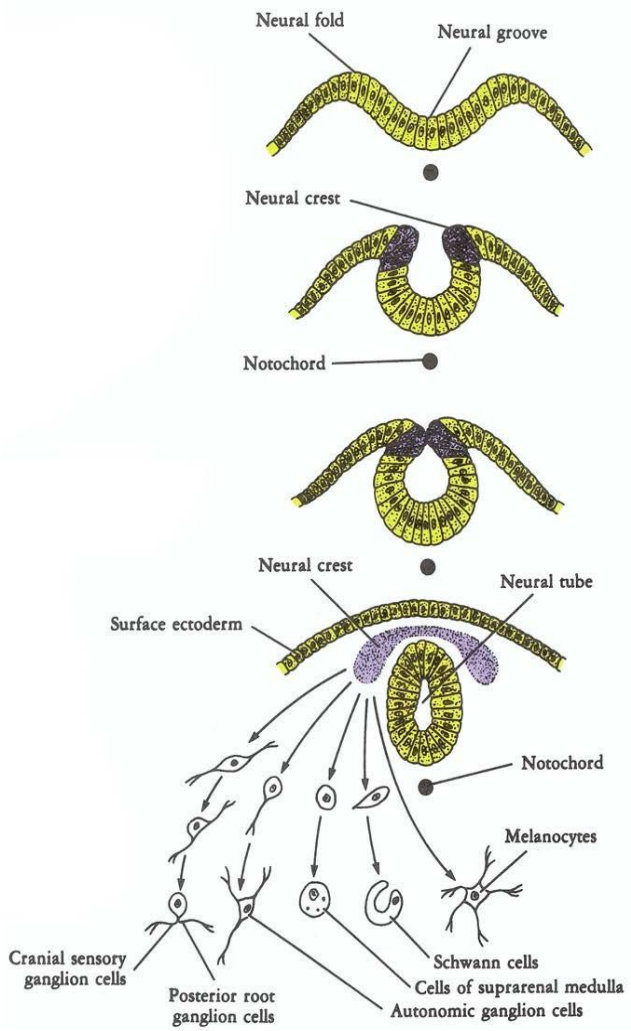
HUBS2103 NOTES- NEURAL & VISCERAL ANATOMY

LECTURE 1- SKULL & TMJ

- **Understand the major processes of CNS and PNS development.**
- **Understand basic embryonic derivatives of the central and peripheral nerve cells.**



- Brain development shapes the internal contours of the braincase.
- Nervous system forms from dorsal layer of 3 layered germ disc.
- Neural groove and neural crest important in forming tube.
- Brain begins as a tube. Primary brain vesicles form in the rostral part of tube. Spinal cord forms in caudal part of tube.
- Notochord develops into nucleus pulpous of intervertebral discs.

- **Process:**
  1. The entire nervous system develops from an infolding of the outer embryonic layer (ectoderm).
  2. This layer also gives rise to the skin, but a long strip of tissue begins to differentiate into nervous tissue, which then infolds and pinches at the end. Forming the **neural tube**.
  3. The neural tube is a tube of cells that will divide to form the brain and spinal cord. The tube develops beneath the **neural crest-** cells from which will go on to form cranial sensory ganglion cells, posterior root ganglion cells, autonomic ganglion cells, Schwann cells, cells of the suprarenal medulla, and melanocytes.
  4. The neural tube forms 3 swellings (vesicles) in the rostral part of the tube (forming the brain) and the spinal cord develops in the caudal part of the tube. The 3 primary swellings/vesicles are termed the fore-, mid-, and hind-brain or prosencephalon, mesencephalon, and rhombencephalon. Each of these 3 vesicles are comprised of further areas:

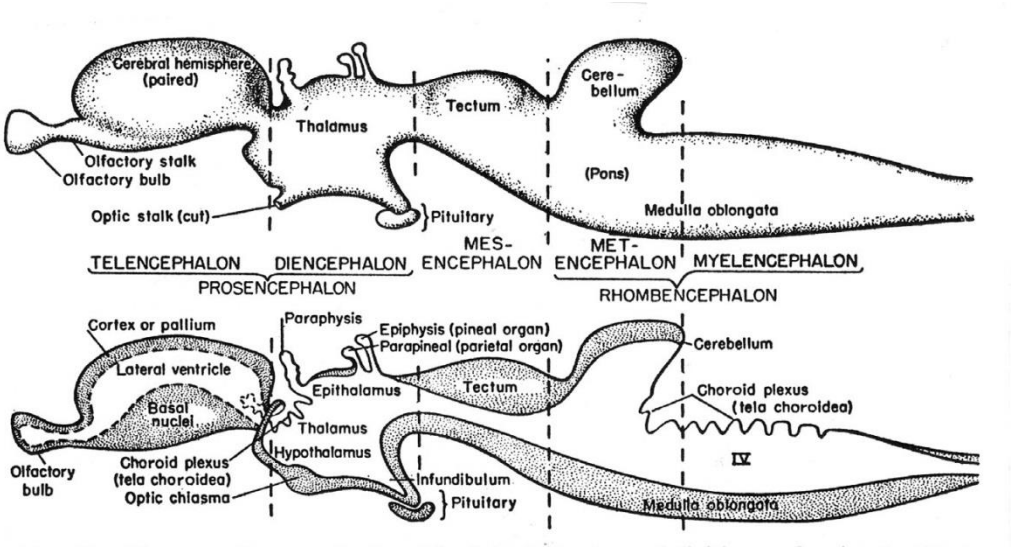
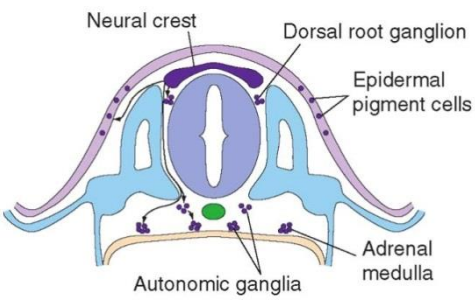


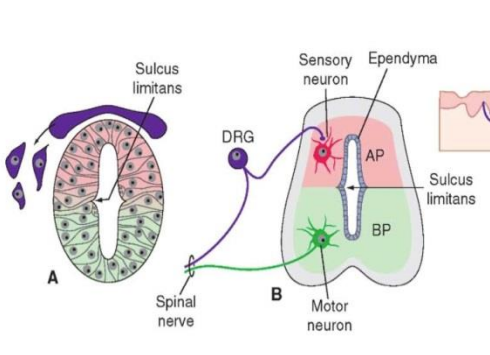
TABLE 2-1 Derivatives of Vesicles of the Neural Tube

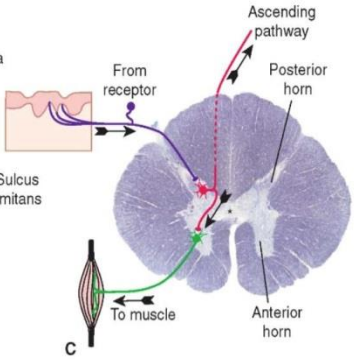
Primary Vesicle	Secondary Vesicle	Neural Derivatives	Cavity
Prosencephalon (forebrain)	Telencephalon Diencephalon	Cerebral hemispheres* Thalamus, hypothalamus, retina, other structures	Lateral ventricles Third ventricle
Mesencephalon	Mesencephalon	Midbrain	Cerebral aqueduct
Rhombencephalon (hindbrain)	Metencephalon Myelencephalon	Pons, cerebellum Medulla	Part of fourth ventricle Part of fourth ventricle, part of central canal

Spinal cord development

- Alar and basal plates mark/outline future sensory and motor regions of the spinal cord (alar plate- sensory and basal plate- motor).
- Notochord develops into nucleus pulposis of intervertebral discs.
- Anencephaly results from failure of anterior/rostral end of neural tube to close.
- Spina Bifida results from failure of neural tube to close.







A. Neural tube 4th week

B. Spinal cord 6th week. Dorsal root ganglion cells derived from neural crest send their central processes into SC to terminate on alar plate. Basal plate cells become motor neurons, with axons on ventral root.

C. Adult spinal cord

- **Be able to identify skull bones and the major foramina (holes) – entry and exit points for major vessels and nerves.**
    - Typically have cranial and facial regions.
    - Human skull comprised of 22 pieces.
    - Evolved to support/protect brain, house and orient cranial sense organs (e.g. eyes, ears), and secure and process food (e.g. teeth, levers, muscle attachments).
    - Blood vessels and nerves enter and exit skull via foramina.
    - CSF which bathes the brain and spinal cord much eventually leave the brain case.
    - 3 cranial fossae- anterior, middle, and posterior.
    - The sphenoid bone lies in the centre of the floor/base of the cranial vault.
    - Sphenoid houses the pituitary in the 'sella tursica' (Turkish saddle).
    - Many holes/foramina (SORS- superior orbital fissure, foramen ovale, foramen rotundum, foramen spinosum).

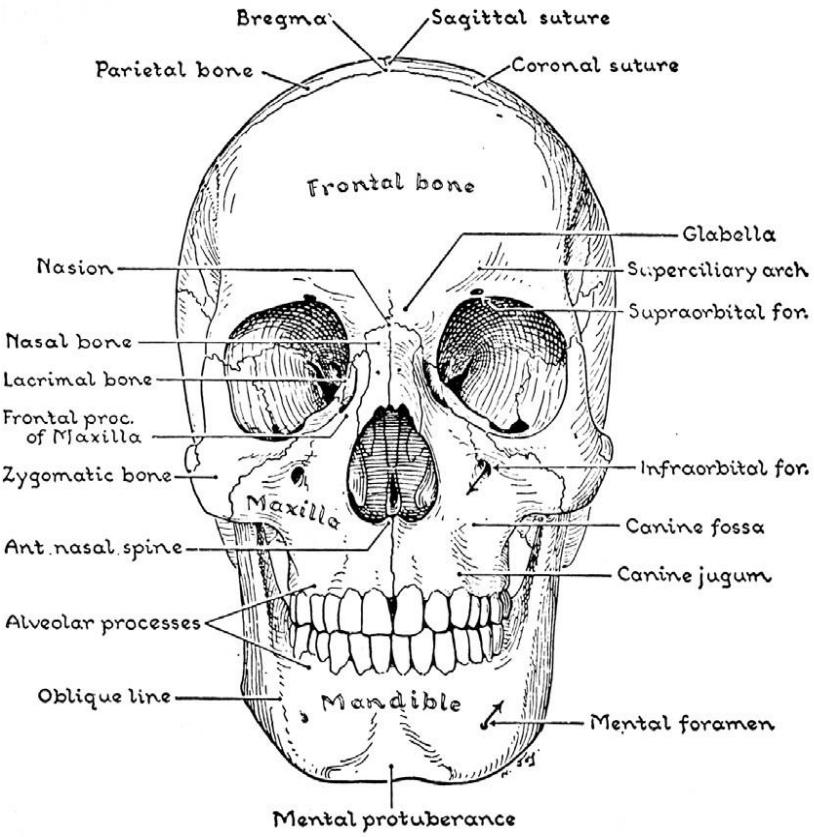


Figure 7.2 Skull on front view (norma frontalis). (From *Grant's Method of Anatomy.*)

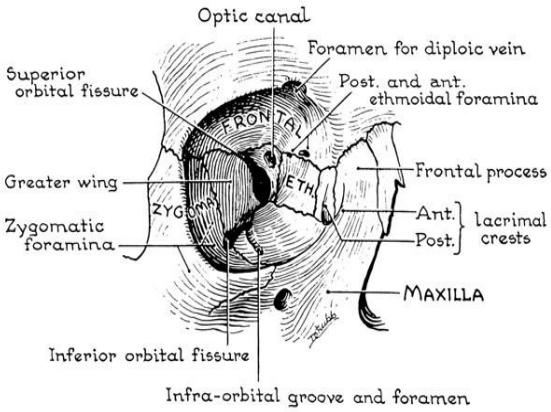


Figure 7.24. Bony walls of the orbital cavity. (From *Grant's Method of Anatomy.*)

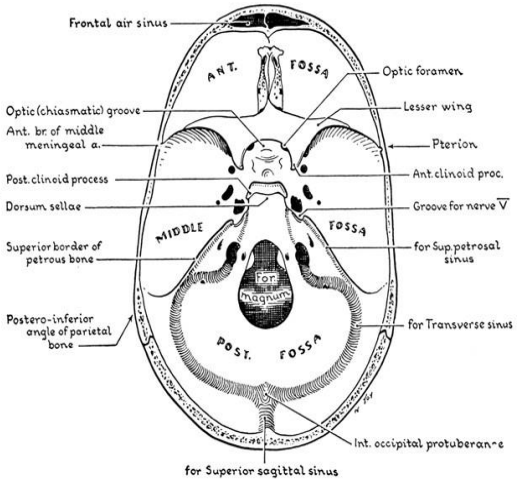


Figure 7.19. Interior of the base of the skull: the three cranial fossae. (From *Grant's Method of Anatomy.*)

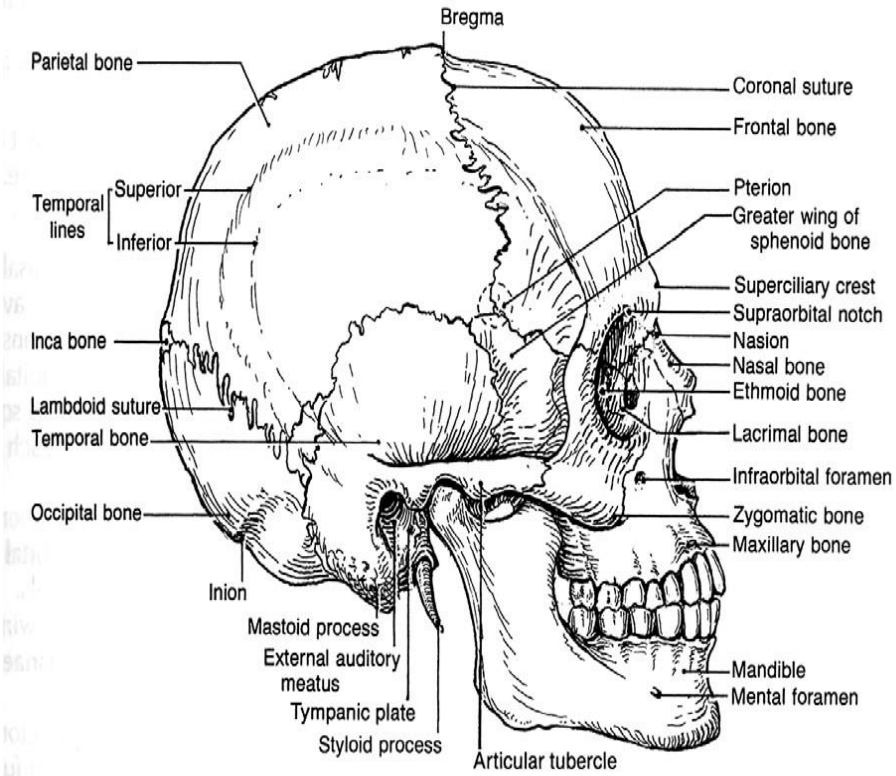


FIGURE 31-3. Lateral aspect of the skull.

- **Describe the embryological origins of cranial nerves from pharyngeal arches.**

Table 9–1 — Structures Derived from Pharyngeal Arch Components*

ARCH	NERVE	MUSCLES	SKELETAL STRUCTURES	LIGAMENTS
First (mandibular)	Trigeminal [†] (CN V)	Muscles of mastication [‡] Mylohyoid and anterior belly of digastric Tensor tympani Tensor veli palatini	Malleus Incus	Anterior ligament of malleus Sphenomandibular ligament
Second (hyoid)	Facial (CN VII)	Muscles of facial expression [§] Stapedius Stylohyoid Posterior belly of digastric	Stapes Styloid process Lesser cornu of hyoid bone Upper part of body of hyoid bone	Stylohyoid ligament
Third	Glossopharyngeal (CN IX)	Stylopharyngeus	Greater cornu of hyoid bone Lower part of body of hyoid bone	
Fourth and sixth [¶]	Superior laryngeal branch of vagus (CN X) Recurrent laryngeal branch of vagus (CN X)	Cricothyroid Levator veli palatini Constrictors of pharynx Intrinsic muscles of larynx Striated muscles of esophagus	Thyroid cartilage Cricoid cartilage Arytenoid cartilage Corniculate cartilage Cuneiform cartilage	

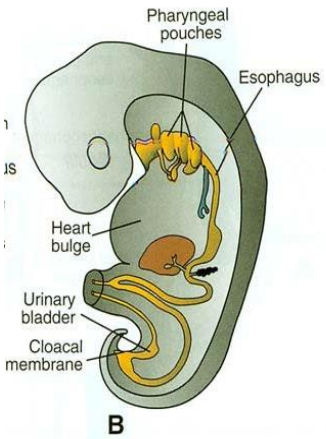
* The derivatives of the pharyngeal arch arteries are described in Chapter 13.

† The ophthalmic division of the fifth cranial nerve (CN V) does not supply any pharyngeal arch components.

‡ Temporalis, masseter, medial, and lateral pterygoids.

§ Buccinator, auricularis, frontalis, platysma, orbicularis oris, and orbicularis oculi.

¶ The fifth pharyngeal arch is often absent. When present, it is rudimentary and usually has no recognizable cartilage bar. The cartilaginous components of the fourth and sixth arches fuse to form the cartilages of the larynx.



eeks of development showing formation of the gastro
rmal germ layer.

- **Describe the structure and anatomical relationships of the temporomandibular joint (TMJ).**
    - A complex and clinically important synovial joint.
    - Hinge and sliding joint with articular disc.
    - Very loose joint capsule, susceptible to dislocation (anterior).
    - Series of ligaments support and arise from the TMJ.
    - Muscles of mastication produce movement around the joint (e.g. temporal, masseter, lateral pterygoid, and medial pterygoid).
    - Moves into elevation/depression, protraction/retraction, and side to side.
    - Located near part of the skull termed the infra-temporal region/fossa.
    - Associated with branches of trigeminal nerve (V CN) and maxillary artery.