

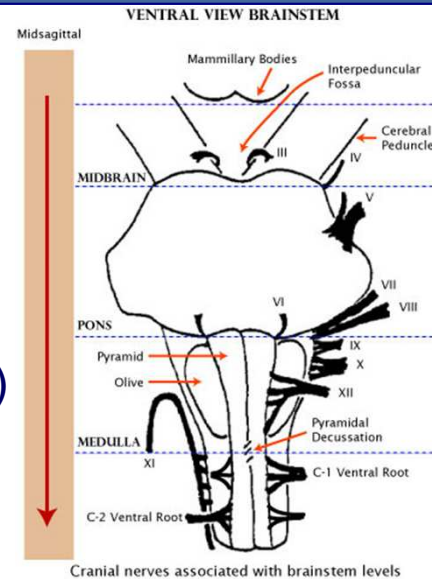
Brainstem: Medulla oblongata

1. Overview of the brainstem – subdivisions
2. Embryonic development of the brain stem
3. Medulla oblongata – external features
4. Internal structure of the medulla oblongata

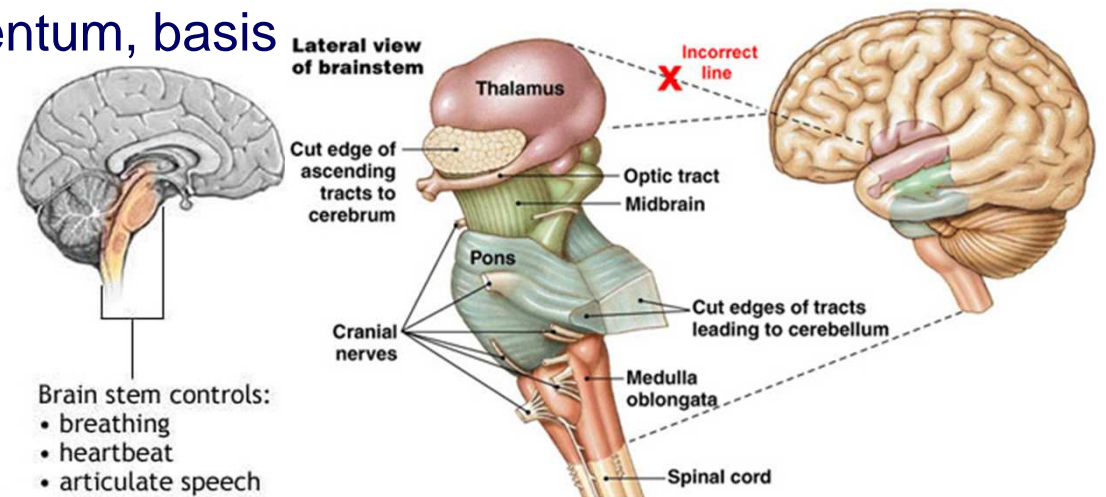
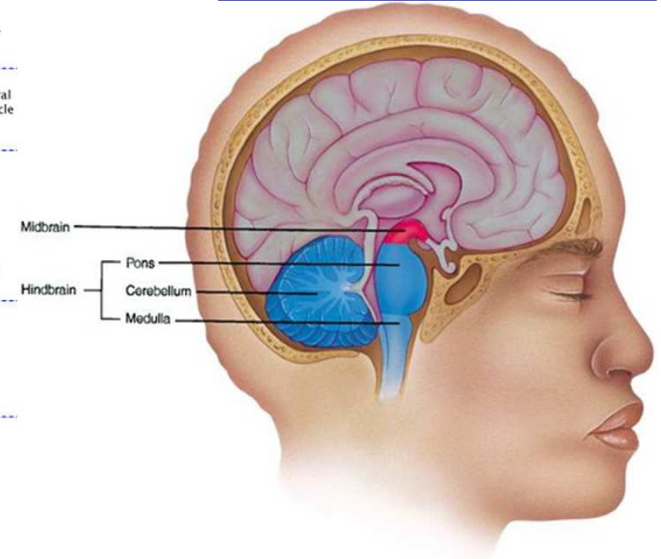


General organization

- 3 subdivisions:
 - ✓ medulla oblongata
 - ✓ pons
 - ✓ midbrain
- 10 cranial nerves attached (with the exception of nn. I and II)
 - ✓ motor and sensory innervation: face&neck
- pathway for:
 - ✓ all fiber tracts passing up and down
- 3 laminae: tectum, tegmentum, basis
- neurological functions:
 - ✓ survival
 - breathing
 - digestion
 - heart rate
 - blood pressure
 - ✓ arousal
 - being awake and alert



Cranial nerves associated with brainstem levels



Brain stem controls:

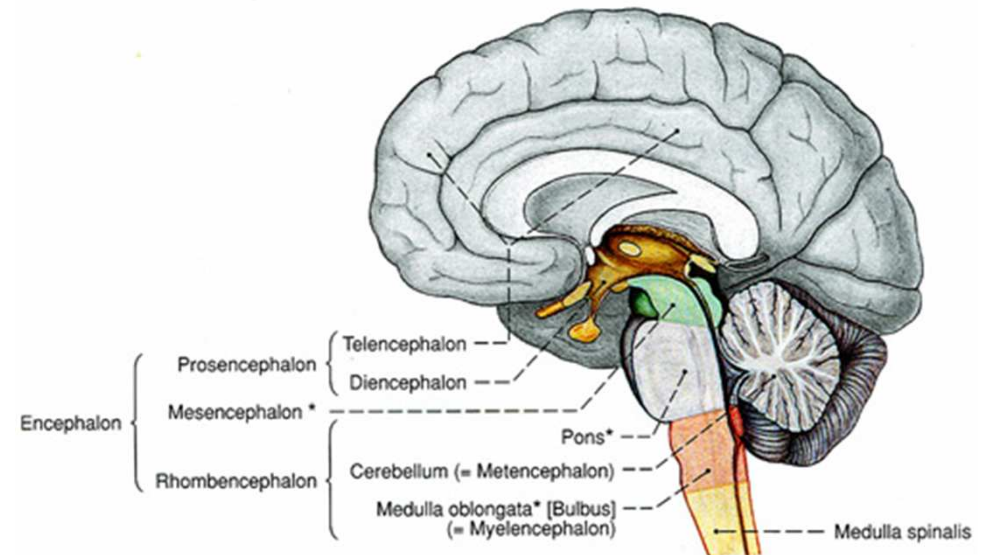
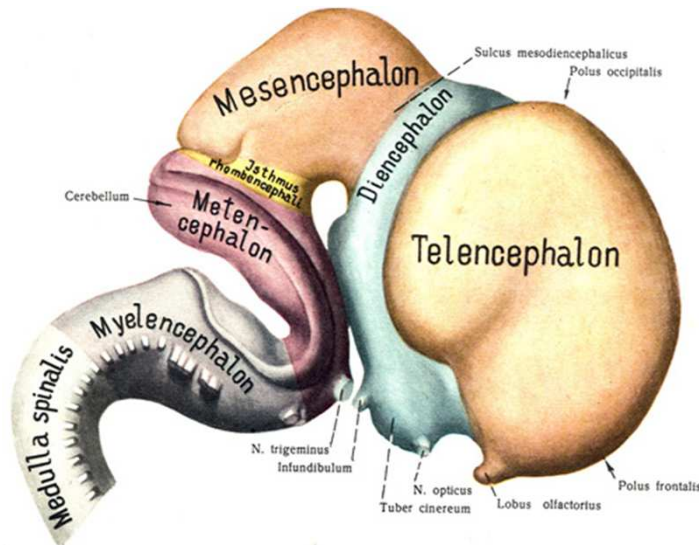
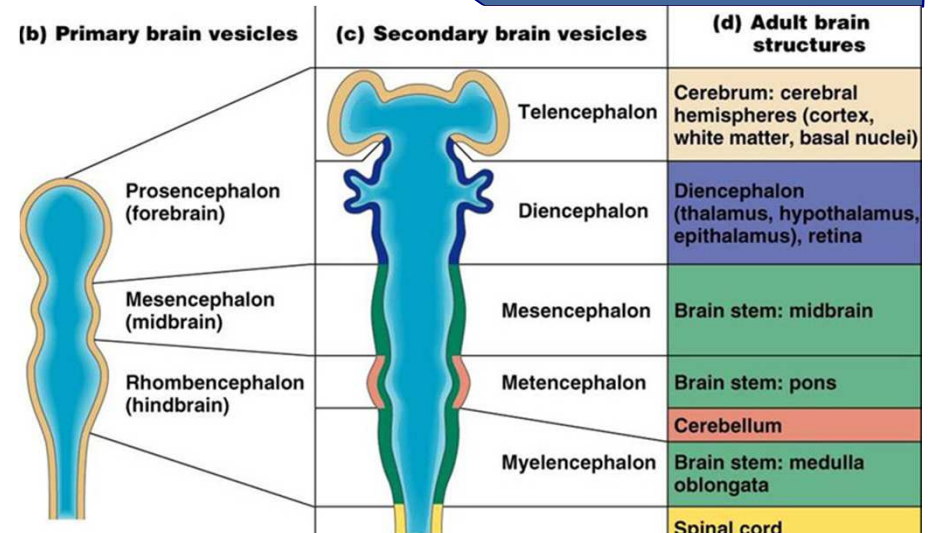
- breathing
- heartbeat
- articulate speech



Embryologic development

Embryonic origin:

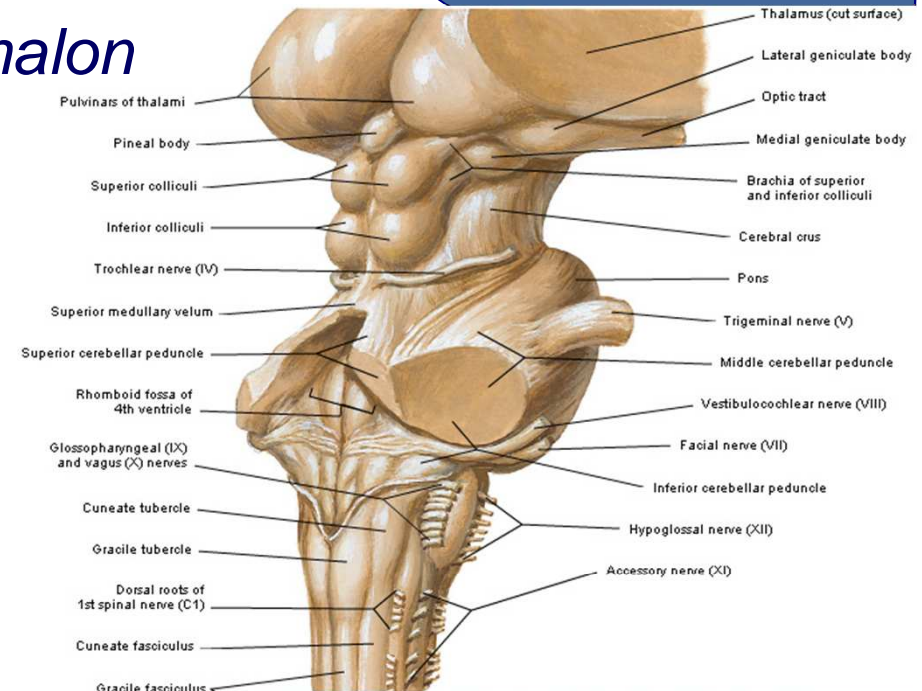
- ✓ mesencephalon ⇒ midbrain
- ✓ rhombencephalon:
 - metencephalon ⇒ pons & cerebellum
 - myelencephalon ⇒ medulla oblongata



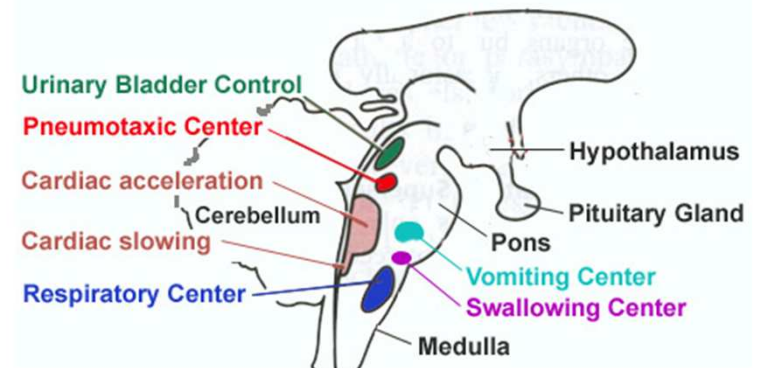


Medulla oblongata – external features

- synonyms: *bulbus*, *myelencephalon*
- shape – pyramidal or conical
- size:
 - ✓ 3 cm longitudinally
 - ✓ 2 cm transversally
 - ✓ 1.25 cm anteroposteriorly
- 2 parts:
 - ✓ lower, *closed part*
 - ✓ upper, *open part*
- functions:
 - ✓ relay station of motor tracts
 - ✓ contains respiratory, vasomotor and cardiac centers
 - ✓ controls reflex activities such as coughing, gagging, swallowing and vomiting



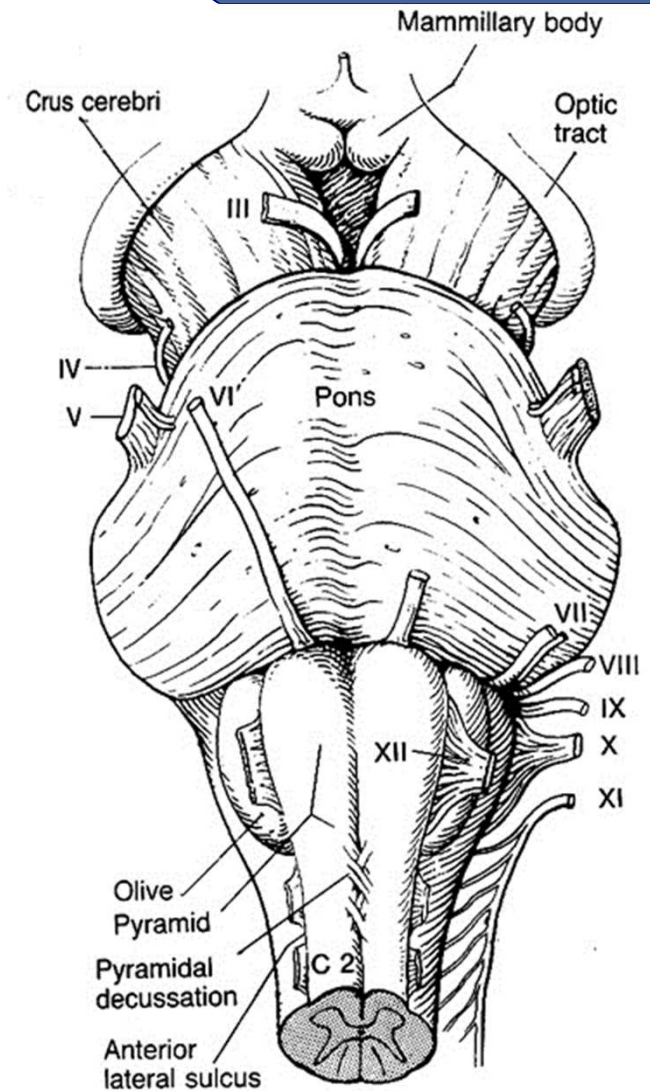
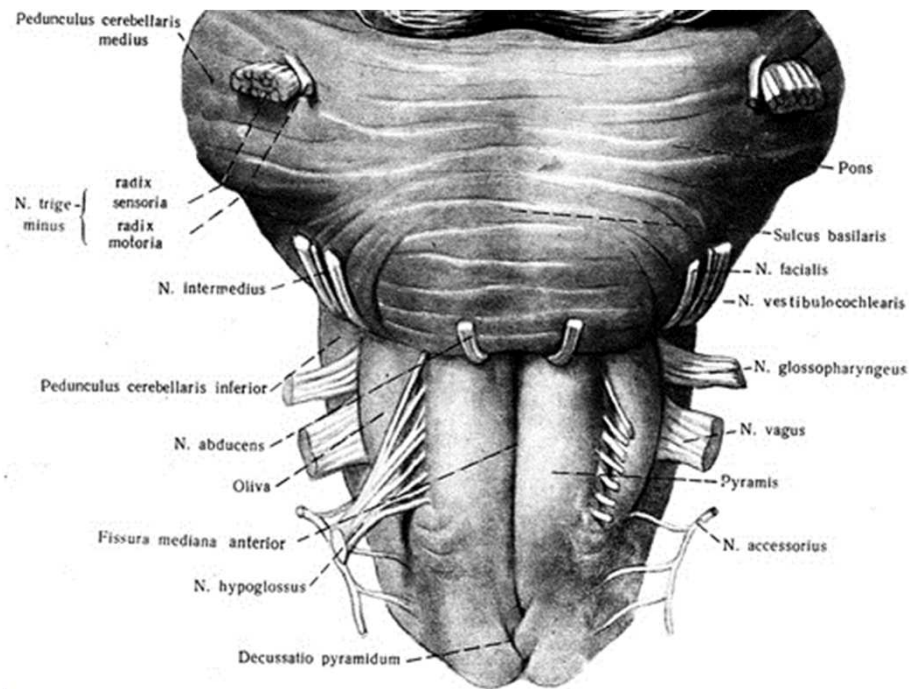
Regulatory Centers in the Brainstem





Medulla oblongata – anterior aspect

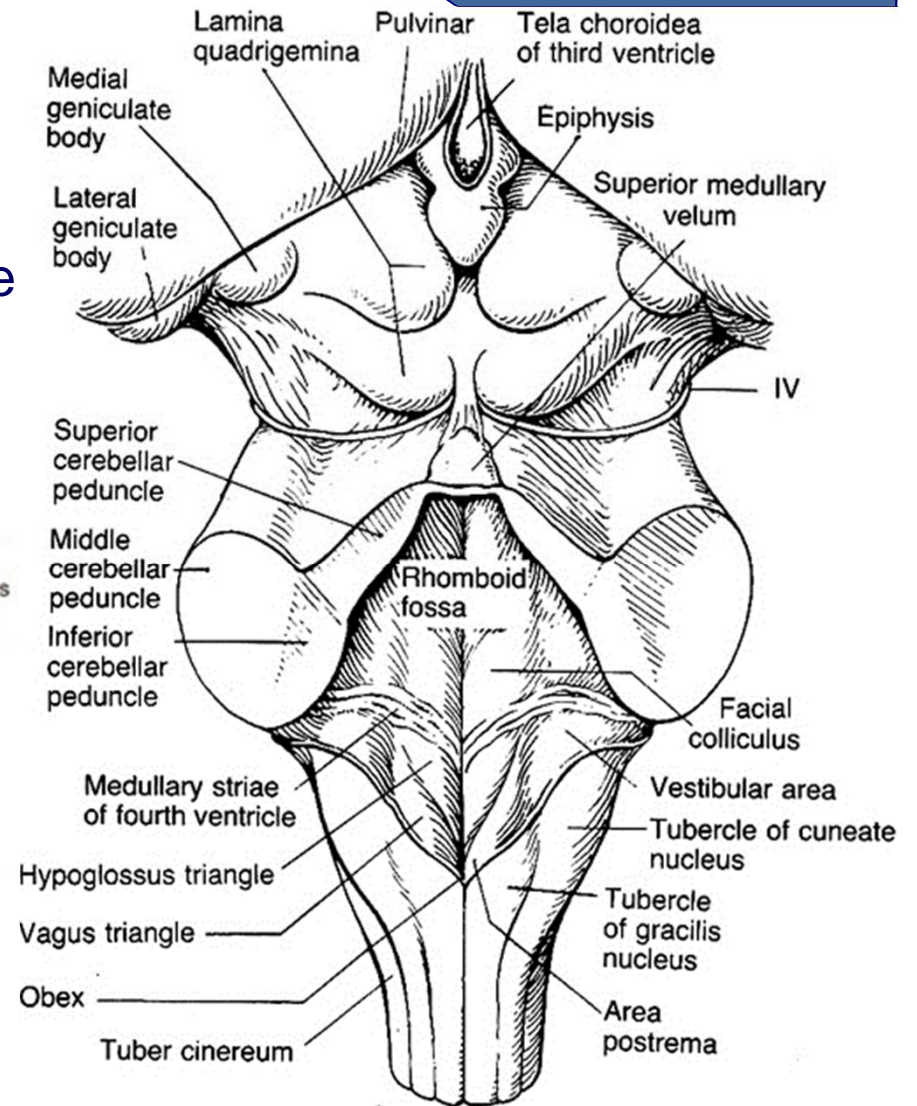
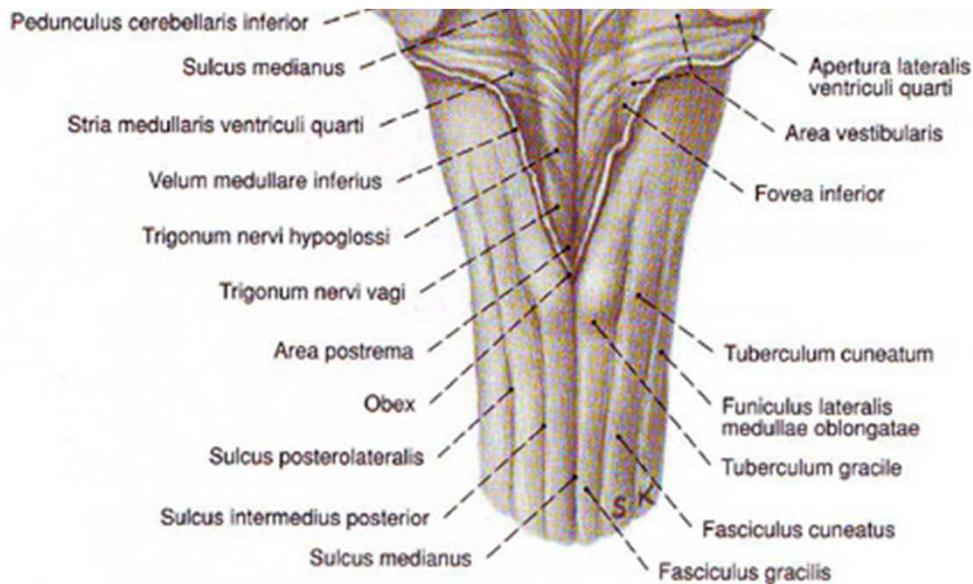
- anterior median fissure
- pyramid ⇒ pyramidal decussation
- olive
- anterolateral sulcus ⇒ hypoglossal nerve (XII)
- retroolivary sulcus ⇒ nn. IX, X and XI





Medulla oblongata – posterior aspect

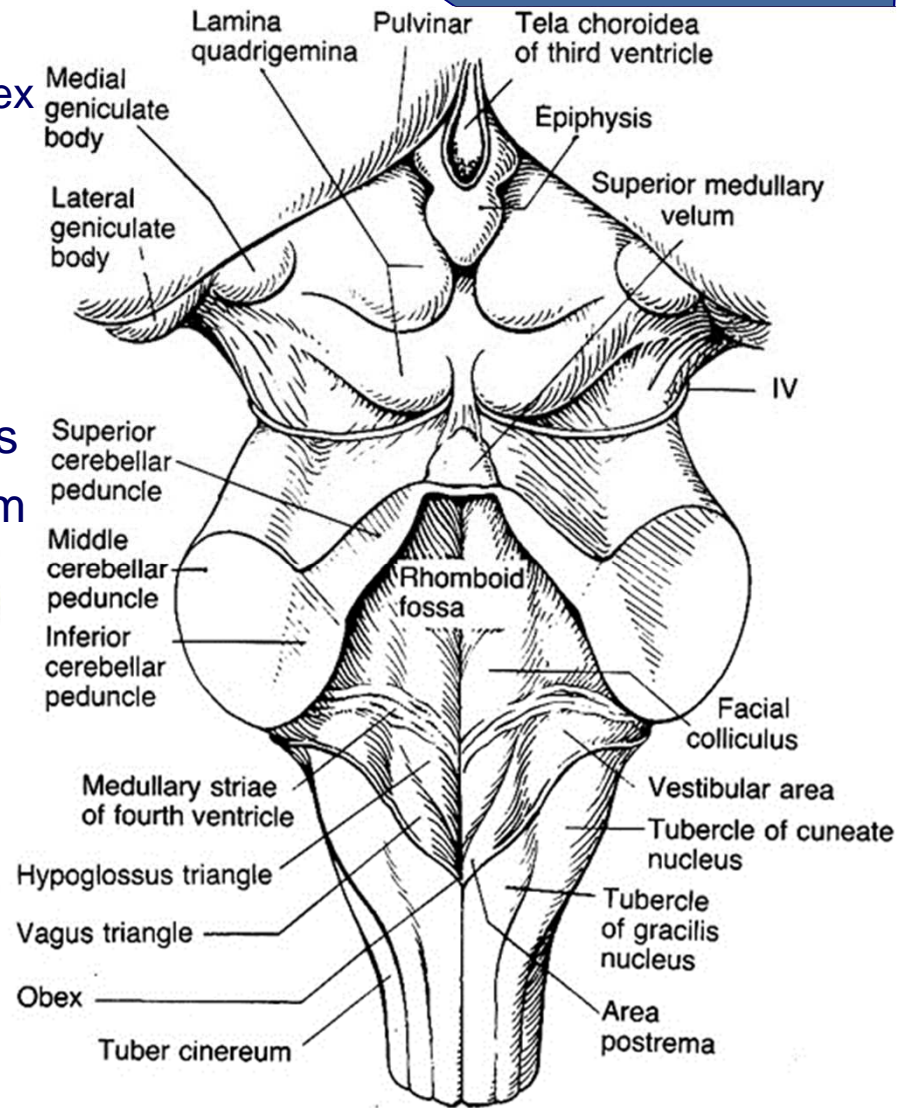
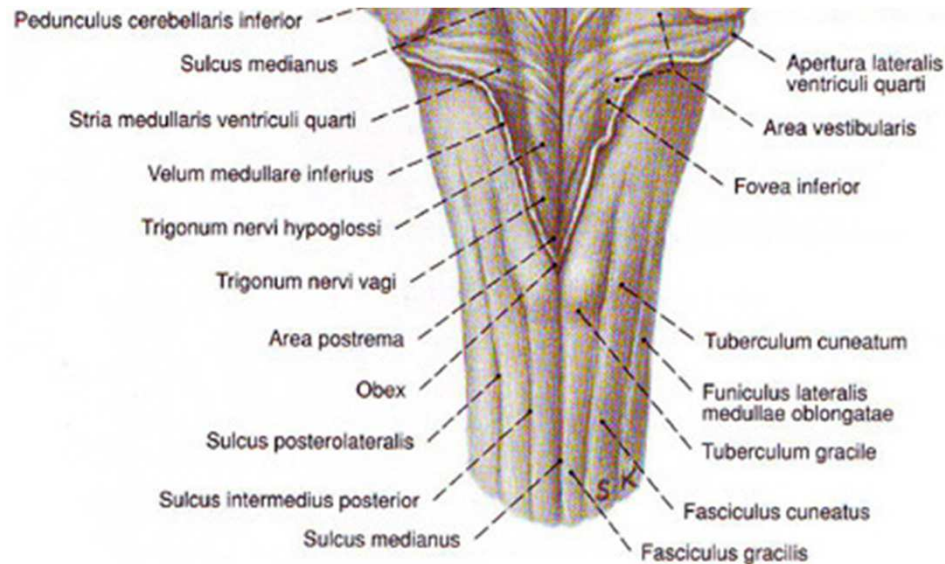
- posterior median sulcus
- caudal, *closed part* – obex:
 - ✓ gracile fascicle ⇒ gracile tubercle
 - ✓ cuneate fascicle ⇒ cuneate tubercle
 - ✓ posterior intermediate sulcus
 - ✓ posterolateral sulcus
 - ✓ *tuberculum cinereum*





Medulla oblongata – posterior aspect

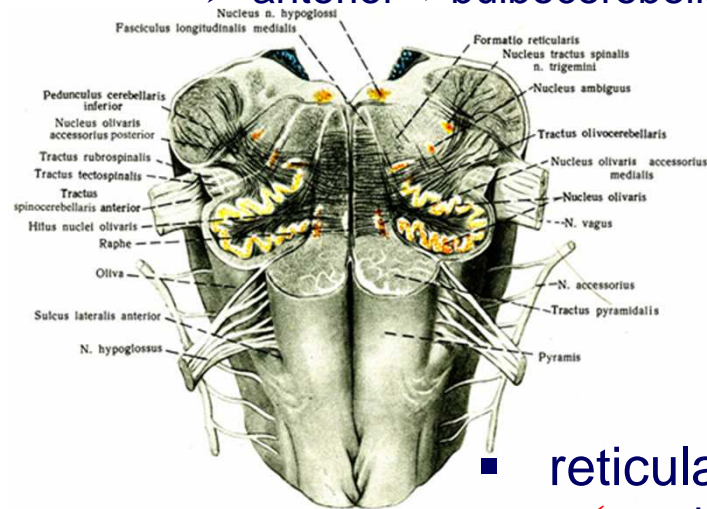
- cranial, *open part* – rhomboid fossa:
 - ✓ medullary striae of fourth ventricle ⇔ obex
 - ✓ *sulcus limitans*
 - ✓ hypoglossus triangle
 - ✓ vagus triangle
 - ✓ area postrema
 - ✓ vestibular area, acoustic tubercle ⇒ pons
 - ✓ inferior cerebellar peduncle ⇒ cerebellum





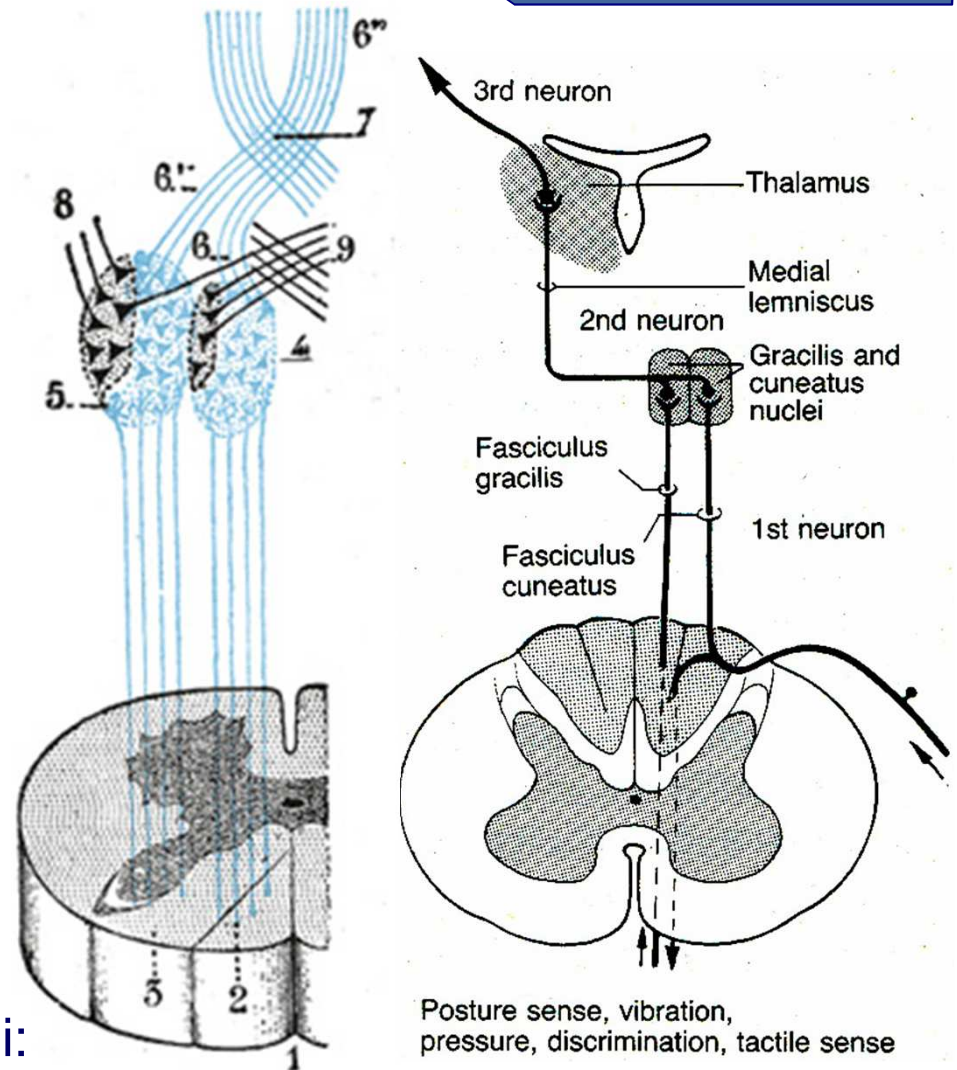
Medulla oblongata – internal structure

- white and grey matter
- olive:
 - ✓ inferior olivary nuclear complex
- posterior column nuclei:
 - ✓ *nucleus gracilis*
 - ✓ *nucleus cuneatus*
 - ✓ internal arcuate fibers ⇒ sensory decussation ⇒ medial lemniscus ⇒ bulbothalamic tract
 - ✓ external arcuate fibers
 - posterior ⇒ cuneocerebellar tract
 - anterior ⇒ bulboocerebellar tract



- reticular nuclei:

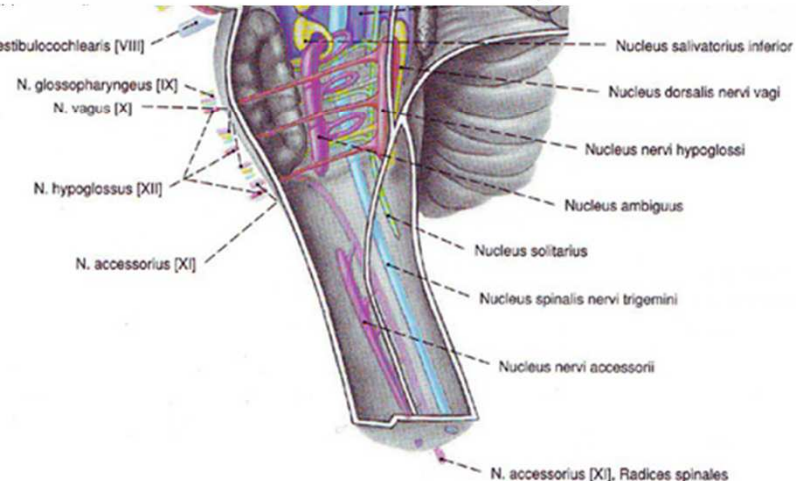
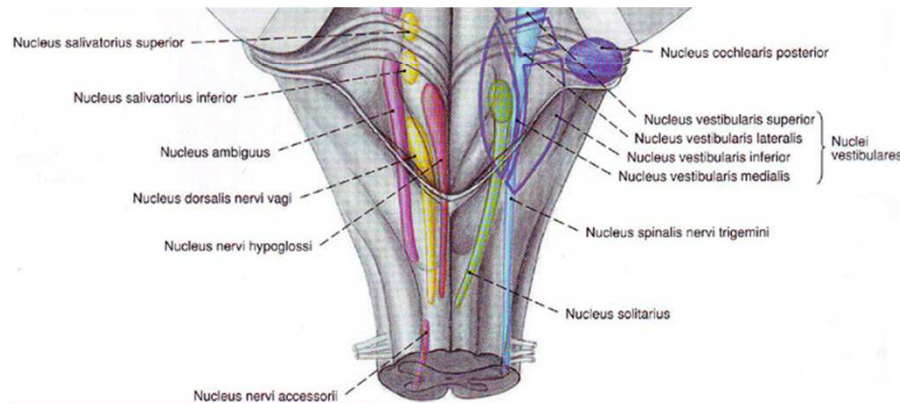
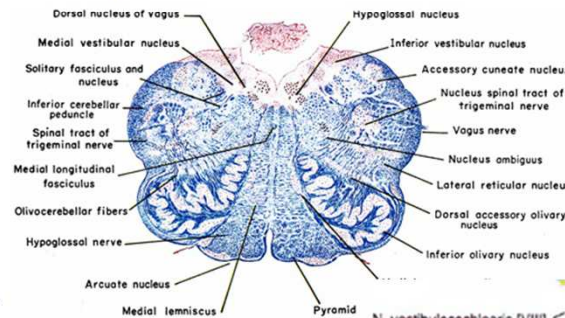
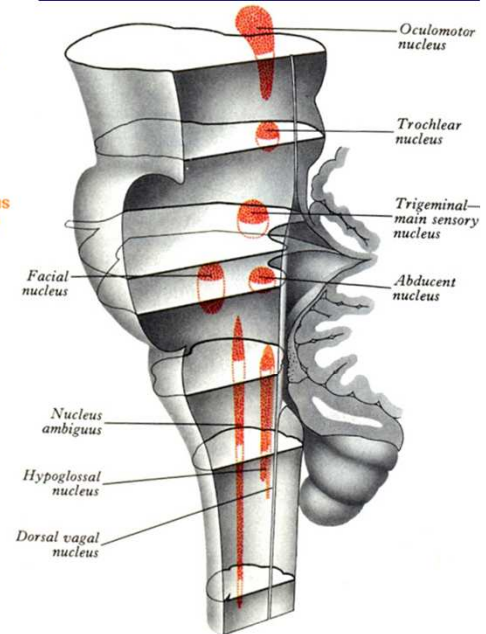
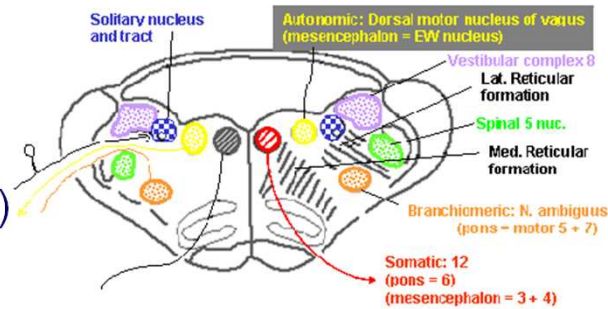
- ✓ raphe nuclei, pallidus, obscurus & magnus – SERgic (B1-B3)





Grey matter: nuclei of the cranial nerves

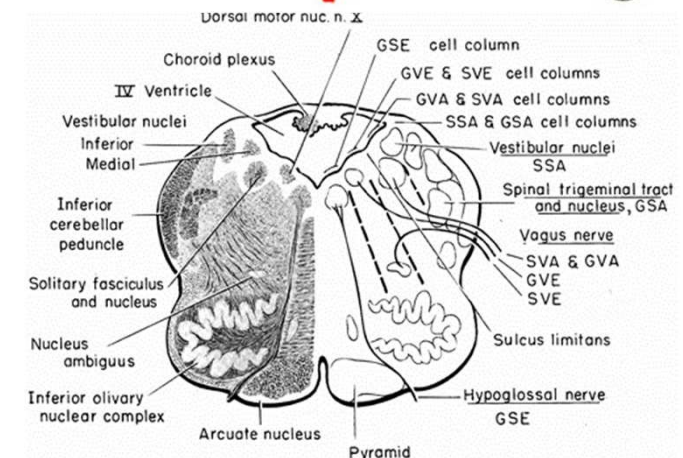
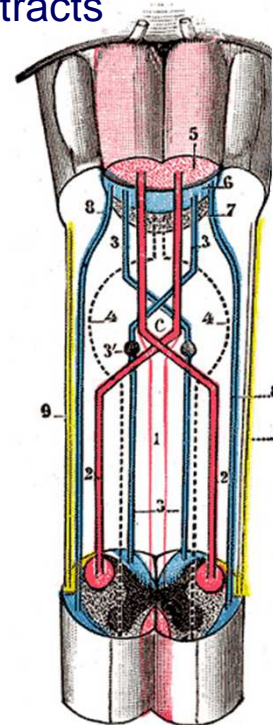
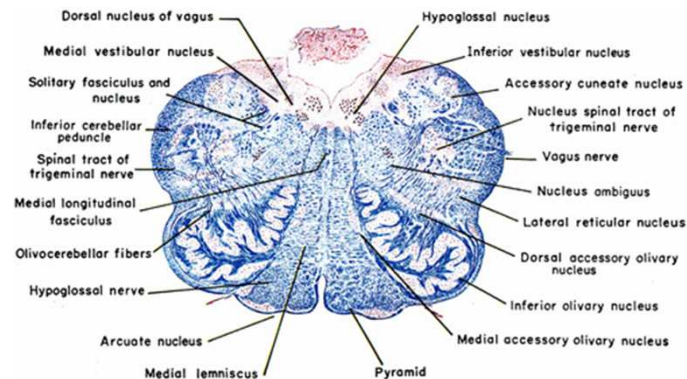
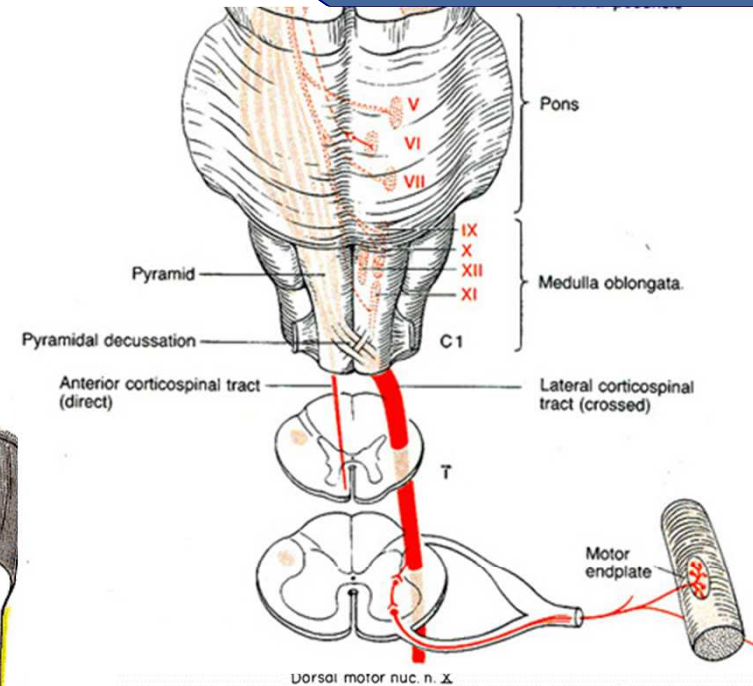
- glossopharyngeal nerve (IX):
 - ✓ inferior salivatory nucleus
 - ✓ nucleus ambiguus (IX, X, XI)
 - ✓ solitary tract nucleus (VII, IX, X)
- vagus nerve (X):
 - ✓ dorsal motor nucleus of the vagus
- accessorius nerve (XI)
- hypoglossal nerve (XII):
 - ✓ hypoglossal nucleus
- trigeminal nerve (V):
 - ✓ spinal trigeminal nucleus





White matter: ascending and descending tracts

- descending (corticobulbar) tracts:
 - ✓ corticospinal tract ⇒ pyramidal decussation
 - ✓ reticulospinal tract
- ascending tracts:
 - ✓ cuneocerebellar tract
 - ✓ anterior and posterior spinocerebellar tracts
 - ✓ anterior and lateral spinothalamic tracts
 - ✓ spinotectal tract
- mixed tracts:
 - ✓ dorsal longitudinal fasciculus:
 - descending hypothalamic axons
 - ascending visceral sensory axons





Thank you...

