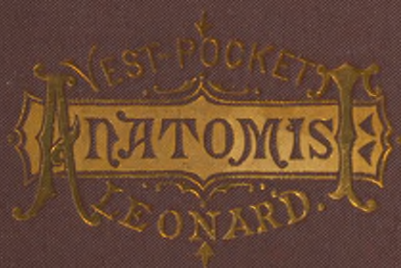


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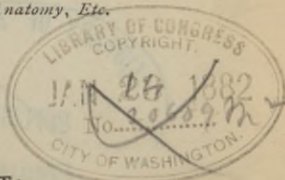
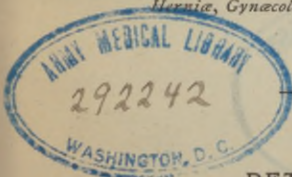
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BY C. HENRI LEONARD, A. M., M. D.,

Professor of the Medical and Surgical Diseases of Women and Clinical
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HEAD AND NECK.

MUSCLES OF THE HEAD—(11 Regions, 39 Muscles).

The nervous supply is indicated by [] brackets.

The — dash divides the origin from the insertion.

(REGION 1) EPICRANIAL REGION, 1 MUSCLE.

Occip'ito-frontal'is: outer $\frac{3}{4}$ superior curved line of occiput, and mastoid process—frontal quadrilateral expansion to the facial muscles. [Supra-orbital, facial, occipital, posterior auricular.]

(2) AURICULAR REGION, 3.

Attollens au'rem: occipital fascia—upper part of pinna. [Small occipital.]

At'trahens au'rem: lateral edge aponeuro'sis of occipito-frontalis—front of helix. [Facial, inferior maxillary.]

Ret'rahens au'rem: mastoid process—lower cranial surface of the concha. [Facial.]

(3) INTRA-AURICULAR REGION, 4.

Ten'sor tym'pani: inferior surface petrous bone, Eustachian tube—backwards to handle malleus. [Otic ganglion.]

Laxa'tor tym'pani ma'jor: spinous process sphenoid, Eustachian tube—back through Glaserian fissure to neck of the malleus. [Facial.]

Laxa'tor tym'pani mi'nor: superior and posterior part external meatus—forward inwards to handle of the malleus. [Facial.]

Stape'dius: interior of pyramid—forward to neck of stapes. [Facial.]

(4) PALPEBRAL REGION (4), 3.

Orbicula'ris palpebra'rum: internal angular process frontal bone, nasal process superior maxilla, sphincter of eye. [Facial, supra-orbital.]

Corru'ga'tor supercil'ii: inner extremity superciliary ridge—under surface orbicularis, opposite the middle of the orbital arch. [Facial and supra-orbital.]

Ten'sor tar'si: crest of os lachrymalis—tarsal cartilage near puncta; covers in lachrymal canals. [Facial.]

(5) ORBITAL REGION, 7.

Lava'tor pale'bræ superio'ris: inferior surface lesser wing of sphenoid, anteriorly to foramen opticum—upper border superior tarsal cartilage. [IIIId.]

Rec'tus super'ior: margin optic foramen—sclerotica. [IIIId.]

Rec'tus infe'rior: optic foramen—sclerotica. [IIIId.]

Rec'tus inter'nus: optic foramen—sclerotica. [IIIId.]

Rec'tus exter'nus: 2 heads between which pass IIIId., nasal branch of Vth, and Vith nerves and ophthalmic vein; *upper* from outer margin optic foramen, *lower* from ligament of Zinn and process of bone at sphenoidal fissure—sclerotica. [Vith.]

Obliq'uus supe'rior: near optic foramen—"pulley" thence at right angles to sclerotica. [IVth.]

Obliq'uus infe'rior: depression in orbital plate in superior maxilla—sclerotica, outer surface. [IIIId.]

(6) NASAL REGION, 7.

Pyramida'lis na'si: occipito-frontalis—compressor naris. [Facial.]

Leva'tor la'pii superio'ris alæ'que na'si: nasal process superior maxilla—cartilage of the ala and lip. [Facial.]

Dila'tor na'ris ante'rior: Cartilage ala—inner border integument ala. [Facial.]

Dila'tor na'ris poste'rior: nasal notch superior maxilla—skin at inner margin nostril. [Facial.]

Compres'sor na'ris: above incisive fossa superior maxilla—pyramidalis nasi, nasal fibro-cartilage, its fellow opposite side. [Facial.]

Compres'sor na'rium mi'nor: alar cartilage—skin at the end of the nose. [Facial.]

Depres'sor alæ na'si: incisive fossa superior maxilla—septum and ala nasi. [Facial.]

(7) SUPERIOR MAXILLARY REGION, 4.

Leva'tor la'pii superio'ris: lower margin orbit—lip. [Facial.]

Leva'tor an'guli o'ris: canine fossa superior maxilla—angle mouth. [Facial.]

Zygomaticus ma'jor: in front zygoma—angle oris. [Facial.]

Zygomaticus mi'nor: malar bone near maxillary suture—angle oris. [Facial.]

(8) INFERIOR MAXILLARY REGION, 3.

Leva'tor la'bii Inferio'ris, or **Leva'tor men'ti**: incisive fossa inferior maxilla—skin of chin.

Depres'sor la'bii inferio'ris: external oblique line inferior maxilla—integument of lower lip. [Facial.]

Depres'sor an'guli o'ris, or **Quadra'tus men'ti**: external oblique line inferior maxilla—angle oris. [Facial.]

(9) INTER-MAXILLARY REGION, 3.

Orbicula'ris o'ris: sphincter oris. [Facial.]

Buccina'tor: alveolar processes superior and inferior maxillæ—converges, to the angle of the mouth, and orbicularis. [Facial, inferior maxillary.]

Riso'rius: fascia above masseter—angle oris. [Facial.]

(10) TEMPORO-MAXILLARY REGION, 2.

Masse'ter: malar process superior maxilla, lower border zygoma—angle and lower half ramus inferior maxilla, outer surface. [Inferior maxillary.]

Tempora'lis: temporal fossa, curved line of frontal and parietal bones, pterygoid ridge of sphenoid—coronoid process inferior maxilla. [Inferior maxillary.]

(11) PTERYGO-MAXILLARY REGION, 2.

Pterygoide'us inter'nus: pterygoid fossa, tuberosity palate bone—lower and inner side ramus inferior maxilla. [Inferior maxillary.]

Pterygoide'us exter'nus: *upper* head from pterygoid ridge of great wing of sphenoid; *lower* from external pterygoid plate, tuberosity of palate, and superior maxillary bones—pterygoid depression in front condyle inferior maxilla. [Inferior maxillary.]

MUSCLES OF THE NECK—(11 Regions, 42 Muscles).

(REGION 1) SUPERFICIAL CERVICAL REGION, 2.

Platys'ma myoide'us: clavicle, acromian process, fascia of deltoid and pectoralis major—inferior maxilla below external oblique line. [Facial, superior cervical.]

Ster'no-clei'do mastoide'us: sternum and clavicle—mastoid process, superior occipital curved line. [Spinal accessory, cervical plexus.]

(2) INFRA-HYOID REGION, 4.

Ster'no-hyoide'us: sternum and sternal end of clavicle—hyoid bone. [Communicating branch of descendens and communicans noni.]

Ster'no-thyroides: upper posterior edge sternum—oblique line of ala of cartilage (thyroid) [Communicating branch of descendens and communicans noni.]

Thy'ro-hyoides: oblique line of thyroid cartilage—body and greater cornu hyoid bone. [Hypoglossal.]

O'mo-hyoides: upper border scapula (bound down to clavicle by cervical fascia)—hyoid bone. [Communicating branch of descendens and communicans noni.]

(3) SUPRA-HYOID REGION, 4.

Digas'tricus: mastoid process of temporal (ligament binding hyoid bone)—symphysis inferior maxilla. [Facial, inferior dental.]

Sty'lo-hyoides: outer surface, middle styloid process—body hyoid bone, perforated by digastricus. [Facial.]

My'lo-hyoides: (forms floor of mouth) mylo-hyoid ridge of inferior maxilla—body of os hyoides. [Inferior dental.]

Ge'nio-hyoides: inferior genial tubercle of inferior maxilla—body os hyoides. [Hypoglossal.]

(4) LINGUAL REGION (5), 4.

Ge'nio-hyo-glossus: superior genial tubercle of inferior maxilla—os hyoides and whole length inferior surface tongue. [Hypoglossal.]

Hyo-glossus: side of body and greater and lesser cornua hyoid—back and side of tongue. [Hypoglossal.]

Lingua'lis: under surface glossa from base to tip, between hyo-glossus and genio-hyo-glossus. [Chorda tympani.]

Sty'lo-glossus: outer and anterior center styloid process—side of tongue. [Hypoglossal.]

(5) PHARYNGEAL REGION (5), 4.

Constric'tor infe'rior: sides of cricoid and thyroid cartilages—fibrous raphé of posterior median line of pharynx. [Pharyngeal plexus, glosso-pharyngeal, external laryngeal]

Constric'tor me'dius: greater and lesser cornua hyoid—posterior median pharyngeal raphé. [Glosso-pharyngeal, pharyngeal plexus.]

Constric'tor supe'rior: lower 3d of the margin of internal pterygoid plate, palate and contiguous palatal muscles—posterior median pharyngeal raphé and occipital pharyngeal spine. [Glosso-pharyngeal, pharyngeal plexus.]

Sty'lo-pharyngeus: inner side base of styloid process—constrictor muscles and upper border thyroid cartilage. [Glosso-pharyngeal and pharyngeal plexus.]

(6) PALATAL REGION, 5.

Leva'tor pala'ti: under surface petrous portion of temporal, Eustachian tube—posterior surface soft palate. [Facial.]

Ten'sor pala'ti: scaphoid fossa of the sphenoid, Eustachian tube (bound to hamular process)—anterior surface hard and soft palate. [Otic ganglion.]

Az'ygus uv'u-læ: posterior nasal spine palate bone—uvula. [Facial.] (Is not a *single* muscle as its name implies.)

Pala'to-glos'sus: (*anterior pillar*) anterior lateral surface soft palate—side and dorsum of tongue. [Meckel's ganglion.]

Pala'to-pharynge'us: (*posterior pillar*) soft palate—joins stylo-pharyngeus to be inserted into posterior border thyroid cartilage. [Meckel's ganglion.]

(7) INTRA-LARYNGEAL REGION, 5.

Cri'co-thyroid'e'us: front and side of cricoid—up- and outwards to lower border thyroid cartilage. [Laryngeal nerve supplies the muscles of this group.]

Thy'ro-arytænoide'us: posterior surface thyroid cartilages and crico-thyroid membrane—backwards to anterior surface arytenoid cartilage.

Cri'co-arytænoide'us latera'lis: superior border cricoid cartilage—obliquely up- and backwards to external angle base arytenoid cartilage.

Cri'co-arytænoide'us poste'rior: posterior surface cricoid cartilage—up- and outwards to external angle base arytenoid.

Arytenoide'us: fills up posterior concave surface of arytenoid cartilage.

Vocal Chords: the INFERIOR or TRUE are the *inf. thyro-arytenoid ligaments* of yellow elastic tissue attached, in front, to depression between the two alæ of the thyroid cartilage—ant. angle of base of arytenoid cartilage. The SUPERIOR or FALSE are the *Sup. thyro-arytenoid ligaments* attached, in front, to angle of thyroid cartilage, below epiglottis—anterior surface of arytenoid cartilage.

(8) EPIGLOTTIDIAN REGION, 3.

Thy'ro-epiglottide'us: internal surface thyroid cartilage—upwards to margin of epiglottis. [Laryngeal.]

Arytæ'no-epiglottide'us supe'rior: apex arytenoid cartilage—to fold mucous membrane between cartilage and side of epiglottis. [Laryngeal.]

Arytæ'no-epiglottide'us infe'rior: arytenoid cartilage just above superior vocal chord—forwards and upwards to the margin of the epiglottis. [Laryngeal.]

(9) ANTERIOR VERTEBRAL REGION, 4.

Rec'tus cap'itis anti'cus ma'jor: (continuation scalenus anticus) 4 slips from anterior tubercles transverse processes 3d, 4th, 5th and 6th cervical vertebræ—basilar process occipital bone. [Suboccipital, and cervical plexus.]

Rec'tus cap'itis anti'cus mi'nor: anterior surface lateral mass of atlas and its transverse process—basilar process occipital. [Suboccipital, cervical plexus.]

Rec'tus latera'lis: upper surface transverse process atlas—jugular process occipital. [Suboccipital.]

Longus col'li: 1st *portion* from anterior tubercles transverse processes of 3d, 4th and 5th cervical vertebræ—tubercle of anterior arch of atlas; 2d *portion* from 1st, 2d (and 3d) dorsal—transverse processes 5th and 6th cervical vertebræ; 3d *portion* from 1st, 2d, 3d dorsal and 7th, 6th, 5th cervical—bodies 2d, 3d and 4th cervical vertebræ. [Lower cervical branches.]

(10) LATERAL VERTEBRAL REGION, 3

Scale'nus anti'cus: inner border and superior surface 1st rib—anterior tubercles transverse processes 3d, 4th, 5th and 6th cervical vertebræ. [Branches lower cervical.]

Scale'nus me'dius: behind groove for subclavian artery on 1st rib—posterior tubercles transverse processes lower 6 cervical vertebræ. [Branches lower cervical.]

Scale'nus posti'cus: 2d rib, outer surface—transverse processes lower 3 cervical vertebræ. [Branches lower cervical.]

(11) POSTERIOR VERTEBRAL REGION, 4.

Rec'tus cap'itis posti'cus ma'jor: spinous process axis—inferior occipital curved line. [Occipital.]

Rec'tus cap'itis posti'cus mi'nor: tubercle posterior arch atlas—beneath insertion of above. [Occipital.]

Obliq'uus infe'rior: spinous process axis—horizontally to transverse process atlas. [Occipital.]

Obliq'uus supe'rior: transverse process atlas—occipital bone, between curved lines. [Occipital.]

ARTERIES OF THE HEAD AND NECK.

CARO'TIS COMMU'NIS: arises on right side, from innominate, behind sterno-clavicular articulation; on left side, from arch of aorta, highest part, and is more deeply


placed than the right and passes obliquely outwards to root of neck behind sterno-hyoid and sterno-thyroid muscles, innominate vein and thymus gland. Starting now from each side of neck, each passes up and outwards to superior border of thyroid cartilage, there dividing into external and internal carotid. Course indicated by line from sternal end clavicle to point midway between mastoid process and angle of inferior maxilla. Vein lies to outside, pneumogastric nerve on posterior plane between them, the three being enveloped by same sheath of cervical fascia. No branches but terminal.

CAROTIS EXTERNA: (8 brs., see above) up between neck of inferior maxilla and external meatus, there dividing into temporal and internal maxillary. Crossed by hypoglossal nerve, lingual and facial veins, digastric and stylo-hyoid muscles. Is quite superficial. **Thyroïdæa superior:** greater cornu hyoid, curving down to thyroid gland, *anas.* with its fellow of opposite side and inferior thyroid. **Hyoidæa,** runs along inferior border of bone, *anas.* with opposite fellow. **Descendens superficialis,** down and outwards across sheath common carotid supplying sterno-mastoid and adjacent muscles and integument. **Laryngæa superior** pierces thyro-hyoid membrane supplying muscles, mucous membrane, glands, etc., of larynx and epiglottis, *anas.* with opposite fellow. **Cricothyroïdæa,** transversely across crico-thyroid membrane, *anas.* with opposite fellow. **Lingualis:** up and inwards to under surface of tongue (ranine); runs parallel with hypoglossal nerve. **Hyoidæa,** along superior border bone, supplying muscles, *anas.* with opposite fellow. **Dorsalis linguae,** ascends to dorsum tongue, *anas.* with opposite fellow, supplying mucous membrane, tonsil, epiglottis, soft palate, etc. **Sublingualis** runs for and outwards to sublingual gland, supplies it, adjacent muscles, membranes, etc. **Ranina,** on lingualis to tip of tongue, accompanied by gustatory nerve, *anas.* with opposite fellow, supplying adjacent parts. **Facialis:** near angle inferior maxillary obliquely for and upwards to maxillary gland, then up over jaw, up and forwards to angle of mouth, along side of nose to inner canthus of eye (angular.) **CERVICAL BRS.:** **Palati na ascendens,** between stylo-glossus and stylo-pharyngeus, to outer side pharynx, supplying muscles, tonsil, Eustachian tube, etc.; divides, one branch going up tensor palati to supply soft palate, glands, etc.; the other branch goes to tonsil, *anas.* with tonsillar. *Anas.*

posterior palatine of internal maxillary. *Tonsilla'ris*, up to supply this gland and root of tongue. *Submaxilla'res* (3 or 4), supplying this gland and adjacent parts. *Submentala's*, off just as facial quits submaxillary gland, running forwards upon mylo-hyoid, supplying it and digastric (*anas.* with sublingual) to symphysis; the superficial branch turns round the chin, passing up to *anas.* with inferior labial, supplying muscles and integument; the deep branch runs up on bone to supply deep muscles and lip, *anas.* with inferior labial and mental. **FACIAL BRs.:** *Muscula'res*, to internal pterygoid, masseter, buccinator. *Labia'lis infé'rior*, beneath depressor anguli oris to lower lip, *anas.* inferior coronary, mental branch of dental, etc. *Corona'ria infé'rior* beneath depressor anguli oris along edge lower lip, supplying adjacent parts, and *anas.* with opposite fellow, inferior labial, and mental branch of inferior dental. *Corona'ria supé'rior* along edge of upper lip, *anas.* with opposite fellow, supplying adjacent parts, septum and ala of nose. *Latera'lis na'si*, supplying side and dorsum of nose, septum, *anas.* opposite fellow, infra orbital and nasal branch ophthalmic. *Anguli'ris*, terminal branch, ascends up to inner canthus, *anas.* with nasal branch ophthalmic. **Occipita'lis:** from posterior part near inferior margin of digastricus, up between atlas and mastoid process, horizontally across occiput, then up to vertex, then dividing into numerous branches. *Muscula'res*, to digastricus, stylo-hyoid, stylo-mastoid, splenius capitis, trachelo-mastoid. *Auricula'ris*, to posterior surface concha. *Meninge'a infé'rior* along side internal jugular vein through foramen lacerum to dura in posterior fossa. *Arte'ria prin'ceps cerci'cis*, descends back part neck, superficial branch supplying splenius and trapezius, *anas.* with superficial cervical; the deep branch *anas.* with vertebral and cervical branch superior intercostal; supplies adjacent parts. *Crania'les*, to muscles and integument of posterior surface cranium. **Auricula'ris poste'rior:** from above stylo-hyoid, ascends beneath parotid gland, to groove between mastoid process and ear cartilage, dividing into anterior and posterior branches, the former passes forwards to *anas.* with temporal, the other back to *anas.* with occipital. *Sty'lo-mastoide'a*, enters do foramen supplying cells, tympanum and semi-circular canals. *Auricula'ris*, to back part of cartilage of ear, and penetrating to its anterior surface. **Pharynge'a ascen'dens:** (smallest branch) deep seated, arising near commencement external

carotid, up between internal carotid and pharynx, to base of skull. *External branches*, to recti antici muscles, glands of neck, sympathetic, pneumogastric and hypoglossal nerves; *anas.* with ascending cervical. *Pharyngeæ* (3 or 4) to parts of pharynx and adjacent muscles, etc. *Meningeæ* backwards through foramen lacerum posterius, another branch through foramen lacerum basis cranii, another through anterior condyloid foramen to dura mater. **Tempora'lis**: from parotid gland up to root zygoma, dividing into anterior and posterior. *Transier'sa facie'i*, in parotid gland, runs across face, supplying glands, integument and muscles, *anas.* with facial and infra-orbital. *Tempora'lis média*, above zygoma to temporal muscle and orbicularis, *anas.* with lachrymal and palpebral branches of ophthalmic and deep temporal branches of internal maxillary. *Aricula' res anterio' res*, to anterior ear, *anas.* with posterior auricular. *Tempora'lis ante'rior* forwards over forehead, supplying integument, muscles, etc., *anas.* with frontal and supra-orbital. *Tempora'lis poste'rior*, up- and backwards over side of head, *anas.* with opposite fellow posterior auricular and occipital. **Maxilla'ris inter'na**: (see external carotid) inwards to inner side of condyle inferior maxilla into speno-maxillary fossa, to supply deep structures of the face. **MAXILLARY PORTION**: *Ca'vi tym'pani* (tympenic) up through fissura Glaseri, supplying membrani tympani, laxator tympani; *anas.* with stylo-mastoid and Vidian. *Meninge'a média*, from internal lateral ligament of jaw up through foramen spinosum, dividing into anterior and posterior branches, supplying anterior and posterior surface of dura and bones, facial nerves, and branches to other parts; *anas.* with opposite fellow, anterior and posterior meningeal. *Meninge'a par'va*, through foramen ovale to Casserian ganglion and dura; also to nasal fossa and soft palate. *Alveola'ris infe'rior*, (inf. dental) with dental nerve to foramen on ramus, then along dental canal supplying teeth, etc., till opposite bicuspid tooth, then divides into incisor and mental branches, the former to incisor teeth, *anas.* with opposite fellow; the latter passes out mental foramen, *anas.* with inferior labial, inferior coronary, submental and supplies adjacent parts. Mylo-hyoid branch given off just as artery enters inferior dental foramen; it runs in its groove to its muscle. **PTERYGOID PORTION**: *Tempora'les profundæ* (2) anterior and posterior branches up to temporal muscle. *Pterygoideæ*, to do muscles. *Masseter'ica*, to do muscles. *Bucca'lis*, to do mus-

cles. **SPHENO-MAXILLARY PORTION:** *Alveola'ris*, common branch with following, supplying (superior dental) teeth, antrum and gums. *Infra-orbita'lis*, continuation of main artery, along infra-orbital canal, and out infra-orbital foramen, supplying inferior rectus and inferior oblique, antrum, front teeth, lachrymal sac, etc., *anas.* with facial, buccal, nasal branch ophthalmic, etc. *Palati'na Descen'dens*, down posterior palatine canal to gums, mucous membrane, palate, etc. *Vidia'na*, through its canal, with nerve to pharynx, Eustachian tube and tympanum. *Pterygo-palati'na*, to upper part pharynx and Eustachian tube. *Spheno-palati'na* (nasal), to mucous membrane of nose, septum, antrum, ethmoid and sphenoid cells.

CAROTIS INTER'NA: (8 brs.) Superior border thyroid cartilage up through carotid foramen in temporal bone; in the skull it runs forwards in a course represented by  [italic f laid horizontally.] No branches from cervical part. Tonsil is internal to it. *Tympani'ca*: to tympanum. **Receptaculæ**: small branches to cavernous sinus, pituitary body, Casserian ganglion, etc. **Ophthalmica**: at inside anterior clinoid process, forwards through optic foramen to inner canthus, dividing into frontal and nasal. *Lachryma'lis*, to lachrymal gland, conjunctiva; malar and meningeal branches; *anas.* freely with temporal, palpebral, etc. *Supra-orbita'lis*, out supra-orbital foramen to muscles and skin of forehead and pericranium; *anas.* with temporal, facial, etc. *Ethmoida'les*, (2) anterior and posterior to ethmoidal cells and meninges. *Palpebra'les*, (2) superior and inferior, encircle eyelids, down nasal duct, *anas.* with temporal, inferior orbital, etc. *Fronta'lis*, out inner angle orbit to forehead, supplying adjacent parts, *anas.* with supra-orbital. *Nasa'lis*, to lachrymal sac, then down the nose, supplying whole surface; *anas.* with facial, etc. *Cilia'res bre'ves*, (12-15) supply choroid and ciliary processes. *Cilia'res lon'gæ*, (2) ciliary ligament and iris. *Cilia'res anterio'res*, from muscular branches, to iritic arterial circle. *Centra'lis retinae* pierces optic nerve and runs in it to retina. *Musculares*, (2) superior and inferior to muscles of eye. **Cerebri arte'ria ante'rior**: at fissure of Sylvius forward in the great longitudinal fissure, *anas.* with its fellow by *ante'rior commu'nicans*; curves round anterior border corpus callosum, running back to its posterior part to *anas.* with posterior cerebral supplying olfactory and optic nerves, inferior surface anterior lobes, 3d ventricle, anterior perforated space, corpus callosum and

inner surface of hemispheres. **Cere'bri arte'ria me'dia:** (largest branch,) obliquely outwards along fissure of Sylvius, dividing into *anterior* branch to pia of anterior lobe, *median* branch to small lobe at extremity of Sylvian fissure; *posterior* branch which supplies middle lobe; *small* branches to corpus striatum through substantia perforata. **Commu'nicans poste'rior:** from back part of artery backwards, *anas.* with posterior cerebral of basilar. **Choroide'a ante'rior:** from back part of artery back- and outwards, entering descending horn of lateral ventricle; is distributed to hippocampus major, corpus fimbriatum and choroid plexus.

VERTEBRA'LIS: (6 brs.) 1st and largest branch of subclavian. Enters foramen in transverse process of 6th cervical vertebra and ascends in the vertebral foramina to the axis, then outwards, piercing occipito-atloid ligament and dura, passing through foramen magnum along in front of medulla, unites with opposite fellow to form basilar. *Spina'les latera'les*, enter spinal canal through the intervertebral foramina and supply (anterior branches) the cord and membranes and (posterior branches) posterior surface of vertebral bodies. *Muscula'res:* deep muscles of neck, *anas.* with occipital and deep cervical. *Posterior'es meninge'æ*, (2) to falx cerebelli. *Spina'lis ante'rior*, given off near termination, unites with opposite fellow, and descends on cord, *anas.* with spinal branches through the intervertebral foramina down to sacrum. Supplies pia of cord (being placed beneath it) and cord. *Spina'lis poste'rior*, arises at side of medulla and passes down posterior surface of cord, being reinforced similarly to the anterior spinal, to sacrum. *Infe'rior cerebella'ris*, winds back over medulla, to under surface of cerebellum, there dividing, the inferior branches going backwards to notch between the two hemispheres, the external branch supplying the inferior surface, *anas.* with superior cerebellar; branches, also, to choroid plexus, and 4th ventricle.

BASILLA'RIS: (see above); from posterior to anterior border of pons, there dividing into posterior cerebral. *Transver'sæ*, to pons, internal auditory meatus, under surface cerebellum (ant. cerebellar.) *Superior cerebella'ris*, near end basilar, up over cerebellum, supplying it, pineal gland, velum interpositum. *Posterior cerebra'lis*, winds round crus cerebri to inferior surface of posterior cerebral lobes, supplying them, and choroid plexus, *anas.* with anterior and middle cerebral.

Circle of Willis: (10 vessels); forward, from behind forwards, by basilar, 2 posterior cerebral, 2 posterior communicating, 2 internal carotids, 2 anterior cerebral, anterior communicating.

Infe'rior Thyroide'a: (see arteries of upper extremity); branch of thyroid axis, up behind sheath of common carotid and sympathetic nerve to under surface of thyroid gland, *anas.* with opposite fellow, and superior thyroid. *Laryngea'lis*, to back part larynx. *Trachea'les*, to trachea, *anas.* with bronchial. *Oesophagea'les*, to the oesophagus. *Cervica'lis ascendens*, up neck, supplying muscles, vertebræ, cord and membranes.

Cervi'cis profun'da: (see arteries of upper extremity); branch of superior intercostal, ascends back part of neck, below complexus, to axis, supplying adjacent parts, and *anas.* with branches of vertebral and princeps cervicis of occipital.

VEINS OF THE HEAD AND NECK.

Ve'næ Dip'loes: walls only of epithelium, with many *cul-de-sacs*. *Fronta'lis*, opens into supra-orbital through supra-orbital notch. *Tempora'lis ante'rior* opens into deep temporal. *Tempora'lis poste'rior* confined to parietal region, opens into lateral sinus. *Occipta'lis*, opens into occipital vein or sinus.

Cerebra'les: noted for their thin coats, muscular tissue and absence of valves. *Superio'res*, (7 or 8 on each side) for- and inwards to superior longitudinal sinus, there receiving interior cerebral which drain the same hemisphere. *Inferio'res ante'iores*, under surface of anterior lobes; terminate in cavernous sinus. *Inferio'res latera'les*, (3 to 5) terminate in lateral sinus. *Inferio'res Me'diæ*, from posterior lobe, etc., to straight sinus behind *venæ Galeni*.

Ve'næ Gale'ni (2, one from right, one from left ventricle); formed by *ve'na cor'poris stria'ti* and *ve'na choroide'a*; pass back and out of transverse fissure to straight sinus. *Cerebella'les*, superior, inferior and lateral sets; the 1st open into straight, the 2d into lateral, the 3d into superior petrosal sinus.

Si'nus: (16 in No.) *Superior longitudina'lis*, begins at crista Galli, runs back over cerebrum to torcular Herophili; receives superior cerebral and parietal veins. *Infe'rior longitudina'lis*, along posterior part of free margin of falx cerebri to straight sinus. *Tento'rii* (straight), junction

of tentorium and falx cerebri to torcular Herophili; receives inferior longitudinal sinus, *venæ Galeni*, inferior median cerebral, and superior cerebellar veins. *Laterales*, (2) from torcular to foramen lacerum posterius, into internal jugular vein; receives straight and occipital sinus, etc. *Occipitales*, (2) smallest; posterior margin of foramen magnum to torcular. *Caverni*, (2) sides of sella Turcica from sphenoid fissure to apex petrous part of temporal. Receives ophthalmic vein connecting the frontal with these sinuses; also inferior anterior cerebral veins. *Circulares*, surrounds pituitary body, communicates with each cavernous. *Inferiores petrosales*, (2) termination of cavernous to internal jugular vein. *Transversus*, connects the inferior petrosales across basilar process of occipital. *Superiores petrosales*, (2) on superior border petrous part of temporal, connecting lateral and cavernous; receives inferior lateral cerebral and anterior lateral cerebellar veins.

Ve'na Facia'lis: obliquely across side face from inner canthus, to unite, under inferior maxilla, to form a trunk for internal jugular. Receives *supra-orbita'lis*, *supra-palpebra'lis*, *nasa'lis*, *inferior palpebra'lis*, *fronta'lis*, *supra-orbita'lis*, *supra-labia'lis*, *inferior labia'lis*, *bucca'lis*, *masseter'ica*, *submenta'lis*, *inferior palati'na* (which arises from plexus about tonsil, etc.), *submaxilla'ris*, *ranina* veins; also communicates with ophthalmic (see cavernous sinus).

Tempora'lis: from side and vertex of head, uniting with internal maxillary, to form temporo-maxillary. Receives *parotideæ auricula'ris* *anteriores*, *transversa faciei*.

Maxilla'ris Inter'na: *mediæ meningeæ*, *tempora'lis profunda*, *pterygoideæ*, *masseter'ica*, *bucca'lis*, *palati'na*, *inferior denta'lis*, forms, with above, temporo-maxillary.

Temporo-Maxilla'ris: union of temporal and internal maxillary; descends in parotid gland and divides, one branch going to join facial, the other to external jugular. Receives posterior auricular.

Auricula'ris Poste'rior: formed from plexus side of head; receives *stylo-mastoideæ* and branches from external ear; empties into temporo-maxillary.

Occipita'lis: from plexus, back part vertex of skull, descends deeply between muscles of neck, lying in course of artery, to internal jugular. Receives *mastoideæ*, which communicates with lateral sinus.

Jugula'ris Exter'na: from temporo-maxillary near angle lower jaw, down into subclavian; accompanied by auricularis magnus nerve. Has 2 pairs of valves. Receives *oc-*

capita'lis, *posterior jugula'ris exter'na* (draining superficial muscles of back of neck), *supra-scapula'ris*, *transversa cervicis* veins.

Jugula'ris Ante'rior: drains integument and superficial muscles of anterior and middle portion of neck, emptying into subclavian. No valves.

Jugula'ris Inter'na: from jugular foramen at junction of lateral and inferior petrosal sinus, vertically down the side of neck (outer side of main arteries), uniting with subclavian to form vena innominata; 1 pr. valves, $\frac{3}{4}$ inch above termination. Receives *facialis*, *lingua'lis*, *pharynge'æ*, *superior thyroide'a*, and *media thyroide'a*.

Vertebra'lis: drains occipital region and deep muscles of back of neck; enters foramen in transverse process of atlas, down through similar foramina of the cervical vertebrae to 6th (or 7th) where it passes out to enter v. innominata. Receives *posterior condylo'ida*, *muscula'res*, *dorso-spina'les*, *menin'gio-rachidia'næ*, *ascen'dens* and *profunda cervica'les*; 1 pr. valves guard its mouth.

NERVES OF THE HEAD AND NECK.

CRANIAL. 1st or **Ner'vus olfac'tus.**—From corpus striatum, middle and anterior lobes of cerebrum. *Supplies* the Schneiderian membrane. Special function, *smelling*.

2d or **Opt'icus.**—From optic thalami and the corpora geniculata et quadrigemina, out through optic foramen to retina. Special function, *sight*.

3d or **Moto'rius Oc'uli.**—From crus cerebri and pons (?) out through foramen lacerum anterius to all the muscles of the orbit, save the superior oblique and external rectus; a few filaments pass to the iris. Is a motor nerve.

4th or **Pathet'icus.**—From valve of Vieussens, through foramen lacerum anterius to superior oblique. Is a motor.

5th or **Trigem'inus.**—The *sensory*, or posterior root, from the lateral tract of the medulla, the pons, and cerebellum (middle peduncle). The *motor* root from the pyramidal body. The *sensory* supplies are to the eye-ball (iris, ciliary body, etc.), lachrymal gland, conjunctiva, Schneiderian membrane, all the muscles and integument about the eye ball, orbit, os frontalis, nose, mouth, cheek, lips, temple, superior portion of pharynx, tongue, gums and teeth. *Motor* filaments are given to the external and internal pterygoid, temporal, buccinator, and masseter muscles.

Special sensation (taste) to mucous membrane of mouth, gums, tongue (anterior and middle portion), sub-lingual gland, conical and fungiform papillæ. **BRS.**—1. **OPHTHALMICUS**: *sensory*; forward through sphenoidal fissure from Casserian ganglion, joined by cavernous plexus of sympathetic. *Lachryma'lis*. *Fronta'lis*; (a) supra-trochlea'ris, (b) supraorbita'lis. *Nasa'lis*; ganglionic, long ciliary (2 or 3), infra-trochlear branches. II. **SUPERIOR MAXILLA'RI**; *sensory*: forwards through foramen rotundum from Casserian ganglion appearing on face through infra-orbital foramen. *Orbita'lis*; (a) temporal, (b) malar branches. *Sphenopalati'ni* (2). *Posterior'es denta'les* (2); (a) anterior branches, (b) posterior branches. *Anterior denta'lis*. *Palpebra'les*. *Nasa'les*. *Labia'les*. All inosculate with branches from facial. III. **INFERIOR MAXILLA'RI**: *sensor* root from Casserian ganglion, *motor* unites with it after passing through foramen ovale. **ANTERIOR DIVISION**: (a) masseteric, (b) deep temporal, (c) buccal, (d) pterygoid branches. **POSTERIOR DIVISION**: *Auriculo-tempora'lis*; (a) anterior temporal, (b) posterior temporal (out under cover of parotid, (c) communicating with facial, (d) inferior and superior auricular, (e) 2 branches to meatus, (f) branches to temporo-maxillary articulation, (g) branches to parotid gland. *Gustato'rius*, side of tongue to lip; (a) communicating branches, (b) branches of distribution to tongue, gums, etc. *Inferior denta'lis*, in dental canal inferior maxilla to teeth, etc.; (a) mylo-hyoid to do muscle, etc., (b) dental branches.

6th or Abdu'cens.—From pons, corpus pyramidale, and medulla through foramen lacerum anterius to supply motor influence to the rectus externus oculi.

7th or Facia'lis.—From lateral tract medulla and 4th ventricle, out through stylo-mastoid foramen to *all* the muscles of the face, ear and their integument, the platysma, buccinator, digastric, stylo-hyoid, lingualis, stapedius, laxator and tensor tympani, levator palati, and azygos uvulae. Is essentially a motor nerve. *Tympan'icus*. *Chorda tym'pani*. *Posterior auricula'ris*; (a) auricular branch, (b) occipital branch. *Stylo-hyoide'us*. *Digastric branch*. *Temporo-facia'lis*; (a) temporal branches, (b) infra-orbital, (superficial and deep branches), (c) malar branches. *Cervico-facia'lis*; (a) buccal, (b) supra-maxillary branches, (c) infra-maxillary branches.

8th or I. Glosso-pharynge'us, II. Pneumogas'tricus, III. Spina'lis Accessorio'rius.—I. and II. from floor of 4th ventricle; III. from lateral tract of cord as low

as 6th cervico-spinalis, and also from medulla just below origin of I. and II. Part I. passes out through foramen lacerum posterius to supply *sensation* to mucous membrane of pharynx, Eustachian tube, tympanum, and tonsil; *motor* influence to the pharyngeal muscles; *gustation* to posterior third of tongue and its lateral papillæ. Branches of *communication* (sympathetic, facial, tympanic; *Carotid* branches. *Pharyngeal* branches. *Muscular* branches. *Tonsillar* branches. *Lingual* branches. Part II, through foramen lacerum posterius to supply *motor* and *sensor* filaments to the muscles and parts about the pharynx, larynx and trachea concerned in speech and respiration; *motor* filaments to the pharynx, heart, œsophagus, stomach, and filaments to the splenic and hepatic plexus. *Auricularis*. *Pharyngeal branch*. *Superior laryngealis*. *Recurrent* (or inferior) *laryngealis* (the motor of larynx). *Cervico-cardiac* (2 or 3 in number). *Thoraco-cardiac*. *Anterior pulmonares* (2 or 3 in number). *Posterior pulmonares*. *Œsophageales*. *Gastric* branches. Part III. supplies *motor* filaments to sterno-mastoideus and trapezius, the accessory part arising from lateral tract of cord; the spinal portion, as low down as 6th cervical nerve, passing up in spinal foramen into skull, then out, with the accessory portion, through jugular foramen.

9th or Hypoglossus.—From floor of medulla. Is the *motor* of the tongue. Out through anterior condyloid foramen to supply the genio-hyoid, genio-hyo-glossus, hyoglossus, stylo-glossus, thyro-hyoid, sterno-hyoid, omohyoid, and sterno-thyroid muscles. Is deep-seated (beneath internal carotid), but finally curves over externally to the carotid to muscles for distribution. Has *branches of communication* with pneumogastric, sympathetic, 1st and 2d cervical and gustatory. *Descendens noni* (on carotid sheath), joining with 2d and 3d cervical. *Thyro-hyoid* branch. *Muscular* branches.

CERVICALES; each increase in size from 1st to 5th; 8 pairs in all. Have anterior and posterior branches, the latter having ganglionic enlargements. The 1st, or *suboccipital*, (anterior branch) has exit between atlas and occiput; the remaining 7 between their respective vertebræ. The 4 upper (anterior branches) unite to form the cervical plexus; the 4 lower (anterior) with the 1st dorsal form the brachial plexus.

Cervicis plexus; **SUPERF. BR.** *Superficialis colli*, from 2d and 3d; obliquely forwards to anterior and lateral

parts of neck. *Auricula'ris mag'nus*, from 2d and 3d; ascends to parotid gland, having facial, posterior auricular and mastoid branches. *Occipita'lis mi'nor*, from 2d; ascends to side of head; has auricular branch. *Supra-clavicular'es*, from 3d and 4th; downwards, having sternal, clavicular, and acromial branches. DEEP BRs.: *Communican'tes*, loop between 1st and 2d, to sympathetic, hypoglossal, pneumogastric, and spinal accessory nerves. *Muscula'res*, from 1st. *Commu'nicans no'ni*, from 2d and 3d, uniting with descendens noni. *Phreni'cus*, from 3d, 4th and 5th; crosses subclavian artery, down to middle mediastinum, thence to pericardium, diaphragm and pleura. *The left is the longer*. POSTERIOR BRANCHES: each have external and internal divisions supplying the muscles of the back of the neck, etc. *Sub-occipita'lis*, from 1st, up to sub-occipital region. *Occipita'lis ma'jor*, the internal branch from the 2d cervical. *Occipital branch*, from the 3d cervical, internal branch. All the others have only the external and internal branches, supplying the muscles contiguous to them.

UPPER EXTREMITY.

MUSCLES OF THE UPPER EXTREMITY.

(15 Regions, 46 Muscles.)

(1) REGION ANTERIOR THORACIC REGION, 3 MUSCLES.

Pectora'lis ma'jor: sternal half clavicle, $\frac{1}{2}$ front of sternum down to 7th rib, cartilage of true ribs, aponeurosis of external oblique—anterior bicipital ridge of humerus. [Anterior thoracic.]

Pectora'lis mi'nor: 3d, 4th and 5th ribs—anterior border coracoid process of scapula. [Anterior thoracic.]

Subcla'vius: 1st rib-cartilage—under surface middle 3d of clavicle. [Branch from 5th and 6th cervical.]

(2) LATERAL THORACIC REGION, 1.

Serra'tus mag'nus: 9 digitations from the 8 superior ribs—whole length inner margin scapula, posterior surface. [Posterior thoracic.]

(3) ACROMIAL REGION, 1.

Deltoide'us: outer 3d anterior border, upper surface, of clavicle; outer margin, upper surface acromian process; whole length lower border spine of scapula—prominence outer surface (middle) humerus. [Circumflex.]

(4) ANTERIOR SCAPULAR REGION, 1.

Subscapula'ris: inner $\frac{2}{3}$ subscapular fossa—lesser tuberosity humerus. [Subscapular.]

(5) POSTERIOR SCAPULAR REGION, 4.

Supra-spina'tus: internal $\frac{2}{3}$ of supra-spinous fossa of scapula—upper facet greater tuberosity humerus. [Supra-scapular.]

Infra-spina'tus: internal $\frac{2}{3}$ of infra-spinous fossa—middle facet greater tuberosity humerus. [Supra-scapular.]

Te'res mi'nor: dorso-axillary border scapula—lowest facet greater tuberosity of humerus. [Circumflex.]

Te'res ma'jor: dorsum inferior angle scapula—posterior bicipital ridge humerus. [Subscapular.]

(6) ANTERIOR HUMERAL REGION, 3.

Coraco-brachia'lis: apex coracoid process scapula—rough ridge inner (middle) side of humerus. [Musculo-cutaneous.]

Bi'ceps: long head above glenoid cavity; short head, coracoid process—bicipital tuberosity radius. [Musculo-cutaneous.]

Brachia'lis anti'cus: lower half outer and inner surfaces shaft humerus, septa—under surface coronoid process ulna. [Musculo-cutaneous, musculo-spiral.]

(7) POSTERIOR HUMERAL REGION, 2.

Tri'ceps: long head, depression below glenoid cavity; external head, posterior superior part of humerus; internal head, posterior surface of humerus *below* musculo-spiral groove—olecranon process ulna. [Musculo-spiral.]

Subancone'us: just above olecranon fossa humerus—posterior ligament elbow-joint. [Musculo-spiral.]

(8) ANTERIOR BRACHIAL REGION, SUPERFICIAL LAYER, 5.

Prona'tor ra'dii te'res: above internal condyle humerus, common flexor tendon, fascia, inner side coronoid process ulna—rough ridge radius, outer (middle) surface. [Median.]

Flex'or car'pi radia'lis: common flexor tendon, internal condyle humerus, fascia—base of index metacarpal. [Median.]

Palma'ris lon'gus: common internal condyle (humerus) flexor tendon, fascia—annular ligament and palmar fascia. [Median.]

Flex'or car'pi ulna'ris: 1st head, common flexor tendon, internal condyle humerus; 2d head, internal margin olecranon—pisiform bone. [Ulnar.]

Flex'or subli'mis digito'rum: 1st, internal condyle humerus (common flexor tendon); 2d head, inner side coronoid process ulna; 3d head, oblique line radius—lateral margins 2d phalanges; tendon split for passage of flexor profundus digitorum. [Median.]

(9) ANTERIOR BRACHIAL REGION, DEEP LAYER, 3.

Flex'or profun'dus digito'rum: upper $\frac{2}{3}$ anterior and inner surface ulna, inner side coronoid process, interosseous membrane—bases last phalanges. [Ulnar, anterior interosseous.]

Flex'or lon'gus pol'licis: upper $\frac{2}{3}$ anterior surface radius, interosseous membrane—base last phalanx thumb. [Anterior interosseous.]

Prona'tor quadra'tus: oblique line and lower 4th ulna—lower 4th anterior surface and external border radius. [Anterior interosseous.]

(10) RADIAL REGION, 3.

Supina'tor lon'gus: upper $\frac{2}{3}$ external condyloid ridge humerus, septum—styloid process radius. [Musculo-spiral.]

Exten'sor car'pi radia'lis lon'gior: lower third external condyloid ridge humerus, septum—base metacarpus indicis. [Musculo-spiral.]

Exten'sor car'pi radia'lis bre'vior: common tendon external condyle humerus, external lateral ligament, septa—base metacarpus middle finger. [Posterior interosseous.]

(11) POSTERIOR BRACHIAL REGION, SUPERFICIAL LAYER, 4.

Exten'sor commu'nis digito'rum: common tendon external condyle humerus, septa—2d and 3d phalanges. [Posterior interosseous.]

Exten'sor min'imi dig'iti: external condyle humerus, septa—unites with tendon extensor communis digitorum to be inserted into 2d and 3d phalanges of little finger. [Posterior interosseous.]

Exten'sor car'pi ulna'ris: common tendon external condyle humerus, middle 3d posterior border ulna, fascia—base 5th metacarpus. [Posterior interosseous.]

Ancone'us: back part outer condyle humerus—side, olecranon and upper posterior 3d ulna. [Musculo-spiral.]

(12) POSTERIOR BRACHIAL REGION, DEEP LAYER, 5.

Supina'tor bre'vis: external condyle humerus, external lateral and orbicular ligaments, oblique line ulna—(surrounds radius at its upper part) back part inner surface;

outer edge bicipital tuberosity; oblique line of radius. [Posterior interosseous.]

Extensor ossis metacarpi pollicis: posterior surface shaft ulna and radius (middle 3d), interosseous membrane—base 1st metacarpus. [Posterior interosseous.]

Extensor primi internodii pollicis: posterior surface radius, interosseous membrane—base 1st phalanx of thumb. [Posterior interosseous.]

Extensor secundi internodii pollicis: posterior surface ulna, interosseous membrane—base 2d phalanx thumb. [Posterior interosseous.]

Extensor indicis: posterior surface ulna, interosseous membrane—joins tendon extensor communis digitorum to 2d and 3d phalanges indicis. [Posterior interosseous.]

(13) THUMB, RADIAL REGION, 4.

Abductor pollicis: ridge trapezium and annular ligament—radial side base 1st phalanx thumb. [Median.]

Opponens pollicis: palmar surface trapezium, annular ligament—whole length 1st metacarpus, radial side. [Median.]

Flexor brevis pollicis: trapezium, outer $\frac{2}{3}$ annular ligament, trapezoid, os magnum, base 3d metacarpus, tendon flexor carpi radialis—both sides base 1st phalanx thumb. [Median, ulnar.]

Abductor pollicis: whole length 3d metacarpus—ulnar side base 1st phalanx thumb. [Ulnar.]

(14) LITTLE FINGER, ULNAR REGION, 4.

Palmaris brevis: annular ligament palmar fascia—skin inner border palm. [Ulnar.]

Abductor minimi digiti: pisiform bone, tendon flexor carpi ulnaris—ulnar side base 1st phalanx little finger. [Ulnar.]

Flexor brevis minimi digiti: tip unciform process, annular ligament—base 1st phalanx little finger. [Ulnar.]

Opponens minimi digiti: unciform process, annular ligament—ulnar side 5th metacarpus. [Ulnar.]

(15) MIDDLE PALMAR REGION, 3.

Lumbricales: (4); accessories to flexor profundus digitorum—tendon extensor communis digitorum. [Median and Ulnar.]

Interossei dorsales: (4); metacarpi—base 1st phalanges 1st, 2d, 3d fingers. [Ulnar.]

Interossei palmares: (3); 2d, 4th and 5th metacarpal—1st phalanges of same fingers. [Ulnar.]

ARTERIES OF THE UPPER EXTREMITY.

SUBCLAVIA: (4 brs.) *Right*, 1. from innominate at sterno-clavicular articulation to inner margin scalenus anticus. (*Left*, I. from transverse portion aortic arch opposite 2d dorsal vertebra to scalenus anticus); II. internal border scalenus anticus to outer of scalenus medius; III. from external border scalenus medius to lower border 1st rib, midway along clavicle. **Vertebrales**, upper and back portion of part I.—enters foramen 6th cervical vertebra to be continued upwards (see page 11). **Thyroideus axis**, anterior part of first portion, inner side scalenus anticus. *Inferior thyroidea* (see page 12). *Transversa colli*, (a) superficial cervical beneath anterior margin trapezius—to trapezius and glands in that region. (b) Posterior scapularis to superior angle of scapula to anastomose at the inferior angle with subscapular. *Supra-scapularis*—outwards and backwards, parallel with clavicle, to supraspinous fossa; distributed to muscles in that region. **Sternales interna** (mammary), origin just below thyroid axis, behind clavicle along inside chest to 6th intercostal space, there dividing into musculo-phrenic and superior epigastric. *Comes nervi phrenici*, to diaphragm; anastomoses with other phrenic branches. *Mediastinales*, to areolar of anterior mediastinum, also remains of thymus. *Pericardiales*, to upper pericardium, triangularis sterni, *anas.* musculo-phrenic. *Antiores intercostales*, to 5 or 6 upper intercostal spaces, to intercostal and pectoral muscles and mammary gland; *anas.* aortic intercostal. *Perforantes*, to 5 or 6 upper intercostal spaces, to pectoral muscles and mammary gland. *Musculo-phrenica*, perforates diaphragm at 8th or 9th rib, supplying intercostal spaces, diaphragm and abdominal muscles. *Epigastrica superior*—down behind rectus to supply that muscle and others near it; *anas.* with inferior epigastric. **Superior intercostales**, upper and back portion part II to 1st and 2d intercostal spaces, supplying spinal muscles and cord; *anas.* aortic intercostals. *Profunda cervicis*—back to 7th cervical vertebra and between complexus and semispinalis colli runs to axis, supplying contiguous muscles; *anas.* anterior princeps cervicis.

AXILLA'RIA: (7 brs.); lower border 1st rib to tendons latissimus dorsi and teres major; 1st part, 1st rib to pect. minor; II. from superior border pectoralis minor to inferior border same; III. from inferior border pectoralis minor to tendon latissimus dorsi. **Superior Thorac'ica**, 1st part—forwards and inwards along superior border pectoralis minor, supplying pectoral muscles; *anas.* internal mammary and intercostal. **Acromia'les Thorac'ica**, 1st part to upper border pectoralis minor; *Acromia'les*, toward acromion process to deltoid; *anas.* suprascapular and posterior circumflex. **Thorac'ica**, 2 or 3 in number, supplying serratus magnus and pectoral muscles; *anas.* intercostals of internal mammary. *Descending* branches supply pectoralis major and deltoid, as accompanying cephalic vein. **Thorac'ica lon'ga**, II. part, down- and inwards along inferior border pectoralis minor to pectoral muscles, axillary and mammary glands, serratus magnus and subscapularis; *anas.* internal mammary and intercostal. **Thorac'ica ala'ris**, II. part, to glands and areolar tissue of the axilla. **Subscapula'ris**, III. part, opposite inferior border of muscle, down and back inferior margin of muscle to inferior angle scapula; *anas.* posterior scapular. *Dorsa'lis scap'ula*—dividing into 3 branches, "subscapular," "infra-spinous," and "median." Altogether they supply the scapular, latissimus dorsi and serratus magnus muscles. Make a general anastomosis. **Posterior circumflex'a**, opposite inferior border subscapularis, winds around neck humerus to supply deltoid; *anas.* anterior circumflex, suprascapular, acromio-thoracic. **Anterior circumflex'a**, just below above, passes anterior to humerus supplying deltoid; *anas.* post circumflex, acromio-thoracic.

BRACHIA'LIS: (5 brs.); inferior border teres major to $\frac{1}{2}$ inch below bend of elbow. Runs along inner border biceps and coraco-brachialis; is superficial. **Superior profun'da**, opposite inferior border trochanter major, winds backwards in spiral groove down to elbow; *anas.* recurrent radial; supplies deltoid, coraco-brachialis, triceps. **Posterior articula'ris**, perpendicularly down to back of elbow-joint; *anas.* interosseous recurrent, posterior ulnar recurrent, anastomotica magna. **Nutri'cia**, middle of arm to bone near insertion coraco-brachialis. **Inferior profun'da**, just below middle arm to *anas.* posterior ulnar recurrent and anastomotica magna at elbow; accompanied by ulnar nerve. **Anastomotica mag'na**, 2

inches above elbow-joint, winds around and down humerus to elbow-joint; *anas.* posterior ulnar recurrent, inferior profunda, anterior ulnar recurrent. **Muscula' res**, 3 or 4, to coraco-brachialis, brachialis anticus.

RADIA' LIS: (12 brs.); end of the brachialis down radial side forearm, along inner border supinator longus to wrist; then winds around carpus beneath thumb-extensors to enter palm of hand between thumb and index finger to form "deep palmar arch;" *anas.* deep branch of ulnar. **Radia' lis recur' rens**, below elbow—up arm supplying brachialis anticus, supinator longus, supinator brevis, *anas.* superior profunda. **Muscula' res**, to radial side forearm. **Superficia' lis volæ**, just as artery about to wind around the carpus—to muscles in ball of thumb; *anas.* with ulnar forming "superficial palmar arch." **Ante' rior carpa' lis**, to wrist; *anas.* anterior carpalis of ulnar. **Poste' rior carpa' lis**, to wrist; *anas.* posterior carpalis of ulnar, anterior interosseous, and posterior perforating of deep palmar arch as 2 dorsal interosseous branches. **Metacarpa' lis**, (1st dorsal interosseus) supplies adjoining sides index and middle fingers. **Dorsa' les pollicis**, (2); along dorsum of thumb. **Dorsa' lis in' dicis**, radial side back of index. **Prin' ceps pollicis**, beginning palmar arch to sides of palmar aspect to thumb. **Radia' lis in' dicis**, palmar arch to radial side index. **Perforan' tes**, (3); to inosculate with 3 dorsal interosseous. **Palma' res interos'seæ**, (3 or 4); from arch to *anas.*, at finger-clefts, with digital branches of superficial arch.

ULNA' RIS: (8 brs.); little below bend of elbow—along radial side flexor carpi ulnaris to palm of hand, forming "superficial palmar arch" with superficialis volæ. **Ante' rior ulna' ris recur' rens**, just below elbow-joint, up and inwards between brachialis anticus and pronator radii teres, supplying these; *anas.* anastomotica magna, and inferior profunda. **Poste' rior ulna' ris recur' rens**, just below preceding—back and inwards beneath flexor sublimis up to internal condyle humerus, supplying joint and neighboring muscles; *anas.* inferior profunda, anastomotica magna, interosseous recurrent. **Interos'seæ**, short trunk below tuberosity radius—backwards to interosseous membrane, dividing into: **INTEROS'SEÆ ANTE' RIOR**, passing down forearm on interosseous membrane, piercing membrane at superior border pronator quadratus to descend to back of wrist, supplying *nutrient* (to radial and ulnar arteries) and *muscular* branches; gives off *median*

branch, accompanied by *do* nerve. *Anas.* posterior carpal of radial and ulnar. *INTEROSSEA POSTERIOR*, down back forearm, between deep and superficial muscular layers to wrist, supplying these muscles; *anas.* as preceding. *Posterior interossea recurrens*, near its origin to interval between olecranon and external condyle, beneath supinator brevis; *anas.* superior profunda, posterior ulnar recurrent. *Musculares*, to muscles of ulnar side of forearm. *Carpalis anterior*, beneath flexor profundus, *anas.* anterior carpal of radial. *Posterior carpalis*, above pisiform bone, beneath flexor carpi ulnaris, giving small branch to inosculate with posterior carpal of radial, forming "*Posterior carpal arch*"; continued along 5th metacarpus, forming its dorsal branch. *Communicans*, from commencement palmar arch, deeply inwards, *anas.* with radial forming "*deep palmar arch*." *Digitales*, (4); from convexity of superficial palmar arch, supplying ulnar side 4th and adjoining sides 3d, 2d and 1st fingers.

VEINS OF THE UPPER EXTREMITY.

Ulnaris anterior: from anterior carpus and ulnar side hand, up along side forearm to elbow-joint, to form basilica. Communicates with median and posterior ulnar.

Ulnaris posterior: posterior ulnar border hand and vein of little finger (*v. salicetella*)—unites with preceding just below elbow-joint.

Basilica: coalescence of anterior and posterior ulnares; receives median-basilic at elbow; ascends inner side arm to *venae comites* of brachial artery, or axillary vein.

Radialis: dorsum thumb, radial side index and hand—at bend elbow receives median-cephalic to become the cephalic.

Cephalica: up between deltoid and pectoralis major to axillary veins.

Media: palmar surface of hand and middle of forearm (communicates with ulnar and radial), to median-cephalic and median-basilic at elbow.

Cephalica media: obliquely outwards from bend elbow, between supinator longus and biceps; empties into cephalic as a formative branch.

Basilica media: obliquely inwards behind biceps and pronator radii teres; empties into basilic as a formative branch.

The following are the deep veins, and accompany

their respective arteries as *ve'næ com'ites*, intercommunicating with each other, and the superficial veins, frequently.

Digitales: (2); empty into the superficial palmar.

Palma'res superficiales: (2); empty into ulnar and radial.

Palma'res profun'dæ: empty into the radial *venæ comites*.

Interos'seæ: (2); accompany the anterior and posterior interosseous arteries, commencing at the wrist, terminating in *venæ comites* of the ulnar.

Com'ites radia'lis: form, with the ulnar, the *comites* of brachial.

Com'ites ulna'ris: with the radial, form *comites* of brachial.

Com'ites brachia'lis: receiving veins corresponding to the branches of the brachial artery, and empty into the axillary vein.

Axilla'ria: is the continuation of the basilic. Commences at lower border of the axillary space; receives veins corresponding to branches of its artery, and terminates in the subclavian at outer border 1st rib. [Valves at inferior border subscapularis, terminations of *vena scapularis* and *cephalica*.]

Subclavia: continuation of axillary, emptying into *vena innominata* at right sterno-clavicular articulation. Separated from its artery by *scalenus anticus* muscle and phrenic nerve. Receives external and anterior jugulars, branch from cephalic, and internal jugular. [Valves just external to entrance of external jugular, or about 1 inch from its termination.]

NERVES OF THE UPPER EXTREMITY.

PLEX'US BRACHIA'LIS: formed by anterior roots 4 lower cervical and 1st dorsal nerves. 5th and 6th cervical unite, then are joined by 7th to form *upper trunk*. 8th cervical and 1st dorsal unite to form *lower trunk*. Both trunks accompany the subclavian artery to the axilla, lying upon its outer side. Opposite clavicle, each of the trunks gives off a fasciculus, which, uniting, form a *third trunk*; in the centre of the axilla the original *upper cord* lies to the *outside* of the artery; the original *lower cord* to the *inside*; the cord formed from fascicular union, *posteriorly*. The plexus lies between the anterior and middle *scaleni*, beneath the clavicle upon 1st serration of the ser-

ratus magnus and the subscapular muscles. (Has 4 brs. above, 9 below the clavicle.) Receives communicating branches from cervical plexus, phrenic, inferior cervical, sympathetic ganglia. **Communicans**, 5th cervical to phrenic on scalenus anticus. **Muscula' res**, to longus colli, scaleni, rhomboidei and subclavius. **Posterior thorac'icus**, from 5th and 6th cervical to serratus magnus. Passes behind brachial plexus. **Supra-scapula'ris**, from "outer cord" obliquely outwards beneath trapezius, to supra-spinous fossa through supra-scapular notch, here giving 2 branches to supra-spinatus muscle and 1 to joint; in infra-spinous fossa, 2 branches to muscle, 1 to joint, all of these are given off ABOVE the clavicle. Those BELOW the clavicle are: **Externus ante'rior thorac'icus**, "outer cord" inwardly across axillary vessels to pectoralis major. **Internus ante'rior thorac'icus**, "inner cord" passing up between axillary artery and vein (*sometimes perforating the vein*) to pectorales major and minor. **Subscapula' res**, (3); "posterior cord" the *upper* to subscapular muscles; the *longer* to latissimus dorsi; the *lower* to teres major. **Circumflex'us**, "posterior cord," down behind axillary vessels to lower border subscapularis, dividing into *upper* branch winding round neck of humerus, supplying deltoideus and integument; *lower* branch to teres minor, deltoideus and integument over posterior surface deltoid. **Articula'ris**, given off before division, to joint. **Mus'culo-cutaneus**, continuation of outer cord, *perforates coraco-brachialis*, obliquely outwards between biceps and brachialis anticus to these muscles, integument to elbow, and to the joint. **Anterior** branch, down radial border of forearm from elbow, to wrist, supplying integument to ball of thumb; communicates with radial. **Posterior** branch, given off middle of forearm, supplying integument to wrist, on radial side; communicates with radial and external cutaneous. **Inter'nus cutaneus**, "inner cord," down in company with brachial artery, becoming cutaneous at middle of arm, then dividing into *anterior* branch, supplying integument of ulnar side of arm to wrist, communicating with branch from ulnar; *posterior* branch down, on inner side of basilic vein, over internal condyle, on posterior ulnar side of forearm to wrist, communicating at wrist with dorsal branch of ulnar; at elbow, with lesser internal cutaneous. **Cutaneus mi'nor inter'nus**, from "inner cord" to integument inner side of arm. **Me'dius**, (4

branches) arises by 2 roots, one from "outer" and one from "inner" cord; at first lies to outer side of the artery, crosses it at middle of arm; at forearm runs between the 2 heads of the pronator radii teres, beneath flexor sublimis till near annular ligament, when it lies between flexor sublimis and flexor carpi radialis; it passes beneath annular ligament to hand. (No branches in the arm.) *Muscula' res*, from near elbow, to forearm muscles save flexor carpi ulnaris. *Ante'rior interos'seus* follows course of the artery, to flexor profundus digitorum, flexor longus pollicis, and pronator quadratus. *Cuta'neus palma'ris*, crosses annular ligament, the outer branch supplying the thumb-region; the inner branch, the palmar. *Digit'a'les*, (5); two go to thumb, the 3d to radial side of index; the 4th divides to supply adjacent sides of index and middle; the 5th the adjacent sides of middle and ring fingers, communicating with branches from ulnar. *Ulna'ris*, (7 brs.); continuation of "inner cord," down ulnar side of arm and forearm (over the back of inner humeral condyle) upon flexor profundus digitorum, having ulnar artery externally, crosses annular ligament at outer side of pisiform bone, dividing into superficial and deep palmar branches. *Articula' res*, to elbow joint. *Muscula' res*, one to flexor carpi ulnaris, the other to flexor profundus digitorum. Both arise near elbow. *Cuta'neus*, arises middle forearm, has a deep and superficial branch. *Dorsa'lis cuta'neus*, arises 2 inches above wrist, passes to back of hand, supplying ulnar side of wrist, inner side of little and ring fingers. *Articula' res*, to wrist. *Palma'ris superficialis*, supplies palmaris brevis, and integument inner side of hand, ulnar side of little and adjacent sides of the little and ring fingers. *Palma'ris profun'dus*, follows course of "deep palmar arch," supplying muscles of interosseous spaces, lumbricales, abductor and flexor brevis pollicis. *Mus'culo-spira'lis*, (4 brs.; *largest br. of plexus*) continuation of "posterior cord;" winds around the humerus in spiral groove, etc., to front of external condyle, then divides into radial and interosseous. *Muscula' res*, to triceps, anconeus, supinator longus, extensor carpi radialis longior, and brachialis anticus. *Cuta'nei*, (3); internal branches supply integument of back of arm down to olecranon: external branches perforate external head of triceps, supplying integument lower anterior half of arm, the lower branch running down radial side of forearm (posteriorly) to wrist, supplying contiguous integument. *Radia'lis*, down by outer side of radial artery, just con-

cealed by supinator longus till within 3 inches of wrist, where pierces deep fascia of outer side forearm; divides to supply radial side of ball of thumb (communicating with external cutaneous nerve), and on back of hand forms an arch with ulnar, giving off 4 *digital* nerves; the 1st to ulnar side of thumb; the 2d to radial side of index; the 3d, adjoining sides of index and middle; the 4th, adjoining sides of middle and ring fingers. *Interosseus posterior*, pierces supinator brevis, winding to back of forearm, passing down to wrist, there having ganglionic enlargement. Supplies carpus, and all muscles on back of forearm *except* anconeus, supinator longus and extensor carpi radialis longior.

BODY.

MUSCLES OF THE BODY. (10 Regions, 48 Muscles.)

(REGION 1) BACK, FIRST LAYER, 2 MUSCLES.

Trapezius: inner 3d superior curved occipital line, ligamentum nuchæ, spinous processes of 7th cervical and all the dorsal vertebræ—posterior border clavicle, superior margin acromian process and superior border spine scapula. [Spinal accessory, cervical plexus.]

Latisimus dorsi: aponeurosis from spinal processes 6 lower dorsal, all lumbar and sacral vertebræ, external lip iliac crest—twisting upon itself so as to be inserted into bicipital groove of humerus. [Subscapular.]

(2) BACK, SECOND LAYER, 3.

Levator anguli scapulæ: transverse processes of 3 or 4 superior cervical vertebræ—posterior border scapula. [5th cervical, cervical plexus.]

Rhomboideus minor: ligamentum nuchæ, spinal processes 7th cervical and 1st dorsal vertebræ—down and outwards to root scapular spine. [5th cervical.]

Rhomboideus major: spinal processes superior dorsal vertebræ—tendinous arch along vertebral border scapula. [5th cervical.]

(3) BACK, THIRD LAYER, 4.

Serratus posticus superior: ligamentum nuchæ, spinal processes 7th cervical and 2 or 3 superior dorsal vertebræ—superior border 2d, 3d, 4th, 5th ribs. [Posterior external brs. cervical.]

Serra'tus posti'cus infe'rior: spinal processes 11th and 12th dorsal, 1st, 2d and 3d lumbar vertebræ—up and out to inferior border 4 inferior ribs. [External branches dorsal.]

Sple'nus: ligamentum nuchæ, spinal processes 7th cervical and 6 superior dorsal vertebræ—**Capitis**, into mastoid process and occiput; **Colli**, transverse processes 3 or 4 superior cervical vertebræ. [External posterior branches cervical.]

(4) BACK, FOURTH LAYER, SACRAL AND LUMBAR REGION, I.

Erec'tor spi'næ: sacro-iliac groove, lumbo-sacral tendon, iliac crest, transverse processes sacrum—sacro-lumbalis, longissimus dorsi. [External posterior branches lumbar.]

(5) BACK, FOURTH LAYER, DORSAL AND CERVICAL REGION, 10.

Sa'cro-lumba'lis: (see above)—angles inferior ribs. [Dorsal.]

Accesso'rius: angles 6 lower—angles 6 superior ribs. [Dorsal.]

Cervica'lis ascen'dens: 4 or 5 superior ribs—transverse processes 4th, 5th, 6th cervical vertebræ. [Cervical.]

Longis'simus dor'si: see erector spinæ, of which it is the larger portion; inserted (*lumbar* region) into transverse processes lumbar vertebræ; *dorsal*, tips transverse processes of all vertebræ, and 7 to 11 ribs, between their tubercles and angles. [Lumbar, dorsal.]

Transversa'lis col'li: transverse processes 3d, 4th, 5th, 6th dorsal—transverse processes 5 inferior cervical vertebræ. [Cervical branches.]

Trache'lo-mastoide'us: transverse processes 3d, 4th, 5th, 6th dorsal, and articular processes 3 or 4 inferior cervical vertebræ—posterior margin mastoid process. [Cervical branches.]

Spina'lis dor'si: spinal processes 1st, 2d lumbar and 11th and 12th dorsal vertebræ—spinal processes of dorsal vertebræ. [Dorsal branches.]

Spina'lis cervi'cis: spinal processes 5th, 6th cervical (1st and 2d dorsal), vertebræ—spinal process axis (sometimes 3d and 4th cervical). [Cervical branches.]

Complex'us: transverse processes 7th cervical and 3 superior dorsal vertebræ, articular processes 4th, 5th, 6th cervical—occipital bone between superior and inferior occipital lines. [Cervical branches, sub-occipital.]

Biven'ter cervi'cis: 2 or 4 tendons from as many

superior dorsal vertebræ—superior curved occipital line of occiput to inside of complexus. [Cervical branches.]

(6) BACK, FIFTH LAYER, 8.

Semispina'lis dor'si: transverse processes of vertebræ between 11th and 5th dorsal—spinal processes of 6th and 7th cervical and 4 superior dorsal vertebræ. [Dorsal branches.]

Semispina'lis col'li: transverse processes 4 superior dorsal and articular processes 4 inferior cervical vertebræ—spinal processes 2d, 3d, 4th, 5th cervical. [Cervical branches.]

Multif'idus spi'næ: fills groove on either side spinal processes back part sacrum, articular processes in lumbar and cervical region, transverse processes in dorsal region—spinal processes and laminae of the 4 vertebræ above. [Posterior spinal branches.]

Rotato'res spi'næ: (11); upper and back part transverse processes of dorsal vertebræ—inferior border and outer surface of laminae of vertebræ above. [Dorsal branches.]

Supra-spina'les: on spinal processes of cervical vertebræ. [Cervical branches.]

Inter-spina'les: in pairs between spinal processes of adjacent vertebræ; 6 cervical, 3 dorsal (1st to 4th, and 11th to 12th), 4 lumbar. [Spinal branches.]

Exten'sor Coccy'gis: last bone sacrum—inferior part coccyx, lying on posterior surface.

Inter-transversa'les: 7 cervical, 12 dorsal, 4 lumbar, lying between transverse processes. [Spinal branches.]

(7) ABDOMINAL REGION, 6.

Obli'quus abdom'inis exter'nus: 8 digitations from inferior borders 8 lower ribs—down to anterior $\frac{1}{2}$ outer iliac crest, pubic spine and symphysis, linea alba. *Poupart's ligament* formed by its aponeurosis. [Inferior intercostal, ilio-hypogastric, ilio-inguinal nerves supply this and the 5 following muscles.]

Obli'quus inter'nus: outer $\frac{1}{2}$ Poupart's ligament, anterior $\frac{2}{3}$ middle lip iliac crest, lumbar fascia—pectineal line, linea alba, pubic crest, inferior edges cartilages of 4 inferior ribs.

Transversa'lis: outer $\frac{1}{3}$ Poupart's, anterior $\frac{2}{3}$ internal lip ilium, internal surfaces cartilages of 6 inferior ribs, aponeurosis from spinal and transverse processes lumbar vertebræ—pubic crest (forming with above "conjoined tendon"), lineæ ilio-pectinea and alba.

Rec'tus abdom'inis: pubic crest and symphysis—cartilages 5th, 6th, 7th ribs. (In sheath formed by internal oblique and transversalis aponeuroses.)

Pyramida'lis: pubes—linea alba midway to umbili'cus.

Quadra'tus lumbo'rum: posterior fourth of iliac crest, ilio-lumbar ligament, transverse processes 3d, 4th, 5th lumbar vertebræ and last rib.

(8) THORACIC REGION, 5.

Intercosta'les exter'ni: (11); outer lip of groove in inferior borders of ribs—down and *forwards* to superior border rib below. [Intercostal.]

Intercosta'les inter'ni: (11); inner lip of groove—down and *backwards* to rib below. [Intercostal.]

Infracosta'les: inferior surface of one rib—internal surface 1st, 2d or 3d rib below. [Intercostal.]

Triangula'ris ster'ni: side of gladi'olus, internal surface ensiform appendix, cartilage of 3 or 4 lower true ribs—cartilages of 2d, 3d, 4th, 5th ribs. [Intercostal.]

Levato'res costa'rum: (12); transverse processes dorsal vertebræ—superior border rib below, near angle. [Intercostal.]

(9) DIAPHRAGMATIC REGION, 1.

Diaphrag'ma: internal surfaces of 6 or 7 lower ribs, ligamenta arcuata, crures from 2d, 3d, 4th lumbar vertebræ, ensiform cartilage—converge forming common central tendon. *Aortic* opening for aorta, vena azygos major, thoracic duct; *œsophageal*, œsophagus and pneumogastric nerves; *vena cava* for inferior vena cava; *right crus* transmits sympathetic and greater and lesser splanchnics; *left crus*, vena azygos minor and splanchnics. [Phrenic.]

(11) PERINÆAL REGION, 8.

Sphinc'ter a'ni: tip of coccyx and fascia in front—common central perinæal tendon. [Hemorrhoidal branch 4th sacral.]

Sphinc'ter inter'nus: muscular ring ($\frac{1}{2}$ inch wide), 1 inch from anus, surrounding rectum.

Accelera'tor uri'næ: central perinæal tendon and raphé—covers bulb corpus cavernosum, and corpus spongiosum, and dorsal vessels.

Erec'tor pe'nis: internal surface tuber ischii—sides and inferior surface crus.

Transver'sus perinæ'i: internal surface ascending ischic ramus—obliquely for- and inwards to central perinæal tendon.

Leva'tor a'ni: inside of pubic ramus and body, ischic spine, fascia (angle of division into obturator and vesical)—central perineal tendon, rectum, coccyx; assists to form floor of pelvic cavity.

Compres'sor ure'thræ: pubic ramus—surrounds membranous portion.

Coccyge'us: ischic spine and lesser sacro-sciatic ligament—side of coccyx and last sacral segment.

(In the female the above perineal muscles are essentially the same; the *erect'or clitori'dis* takes the place of erector penis, being let into the sides of the clitoris; *sphinc'ter vaginæ* represents somewhat the accelerator urinæ of the male, surrounding the vagina.)

ARTERIES OF THE BODY.

ARCH OF AORTA: (5 branches); from left ventricle, opposite middle of sternum, upwards for 2 inches, arching backwards over root of left lung (on level 2d dorsal vertebra); the "descending portion," runs down on the left side of 2d and 3d vertebrae, there becoming thoracic aorta. In front, are left pleura, lung, pneumogastric, phrenic and cardiac nerves; behind, trachea, right pulmonary vessels and nerves, root of right lung, cardiac plexus, œsophagus, thoracic duct, left recurrent nerve. **Corona'ria dex'tra:** above free margin right semilunar valve, between pulmonary artery and right auricular appendix; runs round right border of heart to posterior interventricular groove, there dividing into 2 branches, supplying right heart; *anas.* at apex with left coronary. **Corona'ria sin'istra:** (smaller); above semilunar valve, passes forwards between left auricular appendix and pulmonary artery to anterior interventricular groove, dividing into 2 branches, supplying left side of heart. **Innomina'ta:** commencement transverse portion of arch, ascends obliquely up to right sterno-clavicular articulation, dividing into common carotid and subclavian. **Caro'tis commu'nis sin'istra** and **Subcla'via sin'istra:** (see pages 6 and 21.)

AOR'TA THORACTICA: (see arch); 5 branches; terminates at aortic opening in diaphragm as "Abdominal Aorta," there lying upon front of vertebral bodies. **Pericardi'acæ:** to pericardium. **Bronchia'les:** (3 generally); to the left bronchus. **Œsophage'æ:** (4 or 5); front of aorta, obliquely down to œsophagus, *anas.* with inferior thyroid, gastric and phrenic. **Mediastina'les poste-**

rio' res: glands and areolar tissue therein. **Intercos- ta' les:** (10 pairs); right longer than left; pass out to do spaces, there dividing into *anterior* branches ascending to inferior border rib above, the smaller branch of it on the superior border rib below, running towards sternum, *anas.* with internal mammary, thoracic branches of axillary, superior intercostal, epigastric, phrenic, lumbar, etc. *Poste- rior* branch passes backwards, supplying vertebræ, cord, and muscles of back. (1st space supplied by superior intercostal of subclavian.)

AOR'TA ABDOM' INIS: (9 brs.); from aortic opening of diaphragm, in front last dorsal vertebra, terminates on body 4th lumbar, in the "Common Iliacs." **Phren'icæ:** (2); obliquely outwards to supply diaphragm, inferior vena cava, œsophagus and supra renal capsules; *anas.* freely. **Cœli'aca:** (axis $\frac{1}{2}$ inch long); horizontally forwards, dividing into CORONA'RIA VENTRIC'ULI (gastric), which passes round lesser curvature stomach from cardiac end to pylorus, there *inose.* with hepatic. **HEPAT'ICA,** to the transverse fissure of liver to supply right and left lobes, giving off *pylo'ric* branch to stomach, running from right to left; *gas'tro duodena'lis* that supplies greater curve of stomach (gas'tro epiplo'ica dex'tra which *inose.* with gas'tro-epiplo'ica sin'istra of splenic), pancreas and duode'nium (pancreat'ico-duodena'lis, with *inose.* which duodenal branch of superior mesenteric); *cys'tica*, small branch to gall bladder. **SPLEN'ICA,** horizontally left to spleen: *pancreat'icæ* (*mag'na* and *par'væ*) small branches to pancreas; *va'sa bré'cia*, 5 to 7 small branches to cardiac end of stomach; *gas'tro-epiplo'ica sin'istra*, around greater curve stomach from left to right, *anas.* gas'tro epiplo'ica dex'tra. **Supra-rena'les:** obliquely up- and outwards to supra-renal capsules. **Mesenter'ica supe'rior:** $\frac{1}{2}$ inch below cœlic axis, to the intestines. *Infe'rior pancreat'ico-duodena'lis*, up to head pancreas and lower $\frac{3}{4}$ duode'nium, *anas.* with pancreat'ico-duodena'lis of hepatic. *Va'sa intesti'na ten'uis*, 12 to 15 looping branches to jejunum and ileum. *Il'io-col'ica*, down right obliquely, to ileum and cæcum. *Col'ica dex'tra*, horizontally to right to ascending colon. *Col'ica me'dia*, up to transverse colon, *inose.* colica dextra and colica sinistra. (Free anastomosis of all these vessels.) **Rena'les:** sides aorta just below superior mesenteric, horizontally outwards to each kidney. **Spermat'icæ:** slender vessels supplying testicles, or ovaries. **Mesenter'ica infe'rior:** left side aorta 2 inches above bifurcation, to sig-

moid flexure of colon, and rectum. *Col'ica sin'istra*, horizontally to left to descending colon. *Sigmoideæ*, branches passing obliquely downwards to sigmoid flexure. *Hæmorrhoidalis sup'rior*, termination of inferior mesenteric, supplying superior part of rectum, *anas.* with middle hæmorrhoidal of internal iliac, and inferior hæmorrhoidal of internal pudic. The branches of both mesenteric arteries are in free anastomosis. **Lumbales:** 4 pairs arising from back aorta, dividing near transverse processes into *abdominal* branches (supplying muscles, and *anas.* with epigastric, internal mammary, intercostal, ilio-lumbar and circumflex iliac branches) and *dorsal* branches (supplying back muscles, etc., with a spinal branch to meninges and cord), *anas.* intercostal. **Sacra me'dia:** back of aorta at its bifurcation, down median line to coccyx, there *anas.* with lateral sacral, supplying adjacent parts.

ILIACÆ COMMUNES: from bifurcation of aorta, obliquely out- and downwards to intervertebral substance between sacrum and last lumbar vertebra, there dividing into Internal and External Iliac; each about 2 inches long. Give small branches to peritoneum, ureters, *psœ*, etc. *The left is the larger.*

ILIACA INTERNA: (see above); $1\frac{1}{2}$ inches long, dividing at greater sacro-sciatic foramen into anterior and posterior trunks. Branches from the ANTERIOR trunk are: **Vesicalis sup'rior:** part of foetal-hypogastric that remains pervious; to fundus of bladder, and vas deferens. **Vesicalis me'dia:** base of bladder and vesiculæ seminales. **Vesicalis inf'rior:** base bladder, prostate, and vesiculæ seminales. **Hæmorrhoidalis me'dia:** rectum, *anas.* with hæmorrhoidal branch of inferior mesenteric and internal pudic. (**Uterine:** to neck, and ascends to fundus, giving branch to ovary and tube, etc. **Vaginal:** corresponds to inferior vesicle, supplying vagina, urethra, etc.) **Obturatoria:** forwards to superior border obturator foramen, escaping there, dividing into an *internal* (curving round inner border foramen, supplying adjacent muscles, etc., *anas.* with external branch and internal circumflex) and *external* branch (round outer margin foramen supplying adjacent muscles). The branches inside the pelvis are *iliac*, *vesical* and *pubic*; the latter *anas.* with epigastric. Sometimes rises from epigastric, then liable to be wounded in an operation for hernia. **Pudica inter'na:** terminal branch; supplies external generative organs; out of pelvis in front of pyriformis (great sacro-sciatic foramen), crosses

ischic spine, re-enters pelvis, through lesser sacro-sciatic foramen, ascends ischic ramus up to pubes. *Hæmorrhoidales, inferiores*, 2 or 3 to rectum, etc. *Superficialis perinæi*, to scrotum and perinæum. *Transversa perinæi*. *A. corporis bulbosi*, to bulb and Cowper's gland. *A. corporis cavernosi*, terminal branch running forwards in this structure. *Dorsalis penis*, forwards to glands. **Sciat'ica**: terminal branch (see lower extremity). Branches from the POSTERIOR trunk are: **Glute'a super'ior**: (see lower extremity.) **Ilio-lumba'lis**: divides at upper part iliac fossa into *lumbar* (to psoas and quadratus muscles, branches to spinal canal) and *iliac* branch (to iliacus internus, *anas.* with gluteal, epigastric, etc.) **Sacrales latera'les**: (2); *superior* enters 1st or sacral foramen, *anas.* with fellow and middle sacral; *inferior*, descends on sacrum, *anas.* over coccyx with middle sacral and opposite fellow.

ILIACA EXTERNA: from bifurcation common iliac to femoral arch. Line drawn from left of umbil'cus to a point on Poupart's ligament midway between pubes and anterior superior spinal process of ilium, indicates its course. **Epigastrica**: few lines above Poupart's, up- and inwards to umbil'cus, there *anas.* with internal mammary and inferior intercostal. *Spermat'ica externa'lis*, to cremaster. *Pudic* branch. *Muscula'res*. **Circumflex'a il'i'i**: origin opposite above, from outer side artery, runs obliquely up- and outwards on iliac crest, supplying adjacent muscles, and *anas.* with gluteal, epigastric and lumbar arteries.

VEINS OF THE BODY.

Innomina'tæ: *right* is short ($1\frac{1}{2}$ inches long), running from sterno-clavicular articulation to join left innominate at inferior border cartilage of 1st rib, forming vena cava superior. Is external to artery, and receives right lymphatic duct, right vertebral, right internal mammary, right inferior thyroid and right superior intercostal veins. *Left* is 3 inches long, runs in front of the three large arterial branches of aorta; receives corresponding venous branches as right. Neither have valves.

Mamma'ria inter'na: 2 to each artery; unite in single trunk, emptying into innominate.

Thyroide'a infe'rior: (sometimes 3 or 4); from thyroid venous plexus, emptying into right and left innominate.

Intercosta'les superio'res: from 2 or 3 superior

intercostal spaces, emptying into innomiatæ. Left bronchial empties into left intercostal.

Ve'na ca'va supe'rior: $2\frac{1}{2}$ to 3 inches long, formed of venæ innominatæ, emptying into right auricle; receives vena azygos major, and pericardial veins. No valves.

Azygos ma'jor: opposite 1st or 2d lumbar vertebra, from right lumbar veins, up through aortic diaphragmatic opening to right side 3d dorsal vertebra, arching over root right lung, emptying into vena cava. Receives the 10 lower right intercostal veins, vena azygos minor, several œsophageal, mediastinal, vertebral, and right bronchial veins. Imperfect valves, though its branches have complete ones.

Azygos mi'nor infe'rior: lumbar region of left side from lumbar veins, or branches of renal, through left crus of diaphragm to 6th or 7th dorsal vertebra, there crossing to terminate in azygos major. Receives 4 or 5 lower intercostal, and some œsophageal and mediastinal veins.

Azygos mi'nor supe'rior: from branches intercostal and azygos minor inferior veins; empties into one of the other azygos veins.

Bronchia'les: from lungs; the right terminating in azygos major; the left in the left superior intercostal.

Spina'les: *dorsi-spina'lis*, whole length of back of spine, forming network, terminating in the vertebral (of neck), the intercostal (of thorax), lumbar and sacral veins.

Longitudina'les spina'les antero'res, whole length vertebral foramen; anterior surface terminating at dorsi-spinal, etc.

Longitudina'les spina'les postero'res, whole length vertebral foramen, posterior surface, terminating in dorsi-spinal.

V. ba'sis vertebra'rum, from bodies of vertebrae, terminating in anterior longitudinal. *Medul'li-spina'les*, cover cord, between pia and arachnoid, from sacrum to occiput; *anas*, freely with those contiguous. No valves in any of the spinal veins.

Ili'aca exter'na, inter'na and commu'nis, see lower extremity.

Ve'na ca'va infe'rior: junction of the 2 common iliacs, up on right side of aorta, terminating in lower and back part of right auricle. It receives: the *lumbar* branches (3 or 4 in No.) from muscles and integument of loins; the *right spermatic* (the left emptying into left renal), both having valves; *ovarian*, have same termination; the *renal*, the left being the longer; the right *supra-renal* (the left terminating in the left renal, or phrenic); the right *phrenics* (the left superior emptying into superior intercostal or in-

ternal mammary, and the inferior into the left renal); the *hepatic*, 3 branches (no valves), these commencing as the *intra-lobular* veins (in the centre of the lobule), forming the *sub-lobular*, and these last finally the larger hepatic trunks.

Ve'na por'ta: 4 inches long; no valves in it or its branches; formed by *mesenter'ica inf'e'rior*, (draining rectum, sigmoid flexure, and descending colon; its branches *inosc.* with internal iliac); *mesenter'ica supe'rior* (draining small intestines, cæcum, ascending and transverse colon); *splen'icæ* (5 or 6 branches from spleen; receiving branches of *va'sa bre'via*, left gas'tro-epiplo'ica, pancreat'ica and pancreat'ico-duodena'lis veins); *gas'trica*, from lesser stomachic curvature.

Cardi'acæ: *ve'na cor'dis mag'na*, from apex, up anterior interventricular groove to base ventricles, curving to left side to back part of heart, emptying into coronary sinus, guarded by 2 valves; receives posterior cardiac and left cardiac veins. *Ve'na cor'dis me'dia*, (posterior cardiac) from apex, up posterior interventricular groove, terminating in coronary sinus, guarded by valve. *Ve'næ par'væ*, (anterior veins), 3 or 4 small branches from anterior surface of right ventricle, emptying into lower part right auricle. *Ve'næ theb'e'siæ* drain muscular substance, opening into right auricle.

Pulmona'les: 4 in number; commence in capillary net-work upon bronchial cells, uniting to form a trunk for each lobe; the one of the middle lobe of the right lung unites with the one from the superior lobe, hence 2 veins from each side. No valves; *carry arterial blood*.

NERVES OF THE BODY.

SPINAL NERVES: 31 pairs, viz.: 8 cervical, 12 dorsal, 5 lumbar, 5 sacral, 1 coccygeal. Each have an anterior and posterior root, hence have moto-sensor functions.

Cervica'les: (see pages 16 and 17). **Dorsales:** 1st from between 1st and 2d dorsal vertebræ, the last from between 12th dorsal and 1st lumbar. The **POSTERIOR** branches have *external* and *internal* branches. The *cutaneous* branches are the 6 upper from the internal branches, the 6 lower from the external branches. These nerves supply the structures of the back. **ANTERIOR** branches supply walls of the chest and abdomen, each having

branches from the sympathetic. *Superiores Intercostales*, pass forwards with the arteries, giving off numerous branches, the chief being the lateral cutaneous, which have anterior and posterior branches. The 1st intercostal has no lateral branches; the 2d has a large one (the *intercosto-humeralis*), which supplies the integument of upper inner half of arm. *Intercostales inferiores*, having nearly the same course as the superior, supplying the anterior cutaneous nerves to abdomen, and having lateral branches.

Lumbales: have largest roots of all; have *anterior* and *posterior* branches; the latter having external and internal branches; the *anterior* branches unite to form the lumbar plexus. Supply muscles and integument in their region. The *anterior* branches communicate with sympathetic. **Sacrales** and **Coccygeales:** (see nerves of lower extremity.)

LOWER EXTREMITY.

MUSCLES OF THE LOWER EXTREMITY.

(14 Regions, 57 Muscles.)

(REGION 1) ILIAC REGION, 3 MUSCLES.

Psoas magnus: last dorsal and all lumbar vertebræ (transverse processes)—lesser trochanter, in union with iliacus. [Anterior branches lumbar.]

Psoas parvus: sides of bodies last dorsal and 1st lumbar vertebræ—ilio-pectineal eminence. [Anterior branches lumbar.]

Iliacus: iliac fossa, crest and anterior spinous processes of ilium, base sacrum—outer side tendon psoas magnus. [Anterior crural.]

(2) ANTERIOR FEMORAL REGION, 7.

Tensor vaginæ femoris: outer crest ilium, anterior superior spinous process—fascia lata $\frac{1}{2}$ way (laterally) down the thigh. [Superior gluteal.]

Sartorius: (*longest muscle of body*); anterior superior spinal process ilium, part of notch below—upper, inner side of tibial shaft, having crossed the anterior surface of the thigh obliquely. [Anterior crural.]

Quadriceps extensor: (*vas'ti inter'nus and exter'nus, rec'tus and crure'us*); the *Rec'tus* from anterior inferior spinal process ilium and groove above acetabulum,—the

Vas'tus Exter'nus from anterior border great trochanter, linea aspera,—the *Vas'tus Inter'nus* and *Crure'us* from inner lip of linea aspera and nearly all internal, anterior and external surface of femur-shaft—all joining into a common tendon to be inserted into patella. [Anterior crural.]

Subcrure'us: lower anterior surface of femur—synovial pouch behind patella. [Anterior crural.]

(3) INTERNAL FEMORAL REGION, 5.

Grac'ilis: inner margin rami of pubes and ischium—inner side upper part tibia above insertion semitendinosus and beneath sartorius. [Obturator.]

Pectine'us: Gimbernat's ligament, linea ilio-pectinea—rough line between trochanter minor and linea aspera. [Obturator and anterior crural.]

Adduc'tor lon'gus: front of pubes—middle 3d of linea aspera. [Obturator.]

Adduc'tor bre'vis: descending ramus of pubes between gracilis and obturator—upper part linea aspera, behind pectineus. [Obturator.]

Adduc'tor mag'nus: ramus of pubes and ischium, and tuber ischii—from great trochanter to inner condyle. [Obturator and great sciatic.]

(4) GLUTEAL REGION, 9.

Glutæ'us max'imus: superior curved line of ilium down to coccyx and sacro-sciatic ligaments—rough line between great trochanter and linea aspera. [Inferior gluteal branch sacral plexus.]

Glutæ'us me'dius: between superior and middle iliac curved lines, crest, fascia—great trochanter. [Superior gluteal.]

Glutæ'us min'imus: between middle and inferior curved lines, margin great sacro-sciatic notch—impression anterior border trochanter major. [Superior gluteal.]

Pyrifor'mis: front of sacrum, anterior margin great sacro-sciatic foramen and anterior surface great sacro-sciatic ligament, etc.—through great sacro-sciatic foramen to superior border great trochanter. [Sacral plexus.]

Obtura'tor inter'nus: inner margin obturator foramen, pubic and ischic rami, and obturator membrane—through lesser sacro-sciatic foramen to superior border great trochanter, in front pyriformis. [Sacral plexus.]

Gemell'us supe'rior: outer surface of spine of ischium—horizontally outwards to superior border great

trochanter, in company with obturator internus. [Sacral plexus.]

Gemellus inferior: superior outer border tuber ischii—superior border great trochanter with obturator internus. [Sacral plexus.]

Obturator externus: inner side obturator foramen, pubic and ischic rami, internal $\frac{2}{3}$ of external surface obturator membrane—out- and backwards to digital fossa of femur. [Obturator.]

Quadratus femoris: outer border tuber ischii—horizontally outwards to linea quadrati of posterior surface of trochanter. [Sacral plexus.]

(5) POSTERIOR FEMORAL REGION, 3.

Biceps: *long* head from tuber ischii, *short* head from linea aspera—outer side head fibula, covering external lateral ligament. *Forms outer "ham-string."* [Great sciatic.]

Semi-tendinosus: tuber ischii in company with biceps, and the aponeurosis—tendon (inner side popliteal space) curves round internal tibial tuberosity to inner surface of shaft (external and beneath sartorius.) [Great sciatic.]

Semi-membranosus: tuber ischii, above and external to biceps and semi-tendinosus—back of tibial tuberosity in 3 digitations, beneath internal lateral ligament. The preceding, with this, and gracilis and sartorius, *form inner "ham-string."* [Great sciatic.]

(6) ANTERIOR TIBIO-FIBULAR REGION, 4.

Tibialis anticus: outer tibial tuberosity and the superior shaft, external surface—inner under surface internal cuneiform and base 1st metatarsus. [Anterior tibial.]

Extensor proprius pollicis: middle anterior surface fibula and interosseous membrane—base last phalanx great toe. [Anterior tibial.]

Extensor longus digitorum: external tuberosity tibia, upper $\frac{2}{3}$ anterior surface shaft of fibula, interosseous membrane—3 tendons distributed to 4 lesser toes. [Anterior tibial.]

Peroneus tertius: (part of above); lower outer fourth fibula—base 5th metatarsus. [Anterior tibial.]

(7) POSTERIOR TIBIO-FIBULAR REGION, SUPERFICIAL LAYER, 3.

Gastrocnemius: 2 heads, one from each femur condyle—unites with soleus to form *tendo Achillis*, inserted into posterior surface os calcis. [Internal popliteal.]

Sole'us: oblique line tibia, back of head and superior portion of fibular shaft—os calcis. [Internal popliteal.]

Planta'ris: outer surface external femur condyle and posterior ligament knee-joint—os calcis, posterior surface. *Noted for long, slim tendon.* [Internal popliteal.]

(8) POSTERIOR TIBIO-FIBULAR REGION, DEEP LAYER, 4.

Poplitæ'us: (forms floor popliteal space); depression below tuberosity of external femur condyle—inner $\frac{2}{3}$ triangular space above oblique line on posterior surface tibia. [Internal popliteal.]

Flex'or lon'gus pol'licis: lower internal $\frac{2}{3}$ fibular shaft, interosseous membrane, muscular septum and fascia—through grooves in tibia, astragalus, and calcis to base last phalanx big toe. [Posterior tibial.]

Flex'or lon'gus digito'rum: posterior surface tibia below oblique line, intermuscular septum—behind inner malleolus, calcic arch, joined by tendon flexor accessorius, divides into 4 tendons, which pass through slits in the tendons of flexor brevis digitorum to be inserted into bases of last phalanges of the 4 outer toes. [Posterior tibial.]

Tibia'lis posti'cus: interosseous membrane, superior $\frac{1}{3}$ posterior surface tibial shaft, superior $\frac{2}{3}$ fibula, inner surface—behind inner malleolus, beneath calcaneo-scaphoid articulation to tuberosity scaphoid and internal cuneiform. [Posterior tibial.]

(9) FIBULAR REGION, 2.

Peronæ'us lon'gus: head, and upper, outer $\frac{2}{3}$ fibular shaft, muscular fascia and septa—behind external malleolus, through cuboid groove to outer side base 1st metatarsus. [Musculo-cutaneous.]

Peronæ'us bre'vis: middle $\frac{1}{3}$ outer surface fibular shaft, muscular septa—behind external malleolus to dorsal surface base 5th metatarsus. [Musculo-cutaneous.]

(10) FOOT, DORSAL REGION, 1.

Exten'sor bre'vis digito'rum: outer side os calcis, astragalo-calcanean ligament, anterior annular ligament—4 tendons; 1st into 1st phalanx of great toe, the rest into outer sides of tendons of long extensor to 2d, 3d, and 4th toes. [Anterior tibial.]

(11) FOOT, PLANTAR REGION, 1ST LAYER, 3.

Abduc'tor pol'licis: inner tuberosity os calcis, inter-

nal annular ligament, plantar fascia—inner side base 1st phalanx great toe. [Internal plantar.]

Flex'or bre'vis digito'rum: internal tuberosity os calcis, plantar fascia, muscular septa—4 tendons, sides 2d phalanges of outer toes. [Internal plantar.]

Abduc'tor min'imi dig'iti: outer tuberosity os calcis, plantar fascia, muscular septum—outer side base 1st phalanx little toe; joins tendon of short flexor. [External plantar.]

(12) FOOT, PLANTAR REGION, 2D LAYER, 2.

Flex'or accesso'rius: *inner* head from inner surface os calcis and calcaneo-scapoid ligament; *outer* head, inferior surface os calcis and plantar ligament—tendon flexor longus digitorum. [External plantar.]

Lumbrica'les: (4); tendon of long flexor—inner sides bases of 2d phalanges of 4 outer toes. [Internal plantar to 1st and 2d, external plantar to 3d and 4th.]

(13) FOOT, PLANTAR REGION, 3D LAYER, 4.

Flex'or bre'vis pol'licis: internal border of the cuboid and contiguous surface of external cuneiform, tendon of tibialis posticus—outer and inner sides base first phalanx big toe. [Internal plantar.]

Adduc'tor pol'licis: tarsal extremity of 2d, 3d and 4th metatarsi and sheath of peroneus longus—outer side base 1st phalanx big toe. [External plantar.]

Flex'or bre'vis min'imi dig'iti: base of 5th metatarsus and sheath peroneus longus—outer side base 1st phalanx of little toe. [External plantar.]

Transver'sus pe'dis: under surface head 5th metatarsus, transverse ligament of metatarsus—outer side 1st phalanx of big toe. [External plantar.]

(14) FOOT, PLANTAR AND DORSAL INTEROSSEOUS REGIONS, 7.

Interos'sei dorsa'les: (4); bipenniform, from adjacent sides of metatarsi—bases of 1st phalanges, outer (except the 1st) side of the 4 outer toes. **Planta'res:** (3); arise from the shafts of the 3d, 4th and 5th metatarsi, inner side—inner sides of the bases of the 1st phalanges of the same toes, and common extensor tendon.

ARTERIES OF THE LOWER EXTREMITY.

SCIAT'ICA: (5 branches); larger terminus of anterior trunk of internal iliac; out through lower part of the great sacro-sciatic foramen resting on pyriformis, descending

between tuber ischii and great trochanter, to supply muscles of the thigh. **Coccygea'lis**: inwards, *piercing* great sacro-sciatic ligament, supplying glutæus maximus and integument. **Glutææ inferio'res**: 3 or 4 supplying glutæus maximus. **Co'mes ner'vi ischiad'ici**: accompanying great sciatic nerve, and finally *pierces* it and is lost in its substance. **Muscula'res**: to back part of hip, *anas.* with gluteal, superficial perforating—external and internal circumflex. **Articula'res**: to hip-joint capsule.

GLUTÆA SUPERIOR: largest branch of internal iliac; out above pyriformis, dividing into deep and superficial branches; supplies iliacus, obturator internus, pyriform. *Superficial* branch, beneath glutæus maximus, supplying it; *anas.* with posterior branch sacral. *Deep* branch, between glutæus medius and glutæus minimus, the superior division *anas.* at anterior superior spinous process of ilium with circumflex iliac and external circumflex; the inferior division goes to great trochanter, *anas.* with external circumflex. Branches supply all muscles in this region, also joint.

FEMORA' LIS: (7 branches); from Poupart's ligament to opening in adductor magnus. A line drawn from the middle of said ligament to internal femuric condyle lies over its course. Vein lies on inside; anterior crural nerve on the outside of artery. **Superficia'lis epigas'trica**: $\frac{1}{2}$ inch below Poupart's ligament, through saphenous opening upwards to umbili'cus in the fascia covering the external oblique abdominis; *anas.* deep epigastric and internal mammary. **Superficia'lis circumflex'a ili'aca**: arises close to above, outwards to iliac crest, supplying glands fascia and integument; *anas.* circumflex iliac, gluteal, external circumflex. **Superficia'lis exter'na pudica**: inner side, $\frac{1}{2}$ inch below Poupart's ligament, pierces fascia lata, crosses spermatic cord, supplies integument of lower part of abdomen, penis, scrotum (or labia); *anas.* internal pudic branches. **Profunda exter'na pudica**: passes inwards on pectineus, piercing fascia at pubes, supplies integument of perinæum, scrotum (or labia); *anas.* superficial perinæal. **Profunda fem'oris**: outer and back part, 1 to 2 inches below Poupart's ligament, passing back of artery and the femoral vein to inner side femur, terminating in adductor magnus, lower 3d; *anas.* with popliteal and inferior perforating. **Circumflex'a exter'na**, having ascending, descending and transverse branches, supplying muscles in that region, and

anas. with gluteal, circumflex iliac, superior articular of popliteal, near great trochanter with sciatic, superior perforating and internal circumflex. *Circumflexa inter'na*, inwards to joint, supplying contiguous muscles, and head of femur; *anas.* with obturator, sciatic, external circumflex and superior perforating. *Perforan'tes*, the "superior," supplying adductors magnus and brevis, biceps, gluteus maximus and *anas.* with sciatic, internal circumflex and middle perforating; "middle" one supplies flexors of thigh and nutrient artery, *anas.* with its fellows; the "inferior" supplies the thigh flexors, *anas.* with its fellows and terminal branch of profunda. **Muscula'res**: 2 to 7 in number, supplying sartorius and vastus internus. **Anastomotica magna**: arises just before the femoral, pierces the adductor magnus, dividing into *superficial* branch, accompanying long saphenous nerve, to supply integument; *deep* branch descends to inner side of knee, where it *anas.* with superior internal articular and recurrent of anterior tibial, and supplies knee-joint and contiguous parts.

POPLITÆA: (7 branches); from termination of femoral down to lower border of popliteus muscle, dividing into anterior and posterior tibial. Nerve and vein superficial to artery. **Muscula'res**: *superior* (2 or 3), supply vastus externus and thigh flexors; *anas.* inferior perforating, terminal branches profunda. *Inferior* (2), supply gastrocnemius heads and plantaris; arise opposite knee-joint. **Cuta'nei**: supply integument of calf of leg. **Articula'res superiores**: *internal*, running inwards over femur condyles, *anas.* with anastomotica magna, inferior internal articular and superior external articular, supplying vastus internus and knee-joint. *External*, running circularly outwards over femur condyles, supplying vastus externus, knee-joint, etc.; *anas.* with external circumflex, and with anastomotica magna, forming an arch. **Azygos articula'ris**: opposite bend of joint, piercing posterior ligament, supplies ligaments, synovial membranes and joint. **Articula'res inferiores**: wind round tibial head; the *internal*, beneath internal lateral ligament, to front and inner side of joint, supplying tibial head and joint. The *external*, beneath external lateral ligament, etc., to front of joint, *anas.* with the one of opposite side, superior articular and anterior tibial recurrent.

TIBIA' LIS ANTE'RIOR: (8 branches); forward

through interosseous membrane and 2 heads of tibialis posticus, lying upon anterior surface of interosseous membrane down to front of ankle, there becoming dorsalis pedis. A line drawn from inner fibular head to midway between the 2 malleoli indicates its course. Has venæ comites; the anterior tibial nerve lies a little superficial and to its outer side. **Recur'rens**: arises just as artery passes through interosseous membrane, running up in tibialis anticus muscle to front of joint, *anas.* with the articulares. **Muscula'res**: numerous, supplying integument and muscles throughout the course, *anas.* with branches from posterior tibial and peroneal. **Malleola'res**: *internal* arises 2 inches above articulation, inwards, beneath tendons ramifying upon inner malleolus, *anas.* with branches from posterior tibia and internal plantar. *External*, outwards beneath tendons, supplying outer malleolus, *anas.* with anterior peroneal, and tarsea branch of dorsalis pedis.

DORSA'LIS PE'DIS: (4 branches); from bend of ankle to 1st interosseous space, there dividing into communicating and dorsalis hallucis. Has venæ comites; anterior tibial nerve lies on outer side. **Tar'sea**: arises over scaphoid, passing outwards beneath extensor brevis digitorum, supplying that muscle and tarsal articulations; *anas.* metatarsal, external malleolar, peroneal, and external plantar. **Metatar'sea**: outwards over metatarsal heads, giving off 3 *interos'sea* branches which pass forwards to clefts of the 3 outer toes, there dividing to supply adjacent sides of the toes, and outer side of little toe. *Anas.* with tarsea and external plantar; the 3 interosseous, each, receive a posterior perforating branch from plantar arch near their origin, and each a branch from anterior perforating of digital near the toe-clefts. **Dorsa'lis hallu'cis**: forwards along outer border 1st metatarsus to 1st toe-cleft, there dividing to supply inner side of big toe, and the adjacent sides of big and 2d toes. **Communi'cans**: dips down into sole, *anas.* with external plantar to form plantar arch, there dividing to supply toes same as dorsalis hallucis.

TIBIA'LIS POSTE'RIOR: (5 brs.); from lower border popliteus, parallel inner border tendo Achillis, to fossa between inner ankle and heel, there dividing into the plantar arteries. Has venæ comites; nerve to the outside for the lower $\frac{1}{2}$ of its course. **Peronæ'a**: from 1 inch below popliteus, obliquely outwards to fibula, de-

scending along inner border of it to outer ankle, supplying contiguous structures, *anas.* with external malleolar, tarsal and external planter. *Anterior peronæa*, given off 2 inches above ankle, pierces interosseous membrane, passes down to front of outer ankle and tarsus, supplying adjacent structures, *anas.* with tarsal and external malleolar. *Nutri'tia*, to fibula. *Muscula' res*, to fibular muscles. **Nutri'tia**: near origin of posterior tibia, being largest of its kind in the body; enters tibia just below oblique line. **Muscula' res**: to soleus and deep muscles. **Communi- cans**: transversely across tibia 2 inches above its inferior extremity to *anas.* with peroneal. **Calca'neæ interna'les**: several branches arising just before division of posterior tibial, supplying fat and integument about heel, and muscles of inner side of foot; *anas.* with peroneal, internal malleolar.

PLANTA' RIS INTER' NA: forwards along inner side of foot to big toe, *anas.* with digital branches, supplies adductor pollicis, flexor brevis digitorum, etc.

PLANTA' RIS EXTER' NA: (2 brs.); out- and forwards to base 5th metatarsus, then turning obliquely inwards to 1st interosseous space, *inosc.* with communicating branch from dorsalis pedis, forming *plantar arch*. **Perforan'tes posterio' res**: (3); ascend through back part of the 3 outer interosseous spaces; *anas.* with interosseous branches of metatarsal. **Digita' les**: (4); arise from arch and supply both sides of the 3 outer toes and outer side of the 2d toe, bifurcating at the respective toe-clefts to do this. At each bifurcation a branch (the *anterior perforating*) is sent upwards through the interosseous space; *anas.* with interosseous branches of the metatarsal.

VEINS OF THE LOWER EXTREMITY.

Saphe'na inter'na: or *long saphenous*: from plexus at dorsum and inner side of foot, ascends, in front of inner ankle, behind inner margin of tibia, bends behind inner femuric condyle, empties into femoral through saphenous opening, $1\frac{1}{2}$ inches below Poupart's ligament, where it receives *superficia'lis circumflexa ili'aca*, *superficia'lis epigastrica*, and *superficia'lis exter'na pudica*. Communicates with internal plantar, tibial, etc. 2 to 6 valves.

Saphe'na exter'na: plexus at dorsum and outer side of foot, up behind outer ankle to median line of leg,

accompanied by external saphenous nerve; empties into popliteal vein, between heads of gastrocnemius; 2 valves, one near termination. *Communicates* with deep veins of foot.

Tibiales posteriores: formed from *external* and *internal plantar* joining with the *peroneal*. Course same as artery.

Tibiales anteriores: continuation of *venæ dorsales pedis*, pierce interosseous membrane at upper part of leg, and form, by junction with the *posterior tibial* veins, the popliteal.

Poplitæa: (see tibial anterior); up to tendinous aperture of adductor magnus, there becoming the femoral; receives *sural*, *articular*, and *external saphenous* veins. 4 valves. Crosses artery from within outwards.

Femorālis: (see above); up to Poupart's ligament, there becoming external iliac. Lies (below) to outside, but crosses beneath the artery to its inside. Receives *muscular* branches, and *profunda femoris*, and *internal saphenous*, at $1\frac{1}{2}$ inches below Poupart's ligament. 4 or 5 valves.

Iliaca externa: (see above); to sacro-iliac symphysis, there uniting with internal iliac to form common iliac. On right side, lies to inside of artery at first, but gradually passes behind it. On left side, altogether on inside of artery. Receives *epigastric* and *circumflex iliac*. No valves.

Iliaca interna: formed by *venæ comites* of *all* the branches of the iliac artery, but the umbilical; lies first to inside, but finally gets behind the artery. No valves, though the plexus that help form it are abundantly supplied. 1. *Hæmorrhoidal* plexus; 2. *vesico-prostatic* plexus; 3. *vaginal* plexus; 4. *uterine* plexus; 5. *dorsalis penis* plexus; these all intercommunicate very freely.

Iliaca communis. (see *iliaca externa*); terminates at intervertebral substance between 4th and 5th lumbar vertebræ, there, with its fellow of opposite side, forms vena cava inferior. On the right it is the shorter, and nearly vertical. Receives *ilio-lumbar*, and sometimes *lateral sacral* veins. *Middle sacral* empties into left common iliac. No valves.

NERVES OF THE LOWER EXTREMITY.

LUMBAR PLEX'US; formed by anterior roots of the 4 upper lumbar nerves communicating with each other. It furnishes different nervous branches to supply the inferior extremities. **Ilio-hypogas'trica**: 1st lumbar, outwards to iliac crest, piercing there the transversalis, the *iliac* branch being distributed to gluteal integument; the *hypoga-tric* supplies the integument in umbilical region. **Ilio-inguina'lis**: 1st lumbar; escapes at external ring, supplying inner thigh, scrotum (labia in female) and inguinal region. **Genito-crura'lis**: 2d lumbar and branch from 1st; pierces psoas, and near Poupart's ligament divides; the *genital* branch to genitals, the *crural* to integument on anterior upper aspect of thigh; *communicates* with middle cutaneous. **Cuta'neus exter'nus**: 2d lumbar; perforates psoas, and at Poupart's ligament divides; the *anterior* branch supplying the anterior and external part of thigh to knee; the *posterior* supplying surface of thigh to its middle. **Obtura'tor**: 3d and 4th lumbar, and at upper part of obturator foramen enters thigh, dividing into: *anterior* branch supplying adductor longus and brevis, pectineus and femoral artery, giving articular branch to hip-joint; *posterior* branch pierces obturator externus, passes to front of adductor magnus, dividing into muscular branches; *articular* branch is given off for knee-joint. **Obtura'tor accesso'rius**: either from obturator, or filaments from 3d and 4th lumbar; supplies pectineus, hip-joint, and a cutaneous branch to leg. *Sometimes wanting.*

ANTERIOR CRURA'LIS: 3d and 4th lumbar, through psoas beneath Poupart's ligament to thigh, external to artery in pelvis, supplies iliacus, and femoral artery; without, all the muscles on front of the thigh but the tensor vaginæ femoris. **Cuta'neus me'dius**, through fascia lata below Poupart's ligament, dividing into 2 branches, supplying sartorius and integument in front as low as knee. **Cuta'neus inter'nus**, obliquely across upper part femoral sheath, the *anterior* branch perforating fascia at lower 3d of thigh, supplies integument of inside of thigh to knee-joint; the *inner* branch descends along posterior border sartorius to knee, piercing fascia, giving off numerous branches, descending still farther, supplying integument of inner side of leg. **Saphe'nus inter'nus**,

downwards beneath sartorius to knee, inner side, then along inner side of leg in company with internal saphenous vein, dividing into 2 branches, one terminating at inner ankle, the other distributed to integument of dorsum of foot. Supplies muscles and integument in its course, giving off branches *communicating* with internal cutaneous and obturator nerves; another to patellar integument and forms a "plexus patellæ" with other branches. **Musculæres**, all muscles of front of leg but tensor vaginæ femoris. **Articulæres**, 2 to knee-joint ligaments.

SACRALES: 5; the 4 upper through anterior sacral canals; the 5th through the sacro-coccygeal foramen; the posterior are smaller and through posterior sacral canals, except the 5th, which is through posterior sacro-coccygeal foramen. Have *long roots*. *Posterior internal* branches supply multifidus spinæ. *Posterior external* branches supply integument over sacrum, coccyx and posterior gluteal region, forming many anastomosing loops. *Anterior*, the 4 upper supplying rectum, bladder, (vagina), and pelvic viscera (*communicating* with sympathetic); with their muscular branches they supply levator ani, coccygeus, sphincter ani, and integument between anus and coccyx, *communicating* with coccygeal.

COCYGEALIS: posterior branch receives branch of *com.* from posterior sacral and is lost in fibrous cover of coccyx. Anterior branch pierces sacro-sciatic ligament, supplying integument about coccyx. *Anas.* 5th sacral.

SACRAL PLEXUS: is formed by lumbo-sacral, the anterior branches of 3 upper (and part of the 4th) sacral nerves. Is triangular in form, the base corresponding to the exits of nerves, and rests on pyriformis, anterior surface, covered by fascia. **Musculæres**, supply pyriformis, obturator internus, gemelli, and quadratus femoris. **Glutæus superior**: back part lumbo-sacral, passes through great sacro-sciatic foramen, the *superior* branch supplying glutæus minimus and medius, the *inferior* branch supplying glutæus minimus and medius, and lower portion tensor vaginæ femoris. **Pudicus**: plexus, lower part; out great sciatic foramen, in through the lesser sacro-sciatic foramen, terminating in perineal, and dorsal nerves of penis. *Inferior hæmorrhoidalis*, near origin pudic, supplies external sphincter and adjacent integument; *communicates* with inferior pudendal and superficial perineal. *Perinaeus*, terminal branch, accompanies perineal artery; the *anterior cutaneous* branches

supply scrotum and under part of penis, (labia), and levator ani; the *posterior* branches supply sphincter ani and integument in front of anus, and back part scrotum. The *muscular* branches supply transversus perinæi, accelerator urinæ, erector penis, compressor urethræ, and bulb. *Dorsalis pe'nis*, along ramus ischii, with pudic artery, follows it and its branches to the glans penis, which it supplies. *Anas*, with sympathetic, and supplies integument of prepuce and of penis, and corpus cavernosum. (In female, to the analogous parts.)

SCIATICUS PARVUS: supplies integument of perinæum, back part of thigh and leg, and glutæus maximus. Two branches from sacral plexus unite to form it; follows course of sciatic artery in distribution, piercing fascia in popliteal region, accompanies external saphenous vein to middle of leg. *Inferiores glutæi*, to glutæus maximus, several large branches. *Inter'nal cutanei*, to skin of upper and inner side of thigh, posterior aspect; scrotum by inferior pudendal that curves around tuber ischii. *Ascendentes cutanei*, run upwards and supply integument of gluteal region, and muscles. Branches to integument of thigh, popliteal region and upper part of leg.

SCIATICUS MAGNUS: $\frac{1}{2}$ inch wide, and continuation of lower part sacral plexus, passing out of great sacro-sciatica foramen below pyriformis, down between great trochanter and tuber ischii to lower $\frac{3}{4}$ of thigh, there dividing into internal and external popliteus. *Articula'res*, to hip-joint and capsule. *Muscula'res*, to flexors of the leg, adductor magnus; integument of thigh also supplied by this nerve.

POPLITÆUS INTER'NUS: (see above); largest terminal branch; down through middle of popliteal space, beneath soleac arch, becoming posterior tibial. *Articula'res*, (3); knee-joint, accompanying superior internal articular, and azygos arteries. *Muscula'res*, (4 or 5) to gastrocnemius, plantaris, soleus and popliteus. *Saphenus exter'nus*, down, between gastrocnemius heads, to middle of leg, there piercing fascia and *anas*, with communicans peronæi, then down along outer margin of tendo Achillis, in company with vein, supplying integument of outer side of foot and little toe; *communicates* with musculo-cutaneus.

TIBIALIS POSTERIOR: from lower border popliteus, passes down leg with posterior tibial artery, between heel and internal ankle, there dividing into external and

internal plantar; above, lies to inside of artery; below to outer side. **Muscula' res:** to tibialis posticus, flexor longus digitorum, and pollicis. **Cuta'neus planta'ris:** perforates internal annular ligament, supplying integument of heel and inner side of sole of foot. **Planta'ris inter'nus:** (see above); largest terminal branch; accompanies internal plantar artery along inner side of foot. **Cuta'nei,** to sole of foot. **Muscula' res,** to flexor brevis digitorum, and abductor pollicis. **Articula' res,** to tarsus and metatarsus. **Digita'les,** (4); supplying the first 3 toes (both sides) and inner margin of the 4th toe, integument, articulations, nails, etc., and 1st and 2d lumbricales. **Planta'ris exter'nus:** (see tibial posterior); follows course of its artery to outer side of foot, supplying little toe and outer half of 4th toe, and structures adjacent, flexor accessorius, and abductor minimi digiti. **Superficia'lis** branch goes to outer side of 5th and adjacent sides of 4th and 5th toes, flexor brevis minimi digiti, and the 2 interossei of 4th metatarsal space. **Deep** branch supplies remaining interossei, 2 outer lumbricales, adductor pollicis, transversus pedis.

POPLITÆ'US EXTER'NUS (or peronæ'us): $\frac{1}{2}$ size of internus poplitæus (see great sciatic); descends along outer margin of popliteal space to fibula, and about 1 inch below its head divides into anterior tibial and musculo-cutaneus. **Articula' res:** (2); accompany external articular arteries to outer side of knee. Sometimes a 3d is given off as a recurrent, which supplies front of knee. **Cuta'nei:** (2 or 3); supply integument of back and outer side of leg as far as its lower 3d. **Communica'ns peronæ'i:** arises near fibular head, joining external saphenus at middle of leg. **Tibia'lis ante'rior:** (see above); passes obliquely forwards to front of interosseous membrane, reaching outer side of anterior tibial artery at middle of leg, descending thence to front of ankle it divides into external and internal branches. **Muscula' res,** to tibialis anticus, extensor longus digitorum, extensor proprius pollicis. **Exter'nal** or *tarsæus*, outwards across tarsus, supplies external brevis digitorum, and articulations of tarsus and metatarsus; becomes ganglionic. **Internal** branch accompanies dorsalis pedis artery, supplying 1st interosseous space and adjacent sides 1st and 2d toes; *communicates* with internal division of musculo-cutaneus. **Musculo-cuta'neus:** supplies muscles of fibular side of leg and dorsal integument of foot (see poplitæ'us exter'nus).

At lower 3d of leg (its front and outer side) divides into internal and external branches. *Muscula' res*, to fibular muscles and integuments. *Internal* branch, down in front of ankle to supply inside of great toe and adjacent sides of 2d and 3d toes, integuments of inner ankle and inside of foot; communicates with internal saphenus and anterior tibial. *External* branch, down from outer side dorsum of foot to supply adjacent sides of 3d, 4th and 5th toes, integument of outer ankle and outer side of foot; communicates with external saphenus.

OSTEOLOGY.

NOTE.—Muscles in *italics*, are muscles of insertion. Figures in [] show the primary number of ossific centres, and date of appearance of ossification.

COMPOSITION: Gelatine and blood-vessels, 33.30; calcic phosphate, 51.04; calcic carbonate, 11.30; calcic fluoride, 2.00; magnesian phosphate, 1.16; sodic chloride and oxide, 1.20; total, 100.00.

NUMBER: vertebral column (including sacrum and coccyx) 26; cranium, 8; ossiculi auditus, 6; face, 14; hyoid, sternum and ribs, 26; upper extremity, 64; lower extremity, 60; total, 204. To this may be added the patellæ and teeth, making a grand total of 238.

SPINE has 33 vertebræ, viz.: 7 cervical, 12 dorsal, 5 lumbar, 5 sacral, 4 coccygeal. They each have a body, 7 processes, 2 pedicles, 2 laminæ, 4 notches and a foramen. The **Cervical** are noted for the smallness and broadness of body, bifid spinous processes, bifid and perforated transverse processes, etc. The peculiar are the 1st, or *atlas*, which is like a "ring;" the 2d, or *axis*, having a large (odontoid) process; the 7th, or *prominens*, having a long, spinous process. The **Dorsal** have body largest antero-posteriorly, spinous processes directed downwards, facets for ribs. Peculiar are the 1st, having one whole facet; the rest demi-facets for the ribs; 10th, 11th and 12th, each one having a distinct facet for a rib. *Muscles:* to the atlas are attached 10; to the axis, 11; to the remaining (anteriorly) 10, (posteriorly) 22. [The vertebræ are developed from 3 centres by ossification, the first appearing at 6th week; at sixteen 4 secondary centres appear, and at twenty-one a circular plate for superior and inferior surfaces of body. A few exceptions, as atlas (2 primitive centers), axis (6), 7th cervical and the lumbar (5).]

Sacrum: triangular, anterior and posterior foramina, lateral masses, laminæ, tubercular transverse processes, promonotory, sacral canal and groove, auricular surface. *Articulations*, (4); 2 innominate, 5th lumbar, coccyx. *Muscles*, (5); pyriform, *coccygeus*, glutæus maximus, erector spinæ, latissimus dorsi. [35, 8th week.]

Coccyx: cornua. *Articulation*, (1); sacrum. *Muscles*, (4); *coccygeus*, glutæus maximus, sphincter and levator ani. [4, birth to puberty.]

Occipitale: superior and inferior curved lines, crest, protuberance, foramen magnum, condyles, basilar and jugular processes, pharyngeal spine, anterior and posterior condyloid foramina; fossæ cerebri et cerebelli, torcula, protuberance, grooves for occipital, lateral, inferior, petrosal, superior longitudinal sinûs and medulla, jugular fossa. *Artic.* (6); 2 parietal, 2 temporal, sphenoid, atlas. *Musc.* (12); occipito-frontalis, trapezius, *sterno-cleido-mastoid*, *complexus*, *splenius capitis*, *obliquus superior*, *rectus posticus major* and *minor*, *rectus lateralis*, *rectus anticus major* and *minor*, superior pharyngeus constrictor. [4, 10th w.]

Parietale: eminence, foramen, temporal ridge; Pacchionian depressions, middle meningeal groove, superior longitudinal and lateral sinûs. *Artic.* (5); fellow, occipital, frontal, temporal, sphenoid. *Musc.* (1); temporal. [1.]

Frontale: eminence, superciliary ridges, external and internal angular processes, supra-orbital notches and arches, temporal ridges and fossæ, nasal eminence and spine; orbital plates, lachrymal fossa, pulley depression, ethmoid notch, anterior ethmoid foramina, foramen cæcum, meningeal grooves, Pacchionian depressions, frontal and superior longitudinal sinûs (frontal suture). *Artic.* (12); 2 parietal, sphenoid, ethmoid, 2 nasal, 2 superior maxillæ, 2 lachrymal, 2 malar. *Musc.* (3 pr.); corrugator supercillii, orbicularis palpebrarum, temporal. [2.]

Temporale: zygoma, articular eminence, glenoid fossa, Glasserian fissure, vaginal, styloid, mastoid and auditory processes, mastoid foramen, superior and inferior petrosal and lateral sinûs, aquæductus vestibuli, meatus auditorius internus, hiatus Fallopii, opening for smaller petrosal nerve, depression Casserian ganglion, carotid canal, openings for Jacobson's and Arnold's nerves, aquæductus cochleæ, jugular fossa, stylo-mastoid foramen, auricular fissure, canal for Eustachian tube, and tensor tympani. *Artic.* (5); occipital, parietal, sphenoid, inferior

maxilla, malar. *Musc.* (14); temporal, masseter, occipito-frontalis, *sterno-mastoid*, *splenius capitis*, *trachelo-mastoid*, digastric, retrahens aurem, stylo-pharyngeus, stylo-hyoid, stylo-glossus, levator palati, tensor tympani, stapedius. [4, 8th week.]

Sphenoi'des: ethmoid spine, optic groove, olivary process, sella turcica, anterior middle and posterior clinoid processes, cavernous groove; foramina opticum, lacerum anterius, rotundum, Vesalii, ovale, spinosum; spinous, hamular, vaginal and external and internal pterygoid processes; rostrum, pterygoid notch and ridge, scaphoid, pterygoid, temporal and zygomatic fossæ, Vidian and pterygo-palatine canals. *Artic.* (12); all of cranium and 2 malar, 2 palate and vomer. *Musc.* (12 pr.); temporal, external and internal pterygoid, superior constrictor, tensor palati, laxator tympani, levator palpebræ, obliquus superior, internal and external recti, superior and inferior recti. [10, 8th w.]

Ethmoi'des: crista galli, infundibulum, os planum, unciform process, olfactory foramina, superior meatus, anterior and posterior cells. *Artic.* (15); sphenoid, frontal, 2 sphenoidal turbinated, 2 nasal, 2 superior maxillary, 2 lachrymal, 2 palate, 2 inferior turbinated, vomer. *Musc.* none. [3, 4th m.]

Nasa'le: groove for nasal nerve. *Artic.* (4); frontal, ethmoid, fellow, superior maxilla. *Musc.* none. [1, 8th w.]

Maxilla're supe'rior: nasal process lachrymal tubercle, orbicular surface, infra-orbital groove and foramen, canine and incisive fossa, canine eminence, alveolar process, posterior dental canals, maxillary tuberosity, middle and inferior meatus, palate process, anterior and posterior palatine canals; antrum. *Artic.* (9); frontal, ethmoid, nasal, malar, lachrymal, inferior turbinated, palate, vomer, fellow. *Musc.* (9); orbicularis palpebrarum, inferior obliquus oculi, levator labii superioris alæque nasi, levator labii superioris proprius, levator anguli oris, compressor naris, depressor alæ nasi, masseter, buccinator. [4, early.]

Lachryma'le: lachrymal groove. *Artic.* (4); frontal, ethmoid, superior maxilla, inferior turbinated. *Musc.* (1); tensor tarsi. [1, 8th week.]

Mala're: frontal, zygomatic, orbital and maxillary processes, temporo-malar canal. *Artic.* (4); frontal, sphenoid, temporal, superior maxilla. *Musc.* (5); levator labii superioris proprius, zygomaticus major and minor, masseter, temporal. [1, 8th week.]

Os pala'ti: orbital, maxillary, and sphenoid processes, sphenopalatine foramen, superior meatus and superior turbinated crest, middle meatus and inferior turbinated crest, inferior meatus; posterior palatine canal, tuberosity, posterior nasal spine. *Artic.* (7); sphenoid, ethmoid, superior maxilla, inferior and superior turbinated, vomer, fellow. *Musc.* (4); tensor palati, azygos uvulae, internal and external pterygoid. [1, —.]

Turbina'tum infe'rior: lachrymal, ethmoid and maxillary processes. *Artic.* (4); ethmoid, superior maxilla, lachrymal, palate. *Musc.* none. [1, 4th month.]

Vo'mer: naso-palatine groove, *Artic.* (6); sphenoid, ethmoid, 2 superior maxilla, palate. *Musc.* none. [2, 8th week.]

Maxilla're infe'rior: coronoid process, condyle, ramus, sigmoid notch, mental foramen and process, symphysis, groove for facial artery, inferior dental foramen, mylo-hyoid groove and ridge, sublingual and submaxillary fossae, genial tubercles. *Artic.* (2); 2 temporal. *Musc.* (14 pr.); levator menti, depressor labii inferioris, depressor anguli oris, *platysma*, buccinator, *masseter*; genio-hyo-glossus, genio-hyoid, mylo-hyoid, *digastric*, superior constrictor, *temporal*, *internal* and *external pterygoid*. [2, early.]

Hyo'id'es: greater and lesser cornua, body. *Artic.* none. *Musc.* (11); *sterno-*, *thyro-*, *omo-*, *stylo-*, *mylo-* and *genio-hyoid*, genio-hyo-glossus, hyo-glossus, middle constrictor, *lingualis*, *pulley* of *digastric*. [5, 8th month.]

Ster'num: *manu'brium*, *gladi'olus*, *en'siform appendix*, facets for 7 superior ribs. *Artic.* (16); 7 pairs ribs, 2 clavicles. *Musc.* (10); pectoralis major, sterno-mastoid, sterno-hyoid and sterno-thyroid, *triangularis sterni*, *obliquus externus* and *internus*, *transversalis*, *rectus*, *diaphragm*. [6, 5th month.]

Cos'tæ (ribs): head, neck, tuberosity, articular and non-articular protuberances, angle, facets for superior and inferior vertebrae. *Artic.* (24); vertebrae and costal cartilages. *Musc.* (19); [3 each, save the last two, these but 2; early.] *Peculiar ribs:* 1st, shortest, most curved, horizontally placed, having grooves for subclavian artery and vein; 2d, some larger than 1st, is not twisted, etc.; 10th, single articular facet; 11th and 12th, single articular facet, no neck or tuberosity.

Costal cartilages: *artic.* with sternum and ribs. *Musc.* (10); subclavius, sterno-thyroid, pectoralis major, *internus obliquus*, *transversalis*, *rectus*, *diaphragm*, internal

and external intercostal, triangularis sterni. (The last 3 are muscles of origin and insertion.)

Clavic'ula: shape of letter *f*; sternal and acromial extremity; oblique line, tuberosity, rhomboid impression. *Artic.* (3); sternum, scapula, 1st costo-cartilage. *Musc.* (6); sterno-mastoid and sterno-hyoid, *trapezius*, pectoralis major, deltoid, *subclavius*. [2, first of all.]

Scap'ula: acromian and coracoid processes, glenoid cavity, neck, subscapular fossa, ridges; supra-scapular notch, supra- and infra-spinous fossæ, spine, groove for dorsalis scapulæ vessels. *Artic.* (2); clavicle, humerus. *Musc.* (17); subscapularis, supra- and infra-spinatus, *trapezius*, deltoid, omo-hyoid, *serratus magnus*, *levator anguli scapulæ*, *rhomboideus major* and *minor*, triceps, teres major and minor, biceps, coraco-brachialis, *pectoralis minor*, latissimus dorsi. [7, 8th week.]

Hu'merus: head, anatomical and surgical necks, greater and lesser tuberosities, bicipital ridge and groove, posterior bicipital ridge, rough deltoid surface, internal and external condyles, coronoid and radial depressions, radial head, trochlear surface; musculo-spiral groove, olecranon depression. *Artic.* (3); scapula, ulna, radius. *Musc.* (24); supra and infra-spinatus, teres major and minor, subscapularis, pectoralis major, latissimus dorsi, deltoid, coraco-brachialis, brachialis anticus, triceps; pronator radii teres, flexor carpi radialis, palmaris longus, flexor sublimis digitorum, flexor carpi ulnaris; supinator longus, extensor carpi radialis longior and brevior, extensor communis digitorum, extensor minimi digiti, extensor carpi ulnaris, anconeus, supinator brevis. [7, early.]

Ulna: olecranon, greater and lesser sigmoid cavities, coronoid process, nutrient foramen, styloid process; oblique line, groove for extensor carpi ulnaris. *Artic.* (2); humerus, radius. *Musc.* (13); triceps, anconeus, flexor and extensor carpi ulnaris, brachialis anticus, pronator radii teres, flexor sublimis and profundus digitorum, pronator quadratus, supinator brevis; extensor ossis metacarpi and extensor secundi internodii pollicis, extensor indicis. [3, 5th w.]

Ra'dius: head, neck, bicipital tuberosity, oblique line, nutrient foramen, styloid process, 2 grooves; 4 grooves for extensor muscles. *Artic.* (4); humerus, ulna, scaphoid, semi-lunar. *Musc.* (9); biceps, supinator longus and brevis, flexor sublimis digitorum, flexor longus pollicis, pronator quadratus, extensor ossis metacarpi pollicis, extensor primi internodii pollicis, pronator radii teres. [3.]

CARPUS: (8); [1 after birth]: **Scaphoi'des:** *artic.* (5); radius, trapezium, trapezoid, magnum, semi-lunar. **Semi-luna're:** *artic.* (5); radius, magnum, unciform, scaphoid, cuneiform. **Cuneifor'me:** *artic.* (3); semilunar, pisiform, unciform. **Pisifor'me:** *artic.* (1); cuneiform. *Musc.* (2); *flexor carpi ulnaris*, abductor minimi digiti. (LOWER ROW.) **Trapezium:** *artic.* (4); scaphoid, trapezoid, 1st and 2d metacarpal. *Musc.* (3); abductor, flexor ossis metacarpi and flexor brevis pollicis. **Trapezoi'des:** *artic.* (4); scaphoid, 2d metacarpal, trapezium, magnum. *Musc.* (1); flexor brevis pollicis. **Os mag'num:** *artic.* (7); scaphoid, semi-lunar, 2d, 3d, 4th metacarpal, trapezoid, unciform. *Musc.* (1); flexor brevis pollicis. **Uncifor'me:** *artic.* (5); semi-lunar, 4th, 5th metacarpal, cuneiform, os magnum. *Musc.* (2); flexor brevis and flexor ossis metacarpi minimi digiti; anterior annular ligament.

METACARPI: (5); bones are prismoid, curved longitudinally, convex behind, concave in front. [2, 6th week.] **1st:** *artic.* (2); trapezium; 1st phalanx. *Musc.* (3); *flexor* and *extensor ossis metacarpi pollicis*, 1st dorsal interosseous. **2d:** *artic.* (5); trapezium, trapezoides, magnum, 3d metacarpus, 2d phalanx. *Musc.* (5); *flexor carpi radialis*, *extensor carpi radialis longior*, 1st and 2d dorsal interosseous, 1st palmar interosseous. **3d:** *artic.* (4); magnum, 2d and 4th metacarpal, 3d phalanx. *Musc.* (5); *extensor carpi radialis brevior*, flexor brevis pollicis, adductor pollicis, 2d and 3d dorsal interosseous. **4th:** *artic.* (5); magnum, unciform, 3d and 5th metacarpal, 4th phalanx. *Musc.* (3); 3d and 4th dorsal and 2d palmar interosseous. **5th:** *artic.* (3); unciform, 4th metacarpal, 5th phalanx. *Musc.* (5); *flexor* and *extensor carpi ulnaris*, *flexor ossis metacarpi minimi digiti*, 4th dorsal and 3d palmar interosseous. (An error in "Gray" here.)

PHALANGES: (14); [2, 6th w.] **First row:** *artic.* metacarpal and 2d row. *Musc.* 1st or thumb, (4); *extensor primi internodii*, *flexor brevis*, abductor and adductor pollicis. Index, (2); 1st dorsal and palmar interosseous. Middle finger, (2); 2d and 3d dorsal interosseous. Ring 2, 4th dorsal, and 2d palmar interosseous. Little finger, (3); 3d palmar interosseous, *flexor brevis* and abductor minimi digiti. **Second row:** thumb, (2); *flexor longus* and *extensor secundi internodii pollicis*. To the others, (4); *flexor sublimis* and *extensor communis digitorum*, with *extensor indicis* to index and *extensor minimi digiti* to little finger. **Third row:** *flexor profundus*, and *extensor communis digitorum*.

Innomina'tum: crest, superior, middle and inferior curved lines, anterior and posterior superior and inferior spinal processes, greater and lesser sacro-sciatic notches, ilio-pectineal eminence line and groove, acetabulum, cotyloid notch; body, crest, spine, angle of pubes, ischic spine and tuberosity, obturator foramen, ischic and pubic rami; internal iliac fossa, groove for obturator and pubic vessels, symphysis pubis, auricular and sacro-iliac rough surfaces. *Artic.* (3); fellow, sacrum, femur. *Musc.* (33); tensor vaginæ femoris, *obliquus externus* and *internus*, *latissimus dorsi*, *transversalis*, *quadratus lumborum*, *erector spinæ*; 3 *glutæi*, *rectus*, *pyriformis*, *iliacus*, *sartorius*; (*ischium*) *obturator externus* and *internus*, *levator ani*, 2 *gemelli*, *coccygeus*, *biceps*, *semi-tendinosus*, *semi-membranosus*, *quadratus femoris*, *adductor magnus*, *transversus perinæi*, *erector penis*; (*pubes*) *psoas parvus*, *pectineus*, *adductor longus* and *brevis*, *gracilis*, *compressor urethræ* (*accelerator urinæ*). [8; 3 primary, 5 secondary.]

Femur: head, depression for ligamentum teres, neck, greater and lesser trochanters, spiral line, shaft, internal and external tuberosities and condyles; digital fossa, trochanteric line, inter-condyloid notch, *linea aspera*. *Artic.* (3); *innominatum*, *tibia*, *patella*. *Musc.* (23); *glutæus medius* and *minimus*, *pyriformis*, *obturator internus* and *externus*, 2 *gemelli*, *quadratus femoris*; *psoas magnus*, *iliacus*; 2 *vasti*, *glutæus maximus*, *biceps*, 3 *adductors*, *pectineus*, *crureus* and *subcrureus*, *gastrocnemius*, *plantaris*, *popliteus*. [5, 5th w.]

Patella: subcutaneous surface; outer and inner facets. *Artic.* condyles of femur, (ligamentum patellæ attaches it to tibia.) *Musc.* (4); *rectus*, *crureus*, *vastus externus* and *internus*. [Sesamoid, 3d year.]

Tib'ia: head, spine, internal and external tuberosity, tubercle, fibular facet, crest, internal malleolus; popliteal notch, oblique line, nutrient foramen, common groove for flexor longus digitorum and tibialis posticus, another for flexor longus pollicis. *Artic.* (3); femur, fibula, astragalus. *Musc.* (10); *semi-membranosus*; *tibialis anticus*, *extensor longus digitorum*; *sartorius*, *gracilis*, *semi-tendinosus*; *popliteus*, *soleus*, *flexor longus digitorum*, *tibialis posticus*, *ligamentum patellæ*. [3, 5th w.]

Fib'ula: head, styloid process, shaft, external malleolus; groove for peroneus longus and brevis, nutrient foramen. *Artic.* (2); tibia, astragalus. *Musc.* (9); *biceps*, *soleus*, 3 *peronei*; *extensor longus digitorum* and *pollicis*, *tibialis posticus*, *flexor longus pollicis*. [3, 6th w.]

TAR'SUS; (7): **Cal'cis**: greater and lesser processes, tubercle, superior and inferior grooves. *Artic.* (2); **astragalus**, cuboid. *Musc.* (8); *tibialis posticus*, *tendo Achillis*, *plantaris*, abductor pollicis and minimi digiti, flexor and extensor brevis digitorum, flexor accessorius. [1, 6th m.]

Cuboi'des: *artic.* (4); calcis, external cuneiform, 4th and 5th metatarsi (occasionally scaphoid.) *Musc.* (1); flexor brevis pollicis. [1, 9th m.] **Astrag'alus**: *artic.* (4); tibia, fibula, calcis, scaphoid. *Musc.* none. [1, 7th m.]

Scaphoi'des: *artic.* (4); astragalus, 3 cuneiform (sometimes cuboid.) *Musc.* (1); *tibialis posticus*. [1, 4th y.]

Cuneifor'me inter'nus: largest of the three; *artic.* (4); scaphoid, middle cuneiform, 1st and 2d metatarsal. *Musc.* (2); *tibialis anticus* and *posticus*. [1, 3d y.]

Cuneifor'me me'dius: smallest; *artic.* (4); scaphoid, internal and external cuneiform, 2d metatarsal. *Musc.* none. [1, 4th y.] **Cuneifor'me exter'nus**: *artic.* (6); scaphoid, middle cuneiform, cuboid, 2d, 3d, 4th metatarsi. *Musc.* (2); *tibialis posticus*, flexor brevis pollicis. [1, 1st y.]

METATAR'SI: (5): shaft straight; posterior extremity wedge-shaped, anterior rounded. [2, 8th w.]

1st: greater size, shortest. *Artic.* (3); internal cuneiform, phalanx, 2d metatarsus. *Musc.* (3); *tibialis anticus*, *peroneus longus*, 1st dorsal interosseous. **2d**: longest; *Artic.* (6); 3 cuneiform, 1st and 3d metatarsi, 2d phalanx. *Musc.* (3); adductor pollicis, 1st and 2d dorsal interosseous.

3d: *artic.* (4); external cuneiform, 2d and 3d metatarsi, 3d phalanx. *Musc.* (4); 2d and 3d dorsal and 1st plantar interosseous, adductor pollicis. **4th**: *artic.* (5); external cuneiform, cuboid, 3d and 5th metatarsi, 4th phalanx. *Musc.* (4); adductor pollicis, 3d and 4th dorsal and 2d plantar interosseous. **5th**: tubercular eminence. *Artic.* (3); cuboid, 4th metatarsus, 5th phalanx. *Musc.* (5); *peroneus brevis* and *tertius*, flexor brevis minimi digiti, 4th dorsal and 3d plantar interosseous.

PHALANGES: (14): shaft convex above, concave below; posterior extremity concave, anterior is convex. [2, after metatarsus.] **1st row**: *artic.* metatarsal and 2d row. *Musc.*: big toe, (5); *extensor brevis digitorum*, *transversus pedis*, *abductor*, *adductor* and *flexor brevis pollicis*. Second, (2); 1st and 2d dorsal interosseous. Third, (2); 3d dorsal and 1st plantar interosseous. Fourth, (2); 4th dorsal and 2d plantar interosseous. Fifth, (3); *flexor brevis* and *adductor minimi digiti*, 3d plantar interosseous. **2d row**: *artic.* 1st and 3d phalanges. *Musc.* big toe, (2); *extensor*

and *flexor longus pollicis*. Remaining toes, (4 each); *flexor brevis digitorum*, and *ext. longus* and *brevis digitorum*, *lumbricales*. 3d row: *artic.* 2d phalanges. *Musc.* (3 each); *extensor longus* and *brevis*, and *flexor longus digitorum*.

OSSICULA AUDITUS, (3): **Mal'leus**: head, neck manubrium (handle), *processus brevis* and *gracilis*. *Artic.* (1); *incus*. *Musc.* (3); *laxator major* and *minor tympani*, *tensor tympani*. **In'cus**: body, short and long processes, *os orbiculare*. *Artic.* (2); *malleus*, *stapes*. *Musc.* none. **Sta'pes**: head, neck, base, *crura*. *Artic.* (1); *incus*. *Musc.* (1); *stapedius*.

RÉSUMÉ OF OSTEOLOGY.

Name of Bone.	Number of Articulations.	Number of Muscles attached.	Primary Developmental Centres.
Occipital	6	12	4
Parietal.....	5	1	1
Frontal.....	12	3	2
Temporal	5	14	4
Sphenoid.....	12	12	10
Ethmoid	15	none	3
Nasal	4	none	1
Maxillary Sup.....	9	9	4
Lachrymal	4	1	1
Malar.....	4	5	1
Palate.....	7	4	1
Turbinated Inf....	4	none	1
Vomer	6	none	2
Maxillary Inf.....	2	14	2
Hyoid.....	none	11	5
Sternum.....	16	10	6
Ribs (12)	24	19	34
Clavicle.....	3	6	2
Scapula.....	2	17	7
Humerus.....	3	21	7
Ulna.....	2	13	3
Radius.....	4	9	3
Scaphoid.....	5	none	1
Semilunar.....	5	none	1
Cuneiform	3	none	1
Pisiform	1	2	1
Trapezium	4	3	1
Trapezoid.....	4	1	1

Name of Bone.	Number of Articulations.	Number of Muscles attached.	Primary Developmental Centres.
Os Magnum.....	7.....	1.....	1
Unciform.....	5.....	2.....	1
Metacarpal (5).....	19.....	18.....	10
Phalanges (14).....	23.....	20.....	28
Vertebræ (24).....	72.....	39.....	85
Sacrum.....	4.....	5.....	11
Coccyx.....	1.....	4.....	4
Innominatum.....	3.....	33.....	3 and 5
Femur.....	3.....	23.....	5
Patella.....	1.....	4.....	sesamoid
Tibia.....	3.....	10.....	3
Fibula.....	2.....	9.....	3
Calcis.....	2.....	8.....	1
Cuboid.....	4.....	1.....	1
Astragalus.....	4.....	none.....	1
Scaphoid.....	4.....	1.....	1
Int. Cuneiform.....	4.....	2.....	1
Mid. Cuneiform.....	4.....	none.....	1
Ext. Cuneiform.....	6.....	2.....	1
Metatarsal (5).....	21.....	13.....	10
Phalanges (14).....	23.....	23.....	28
Malleus.....	1.....	3.....	?
Incus.....	2.....	none.....	?
Stapes.....	1.....	1.....	?

ACTION OF MUSCLES.

Head is moved *forwards* by platysma myoideus, sterno-mastoid, rectus capitis anticus major, rectus capitis anticus minor (assisted by, when jaw is fixed), mylo-hyoid, genio-hyoid, genio-hyoglossus, digastricus. *Backwards* by trapezius, splenius capitis, complexus, trachelo-mastoid, rect. cap. post. maj., rect. cap. post. min., obliquus cap. superior. *Sideways* by platysma myoideus, sterno-cleido-mastoid, trapezius, splenius capitis, splen. colli, trachelo-mastoid, complexus.

Neck: *forwards* platysma myoideus, sterno-cleido-mastoid, digastricus, mylo-hyoid, genio-hyoid, genio-hyoglossus, omo-hyoid, sterno-hyoid, thyro-hyoid, rect. cap. ant. major and minor, longus colli. *Backwards* by trapezius,

rhomboideus minor, serratus posticus superior, splenius capitis, splenius colli, complexus, trachelo-mastoid, transversalis colli, inter-spinales colli, rect. cap. post. maj. and minor, obliquus capitis superior and inferior, scalenus posticus, levator anguli scapulæ. *Sideways* by the above in conjoined action, and the scaleni, inter-transversales, recti-laterales.

Trunk: *forwards* by rectus abdominis, pyramidalis, obliquus externus and internus abdominis, psoas magnus and parvus; assisted by (when arms are carried forwards) pectoralis major and minor, serratus magnus. *Backwards*, trapezius, rhomboideus major, latissimus dorsi, serratus posticus superior and inferior, sacro-lumbalis, longissimus dorsi, spinales dorsi, semi-spinalis dorsi, multifidus spinæ, inter transversalis dorsi et lumborum. *Laterally*, obliquus externus and internus, quadratus lumborum, longissimus dorsi, sacro-lumbalis, serratus posticus, latissimus dorsi.

Scapula: *forwards* by pectoralis minor, serratus magnus. *Backwards*, trapezius, rhomboidei, latissimus dorsi. *Upwards*, trapezius, levator scapulæ, rhomboidei. *Downwards*, trapezius, latissimus dorsi, pectoralis minor.

Humerus: *forwards*, deltoid, pectoralis major; assisted, sometimes, by biceps, coraco-brachialis. *Backwards*, deltoid, teres major and minor, triceps (long head), latissimus dorsi. *Inwards*, pectoralis major, latissimus dorsi. *Rotated inwards*, subscapularis, assisted by pectoralis major, lat. dorsi, teres major. *R. outwards*, supra-spinatus, infra-spinatus, teres minor.

Forearm: *forwards*, biceps, brachialis anticus, pronator radii teres; assisted by flex. carpi rad., flex. sublimis digitorum, flex. carpi ulnaris, supinator longus. *Backwards*, triceps, anconeus. *Rotated inwards*, pronator radii teres, flex. carpi radialis, palmaris longus, flexor sublimis dig., pronator quadratus. *R. outwards*, biceps, supinator brevis, extensor secundi internodii pollicis.

Carpus: *forwards*, flex. carpi radialis, palmaris longus, flex. sublimis and profundus dig., flex. carpi ulnaris, flex. longus pollicis. *Backwards*, ext. carpi rad. long. and brev., ext. secundi internodii pollicis, ext. indicis, ext. com. dig., ext. prop. pollicis. *Outwards*, flex. carpi rad., ext. carpi rad. long. and brevior, ext. ossis metacarpi pol., ext. primi internodii pol. *Inwards*, flex. sublim. and

profund. digitorum, flex. and ext. carpi ulnaris, ext. com. dig., ext. min. digiti.

Thumb: *inwards* and *forwards*, opponens, flex. brevis and flex. long. pollicis. *Outwards* and *backwards*, ext. ossis metacarpi, ext. primi and secundi internodii pollicis. *Upwards* and *away from fingers*, abductor, flex. brev. pollicis. *Backwards* and *towards fingers*, adductor, ext. primi and secundi pollicis.

Fingers: *flexed*, flex. sublimis and profundus dig., lumbricales, flex. and abductor minimi digiti. *Backwards*, ext. communis, ext. minimi digiti and indicis. *Outwards*, interossei, abductor indicis and minimi digiti. *Inwards*, interossei, abductor minimi digiti.

Thigh: *forwards*, psoas mag., iliacus, tensor vaginæ fem., pectineus, adductor longus and brevis. *Backwards*, glut. max. and med., pyriformis, obdurator intern., add. mag., biceps, semitend., semi-membranosus. *Inwards*, psoas mag., iliacus, pectineus, gracilis, the 3 adductors, obturator extern., quad. femoris. *Outwards*, tens. vag. fem., the 3 glutæi, pyriformis. *Rotated inwards*, tens. vag. fem., glut. med., and, if leg extended, sartorius, semi-tendinosus. *R. outwards*, glut. max. and med., pyriformis, gemelli, obturatores, quad. fem., psoas mag., iliacus, the 3 adductors, biceps femoris.

Leg: *flexed*, semi-tendinosus, biceps, semi-membranosus, gracilis, sartorius, popliteus. *Extended*, rectus fem., crureus, 2 vasti.

Foot: *inwards*, ext. prop. pollicis, flex. long. dig., flex. long. pol., tibialis posticus. *Outwards*, the 3 peronei, ext. long. dig. *Flexed*, tibialis anticus, ext. prop. pol., ext. long. dig., peroneus tertius. *Extended*, gastrocnemius, plantaris, soleus, flex. long. dig., flex. long. pol., tib. posticus, peroneus longus and brevis.

Toes: *flexed*, adductor, abductor, flex. longus and brevis pollicis, abductor and flex. brev. minimi digiti, flex. brev. and longus digitorum, flex. accessorius, lumbricales, interossei. *Extended*, ext. long. and brevis digitorum, ext. prop. pollicis. *Inwards*, abductor pollicis, interossei. *Outwards*, add. pollicis and min. digiti, interossei.

TRIANGLES AND SPACES.

ANTERIOR TRIANGLE OF NECK. The anterior triangle of the neck is the space in front of the anterior border of the sterno-mastoideus, and is limited by the following boundaries:—*in front*, median line of the neck from chin to top of sternum; *behind*, the anterior border of sterno-mastoideus; *above*, body of lower jaw, and a line continued from its angle to mastoid process of temporal bone, forming the *base* of the triangle, the apex being at top of sternum; *the floor*, is formed by the following muscles: sterno-thyroideus, sterno-hyoideus, thyro-hyoideus, inferior and middle constrictors of pharynx, anterior belly of digastricus, stylo-hyoideus, mylo-hyoideus, and hyo-glossus. The floor is crossed by the anterior belly of the omo-hyoideus and posterior belly of the digastricus, which subdivide the anterior triangle into three smaller ones, viz.—(1) INFERIOR CAROTID TRIANGLE; (2) SUPERIOR CAROTID TRIANGLE; (3) SUB-MAXILLARY TRIANGLE; *Roof*, this triangle is covered in by integument, superficial fascia, platysma myoides, and deep fascia. Between the layers forming the roof are the cutaneous branches of the facial and superficial cervical nerves. The contents will be enumerated in the description of the subdivisions. (1) **Inferior Carot'id Triangle.** This is the lowermost subdivision of the anterior triangle of the neck, and has the following boundaries; *in front*, median line of neck; *behind*, anterior border of the sterno-mastoideus; *above*, anterior belly of the omo-hyoideus; the *muscles* met with on the floor of space are sterno-hyoideus and sterno-thyroideus; it is covered in by integument, superficial fascia, platysma myoides muscle, and deep fascia. **CONTENTS:** This space contains the following structures: thyroid gland, lower part of larynx and trachea; internal jugular and inferior thyroid *veins*; common carotid and inferior thyroid *arteries*; pneumogastric, recurrent laryngeal, descendens noni, communicans noni, and sympathetic *nerves*. (2) **Superior Carot'id Triangle.** This is the middle of the three subdivisions of the anterior triangle of the neck, its boundaries being: *behind*, anterior border of sterno-mastoideus; *above*, poste-

rior belly of digastricus; *below*, anterior belly of omo-hyoideus; the muscles forming the *floor* are the thyro-hyoideus, hyo-glossus, and the inferior and middle constrictors of the pharynx. The *roof* is formed by the same structures as cover in the inferior carotid triangle. **CONTENTS:** Upper part of larynx and lower part of pharynx; Internal jugular, and those which open into it, viz.—lingual, facial, superior thyroid, pharyngeal and sometimes the occipital *veins*; termination of common carotid, external carotid, internal carotid, superior thyroid, lingual, facial, ascending pharyngeal, and occipital *arteries*; pneumogastric, superior laryngeal, external laryngeal, hypo-glossal, descendens noni, spinal accessory, and sympathetic *nerves*; (3) **Sub-maxillary Triangle.** This is the most superior of the three subdivisions of the anterior triangle, and has the following boundaries: *behind*, posterior belly of digastricus; *above*, lower border of the jaw, and line continued from angle of jaw to the mastoid process; *in front*, median line of neck from the chin to the hyoid bone. (Some anatomists limit this space in front by the anterior belly of the digastricus.) The muscles forming the *floor* are the anterior belly of the digastricus, the mylo-hyoideus, and the hyo-glossus, and its *roof* is formed by the same structures as cover in the superior and inferior carotid triangles. **CONTENTS:** Portion of parotid and submaxillary (salivary), and submaxillary lymphatic *glands* and vessels; internal jugular, commencement of external jugular and venous radicles of anterior jugular, the facial, submental, submaxillary, inferior palatine and ranine *veins*; external carotid, internal carotid, facial, sub-mental, mylo-hyoidean (and several smaller branches) *arteries*; within this space are the mylo-hyoid (branch of inferior dental), the infra-maxillary branches of facial, and the ascending branches of the superficial cervical *nerves*. (The two latter, strictly speaking, are not contents of the triangle, as they ramify in the structures which form its roof.) Deeply situated at the back part of the space are the pneumogastric and glosso-pharyngeal *nerves*. (That portion of the hypoglossal nerve, which lies on the hypoglossus muscle, should be included as one of the contents.) The stylo-hyoideus, the stylo-glossus, origin of the stylo-pharyngeus *muscles*, and stylo-maxillary ligament, may also be given as contents of the space. The stylo-hyoideus is sometimes given as a part of the posterior boundary.

POSTERIOR TRIANGLE OF THE NECK. The posterior triangle of the neck is the space behind the posterior border of the sterno-mastoideus, and has the following boundaries: *in front*, posterior border of sterno-mastoideus; *behind*, anterior border of trapezius; *below (base)*, upper border of the middle third of clavicle; *apex*, meeting of anterior and posterior boundaries at the occiput; *floor (from above downwards)*, splenius capitis, levator anguli scapulae, scalenus medius, scalenus posticus and upper digitation of serratus magnus. The space is covered in by the superficial and deep fascia, and at its lower part by the platysma myoides. The contents will be named in the two following subdivisions of this space which are made by the crossing of the space by the posterior belly of the omo-hyoid, about 1 inch above the clavicles. (1) **Occipital Triangle.** This is the larger of the two divisions. Is bounded *in front* by sterno-mastoid; *behind* by trapezius; *below*, by omo-hyoid. Its *floor* is formed by (from above downwards) splenius, levator anguli scapulae, by middle and posterior scaleni. Is covered by integument, platysma (below), superficial and deep fascia. **CONTENTS:** Spinal accessory nerve, transversalis colli artery and vein, and chin lymphatic glands. (2) **Subclavian Triangle.** So called because best situation for tying subclavian artery in the third part of its course. Is bounded, *above*, by posterior belly of omo-hyoid; *below*, by clavicle; *base* (directed forwards) by posterior border of sterno-mastoid. Varies greatly in size in different subjects, and different positions of same subject. Is covered in by same structures as the Occipital. **CONTENTS:** Descending branches of superficial cervical plexus; brachial plexus nerves; subclavian artery (third part of its course); transversalis colli artery and vein; transversalis humeri (supra-scapular) artery and vein; external jugular vein, and communicating branch with cephalic vein; lymphatic vessels and glands.

SUB-OCCIPITAL TRIANGLE. This is situated immediately below the occipital bone, and beneath the upper part of the complexus muscle. Its boundaries are as follows: *above*, obliquus superior; *below*, obliquus inferior; *behind*, rectus capitis posticus major; the *roof* is formed by the complexus muscle, and the *floor* by the posterior occipito-atloid ligament and posterior arch of the atlas. **CONTENTS:** Vertebral artery and sub-occipital nerve (post. br. of first cervical).

TRIANGLE IN FRONT OF ELBOW-JOINT.

This is bounded, *externally*, by the supinator longus; *internally*, pronator radii teres; *above (base)* a line—imaginary—drawn across the arm two inches above the condyles; *apex*, meeting of the supinator longus and pronator radii teres. This space is *covered in* by skin, superficial fascia and bicipital fascia; the *floor* is formed by the lower part of the brachialis anticus and the oblique fibres of the supinator brevis muscles. **CONTENTS:** (from within outwards): Median nerve; brachial artery and venæ comites (about the centre of the space the artery divides into radial and ulnar); tendon of biceps; musculospiral nerve. (The supinator longus and brachialis anticus must be slightly separated in order to expose this nerve.)

SCARPA'S TRIANGLE. This is situated at the upper part of the anterior surface of the thigh, with apex downwards, immediately below the fold of the groin, and has the following boundaries: *Externally*, sartorius; *internally*, adductor longus; *above (base)*, Poupart's ligament; *apex*, meeting of the sartorius and adductor longus muscles. The space is *covered in* by skin, superficial fascia, fascia lata, and cribriform fascia, and the *floor* is formed (from without inwards) by the iliacus, psoas, pectineus, and small portion of adductor brevis muscles. **CONTENTS:** Femoral sheath (derived from the iliac fascia and fascia transversalis); femoral artery (giving off cutaneous branches and a large deep branch—the profunda femoris); femoral vein (here joined by the saphena and profunda veins); anterior crural nerve and its branches; deep lymphatic glands and vessels and fatty tissue. This is the best point for ligation of femoral artery, the artery lying between the vein (inside) and nerve (outside.)

HESSELBACH'S TRIANGLE. This space is situated at the lower part of the abdominal wall, on either side, and is of surgical importance as being the spot where direct inguinal hernia makes its escape from the abdomen. Its boundaries are: *Externally*, epigastric artery; *internally*, outer margin of rectus abdominis muscle; *below (base)*, Poupart's ligament. The structures entering into the formation of the abdominal wall at this spot are (from without inwards); skin; superficial fascia; inter-columnar fascia; conjoined tendon of internal oblique and transversalis muscles; fascia transversalis; subserous cellular tissue; peritoneum. *These seven structures form the coverings of direct inguinal hernia.*

AXILLARY SPACE. This is of conical form, and is situated between the upper part of the side of the chest, and the inner side of the arm, and has the following boundaries: *In front*, pectoralis major and minor muscles; *behind*, subscapularis, teres major, and latissimus dorsi; *inner side*, upper four ribs and intercostal muscles, and upper part of serratus magnus; upper part of the humerus, the coraco-brachialis and biceps; the *apex* of the cone is directed upwards, and is formed by an interval between the first rib, the clavicle and the upper border of the scapula; its *base* is formed by the skin and axillary fascia stretched across from the lower border of the pectoralis major to the lower border of the latissimus dorsi. **CONTENTS:** Axillary artery and vein and their branches; brachial plexus of nerves, and branches of distribution below the clavicle; a few branches of the intercostal nerves; about ten or twelve lymphatic glands, and a quantity of loose fat and areolar tissue.

POPLITEAL SPACE. This space is situated at the back of the knee-joint; and forms what is called the ham. It is lozenge-shaped, and has the following boundaries: *Externally, above the joint*, biceps; *below the joint*, outer head of gastrocnemius and plantaris; *internally, above the joint*, semi-tendinosus, semi-membranosus, gracilis and sartorius; *below the joint*, inner head of gastrocnemius. The *floor* is formed by the lower part of the back of the femur, the posterior ligament of the knee-joint (ligamentum posticum Winslowii) and the popliteus muscle covered by its fascia. The space is *covered in* by skin, superficial fascia and fascia lata. **CONTENTS:** Popliteal vessels and their branches; termination of external saphenous vein; internal and external popliteal nerves and branches; branch of small sciatic nerve; articular branch of obturator nerve; four or five small lymphatic glands, and a quantity of fat and loose areolar tissue.

THE MEDIASTINUM. This is the space in the middle line of the thorax, formed by the approximation of the pleura on either side, and extends from the sternum in front to the bodies of the vertebræ behind. In no place do the reflected pleuræ come in contact with each other, so that the space between them forms a complete septum, dividing the two pulmonary cavities. The mediastinum is divided into three portions. (1) *anterior*, (2) *middle* and (3) *posterior* which contain all the viscera of the

chest, with the exception of the lungs. The boundaries and contents of the three divisions are as follows. (1) **Anterior Mediastinum.** BOUNDARIES: *In front*, the sternum; *behind*, pericardium; *laterally*, pleuræ; contains origin of sterno-hyoideus muscles; origin of sterno-thyroideus muscles; triangularis sterni muscle; left internal mammary artery and venæ comites; (the right internal mammary vessels being covered by pleura, are not included among the contents of the space); remains of thymus gland; lymphatic vessels from convex surface of liver, and loose areolar tissue. (2) **Middle Mediastinum.** BOUNDARIES: *In front*, anterior mediastinum; *behind*, posterior mediastinum; *laterally*, pleuræ. Contains the heart enclosed in pericardium; ascending portion of aorta; superior vena cava; bifurcation of trachea; pulmonary artery and veins; phrenic nerves (from third, fourth and fifth cervical); arteriæ comites nervi phrenici (from internal mammary). (3) **Posterior Mediastinum.** BOUNDARIES: *In front*, pericardium and root of lungs; *behind*, vertebral column; *laterally*, pleuræ. Contains descending aorta; vena azygos major; vena azygos minor; superior intercostal veins; pneumogastric nerves; greater splanchnic nerves; œsophagus; thoracic duct and lymphatic glands and vessels.

ROOT OF LUNG. This is formed by bronchus; pulmonary artery; pulmonary veins; bronchial vessels; bronchial glands; anterior and posterior plexuses of nerves; connective tissue. The following are the relations of the pulmonary veins, pulmonary artery and bronchus: **RIGHT SIDE**, *from before, backwards*: veins, artery, bronchus. *From above, downwards*: bronchus, artery, veins; **LEFT SIDE**, *from before, backwards*, same as right side. *From above, downwards*: artery, bronchus, veins.

THE INGUINAL CANAL and HERNIÆ. The inguinal or spermatic canal commences at the *internal abdominal ring*, and terminates at the *external abdominal ring*, its length being about one and a half inches. It serves for passage of the *spermatic cord*, with its vessels, in the male, and the *round ligament* in the female. This canal is bounded in *front*, by the integument, superficial fascia, aponeurosis of external oblique and partly by the outer third of the internal oblique; *behind*, by the conjoint tendon, triangular ligament, fascia transversalis, areolar tissue, fat, peritoneum; *above*, by the arch of the internal oblique and transversalis; *below*, by union of fascia transversalis.

with Poupart's ligament. It is of great surgical importance on account of being the channel through which **Inguinal Herniæ** escape from the abdomen. Inguinal herniæ are of two kinds, *oblique* and *direct*. The former enters the inguinal canal through the internal abdominal ring, passes obliquely along the canal and through the external ring to descend into the scrotum. *Direct* inguinal hernia escapes from the abdomen at Hesselbach's triangle, and then passes through the external ring. **External ring** is $1\frac{1}{2}$ inches above Poupart's ligament; has for its *inner pillar* the fascia of the external oblique; for its *outer pillar*, Poupart's ligament and fibres of fascia. The *intercolumnar* fascia extends between the pillars at their lower portion. **Internal ring** is $\frac{1}{2}$ inch above Poupart's, in the transversalis fascia, between pubes and anterior spine of ilium. Is an oval opening, long axis being perpendicular. On the internal margin, just above peritonæum, are the epigastric vessels; the *transversalis fascia* here gives the *infundibuliform* to cord and testes, and transversalis covering to hernia. **Coverings of Hernia.** *Oblique:* Integument; superficial fascia; intercolumnar fascia; cremaster muscle; fascia transversalis, or infundibuliform fascia; areolar tissue and peritonæum. *Direct:* Integument; superficial fascia; intercolumnar fascia; conjoined tendon of internal oblique and transversalis muscles; fascia transversalis; areolar cellular tissue; peritoneal sac.

CRURAL, or FEMORAL CANAL, and FEMORAL HERNIA. This canal is a funnel-shaped interval which exists within the femoral sheath between its inner wall and the femoral vein; it is of great surgical importance as being the space into which the sac of femoral hernia is protruded. It is $\frac{3}{4}$ to $\frac{1}{2}$ inch long, extending from Gimbernat's ligament to saphenous opening. Its *anterior wall* is formed by transversalis fascia, falci-form process and Poupart's ligament; its *posterior wall*, by iliac fascia and pubic portion of fascia lata; *outer wall*, by the septum, between it and femoral vein; *inner wall*, by junction of transversalis and iliac fascia; *upper orifice*, closed by septum crurali and a small gland; *lower*, or *saphenus* orifice, by cribriform fascia. It is limited above by the *crural* or *femoral ring*, and is lost below by the adhesion of the sheath to the coats of the vessels. In the normal state the canal is occupied by loose cellular tissue, and numerous lymphatic vessels which perforate the *cribriform fascia*, covering the

saphenous opening in the fascia lata, and the walls of the sheath to reach a lymphatic gland situated at the crural ring. This gland is retained in its position by a thin layer of sub-serous cellular tissue—*sep'tum crurale*—which, together with the peritoneum, separates the canal from the abdominal cavity. The **Cru'ral ring** is the point where femoral herniæ leave the abdomen, and is the most frequent seat of strangulation; its boundaries are: *In front*, Poupart's ligament; *behind*, pubes, covered by pectineus and pubic portion of fascia lata; *externally*, septum separating femoral vein; *internally*, the sharp margin of Gimbernat's ligament, conjoined tendon, transversalis fascia and deep crural arch. **Fem'oral sheath** is formed, *anteriorly*, by transversalis fascia, and anterior portion of fascia lata; *posteriorly*, by iliac fascia and pubic portion of fascia lata. **Crib'riform fascia** is from deep layer of superficial fascia; is attached to falciform process. **Superficial fascia**: Superficial layer, over Poupart's ligament connecting abdominal fascia with fascia lata; deep layer up to Poupart's, above, from its connection with femoral sheath. **Fascia lata**: The *iliac portion* from spine ilium and Poupart's, throwing *falciform process* over pubic portion, almost transversely to the pubes; at top it is adherent to the femoral sheath; the *pubic portion*, from Poupart's ligament and pubes, lying below internal saphenous vein, passes beneath femoral sheath to become attached to pectineal line and capsule of hip-joint. The **Coverings of Fem'oral Hernia**, commencing at the surface, are: Integument; superficial fascia; cribriform fascia; femoral sheath or fascia propria; septum crurale; areolar tissue and fat; peritoneal sac.

ERUPTION OF TEETH.

DECIDUOUS, 20 in number: *central incisors*, 7th mo.; *lateral incisors*, 7—10 mo.; *ant. molars*, 12—14th mo.; *canine*, 14—20 mo.; *post. molars*, 18—36th mo.

PERMANENT, 32 in number: *first molars*, 6½ years; *two mid. incisors*, 7th year; *two lat. incisors*, 8th year; *first bicuspids*, 9—10th year; *sec. bicuspids*, 10—11th year; *canine*, 11—12th year; *sec. molars*, 12—14th year; *wisdom*, 17—21st year.

Those of the lower jaw generally precede those of the upper by one or two months.

GYNÆCOLOGICAL SECTION.

THE 13 MUSCLES OF THE FEMALE PERINÆUM.

Erec'tor Clitori'dis (2, or a pair); arise from anterior region of pubic and ischic rami—into clitoris, at junction of *cru'ra clitori'dis*.

Bul'bo Caverno'sus (2): arise from perineal body and aponeurosis, superior portions—portion into crus of same side, near insertion of erector muscle; the outer portion winds inwards, under erector muscle to the bulb of the vagina, near its isthmus (under the clitoris). A few fibres pass up over the clitoris, and also up to the pubes.

Tranver'sus Perinæ'i Superficia'lis (2): arise from ramus of ischium, in front of tuberosity, and from anterior aponeurosis of the perineal septum—perineal body and integument in front of anus.

Sphinc'ter A'ni Exter'nus: *deep portion*, from tip of coccyx; *superficial portion*, from integument—perineal body, central portion.

Pu'bo-Coccygæ'us (2): from posterior surface of pubes, and aponeurosis—*outer margin*, into the last two bones of coccyx; *inner margin* of each muscle commingles with its fellow of the opposite side, forming loops that pass between the vagina and rectum, and that unite with the deep sphincter ani.

Obtura'to-Coccygæ'us (2): from ilio-pubic line of junction between obturator and recto vesical fascia—sides of last two bones of coccyx. (Has no rectal connection.)

Is'chio-Coccygæ'us (2): from spine of the ischium and aponeurosis—sides of the bones of the coccyx.

NOTE.—The three last named muscles go to form, in the male, what is known as the *levator ani* muscle.

The *pubo-* and *obturato-coccygeal* muscles draw forwards, and assist in closing, the rectum. The *pubo-coccygeal* is also the constrictor of the vagina, *not* the bulbo-cavernosus, as usually given; this muscle (the bulbo-cavernosus) is the compressor of the vaginal bulb, and in contracting draws the labia together.

ARTERIAL SUPPLY OF THE FEMALE GENITALIA.

U'TERUS: This organ receives its supply on each side from three sources: I. The *Ovarian* (or spermatic) arteries, branches of the abdominal aorta. II. A *Branch of the Epigastric* (which passes along the round ligament) which

is from the external iliac. III. The *Uterine*, which is a branch of the internal iliac.

VAGINA: This organ receives its blood supply from 5 arteries, all *Branches from the Internal Iliac*, anterior trunk—except the circumflex uterine, which is a branch of the uterine—viz.: 1st. Vaginal artery, a branch from the anterior trunk of the internal iliac, supplying lower third anterior wall; 2d. Vaginal branches from the uterine artery, supplying middle and upper third; 3d. Vaginal branches from circumflex uterine, supplying upper third. 4th. Vaginal branches from inferior vesical, supplying lower third. 5th. Vaginal branches of hemorrhoidal, supplying lower third.

OVARIA: The ovaries are supplied by the *Ovarian* arteries, branches of the abdominal aorta. These, having reached the inferior border of the glands, suddenly give off ten or twelve branches, which ascend, in a fan-shaped plexus, dividing and intertwining, to the hilum, or inferior portion; then they penetrate the substance proper of the ovary to still further subdivide and anastomose, and finally enmesh the walls of the Graffian follicles.

PERINÆUM and PUDEN'DA: These portions of the female anatomy are supplied with the following branches from the *Internal Pudic*: 1st. Inferior hemorrhoidal (2 branches.); 2d. Transverse perineal; 3d. Vulvar, or superficial perineal; 4th. Bulbar branches; 5th. Deep branch to crus; 6th. Dorsal branch to clitoris. Also the *Superficial External Pudic*, a branch of the femoral, arising about $\frac{1}{2}$ inch below Poupart's ligament; after piercing the fascia lata at saphenus opening it runs inwards to supply the labia of that side, anastomosing with branches of the internal pudic. *Deep External Pudic*, another branch of the femoral, given off near the former, passes inwards, on pectineus muscle, to pierce fascia lata and be distributed to the labia of that side, anastomising with the vulvar.

ABDOMINAL AOR'TA: Extends from the diaphragmatic opening to the body of the 4th lumbar vertebra. See page 33. The branches being in order, 1st, Phrenic; 2d, Cœlic axis; 3d, Supra-renales; 4th, Superior mesenteric; 5th, Renales; 6th, *Ovarian* or *Spermaticæ*; 7th, Inferior mesenterica; 8th, Lumbales; 9th, Sacra media and the two terminal branches, Common Iliacs. *Ovaria'næ* or *Spermaticæ* arise from the front part of the aorta abdominalis, a little below the renal; are long slender vessels (though shorter than in the male) one on each side, and pass down and out-

wards across the ureter of their respective sides, beneath the peritoneum, lying on the psoas muscle; arriving at the pelvis each passes inwards between the broad ligament, laminae to be distributed to the ovary. Two small branches are given to each Fallopian tube, and another to the uterus, which anastomoses with the uterine arteries. Other small branches are continued down the round ligament, through the inguinal canals, to integument of the groins and labia.

ILIACÆ COMMUNES: See page 34.

Iliacæ Exter'na: See page 35; from the junction of sacrum with the last dorsal vertebra around pelvic brim to femoral arch; terminal branches being epigastric and circumflex iliac. *Arte'ria Epigastrica:* from a few lines above Poupart's ligament, it descends to this ligament, then ascends obliquely upwards and inwards, between peritoneum and transversalis fascia, to the umbilicus. It lies behind the inguinal canal, to the inner side of internal abdominal ring (just above the margin of the femoral ring) and in front of the round ligament. It here gives a *branch* to this ligament, that follows the round ligament back to and supplying the uterus, as well as ligament, with arterial blood.

Iliacæ Inter'na: See also page 34. From sacro-dorsal vertebral junction to the great sacro-sciatic foramen, then dividing into its two terminal branches, I. the *Anterior* and II. *Posterior* trunks. Is a short, thick vessel.

POSTERIOR TRUNK. This is a short, rather thick artery dividing into 1st, *Superior*; 2d, *Ilio-lumbar*; 3d, *Lateral Sacral* branches, and which arteries supply the muscular parts in these regions.

ANTERIOR TRUNK; This is the most important branch. For the 3 *vesical branches* of this trunk and *middle hemorrhoidal*, see page 34. **ARTE'RIA UTERI'NA,** a large branch on each side descending between the two laminae of the broad ligaments, near their sacro-iliac attachment, in company with the ureter, to a point somewhat below the level of the ostium externum uteri, then it turns upwards, between the uterine attachments of the broad ligaments, and, in a tortuous course, close to the uterine body, it reaches the Fallopian tube, there inosculating with the terminal branches of the ovarian (spermatic) artery. In its course it gives numerous small branches to the substance of the uterus and adjacent organs. Its main branch is the circular artery. *Obturator:* this is frequently a branch of the uterine artery, passing out of

the foramen of same name, below the obturator nerve. *Vesicalis Inferior*, with its "inferior vaginal branch," passes down to supply the lower portion of the bladder and vagina. *Vaginal Branches*, that supply the middle part of the vagina. *A. Utero-cervicalis*, the largest branch, which inosculates with its fellow and forms the so-called "circular artery" about the neck of the uterus. This is the artery that is liable to be wounded in performing trachelorrhaphy. *Fallopian branches*: these go to furnish the tube with a part of the arterial supply. *A. VAGINALIS*: descends to lower third of vagina to supply structures there adjacent. *HEMORRHOIDA' LIS INFERIOR*: passes down to lower portion of rectum, furnishing there a small *vesical branch* and numerous small *vaginal branches*. *PUDI'CA INTER'NA*: this is the smaller of the terminal branches of the anterior trunk, though the one that mainly supplies the pudenda. It passes down and outwards to greater sacro-sciatic foramen, emerging from pelvis through it, lying between the pyriformis and coccygeus muscles; it then crosses spine of ischium, re-entering pelvis through lesser sacro-sciatic foramen, and ascends, on the rami of the ischium and pubes, in a canal in the obturator fascia, to terminate in the dorsalis clitoridis. The branches in its course are, the *superior vesicalis*, sometimes with its remains of the impervious foetal hypogastric. Two *inferior* or *external hemorrhoidal branches* that supply, in part, the lower portion of rectum. *A. perina'i transversalis*, runs transversely inwards, just beneath the transverse perinaal muscle, supplying the adjacent structures. *Vul'var branch* or *perina'i superficialis*, which is larger than corresponding branch in the male, ascends midway through the anterior perineal space, beneath the superficial fascia, supplying lower portion of vulva and superior perinaeum. *Bulbar branch*, supplying the bulb of the vagina, lying beneath the labium majus. *Profunda vul'var branch*, running deeply upwards to supply the crus clitoridis. *Arte'ria dorsalis clitori'dis* which runs downwards and forwards on the dorsum to the glans clitoridis, there inosculating with its fellow. *A. SCIAT'ICA*: this is the larger of the terminal branches of the anterior trunk, and is distributed to the muscles at the back of the pelvis; see pages 35 and 42.

NERVOUS SUPPLY OF THE FEMALE GENITALIA.

UTERUS: This organ is poorly supplied with cerebro-spinal nerve fibres, the main nervous supply being from the sympathetic system; however, branches from the *second, third and fourth sacral nerves*, and a few filaments of the *sacral plexus*, go to help form the *Inferior Hypogastric Plexus* which is its main source of supply, through the *uterine nerves* that follow closely the course of the uterine arteries. The **FUNDUS** is supplied with branches from the *Ovarian (spermatic) Plexuses*. The **MIDDLE** portion, with branches from a prolongation of the *Hypogastric Plexuses*. The **LOWER** portion, with the anterior branches from the *Inferior Hypogastric Plexus*. All these plexuses inosculate freely with themselves, between the folds of the broad ligament, and literally enmesh the uterus.

OVARIA: These organs are supplied, mainly, with branches from the *Ovarian Plexuses*; a branch, however, of the *Hypogastric plexus*, by the way of the uterus and Fallopian tube (uterine nerve) also reaches each of them.

VAGINA: The main sentient nerve is the *Pudic*, and its branches; which see further on. The vagina is, moreover, completely enmeshed with the numerous inosculating branches of the *Inferior Hypogastric Plexus* of the sympathetic system, and which plexus has frequent communication with the cerebro-spinal system through the branches of the *Internal Pudic*.

PERINÆUM and VULVA: These parts are supplied by the various terminal branches of I. *Pudic* (from sacral plexus); II. The pudendal branch of the *Small Sciatic* (from lower part of sacral plexus); III. Terminal branches of the *Ilio-Inguinal* (branch of 1st lumbar); IV. Genital branch of the *Genito-Crural* nerve (branch 2d lumbar); V. The Sympathetic System through numerous branches from the *Inferior Hypogastric Plexus*.

Nervus Pudica: This nerve arises from lower portion of the *Sacral Plexus* [this plexus is made up of 5 nerves, viz.; the *lumbo-sacral*, and the anterior branches of the *three upper*, and part of the *fourth, sacral nerves*] soon joins company with the internal pudic artery, and leaves the pelvis through the greater sacro-sciatic foramen, to cross the ischic spine and re-enter the pelvis through the lesser sacro-sciatic foramen. It then ascends, lying to the inside of its artery, the ischic and pubic rami, in a sheath

of the obturator fascia, to end in the terminal branch, the dorsal nerve of the clitoris. *Hæmorrhoidalis inferior*: from near origin of pudic [sometimes arises from the fourth sacral] traverses the ischio-rectal fossa, to be distributed to the external sphincter, and anal integument, inosculating with inf. pudendal and superficial perineal. *Musculares posteriores*: several branches given off to supply the triform muscle, and upper border of sphincter ani. *Posterior Superficialis*: given off just below tuberosity of ischium, passes upwards and inwards to mesial line, supplying perineal muscles and integument, and lower portion of labia. *Anterior Superficialis*: given off at point about one-half inch above tuberosity, passes upwards and inwards to supply upper $\frac{2}{3}$ of the labia. *Anastomotica*: small branch given off a little below level of meatus urinarius, to *inosc.* with the pudendal branch of the small sciatic. *Dorsalis Clitoridis*: the pudic is continued up the pubic rami to the root of the clitoris, piercing the suspensory ligament, and becomes the dorsal nerve of the clitoris. It (one on each side) accompanies the dorsal artery to the glans, where it, through its numerous branches and inosculations with the sympathetic system, hoods over this organ. Savage asserts that the clitoris, in comparison with its size, has four or five times the nervous supply that the penis has.

Nervus Pudenda'lis: This nerve is a small branch of the *small sciatic* nerve (formed usually by the union of two branches from lower part of *sacral-plexus*, see page 50), and is given off from that nerve just at the back of the tuberosity ischii. It passes diagonally upwards and inwards, over the course of the ischic and pubic rami, and gives branches to supply the labia, and overlying integument, gracilis muscle; its terminal branches reach the pubes, supplying the crus, clitoris and integument, anastomosing freely with the terminal branches of the ilio-inguinal, and pudic nerves.

Ilio-Inguinalis: The ilio-inguinal nerve, a branch from the *1st lumbar*, runs around the abdominal walls, above the brim of the pelvis, and escapes at the external abdominal ring; its *terminal branch* runs down to the pubes supplying the mons and the superior portions of the labia and clitoris with its filaments, which here *inosc.* with the terminal branches of the pudic and pudendal branch of the small sciatic nerves.

NERVUS SYMPATHETICUS. This is the nerve of all nerves that supplies the female (as well as male) genita-

lia. Through its perverted influence is to be attributed the thousand-and-one reflex ills that female flesh is heir to. **Plex'us Ovaria'nus** or *Spermat'icus*: this is derived from the *Renal Plexus* (the Renal is formed from branches from the solar plexus, semi-lunar ganglion, aortic plexus, and greater and lesser splanchnic nerves); it also receives branches from the *aortic plexus*. It descends on the sides of the vertebræ to the ovaries, there supplying them; it then follows, down the tubes to the uterus (supplying both these organs) there inosculating with branches from the hypogastric plexus. **Plex'us Hypogas'tricus**: is situated in front of the promontory of the sacrum, between the common iliac arteries. It is formed by a union of filaments from the *aortic plexus*, all the *lumbar* and the *first two sacral ganglia*. It bifurcates below, forming the two inferior hypogastric (pelvic) plexuses. It supplies upper portion of rectum and a few branches to the uterus. **Plex'us Hypogas'tricus Inf'e'rior**: This is the pelvic plexus (one on each side) and is the source of chief nervous supply to the rectum, vagina, bladder and uterus. It is formed by the continuation downwards of the bifurcated *hypogastric plexus*, branches from the *second, third and fourth sacral nerves*, and a few filaments from the *sacral ganglia*. This plexus spreads out and enmeshes the viscera in the pelvic cavity with its inosculating filaments; these have received, from the placement of several aggregations of the filaments, the names of *inferior hæmorrhoidal, vesical* and *vaginal plexuses*.

All the above mentioned plexuses are in free communication with all the minor plexuses (phrenic, cœliac axis, gastric, hepatic, splenic, supra-renal, superior and inferior mesenteric) and the large solar plexus, and the cerebro-spinal system, through their many inosculating branches, from one plexus to another; hence this furnishes the physiological and anatomical reason for the many reflex symptoms seen in distant organs when the uterus and ovaries are diseased.

POINTS WORTH REMEMBERING.

- Largest artery*—Abdominal aorta.
 ' *nutrient artery*—Tibial.
 ' *synovial membrane*—At the knee-joint.
 " *muscle*—Glutæus maximus.
 " *nerve*—Sciaticus magnus.
 " *vein*—Vena cava.

Longest muscle—Sartorius.

“ *tendon*—Plantaris.

Branchless artery—Common carotid (except the terminal branches.) There are also no branches from the *cervical* portion of the internal carotid.

Veins carrying arterial blood—Pulmonary. (In the foetus, the veins carrying arterial blood are the umbilical, hepatic and inferior vena cava.)

Artery carrying venous blood—Pulmonary. (In foetus, umbilical, also.)

Nerve perforated by an artery—Sciatic by the comes nervi ischiadici; the arteria centralis retinae also pierces the optic nerve.

Nerve perforated by a vein—Those just named.

Muscle perforated by a muscle—Stylo-hyoid by the digastric.

“ “ “ *large nerve*—Coraco-brachialis by the musculo-cutaneous.

Vein perforated by a nerve—Occasionally the axillary vein by the internal anterior thoracic nerve.

Ligament perforated by a nerve—Sacro-sciatic by the anterior branch of the coccygeal nerve.

Ligament pierced by an artery—The greater sacro-sciatic, by the coccygeal branch of the sciatic artery. The azygos articularis artery also pierces the posterior ligament of the knee-joint.

Membrane pierced by an artery—The thyro-hyoid by the superior laryngeal artery.

Tendons perforated by tendons—These of the flexor sublimis digitorum, of the hands, for the passage of the tendons of the flexor profundus digitorum. In the feet, the tendons of the flexor brevis digitorum are split for the passage of the tendons of the flexor longus digitorum.

Largest branch of the internal carotid artery—Is the middle cerebral; this is the artery that is liable to become plugged by an embolus.

Bones with no muscular attachments—10; ethmoid, nasal, inferior turbinated, vomer, scaphoid, semi-lunar, cuneiform, astragalus, middle cuneiform, incus.

Pillars of the palate—Anterior, formed by projection of palato-glossus muscle; posterior, by projection of palato-pharyngeus muscle.

False vocal cords—Formed by superior thyro-arytænoid ligaments.

True vocal cords—Formed by the inferior thyro-arytænoid ligaments

Hamstrings—Outer formed by tendon of biceps; inner, by the tendons of the gracilis, sartorius, semi-membranosus, and semi-tendinosus.

The palatal veins and muscles, called azygos—Are double, although the term azygos signifies not paired.

Veins with only epithelial walls—Those of the diploë.

Amnios was a term given us by Empedocles (B. C. 450).

Aorta was named by Aristotle (B. C. 384), though he supposed it contained air.

Cataract—The first removal of the lens for this disease was made by Herophilus. Celsus cured the trouble by depressing the lens (couching?).

Dissection—First human dissection after Herophilus' time (Herophilus is said to have dissected 700 subjects) was by Mondini de Luzzi, Prof. of Anatomy at Bologna. Old Alexandria, in times before our era, was famous as being the possessor of two human skeletons; all Greece and Rome flocked there to see them. Montagana (A. D. 1460) boasted that he had examined fourteen human subjects.

Duodenum was named by Herophilus; he also showed the heart to be the beginning of arterial circulation. In fact, he is the father of anatomy. Fallopius (16th century) said of him, "That to contradict him, was like contradicting the gospels;" that he was "the evangelist of anatomists."

Gynecologists—The most prominent ones of early date, so far as surgical procedures are concerned, were Paulus Ægineta (early part of the 7th century) though Aetius (close of the 5th century), Galen (A. D. 131), Soranus (A. D. 98-138), Celsus (about A. D. 60), and even Hippocrates (460 B. C.) treated quite lengthily of the subject. Indeed five Hippocratic treatises on female troubles, were, in early days, in the hands of the medical profession.

Leeches were first employed by Themison (B. C. 30.)

Lexicographer, Medical. The first one was Rufus Ephesius, about A. D. 98 or 117.

Lithotomy was extensively practised in old Alexandria, and the famous oath of Hippocrates (460 B. C.) recognized it as undignified for the physician and surgeon.

Nerves—Their functions were discovered by Herophilus; he overthrew the doctrine that they sprang from the brain-membranes, and proved them to come from the brain itself; their crossing, near their cranial organ, was first proposed by Aræteus, and he, in this way, ac-

counted for a left-sided head injury resulting in a right-sided paralysis.

Physician—This term was first applied to doctors by the people of Charlemagne, A. D. 805.

Pharmacopœia—The first one was issued by an Arabian, Sabor-Ebr-Sahil (9th century) and was called *Krabadin*.

Rhinoplasty was devised by Vincent Vianso, an Italian, who lived in the 15th century; also performed by Brauca and Bojani.

Vein valves were first discovered by Frabricius, during the latter portion of the 10th century.

Tricuspid valves of the vena cava were discovered by Erasistratus, a contemporary of Herophilus. He called them *triglochine*.

Torcula Herophili first described (with *Calamus scriptorius*) and named by Herophilus (about 250 B. C.).

Tinctures were first introduced by Arnold, about the year 1315. He was then a professor at Barcelona.

CIRCULATION.

Cardiac and pulmonic: The venæ cavæ receive the systemic venous blood, and convey it into the right auricle; then it passes into the right ventricle through the tricuspid, or auriculo-ventricular valves, to be thrown into the pulmonic artery (going through the semilunar, or pulmonary valves); is then conveyed to the lungs and oxygenized in the capillary plexus about the intercellular structure and the air-cells, and returned, by the pulmonary veins (4 in number) to the *left* side of the heart, into the left auricle; it then passes into the left ventricle (through the mitral valve) to be forced into the aorta (through the semilunar valves), and from thence to support the system at large.

Fœtal: from the placenta through the umbilical vein to the liver; from thence, by the hepatic veins and *ductus venosus Arantii*, to the inferior vena cava, to the right auricle; the most of the current, guided by the Eustachian valve, passes through the foramen ovale into the *left* auricle, and from thence into the left ventricle, and from thence into the aorta and system at large. A part of the current, however, enters the *right ventricle*, is then forced into the pulmonary artery, and from the imperviousness of the fœtal lungs is most all conveyed to the aorta by the *ductus arteriosus Botalli*. The blood is at last conducted by the umbilical arteries (branches of the internal iliac) to the placenta for re-oxygenation.

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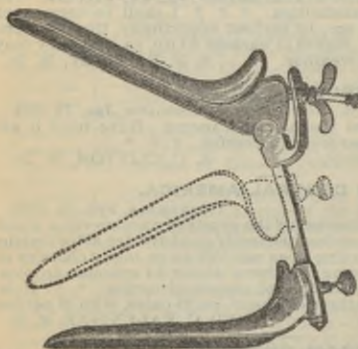
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