the CARDIAC PLEXUS, which lies upon the posterior side of the Sinus Aortæ, and which parts into the TWO CORONARY PLEXUSES. The RIGHT CORONARY PLEXUS, courses, from the Cardiac Plexus, forwards, between the Sinus Aortæ and Pulmonary Artery, so as to gain the anterior surface of the Heart, and to get contiguous to the Right Carotid Artery, which it courses concomitantly with, to be distributed with it, to the right side of the Heart. The LEFT CORONARY PLEXUS, passes forwards and towards the left side, from the Cardiac Plexus, so as to emerge from behind the left side of the Pulmonary Artery, (some branches winding over the Pulmonary Artery), and so get contiguous to the left Coronary Artery, which it courses with, to be distributed, like it, to the substance of the left side of the Heart.

* Filaments already referred to, in the commencement of this description of the Sympathetic, also in the description of the Fifth and Sixth pair of Cerebral Nerves.

BRANCHES, OR RAMI, FROM THE
THORACIC PORTION OF THE
SYMPATHETIC.

The INTERCOSTAL GANGLIA give *backwards* filaments, RAMI COMMUNICANTES,* which pass into the Intercostal spaces, and unite opposite to the Foramina Intervertebralia, with the commencement of the Intercostal Nerves (these are filaments of connection, suspended between the Ganglia of the Sympathetic, and the Intercostal Spinal Nerves before they are distributed, and in office, precisely resemble the connections between the three Cervical Ganglia of the Sympathetic and the Cervical Spinal Nerves).—The Intercostal Ganglia also give filaments *forwards*, RAMI ANTERIORES, which mix with those of the Pulmonic and Œsophageal plexuses (so that the Œsophagus and Lungs are in part supplied by the Sympathetici Maximi).

The *Seventh, Eighth, and Ninth Ganglia* give off, a branch, *individually*—which three branches slant, downwards and forwards, obliquely over the sides of the bodies of the Dorsal Vertebrae, gliding behind the Pleura, and by gradually converging unite into a single trunk, called the —

SPLANCHNIC BRANCH, RAMUS
SPLANCHNICUS.

This descends through the lateral and lower part of the Posterior Mediastinum, the *left* being laterally to the Aorta Thoracica, and the *right* to the Vena Azygos; it then passes through the Foramen Posticum Diaphragmatis, and terminates (as a trunk) in the SEMILUNAR GANGLION, by the side of the Cœliac Artery: the *left Semilunar Ganglion* is situated by the left side of the Cœliac Artery, upon the left Crus of the Diaphragm, and between the Cœliac Artery and the left Supra-Renal Capsule: the *right* is situated upon the right Crus, between the right side of the Cœliac Artery and the Inferior Vena Cava (the latter intercepting it from the right Supra-Renal Capsule). The superior Cornua of the Semilunar Ganglia are united by transverse filaments superiorly to the Cœliac Artery, and the inferior Cornua by transverse filaments below the artery (the two thus forming a ganglionic

ring which encircles the Cœliac Artery.) These Ganglia unitedly send off, a *mesh-work of minute filaments*; which is situated in the Cellular membrane that unites the Peritoneal lining of the Abdomen to the Crura of the Diaphragm; and which Plexus is spread out to a distance, like a nervous halo, around the Cœliac Artery; and at certain points of the minute intersections of these filaments there are small enlargements or nervous Ganglionic knots.

The filaments of this Plexus are carried off in the form of *several sets of filaments*, called the ABDOMINAL PLEXUSES; that pass off from it in a radiation which has been compared to the rays of the sun—and hence this Plexus is called the SOLAR PLEXUS, it is also termed the CœLIAC PLEXUS.

These Abdominal Plexuses, thus radiating from the Solar Plexus, course in the form of so many streams of straight continued filaments along the various Arteries of Abdomen given off from the Aorta, so as to reach and supply, with them, the Abdominal Viscera.

The Abdominal Plexuses, sent off from the Solar, are:—

1st. THE HEPATIC PLEXUS, which consists of filaments that pass along the Hepatic Artery, and divide upon the bifurcation of the Hepatic Artery into two sets, called the *Right and Left Hepatic Plexuses*, which pass upwards with the two divisions of the Hepatic Artery through the Fissura Transversalis, and are distributed to the substance of the Right and Left Lobes of the Liver:

2nd. THE SPLENIC PLEXUS, passes along with the Splenic Artery, at the Fissura Longitudinalis gives filaments to the Coats of the Spleen, and is then distributed through its substance:

3rd. THE SUPERIOR MESENTERIC PLEXUS, is filaments which pass downwards upon the Superior Mesenteric Artery, emerging first from behind the Pancreas, then passing behind the root of the Transverse Mæso-Colon, then with the Artery through the Root of the Mesentery and over the Transverse portion of the Duodenum, and divides with the Superior Mesenteric Artery into Minor Continuities, which pass along the branches of the Superior Mesenteric Artery to be distributed, with them, to the convolutions of the Small Intestines, Cœcum, Ascending Portion of the Colon, Hepatic Flexure, and right side of the Transverse Arch:

4th. The RENAL PLEXUSES, are filaments which are also given off from the Solar; and passing outwards upon the two Renal Arteries, perforate (with them) the Sinuses of the Kidneys; as each is perforating the

* These I so call for the sake of distinction; these *Rami Communicantes*, are the filaments which were described to be given *forwards*, to the Sympathetic, from the commencements of the Spinal Nerves.

† The terms *Rami Communicantes*: *Rami Anteriores*, I have ventured to apply to these Branches.

Sinus it sends a transmission of minute filaments to the investing Coats of the Kidney, and is then distributed chiefly to the Cortical Part, in a less degree to the Tubular part.

The Renal Plexus generally receives the RAMUS SPLANCHNICUS MINOR;—which arises by a filament from the Tenth, and by another from the Eleventh Intercostal Ganglion: these slant, downwards and forwards, upon the sides of the Vertebrae, behind the Pleurae, and converge so as to unite into the branch; (the origins of this, and the lower origins of the Larger Splanchnic Branch, are frequently called the RAMI SPLANCHNICI ACCESSORII); which descending through the Foramen Posticum Diaphragmatis, or the Crus Diaphragmatis, ends in the root of the Renal Plexus, or in the Semilunar Ganglion.

5th. The Commencements of the Renal Plexuses send off the SPERMATIC PLEXUSES, which are filaments that pass downwards behind the Peritoneum, in cellular connection with the Spermatic Arteries, like the Spermatic Veins; in the male, each passes (with the continuation of the Spermatic Artery) through the Abdominal Canal; then descends through the Cellular Membrane of the Spermatic Cord, invested by the sheath of the Cremaster Muscle and Fascia Spermatica, to be distributed to the substance of the Epididymus and Testicle: in the female, they turn with the continuations of the Spermatic Arteries, over the Arteriae Iliacae Communes into the cavity of the Pelvis, are continued inwards between the two laminae of the Ligamenta Lata, so as to supply the contents of the Ligamenta Lata, viz. the Fallopian Tubes, (as well as their loose extremities and Fimbriae) also the Ovaria, and are subsequently dispersed in the substance of the Fundus or upper part of the Uterus.

6th. The Solar Plexus also gives off the AORTIC PLEXUS, which consists of very numerous filaments that pass downwards upon the surface of the Aorta Abdominalis, giving the fibrous appearance to the Cellular surface of the Aorta (when the Peritoneum is torn from it), and meeting with the origin of the Inferior Mesenteric Artery, it sends off—

7th. The INFERIOR MESENTERIC PLEXUS, which is a process of filaments passing downwards upon the Inferior Mesenteric Artery; which parts, with the branches of the Inferior Mesenteric Artery, into subdivisions of filaments; that are continued, with the branches of the Inferior Mesenteric Artery, to supply the left side of the Transverse Arch, the Splenic Flexure, the Descending Portion, the Sigmoid Flexure of the Colon, and in part the Rectum.

The AORTIC PLEXUS is subsequently continued downwards, upon the Aorta, and on its bifurcation divides into the

8th. Two ILIAC PORTIONS OR PLEXUSES, which turning over the Arteriae Iliacae Communes, in two Columns of filaments, are continued into the cavity of the Pelvis—where each forms a considerable plexus called the

9th. HYPOGASTRIC OR THE INTERNAL ILIAC PLEXUS, which is suspended in the Cellular membrane in the back of the Pelvis, embraces the Internal Iliac Artery, and the origins of its branches which are immersed in the same cellular tissue: and is sent off in *minor plexuses* along the branches of the Internal Iliac Artery, supplying the Pelvic Viscera; so as to supply, in part, the Rectum (the Rectum is also supplied by the Inferior Mesenteric Plexus), the lower part of the Uterus, and, in part, the Vagina (the upper part of the Uterus is supplied by the Spermatic Plexuses; the lower part of the Vagina by the Fourth Sacral Nerve) and also the Bladder, (the lower part and Cervix of which is supplied by the Fourth Sacral.

BRANCHES GIVEN OFF FROM THE CONTINUATION OF THE SYMPATHETICUS MAXIMUS, SUBSEQUENTLY TO THE SPLANCHNIC; OR FROM THE LUMBAR AND SACRAL PORTIONS OF THE SYMPATHETICUS MAXIMUS.

The LUMBAR GANGLIA of the Sympatheticus Maximus are *united, by filaments, RAMI COMMUNICANTES*, (which pass *backwards* upon the Intervertebral Substances, and behind the Psoas Magnus Muscle) with the commencements of the *Lumbar Nerves*, opposite to the Foramina Intervertebralia and deeply in the origin of the Psoas Magnus Muscle: they also send filaments *forwards*, RAMI ANTERIORES, which blend with those of the Aortic Plexus.

From the SACRAL GANGLIA *filaments of connection, RAMI COMMUNICANTES*, pass *outwards* upon the Sacral Raphe, which unite with the Trunks of the Large Sacral Nerves at the Anterior Sacral Foramina: and others pass *forwards*, RAMI ANTERIORES, into the Hypogastric Plexus.

GENERAL OBSERVATIONS.

By my description of the course and distribution of the Sympatheticus Maximus, and by my description also of the Spinal Nerves, it is seen that the commencements of all the Spinal Nerves at their exit from the Foramina Interverte-

bralia, are connected with the Sympatheticus Maximus—the Cervical Spinal Nerves by filaments,* with the Cervical Ganglia of the Sympatheticus Maximus—the Dorsal or Intercostal Spinal Nerves, by filaments,* with the Intercostal Ganglia of the Sympatheticus Maximus—the Lumbar Spinal Nerves, by filaments,* with the Lumbar Ganglia of the Sympatheticus Maximus—and the Sacral Spinal Nerves, by filaments,* with the Sacral Ganglia of the Sympatheticus Maximus. These filaments, in my description of the Sympatheticus Maximus, I have described as being given *backwards* from the Ganglia to the Spinal Nerves; and in my description of the Spinal Nerves, I have described them to be given *forwards* from the Spinal Nerves to the Ganglia; this I mention for the purpose of facilitating the comprehension of my description. It must be understood (whatever office they may have besides, or whatever their ultimate destination may be) that they are *filaments of communication or sympathy*; by these, all parts sympathise with the viscera which the Sympathetic supplies, and *vice versa*.

As I have already stated the Sympatheticus Maximus is for the purpose of bestowing its living powers to the Involuntary Viscera, viz., the property of contractability, and susceptibility to the impressions which they are naturally subject to, or that is to say, a sensibility, by which

they are excited to contract, when their natural stimuli are applied to them; the application of which keeps them in continued functional action; and as the Spinal Nerves give volition and sensibility to the other parts of the body, and more especially the Voluntary Muscles of the limbs, &c., we see the reason that by these *connections*, or *RAMI COMMUNICANTES*, a derangement of the Viscera shall produce symptomatic or sympathetic affections of the limbs and other parts of the body; why, in fact, colic shall be accompanied with dreadful spasm of the Voluntary Muscles of the Abdomen, and why the limbs also may be spasmodically contorted; or we see the reason also why cold applied to the extremities, may induce, by sympathy, a Diarrhœa; or why cold water splashed upon the extremities, may hasten and increase the effects of a purgative; or why, in fact, by fear, which has its first production in the brain, by the peculiar influence of the brain over (by its continuity with) the *whole of the nervous system*—the whole of the nervous powers shall be so deranged or affected—that the actions of the vital viscera may be irregular, or they may falter—and in connection with this, the functions of the Voluntary Muscles will be deranged; *i. e.* their actions will be irregular, subsultus tendinum will be produced, or the limbs will quiver. All these symptoms being necessarily accompanied with a great depression of all the powers of the system.

* Rami Communicantes.

FINIS.



