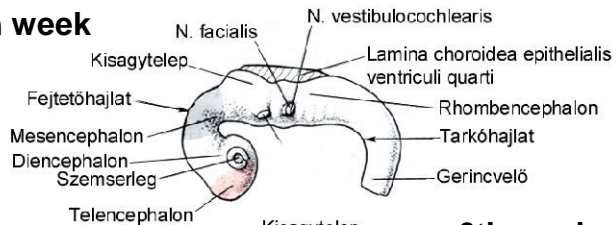


**Macroscopy and development of
the brainstem and cerebellum.
The 4th ventricle.**

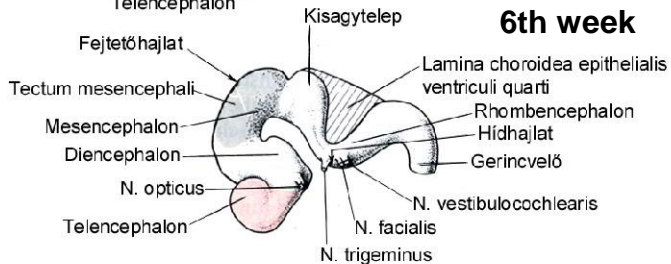
János Hanics M.D. Ph.D.



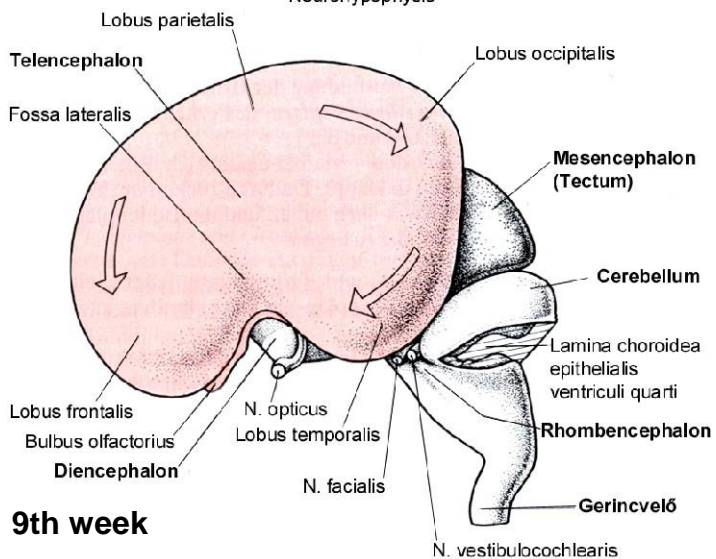
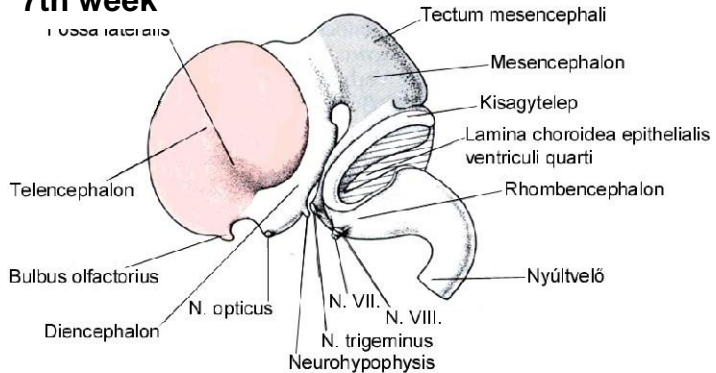
5th week



6th week

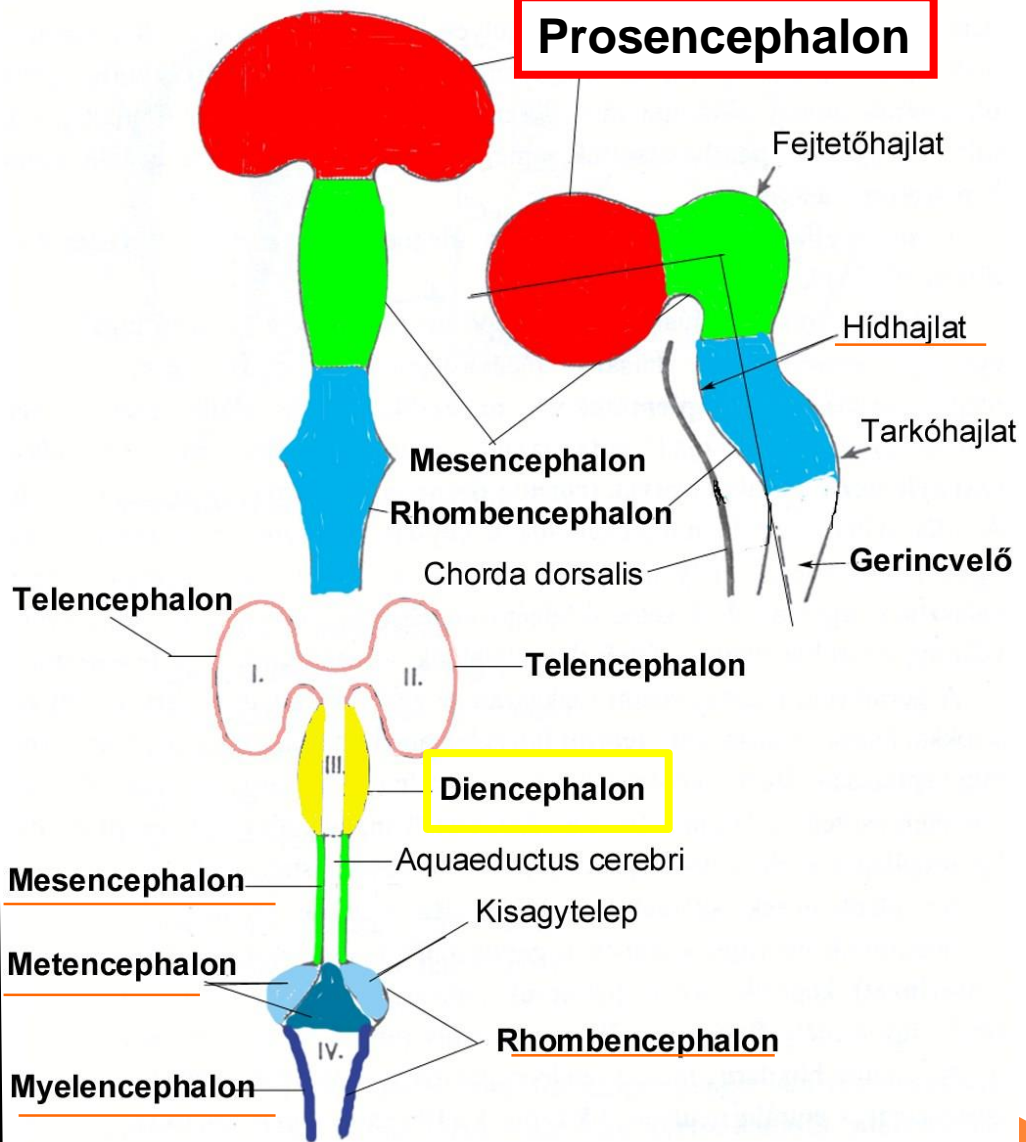


7th week



9th week

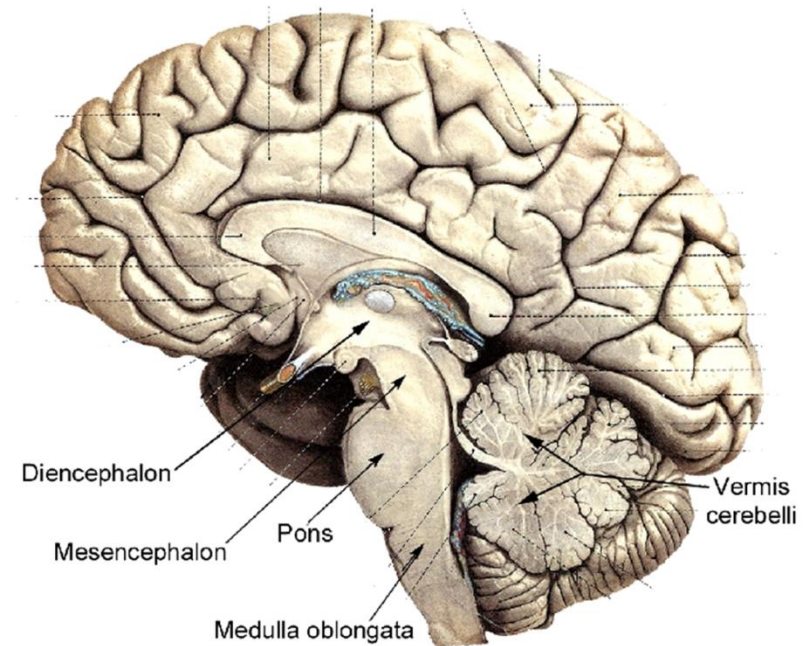
Prosencephalon



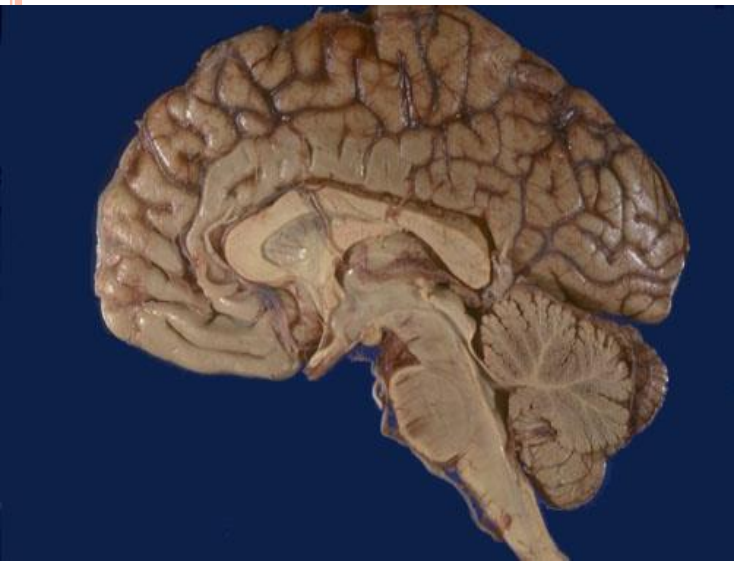
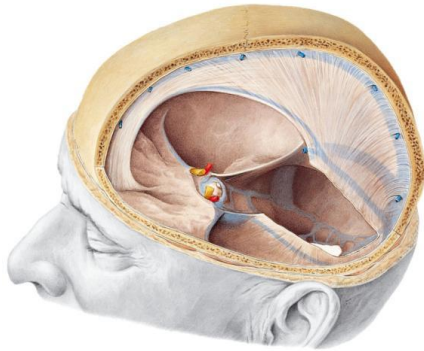
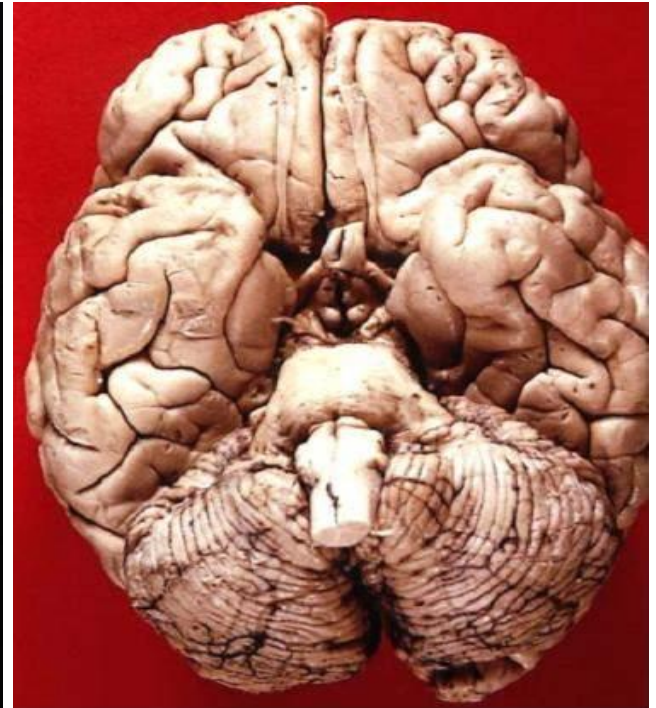
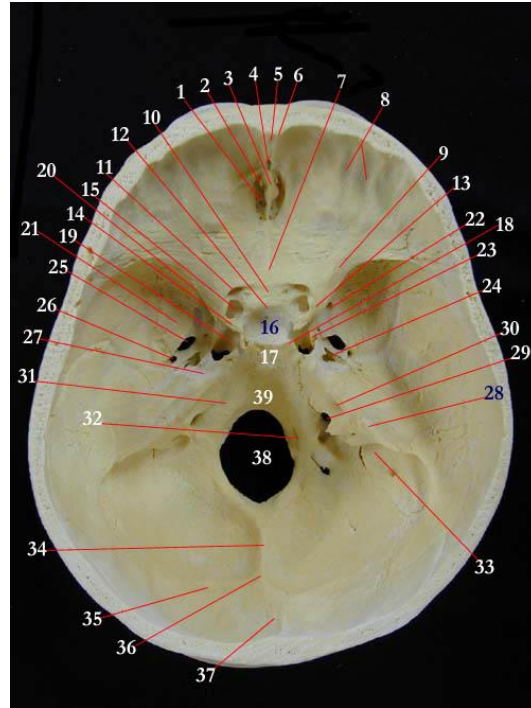
Parts of the brainstem

- Mesencephalon (Midbrain)
- Pons
- Oblongate medulla

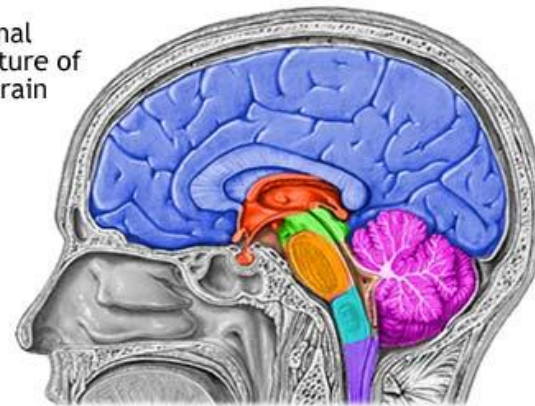
- Incorporated cavities:
cerebral aquaeduct
and IV. ventricle



Position within the skull



Internal structure of the brain



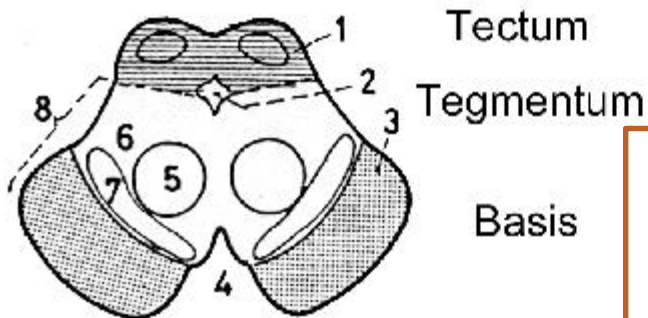
- Spinal cord
- Cerebellum
- Diencephalon
- Pons
- Medulla Oblongata
- Midbrain
- Cerebral hemisphere



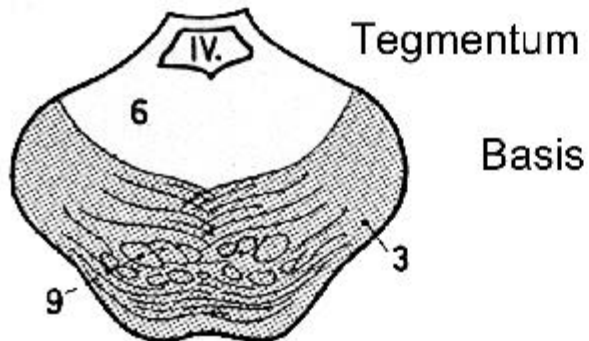
Cross sections of the brainstem

3 level arranged in the longitudinal axis:

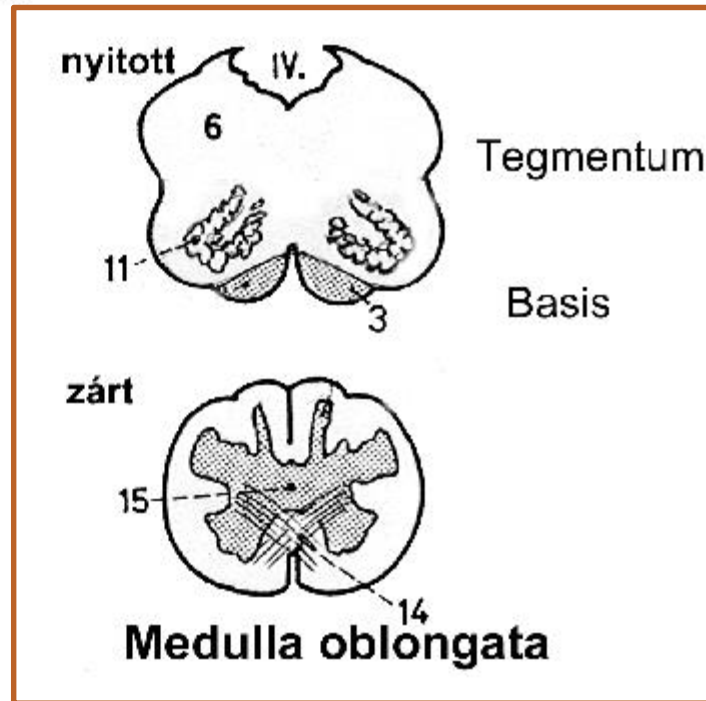
- 1) Tectum + tegmen ventriculi quarti (dorsal)
- 2) Tegmentum (middle)
- 3) Basis (ventral)



Mesencephalon



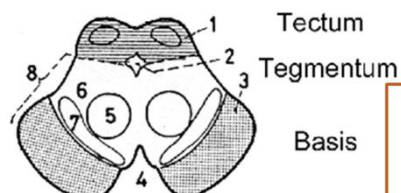
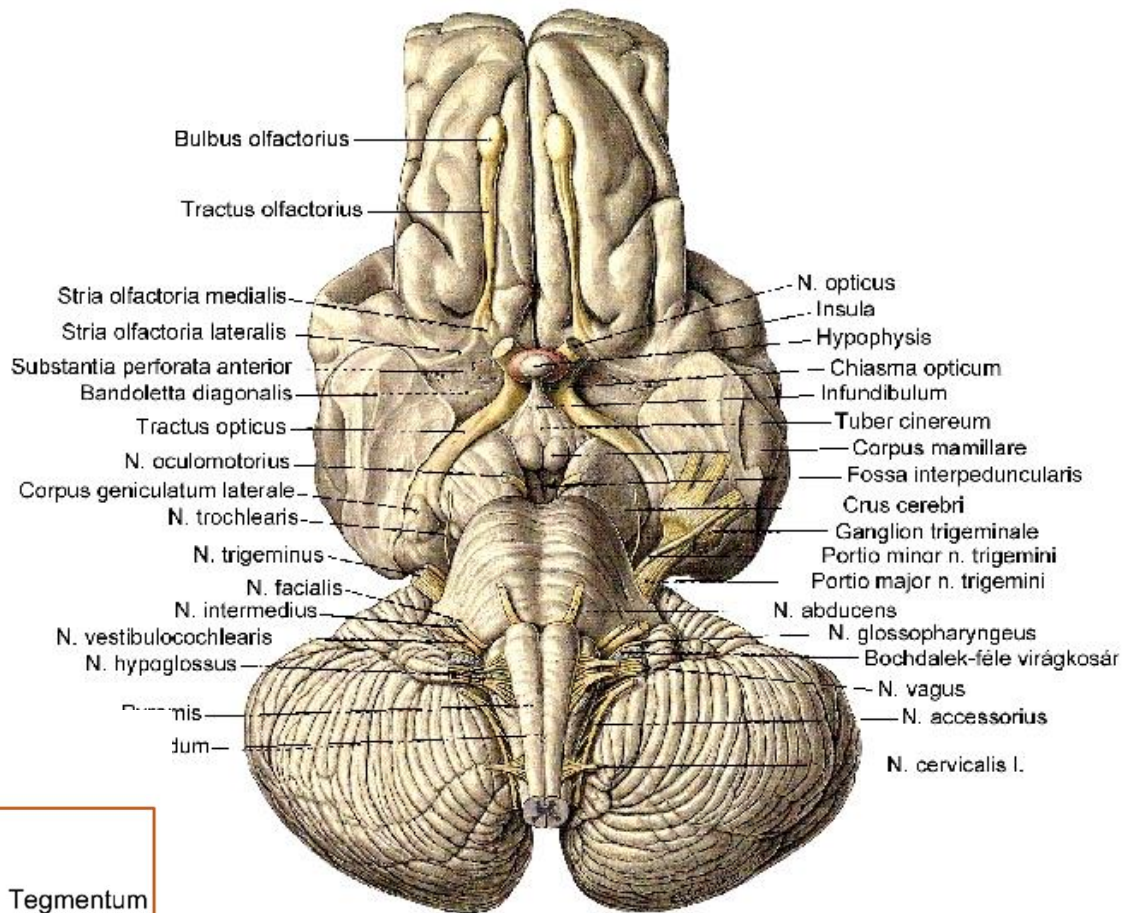
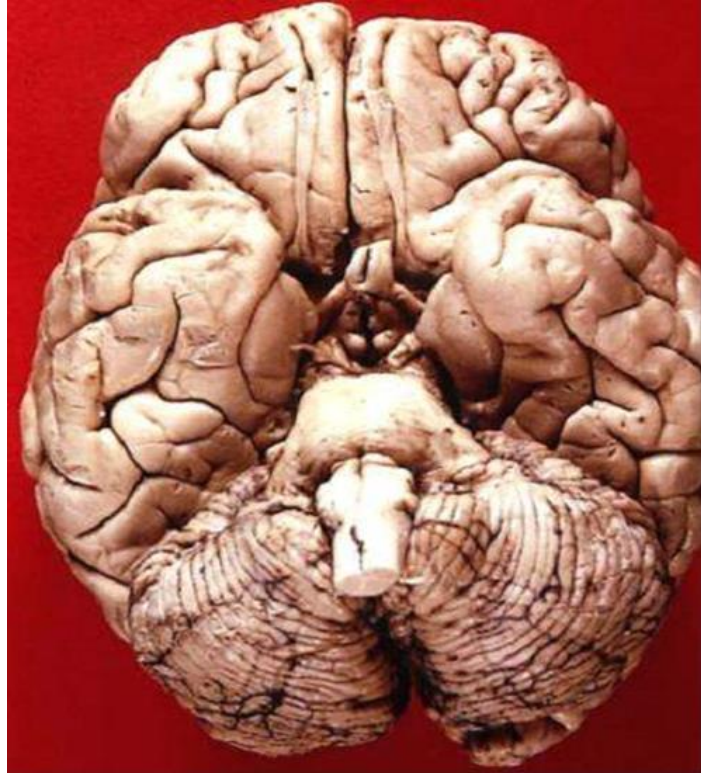
Pons



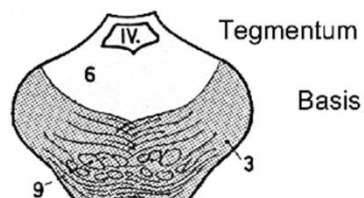
Medulla oblongata



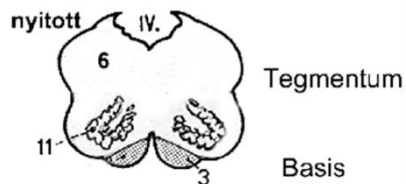
Ventral aspect of the brainstem



Mesencephalon



Pons



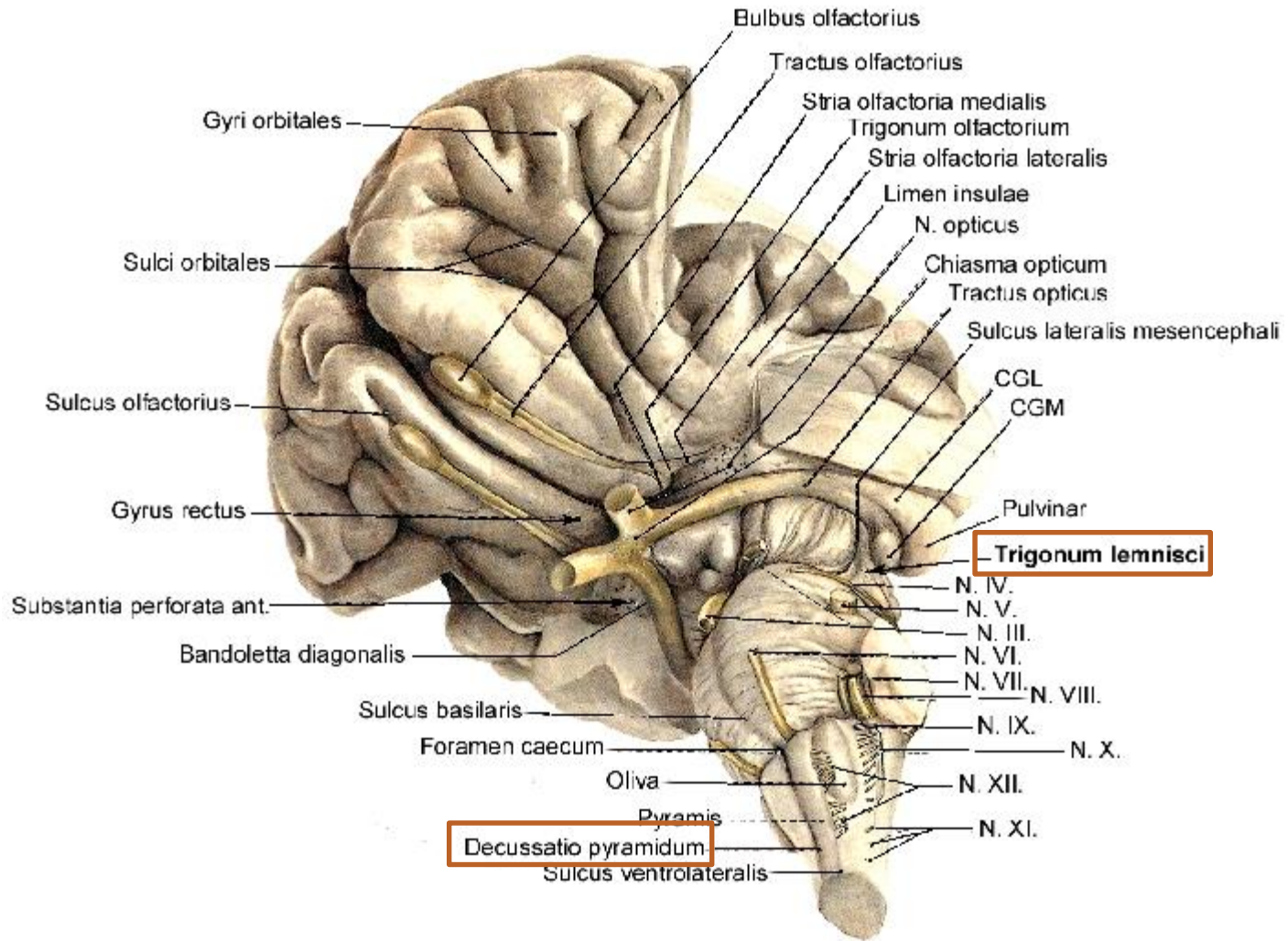
The exits of cranial nerves (from brain, dura and skull)

The *real cranial nerves* (CN III-XII.) originate from the brainstem (=midbrain, pons, medulla). 1st and 12nd cranial nerves are not real cranial nerves because they are extensions of the brain (CNS!).

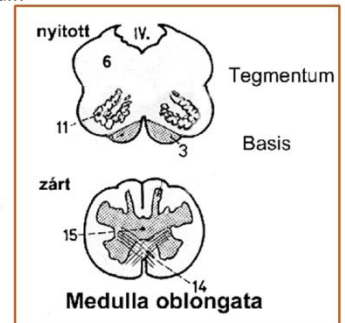
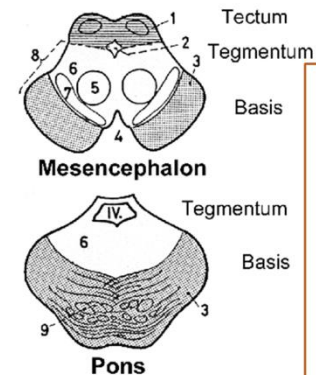
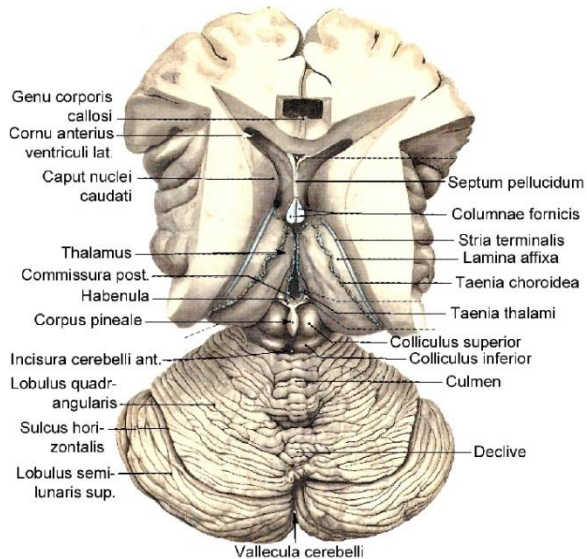
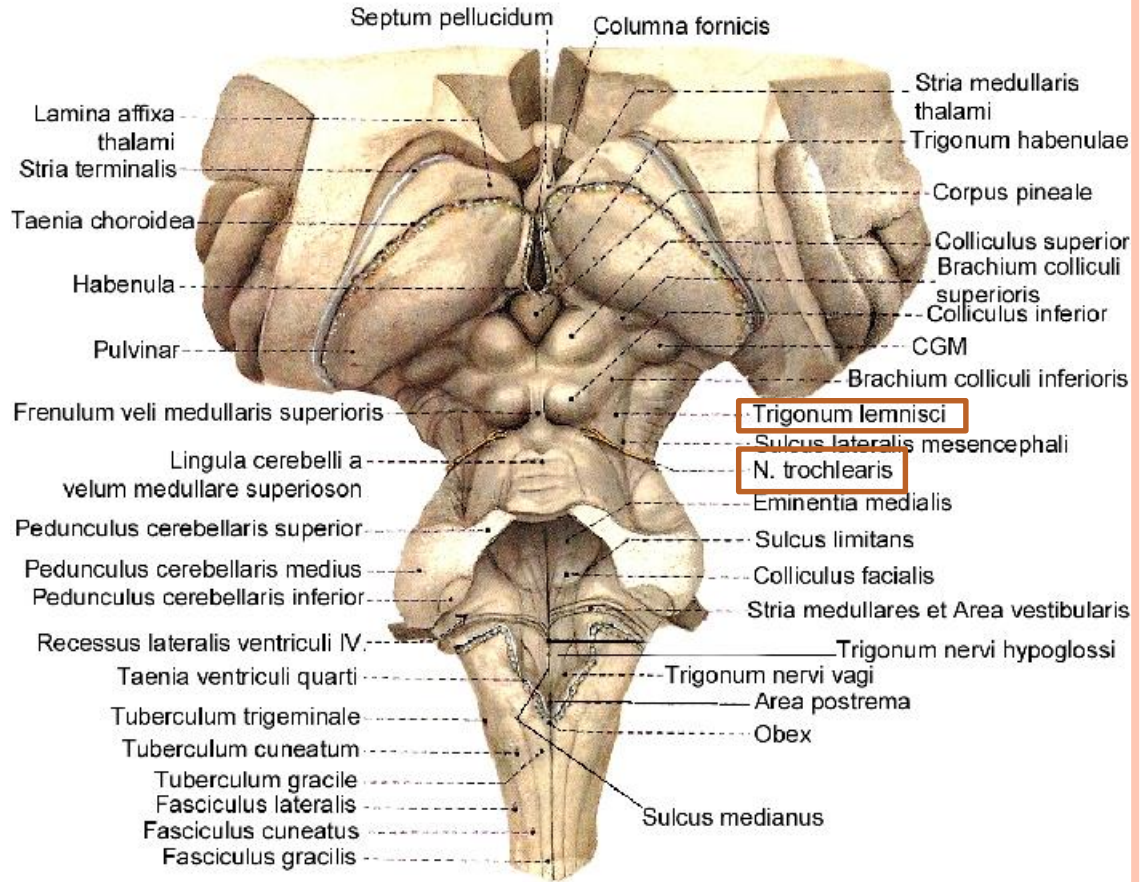
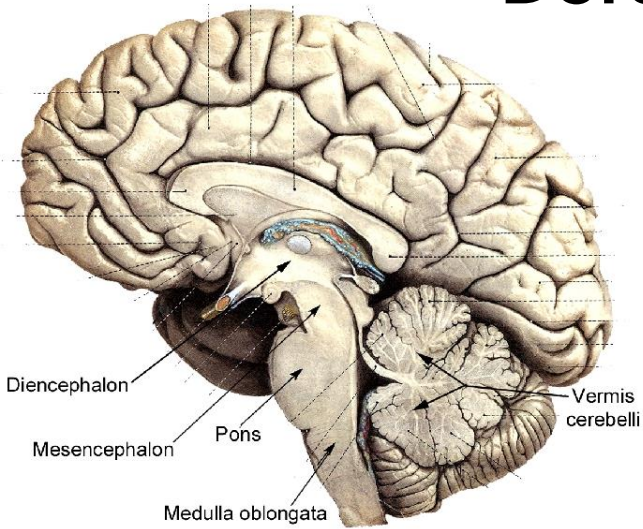
	Brain exit	Dural exit	Skull (cranial) exit
I. Olfactory nerve	Olfactory bulb	Cribriform plate	Cribriform plate
II. Optic nerve	Optic chiasma	At the posterior pole of the eyeball (!)	Optic canal
III. Oculomotor nerve	Oculomotor sulcus (=medial sulcus of crus cerebri) in the interpeduncular fossa ; between post. cerebral a. and sup. cerebellar a.	Cavernous sinus (lateral wall) Enters btw. the ant. and post. petroclinoidal folds	Sup. orbital fissure
IV. Trochlear nerve	Below inferior colliculi; both sides of the frenulum of sup. medullary velum Note: n. IV. is the only cranial nerve which exits out the DORSAL aspect of the brain!!	Cavernous sinus (lateral wall) Enters within the ant. petroclinoidal fold	Sup. orbital fissure
V. Trigeminal nerve	Btw. pons and brachium pontis, anteriorly - larger, sensory root inferiorly, motor root superiorly	Trigeminal (Meckel's) cave V/1.: cavernous sinus (lateral wall) V/2.: cavernous sinus (lateral wall) V/3.: For. ovale	V/1.: Sup. orbital fissure V/2.: For. rotundum V/3.: For. ovale
VI. Abducent nerve	At the ponto-medullary junction , on both sides of foramen cecum	Cavernous sinus (freely!) Ascends in the clivus in the <i>Dorello's canal</i> ; enters the cavernous sinus far below the post. petroclinoidal fold	Sup. orbital fissure
VII. Facial nerve*	Btw. pons and brachium pontis, posteriorly - in the cerebello-pontine angle	The fundus of the internal acoustic meatus	
VIII. Vestibulocochlear nerve	Btw. pons and brachium pontis, posteriorly - in the cerebello-pontine angle; laterally from n. VII.		
IX. Glossopharyngeal nerve	In the lateral parolivary sulcus (superiorly)	Jugular foramen (anterior part: pars nervosa)	
X. Vagus nerve	In the lateral parolivary sulcus (below n. IX.)		
XI. Accessory nerve	In the lateral parolivary sulcus (inferiorly) - the <i>cranial roots</i> of n. XI. From spinal segments C1-6 the <i>cervical or spinal roots</i> of n. XI.		
XII. Hypoglossal nerve	In the medial parolivary sulcus	Hypoglossal canal	

* nervus intermedius exits between n. VII. and n. VIII. but belongs to n. VII. (parasympathetic and taste fibres)

Lateral view

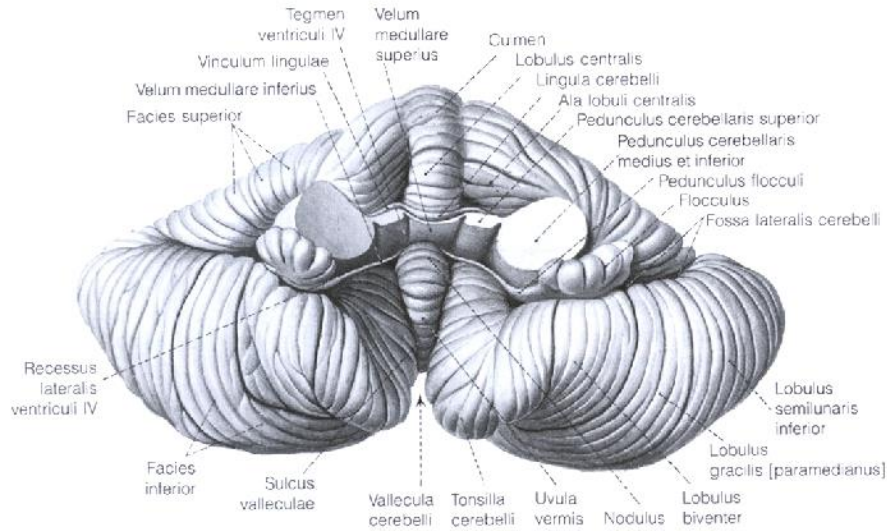


Dorsal aspect of the brainstem

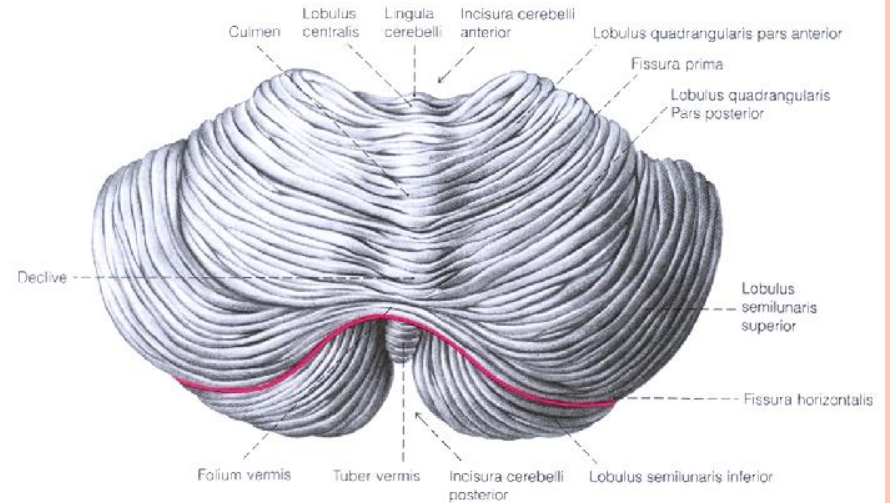


Cerebellum

Folia cerebelli – thin „gyri”



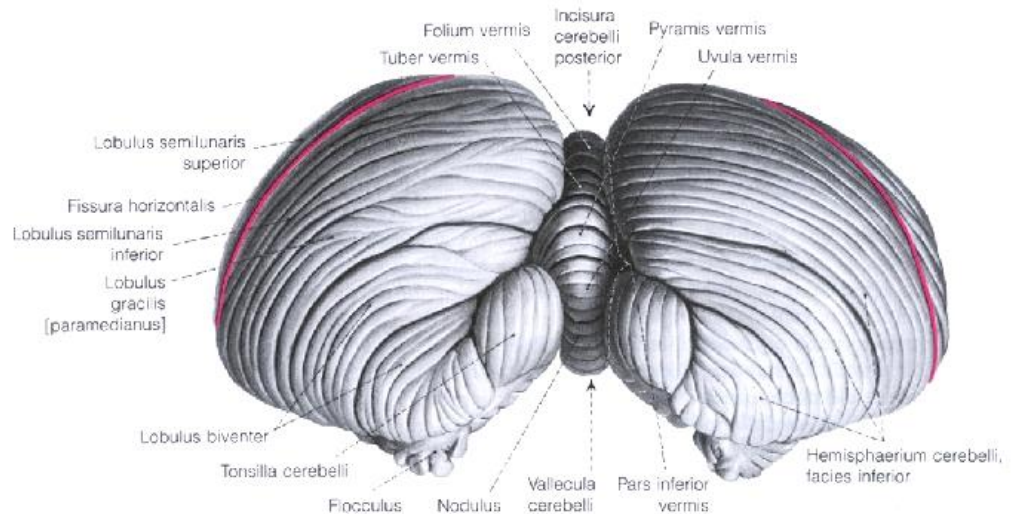
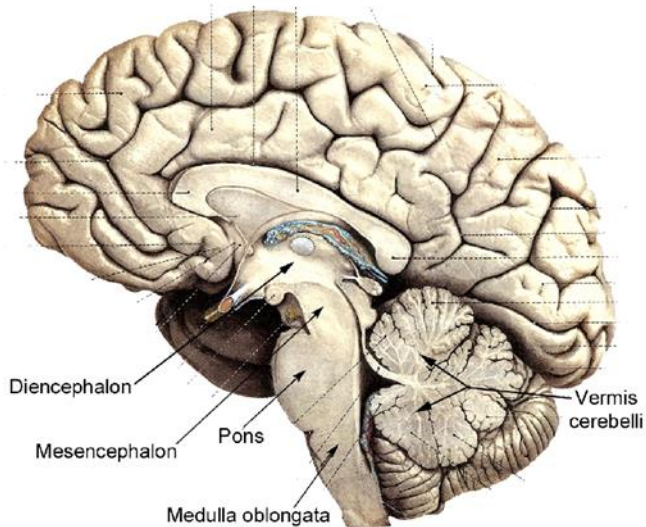
Fissura cerebelli – Between lobes



Vermis

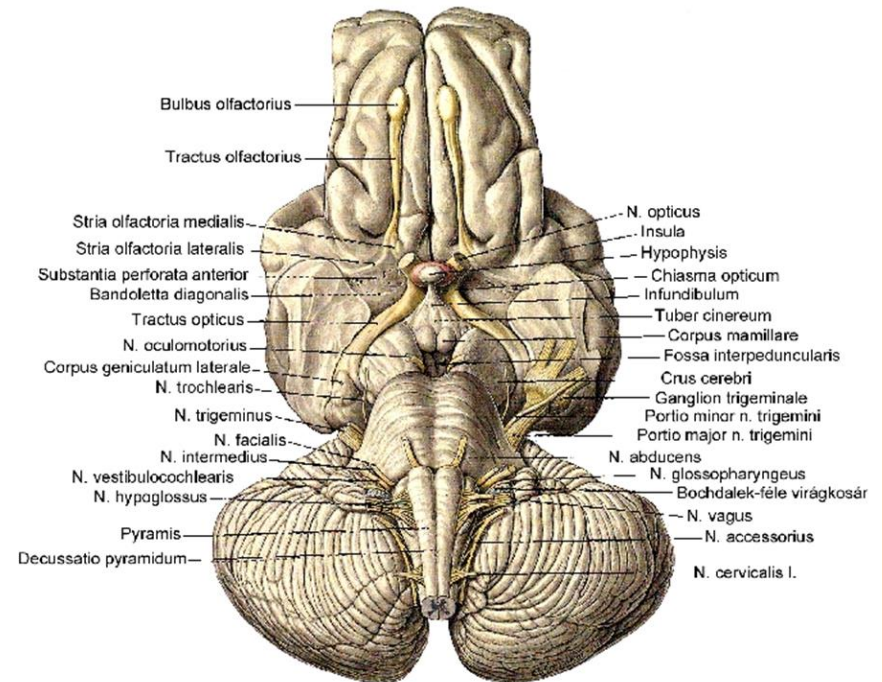
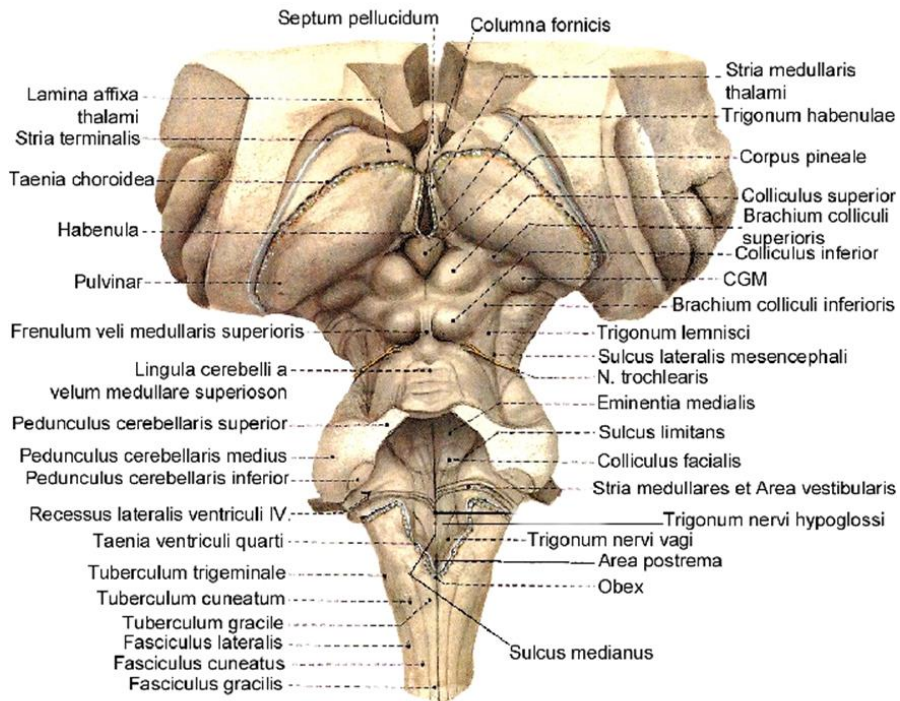
Arbor vitae

Hemisphaeria cerebelli

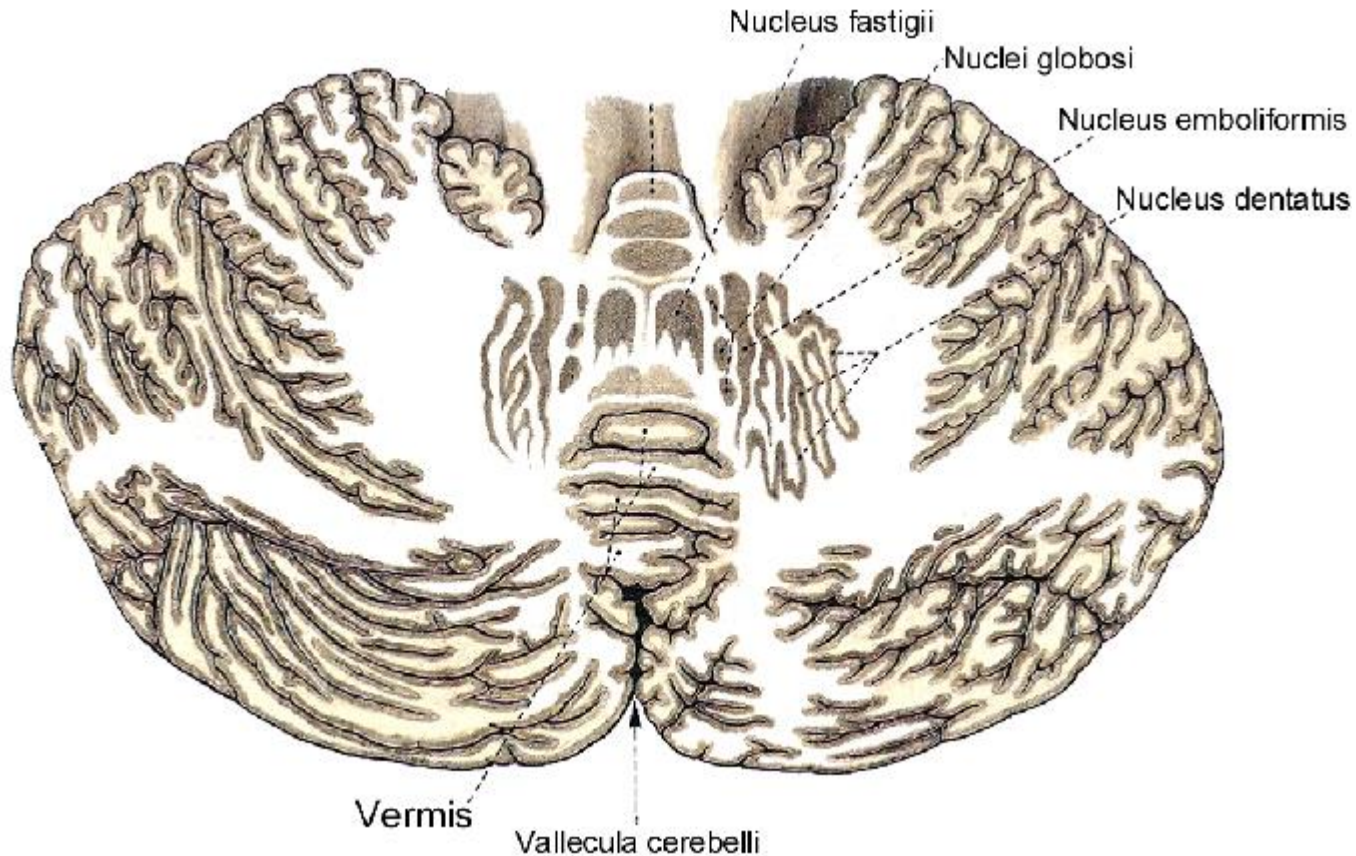


Cerebellar peduncles (3 pair)

- Connect cerebellum with 3 part of brainstem:
 - midbrain: superior cerebellar peduncle is (brachium conjunctivum)
 - pons: medial cerebellar peduncle (brachium pontis) - ventral!!!
 - oblongate medulla: inferior cerebellar peduncle (corpus restiforme)



Cerebellar nuclei (4 pair)



Cortex cerebelli – cortical zone

Laminae albae – inner white matter

Corpus medullare – the central continuous white matter

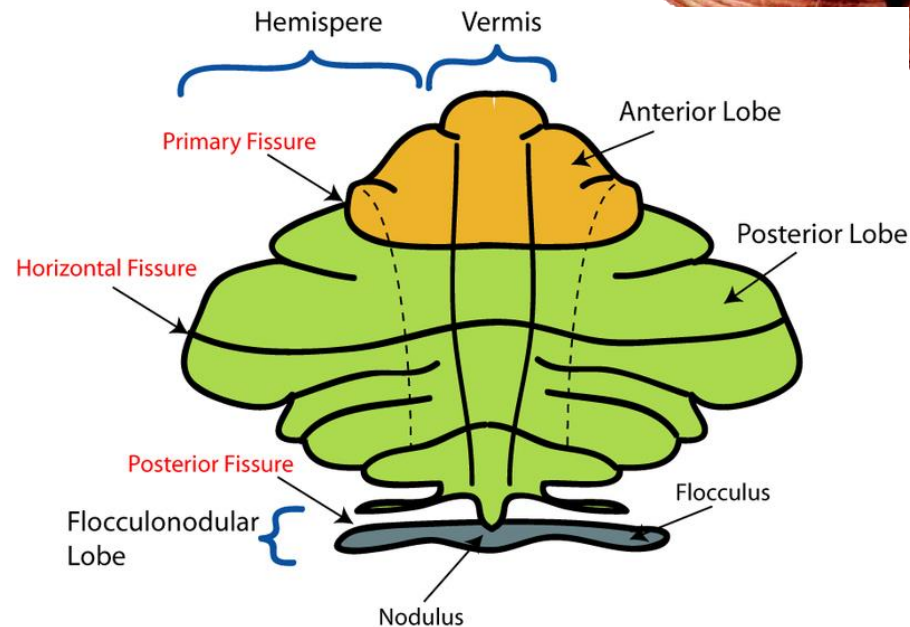
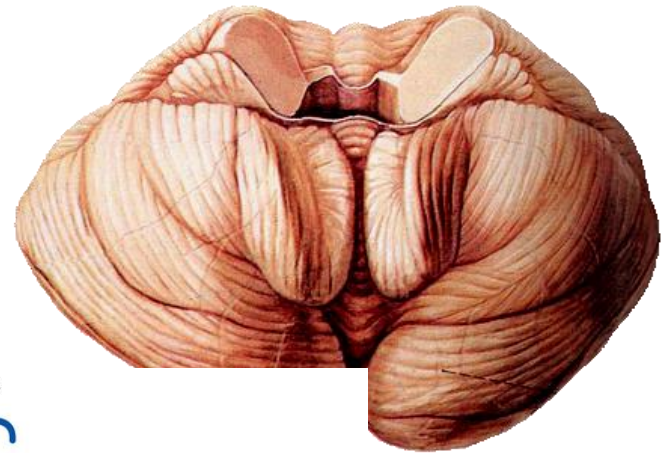
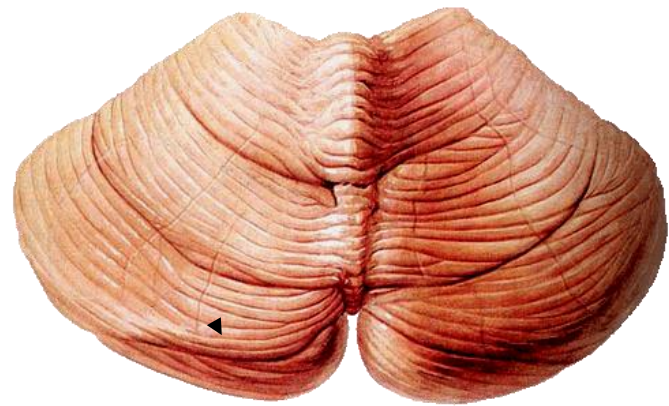


○ Fissures

- Primary fissure
- Horizontal fissure
- Postero(lateral) fissure

○ Lobes

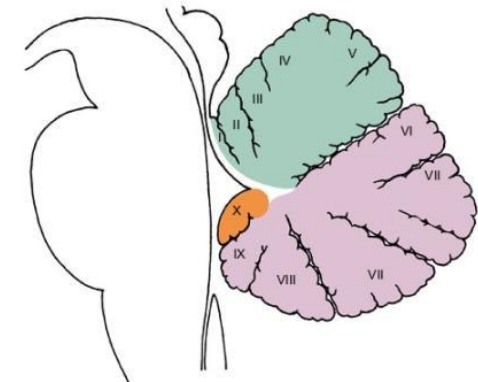
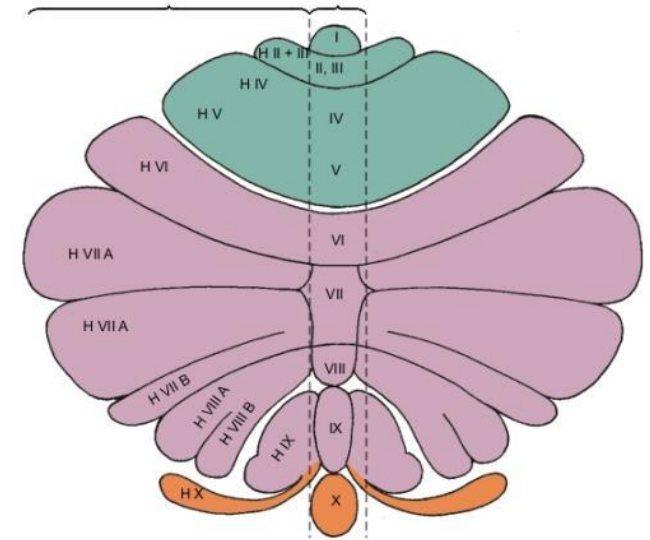
- Flocculonodular lobe
flocculus and nodulus
- Anterior lobe
- Posterior lobe



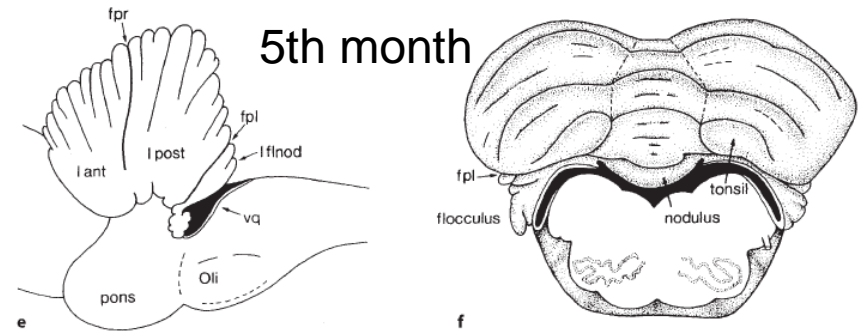
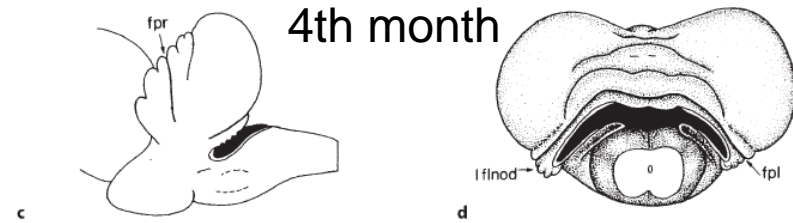
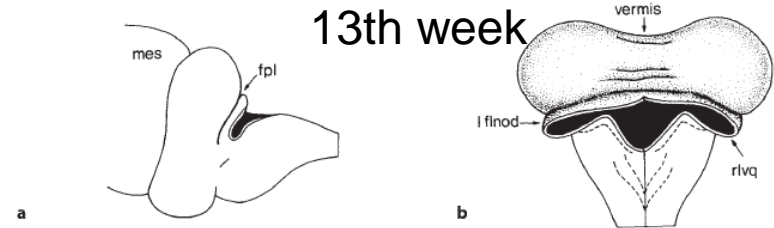
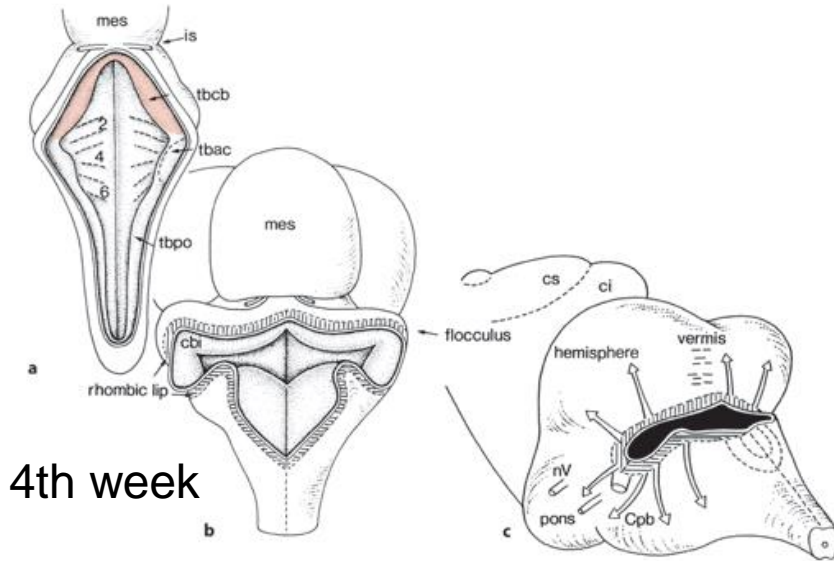
Divisions of cerebellum

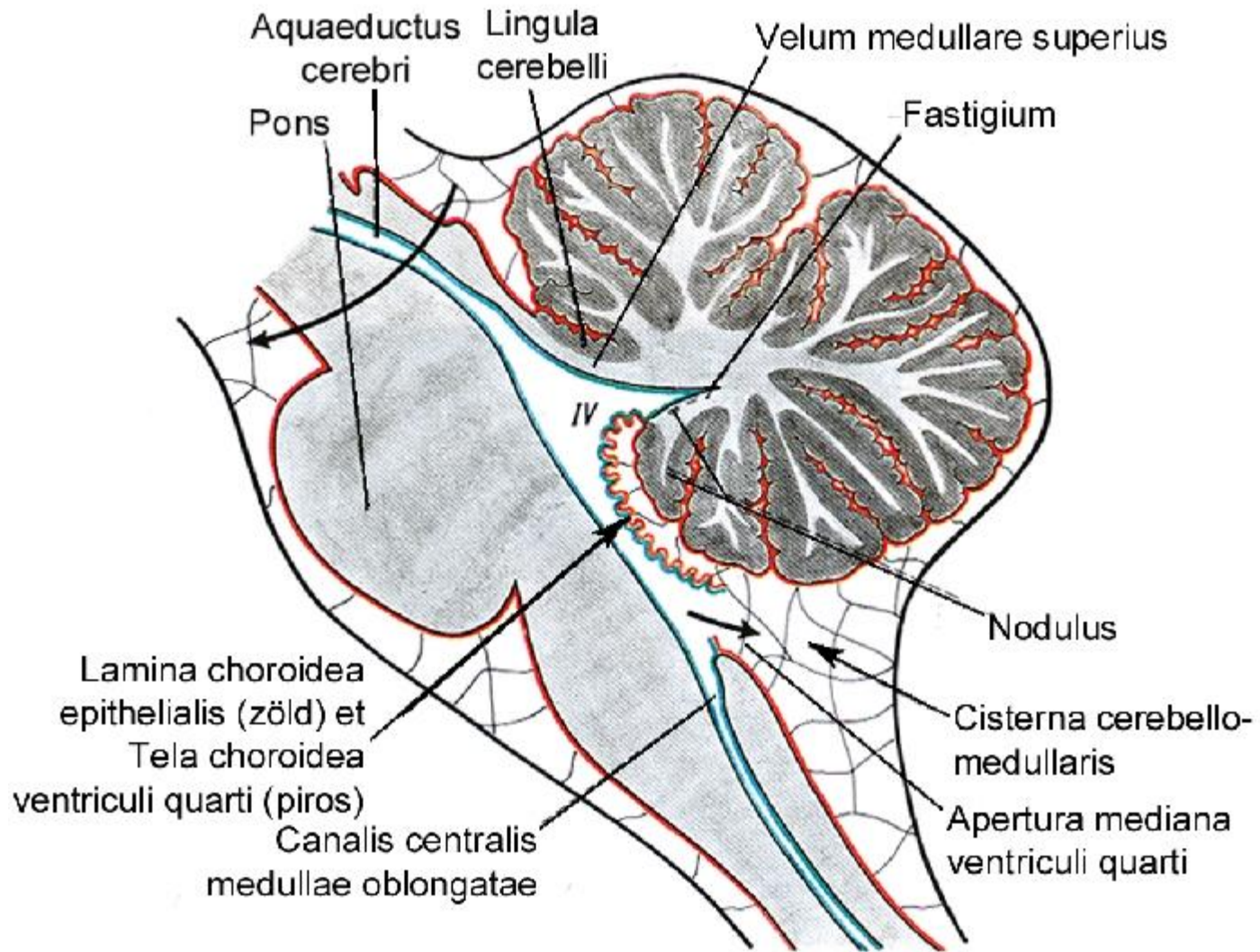
Larsell's division
(with roman numerals from I to X)

Lobuli of vermis	Hemispherical lobuli	Genetical division
lingula cerebelli <i>(archicerebellum)</i>	vinculum lingulae	corpus cerebelli
lobulus centralis	ala lobuli centralis	lobus anteriorja
culmen	lobulus quadrangularis	palaeocerebellum
fissura prima		
declive	lobulus simplex	corpus cerebelli
folium vermis	lobulus semilunaris superior	lobus posteriorja
fissura horizontalis cerebelli		
tuber vermis	lobulus semilunaris inferior	neocerebellum
	lobulus gracilis	
pyramis vermis	lobulus biventer	
uvula cerebelli	tonsilla cerebelli	palaeocerebellum
fissura dorsolateralis		
nodus	flocculus	lobus flocculonodularis
		archicerebellum

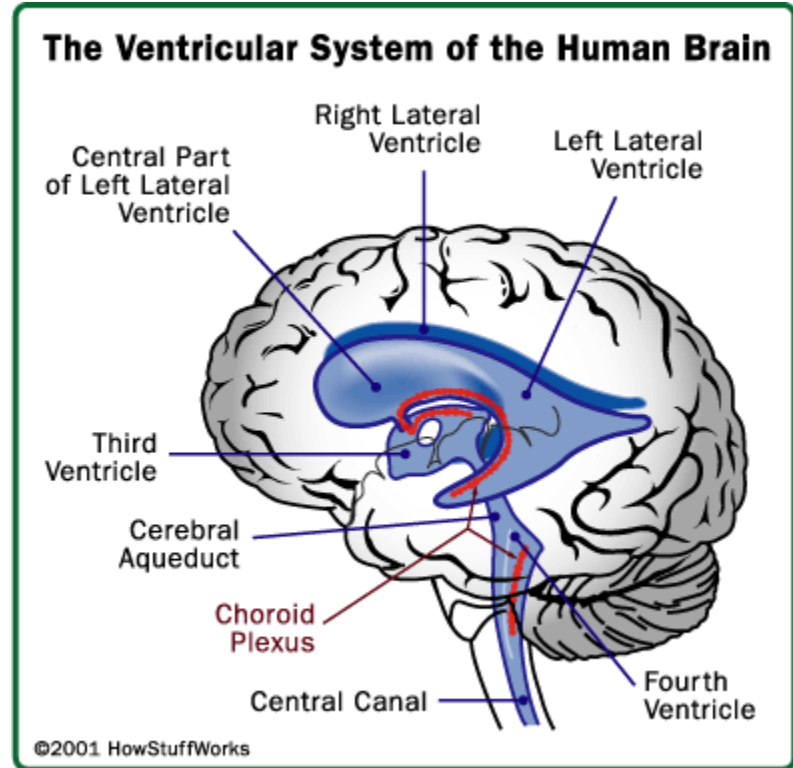
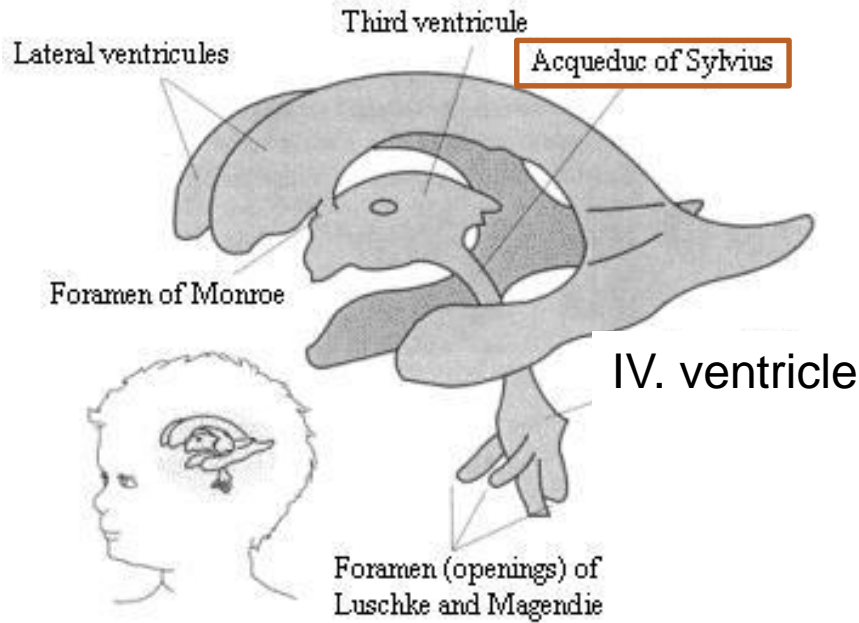


Development of the cerebellum

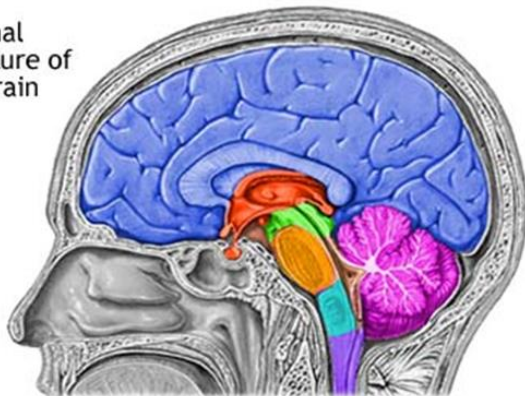




IV. ventricle



Internal structure of the brain



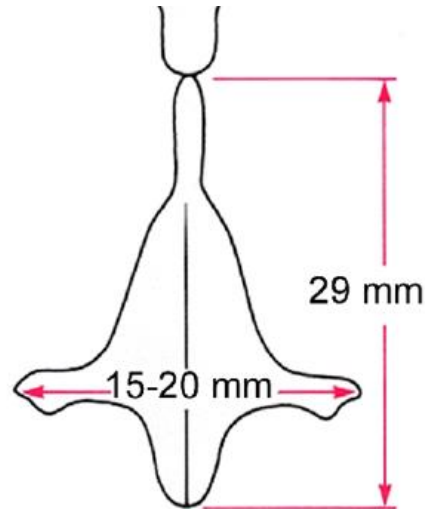
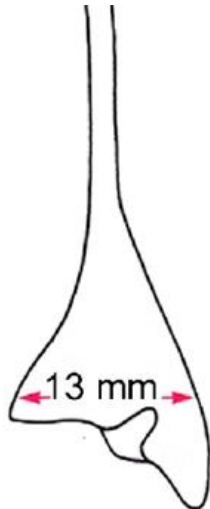
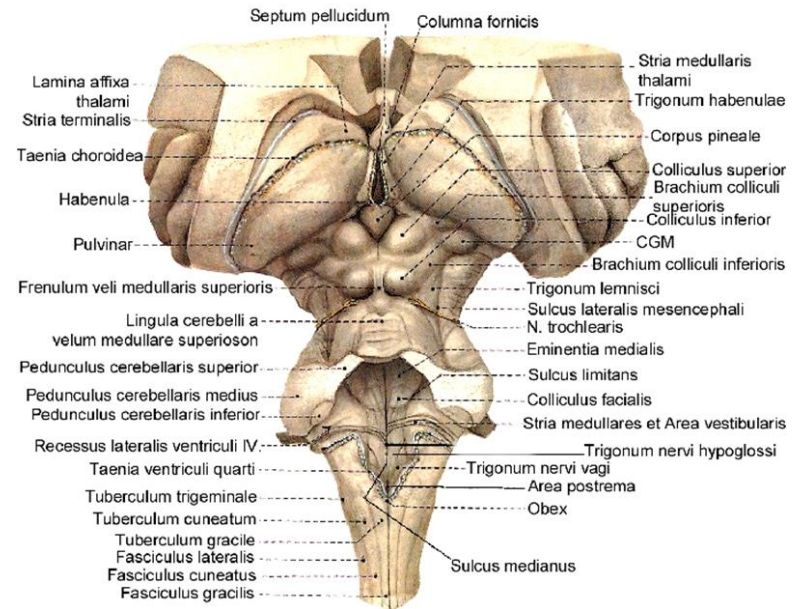
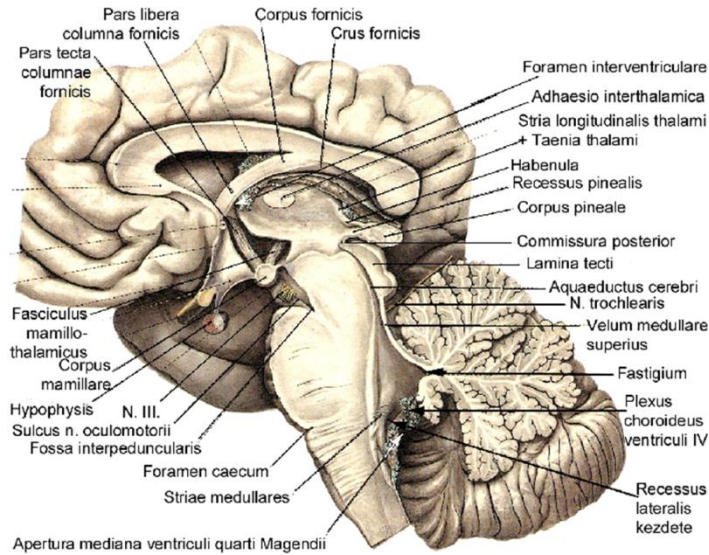
- Spinal cord
- Cerebellum
- Diencephalon
- Pons
- Medulla Oblongata
- Midbrain
- Cerebral hemisphere

Connections of IV. ventricle:

- 1) Cerebral aquaeduct (Sylvius)
- 2) (Level of calamus scriptorius) – central canal (spinal cord)
- 3) 3 opening to subarachnoideal space: 2 lateral aperture (Luschka's), 1 median aperture (Magandi's)

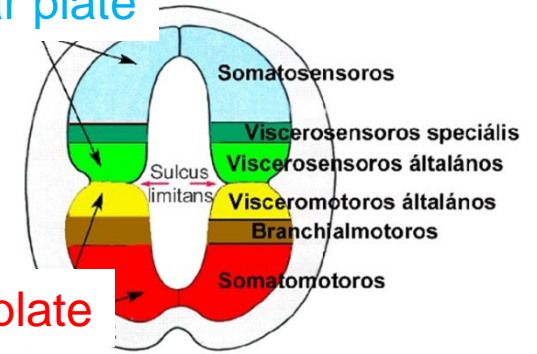


Parameters of the IV. ventricle

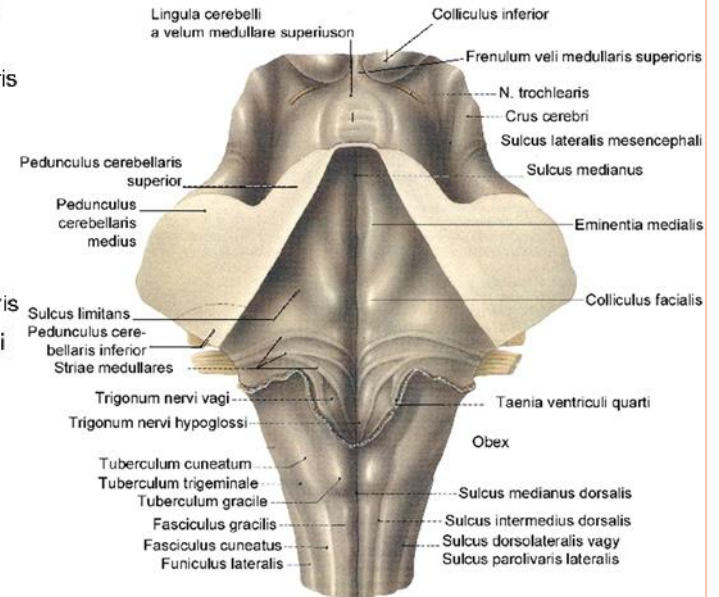
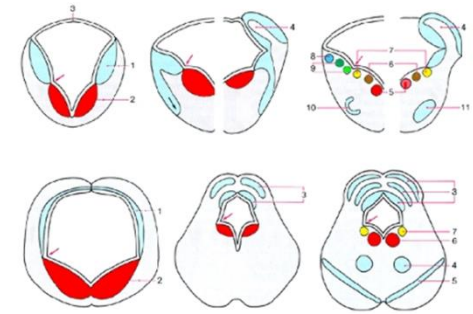
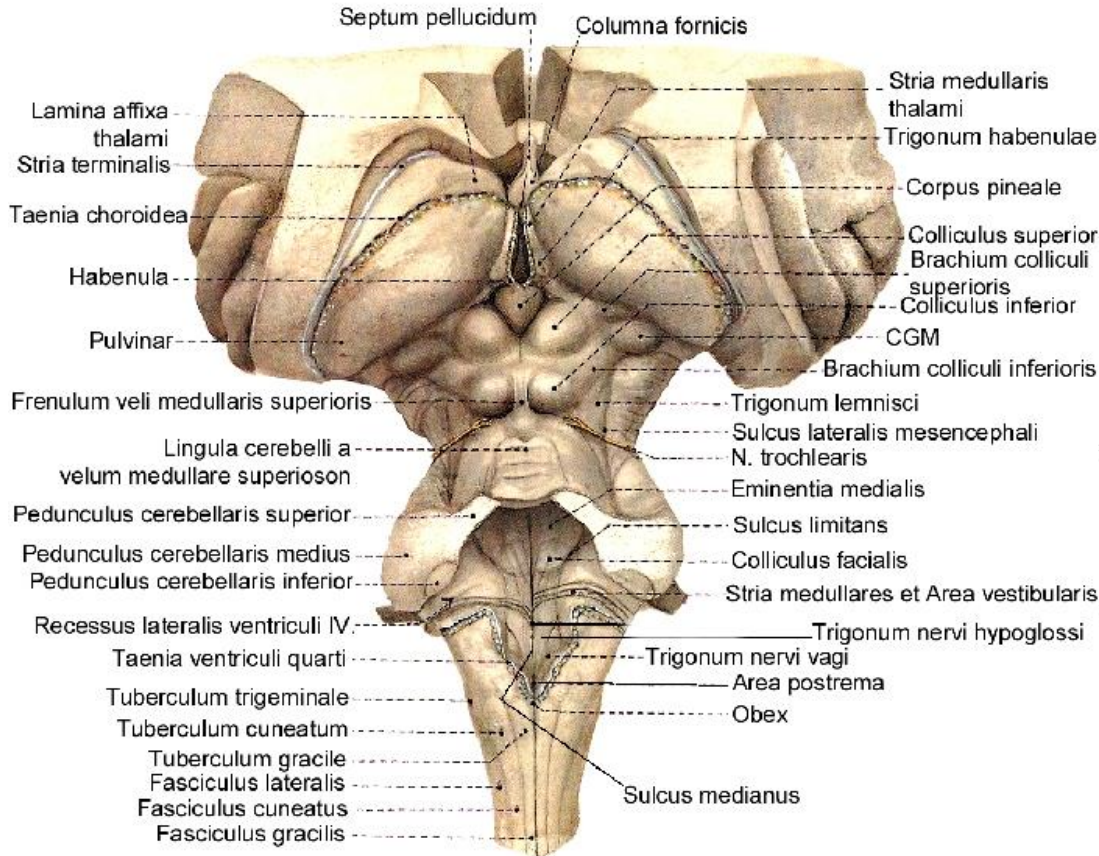


Floor of the IV. ventricle = rhomboid fossa

Alar plate

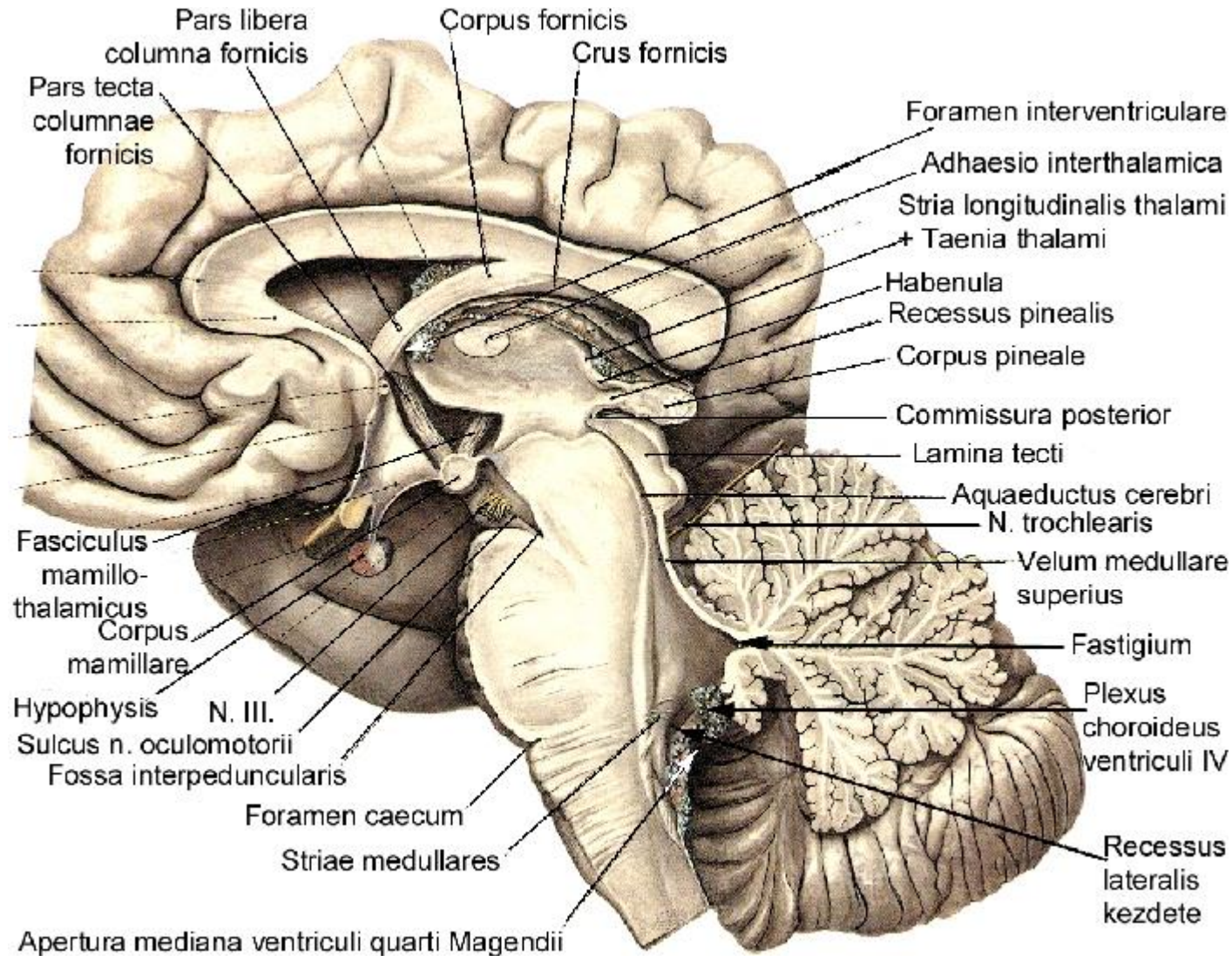


Basal plate



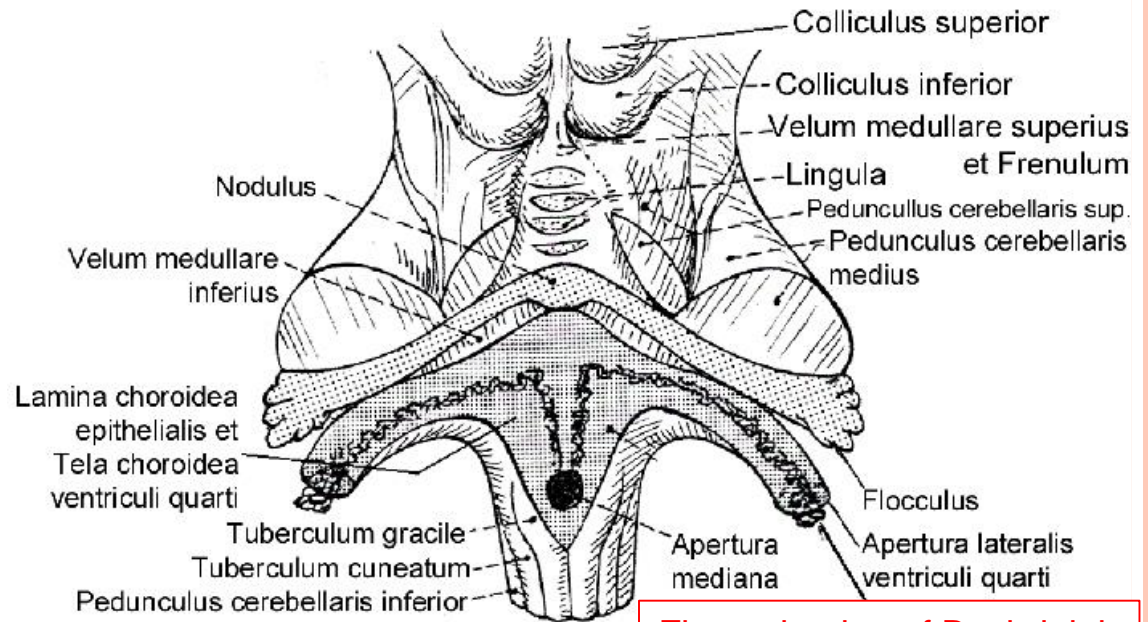
Roof of the IV. ventricle – tegmen ventriculi quarti

1 superior medullary velum + fastigium + nodulus + 2 inferior medullary velum + choroid lamina epithelialis of the IV. ventricle

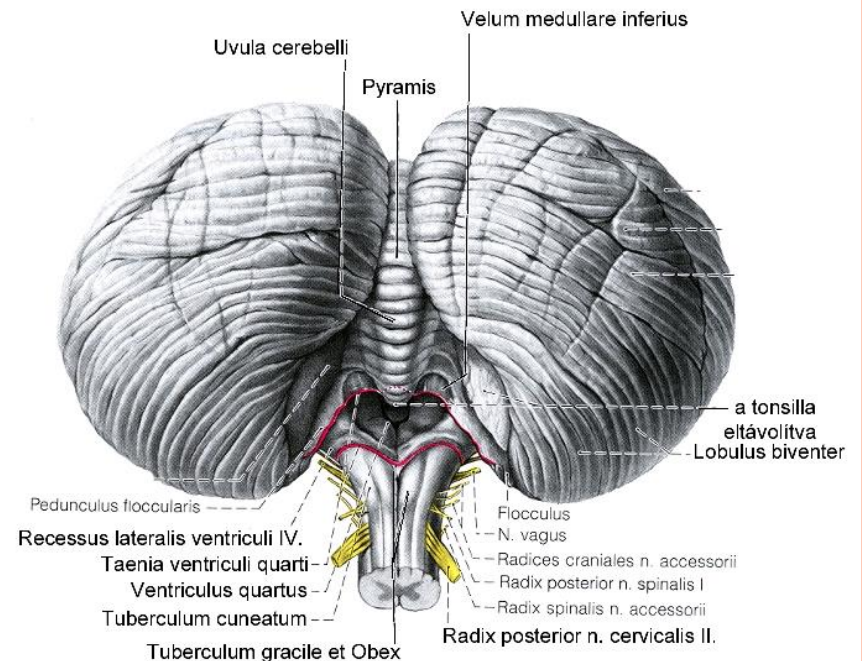
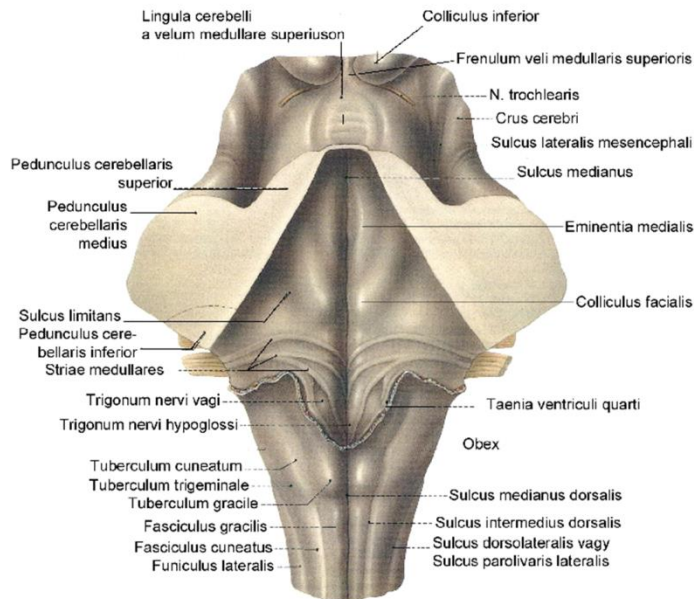


Choroidea lamina epithelialis ventriculi quarti – adhesion line: taenia ventriculi quarti

Lamina?
Tela?
Plexus?

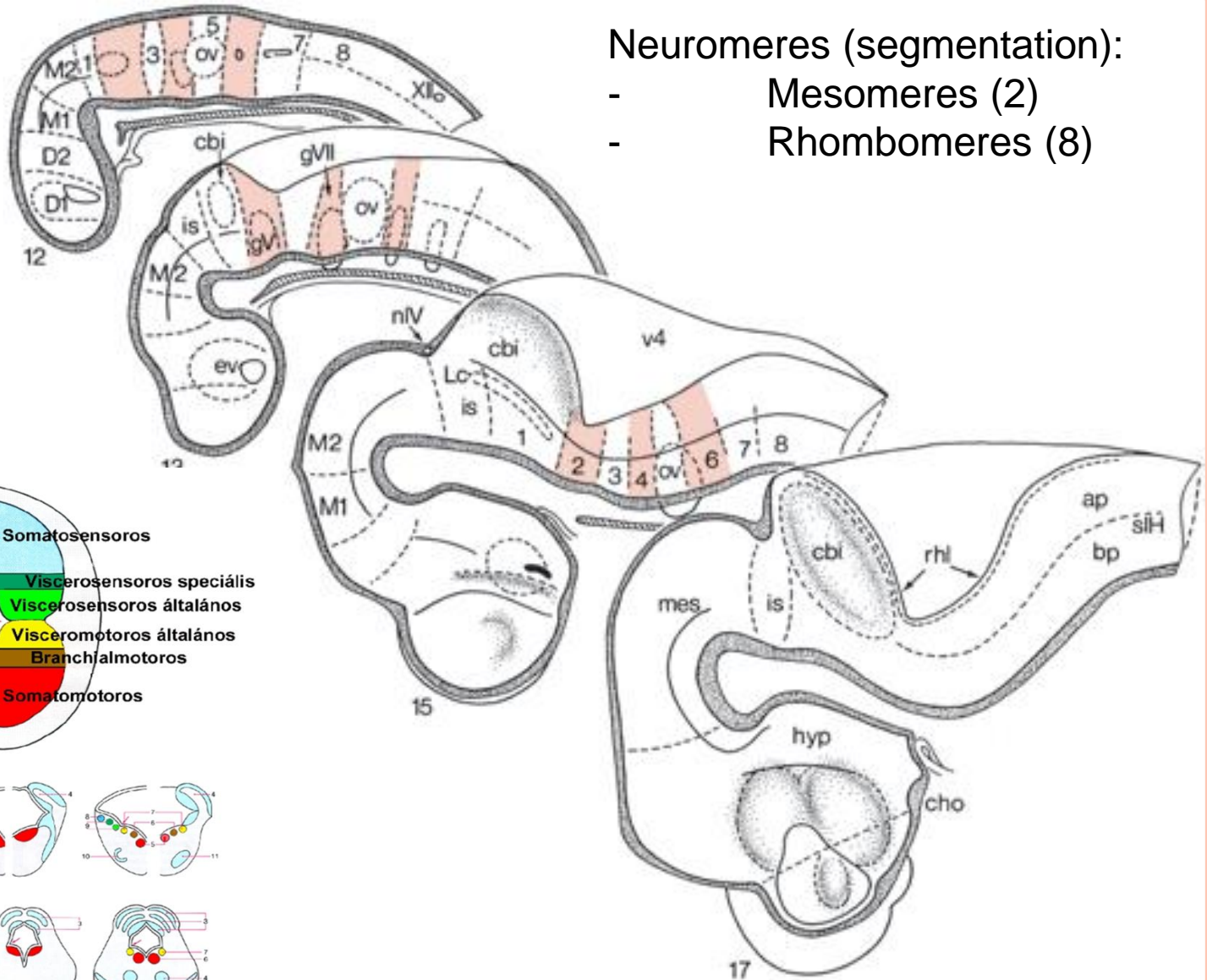


Flower basket of Bochkalek

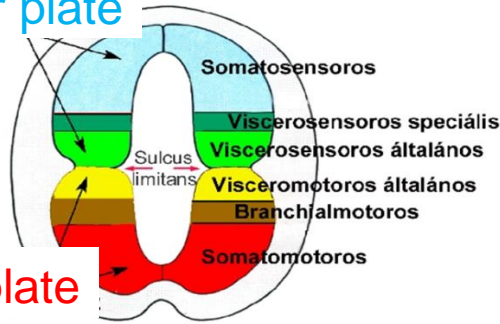


Development of the brainstem

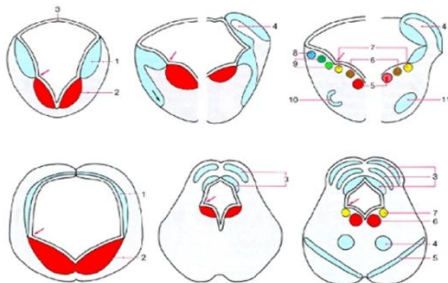
- Neuromeres (segmentation):
- Mesomeres (2)
 - Rhombomeres (8)

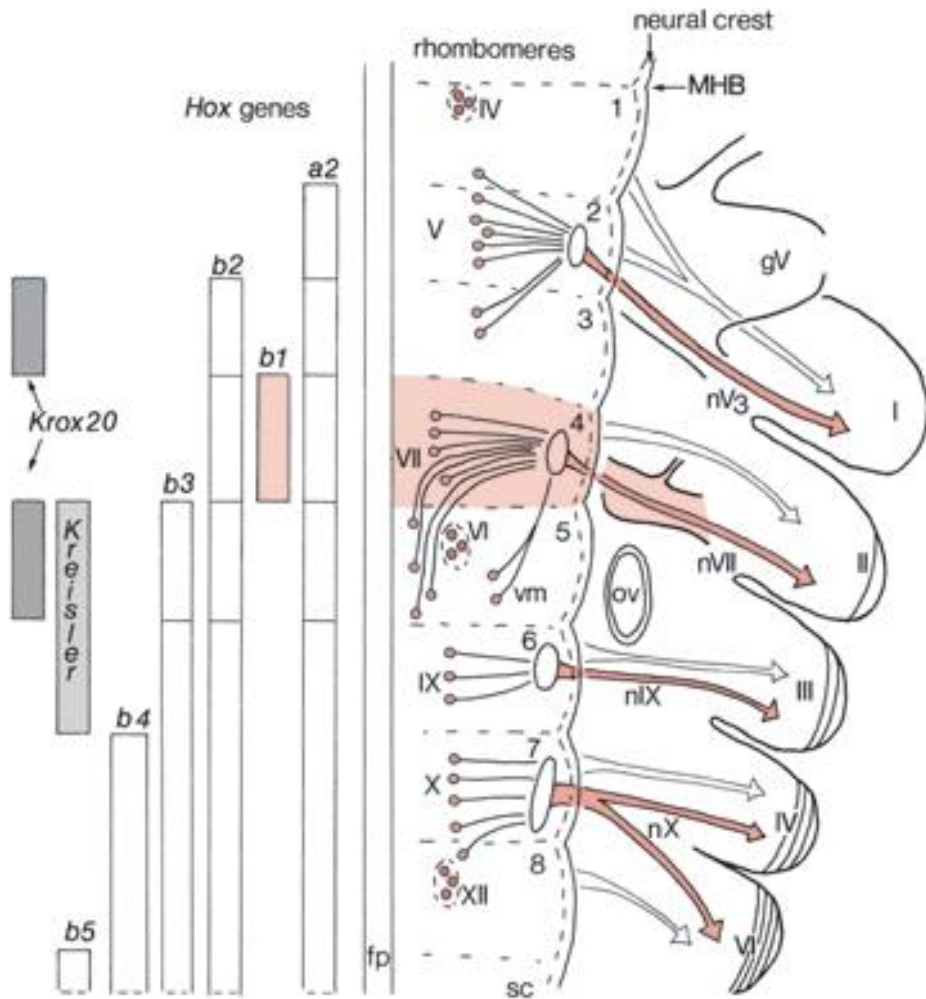


Alar plate



Basal plate





Ectodermal placodes

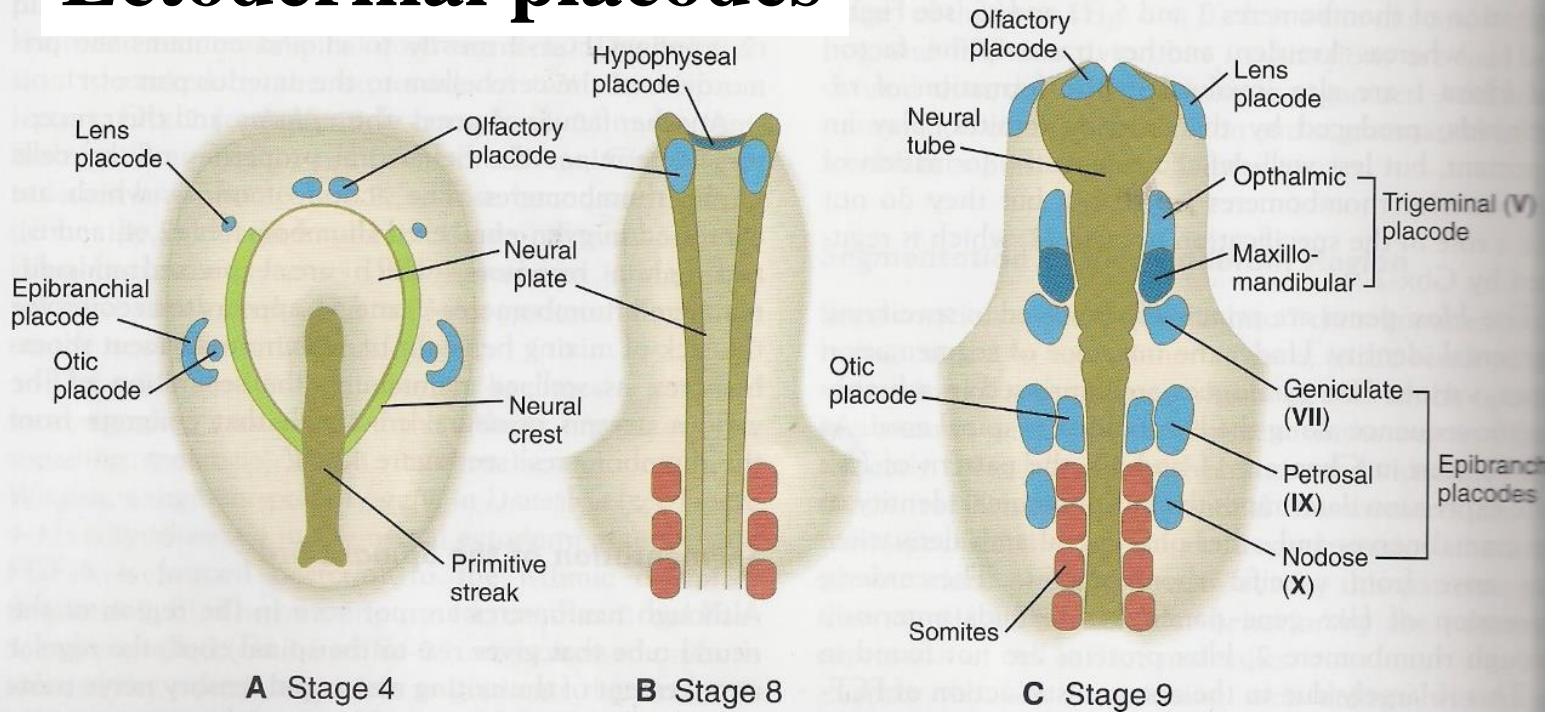


FIGURE 6-5 Early stages in the formation of cranial ectodermal placodes in the chick embryo, as viewed from the dorsal aspect. The placodes are shown in blue.

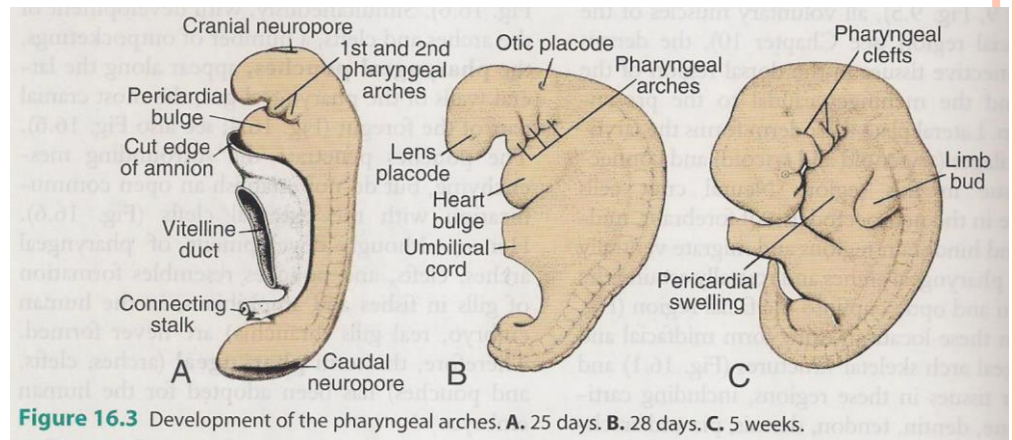
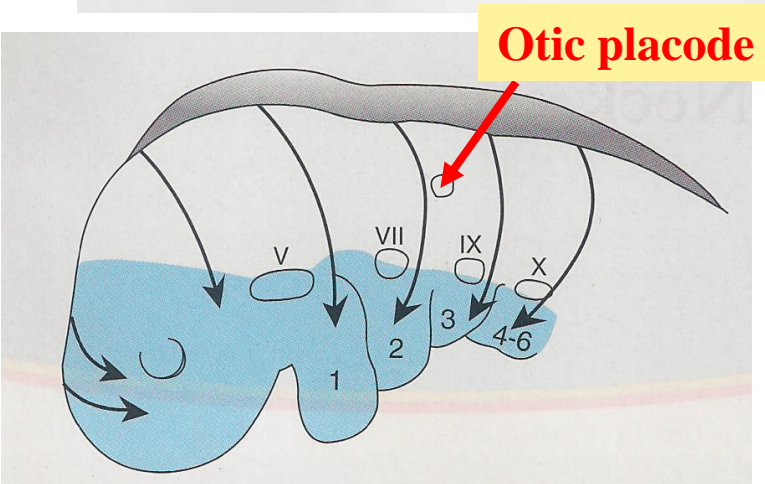


Figure 16.3 Development of the pharyngeal arches. **A.** 25 days. **B.** 28 days. **C.** 5 weeks.

Ectodermal placodes

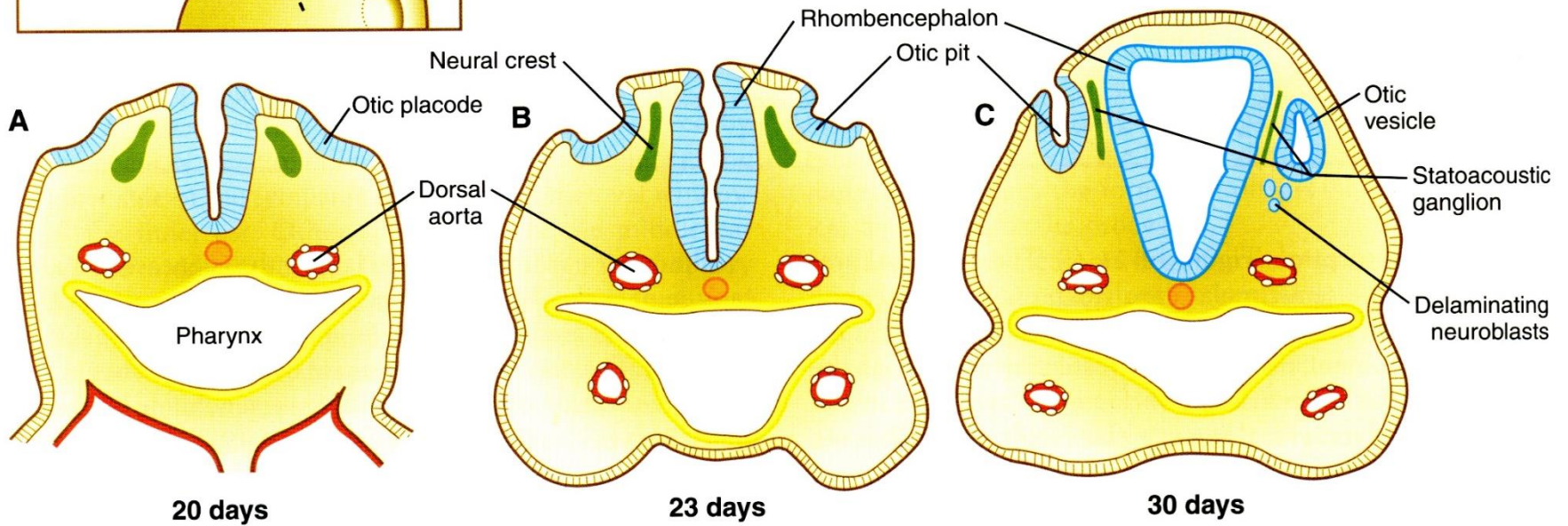
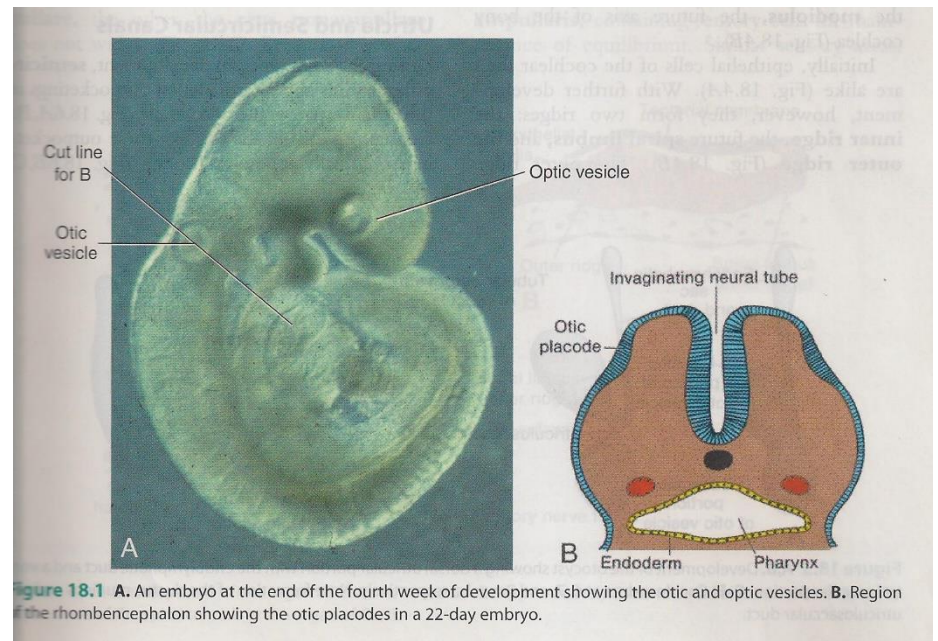
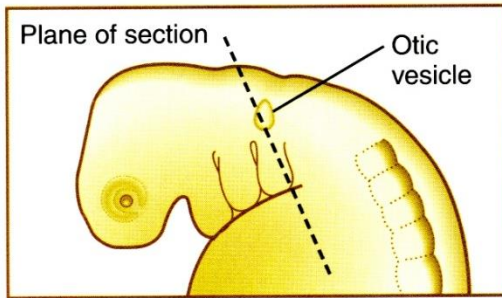


FIGURE 13-20 Formation of the otic vesicles from thickened otic placodes.

**Thank You for your
attention!!!**

