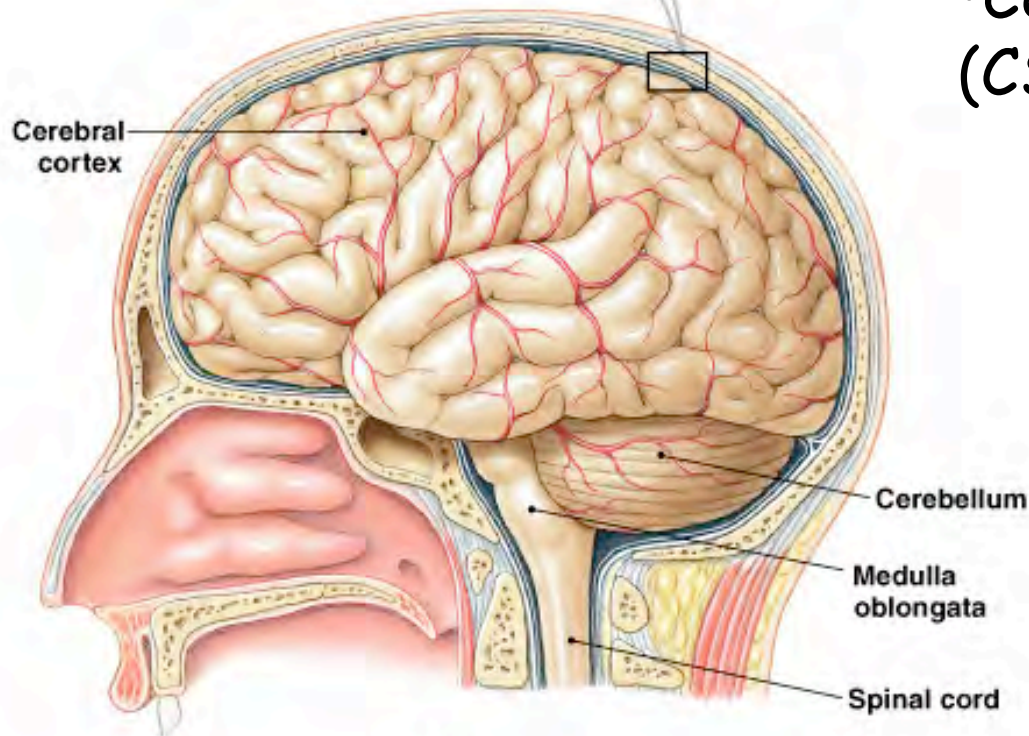
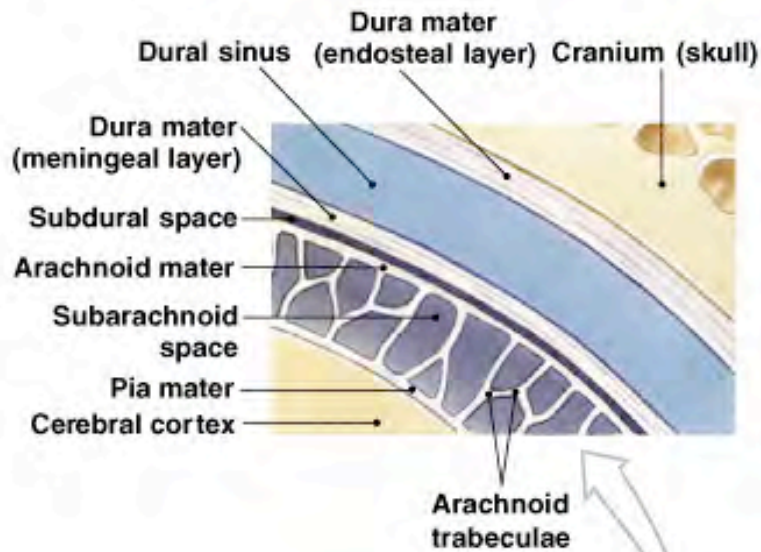


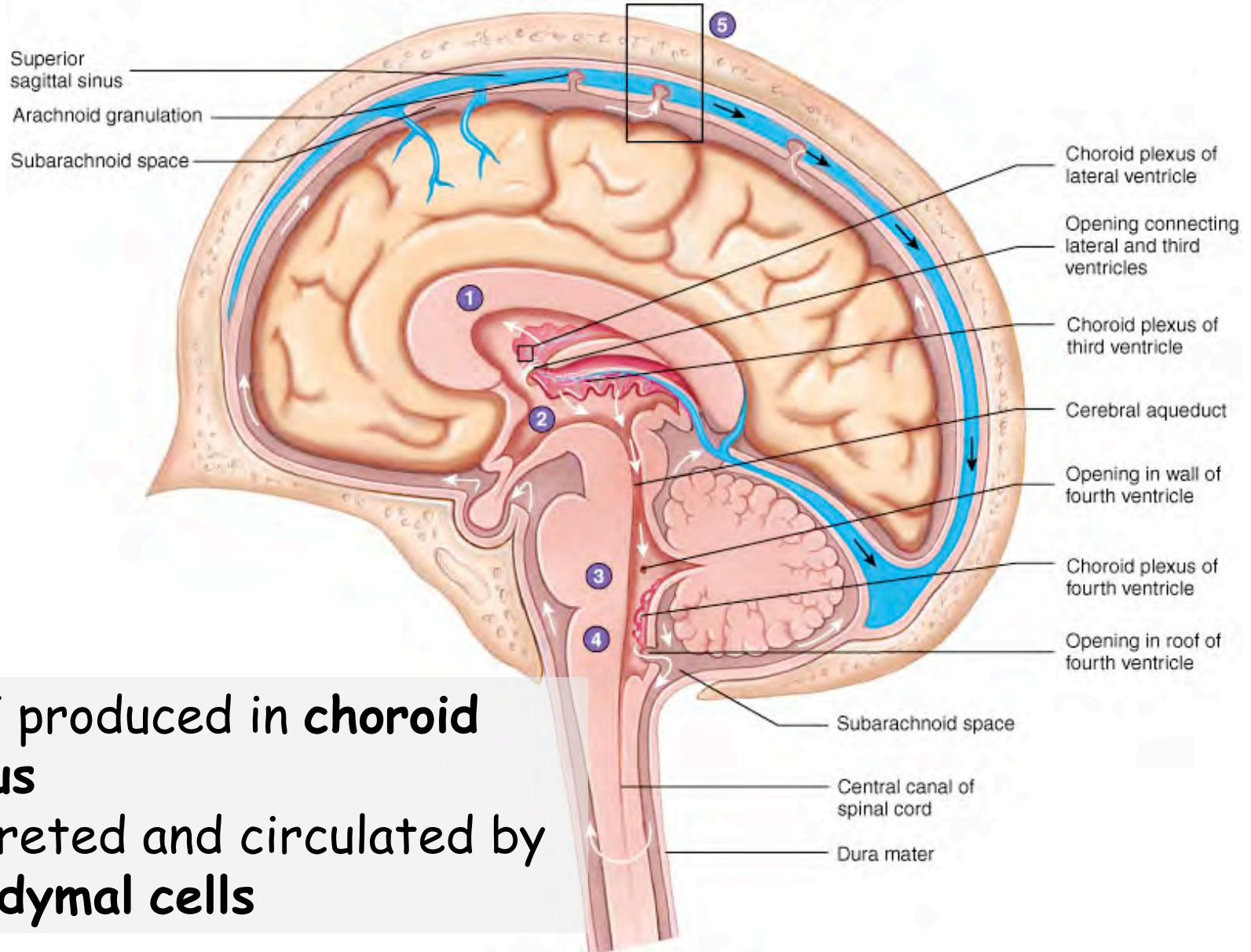
CNS

Anatomy of the Brain

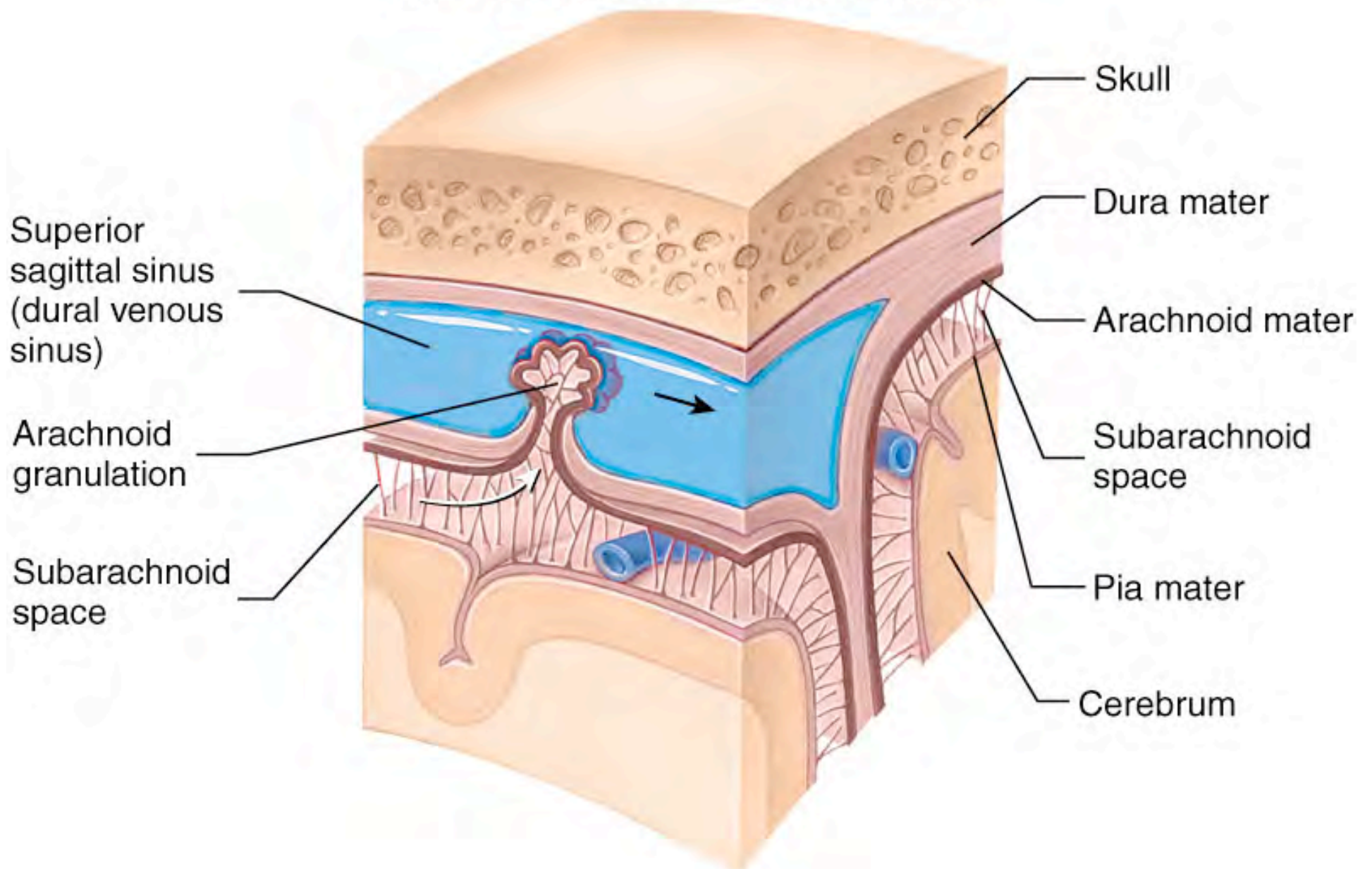


## Support and Protection

- Meninges encase brain & SC
- Three layers:
  - Dura mater
  - Arachnoid
  - Pia mater
- Between layers:
  - Cerebrospinal fluid (CSF; airbag for brain)

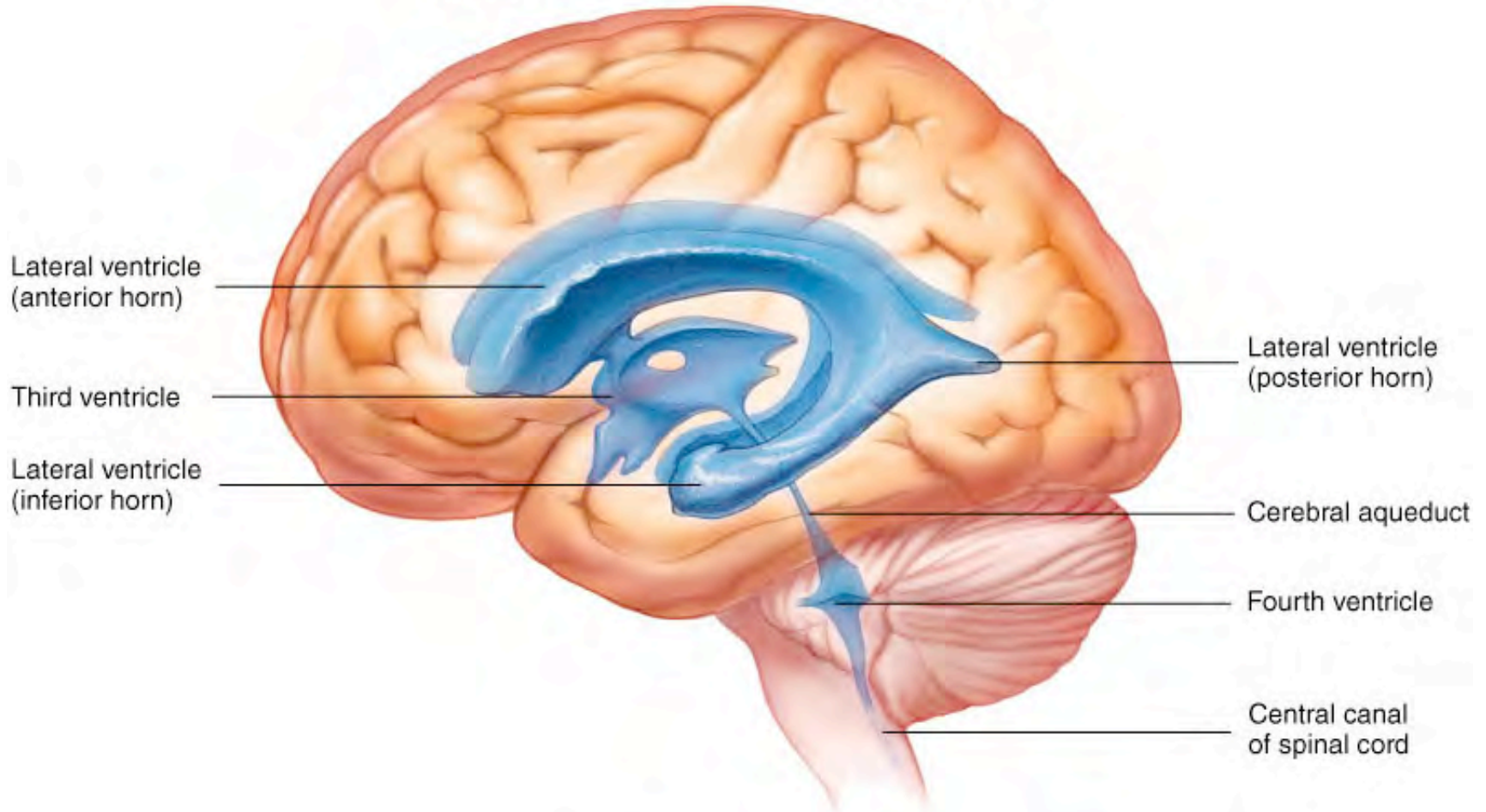


- CSF produced in **choroid plexus**
- Secreted and circulated by **ependymal cells**



# Ventricles

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Lateral ventricle  
(anterior horn)

Third ventricle

Lateral ventricle  
(inferior horn)

Lateral ventricle  
(posterior horn)

Cerebral aqueduct

Fourth ventricle

Central canal  
of spinal cord

**Lateral view**

**CEREBRUM**

- Conscious thought processes, intellectual functions
- Memory storage and processing
- Conscious and subconscious regulation of skeletal muscle contractions

Left cerebral hemisphere

Gyri

Sulci

Fissures

**DIENCEPHALON**

**THALAMUS**

- Relay and processing centers for sensory and motor information

**HYPOTHALAMUS**

- Centers controlling emotions, autonomic functions, and hormone production

**MESENCEPHALON**

- Processing of visual and auditory data
- Generation of reflexive somatic motor responses
- Maintenance of consciousness

**PONS**

- Relays sensory information to cerebellum and thalamus
- Subconscious somatic and visceral motor centers

**MEDULLA OBLONGATA**

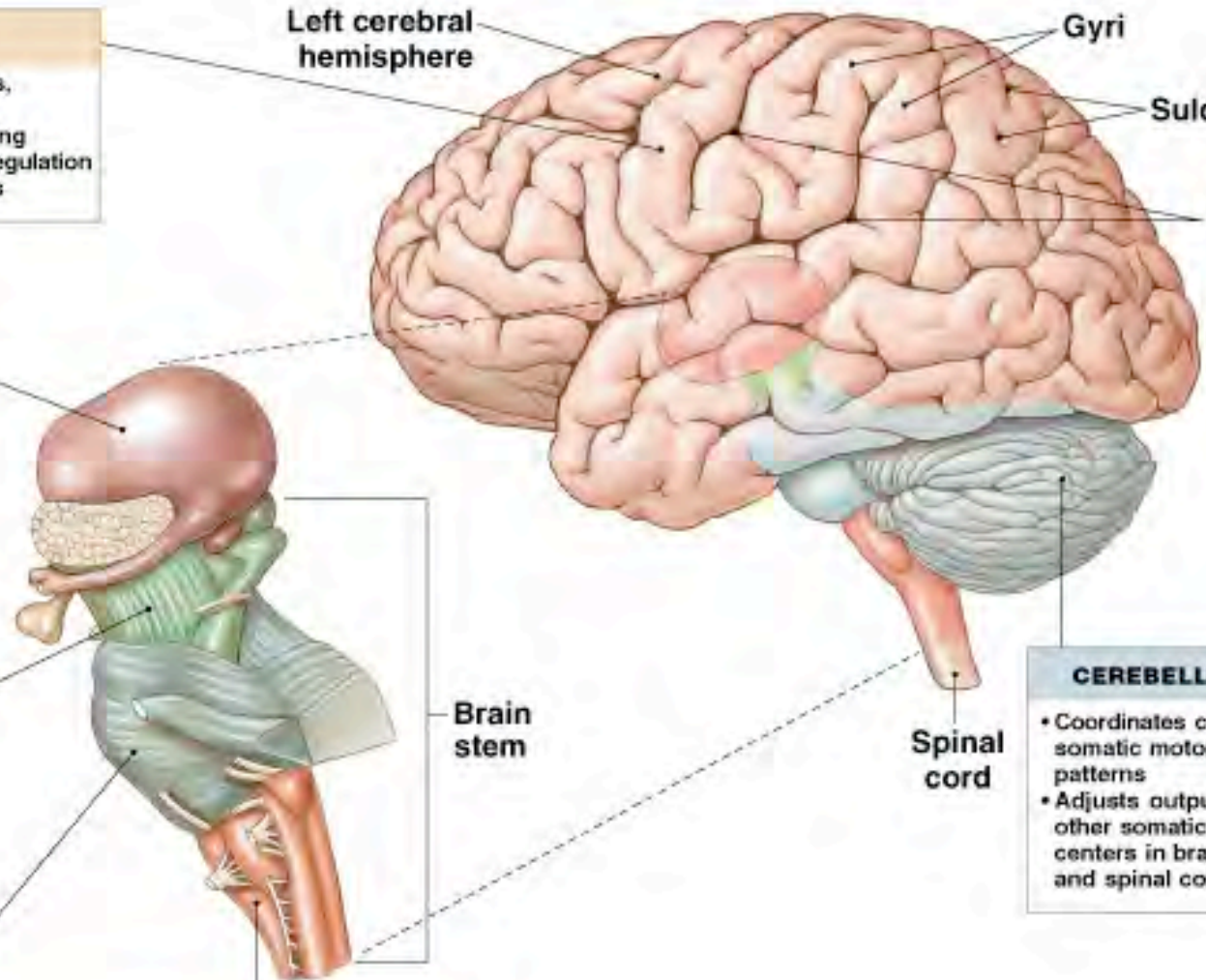
- Relays sensory information to thalamus and to other portions of the brain stem
- Autonomic centers for regulation of visceral function (cardiovascular, respiratory, and digestive system activities)

Brain stem

Spinal cord

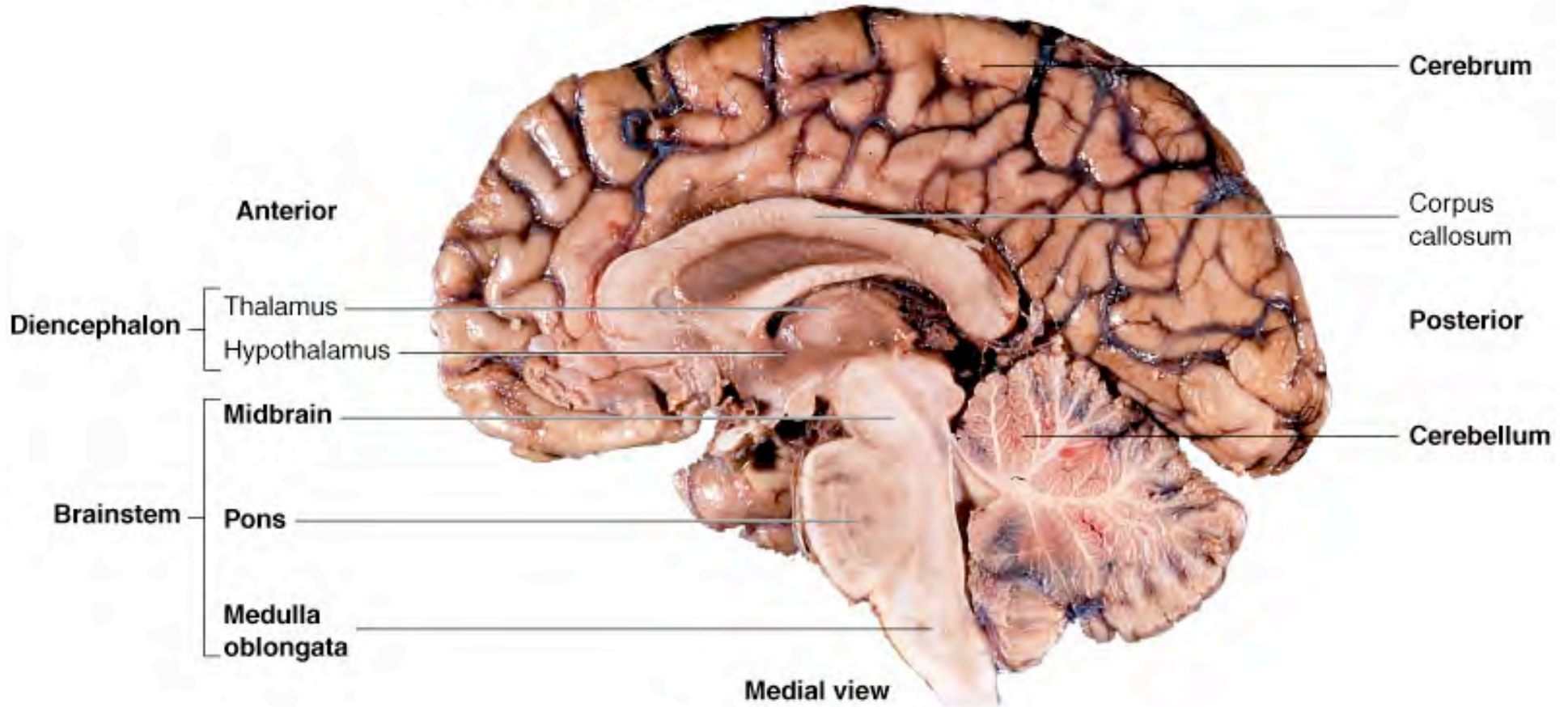
**CEREBELLUM**

- Coordinates complex somatic motor patterns
- Adjusts output of other somatic motor centers in brain and spinal cord

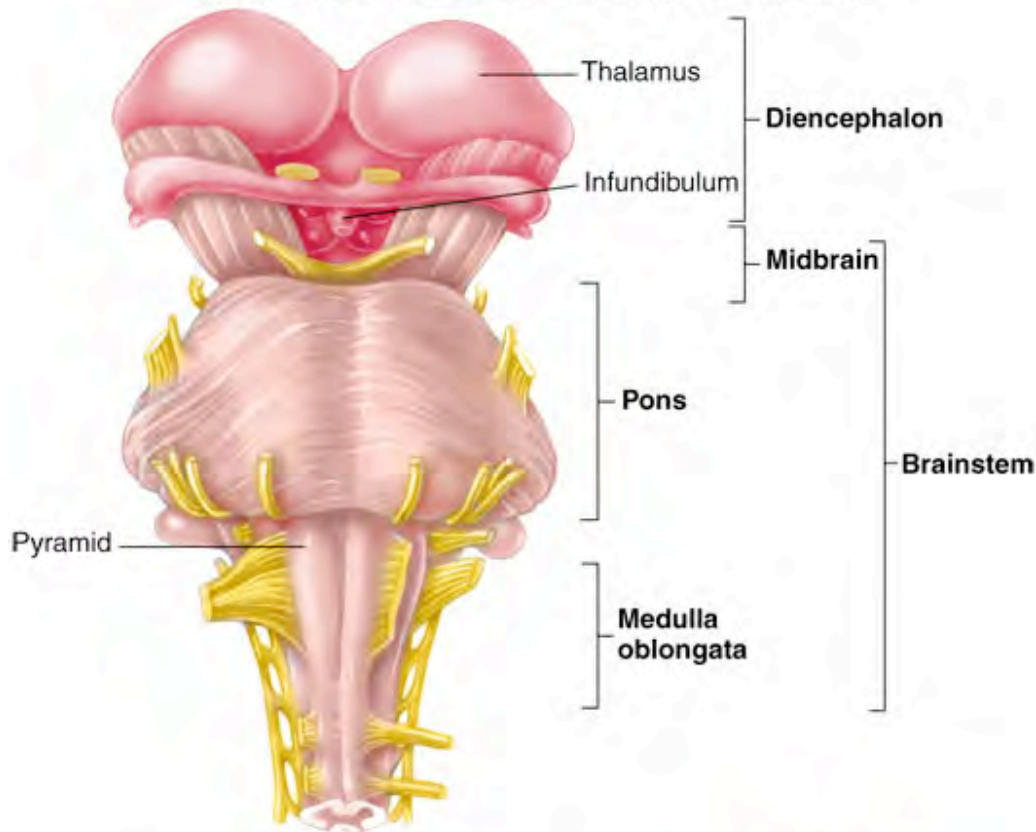


# Major Features of Brain

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(a) Anterior view



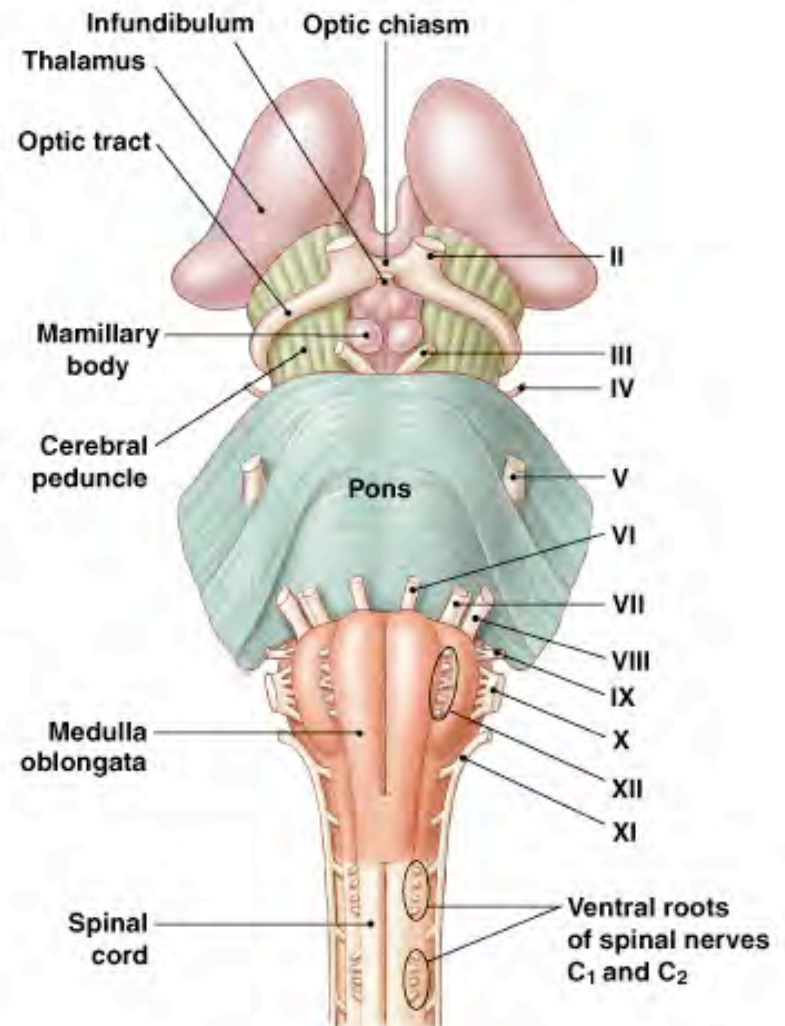
# Brainstem

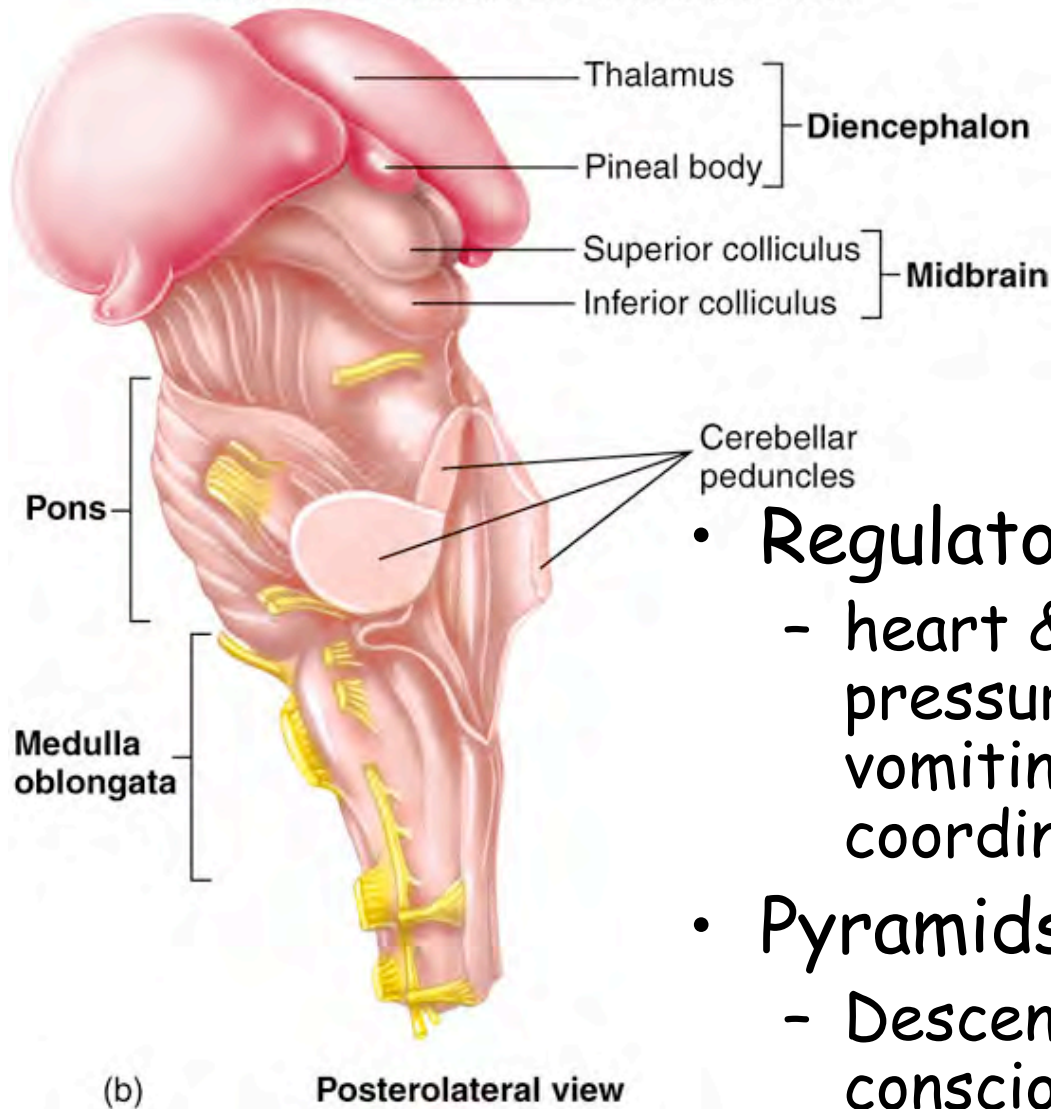
- Cranial nerves 3-12
- Medulla oblongata
- Pons
- Mesencephalon
- Diencephalon
  - Thalamus
  - Hypothalamus



# Brainstem

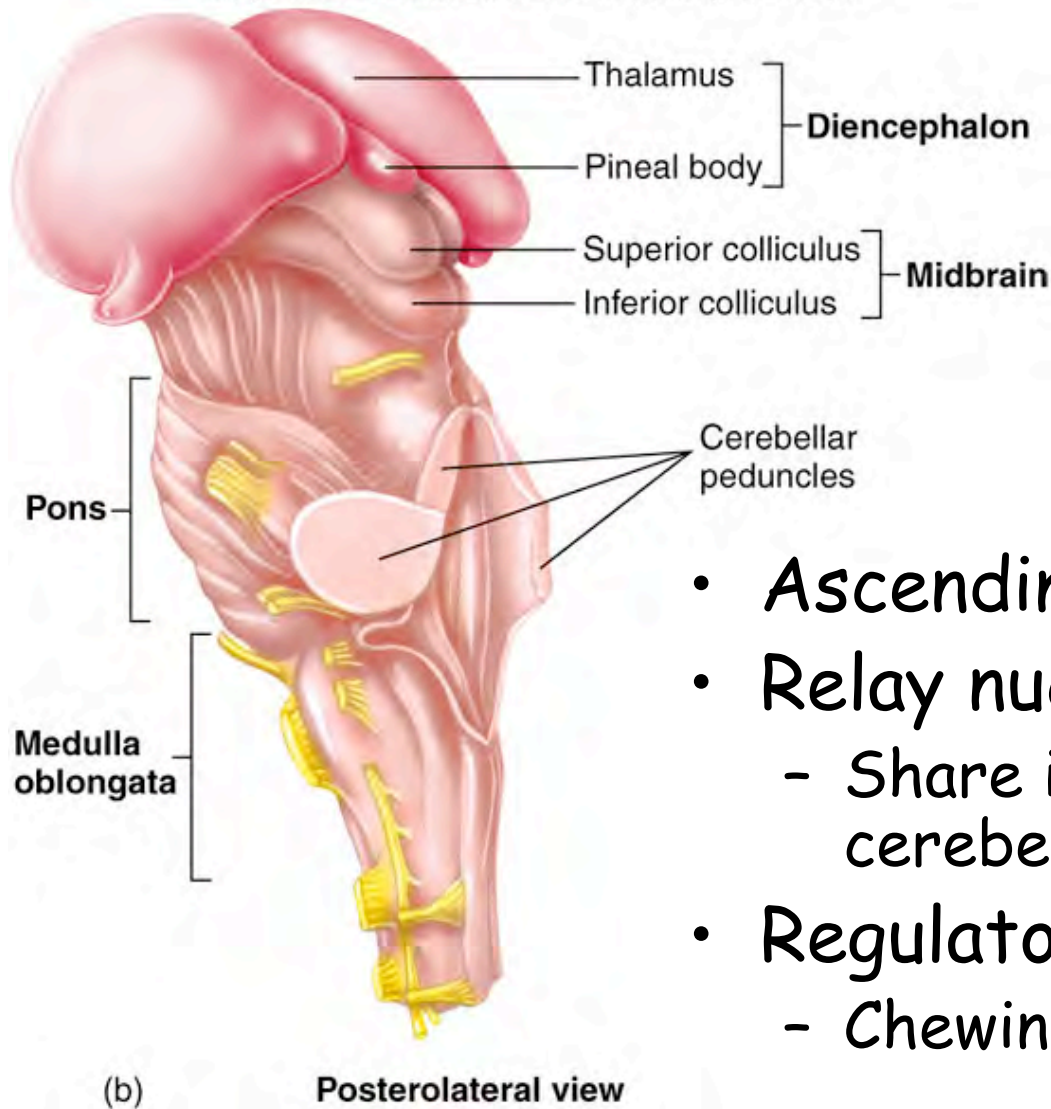
- **Diencephalon:** Thalamus (sensory info. filter) & hypothalamus (eating & drinkin reflexes)
- **Mesencephalon:** Visual and Auditory reflex centers (head-turning)
- **Pons:** Relay station for sensory info.
- **Medulla oblongata:** Regulate cardio, respiratory, digestive activities





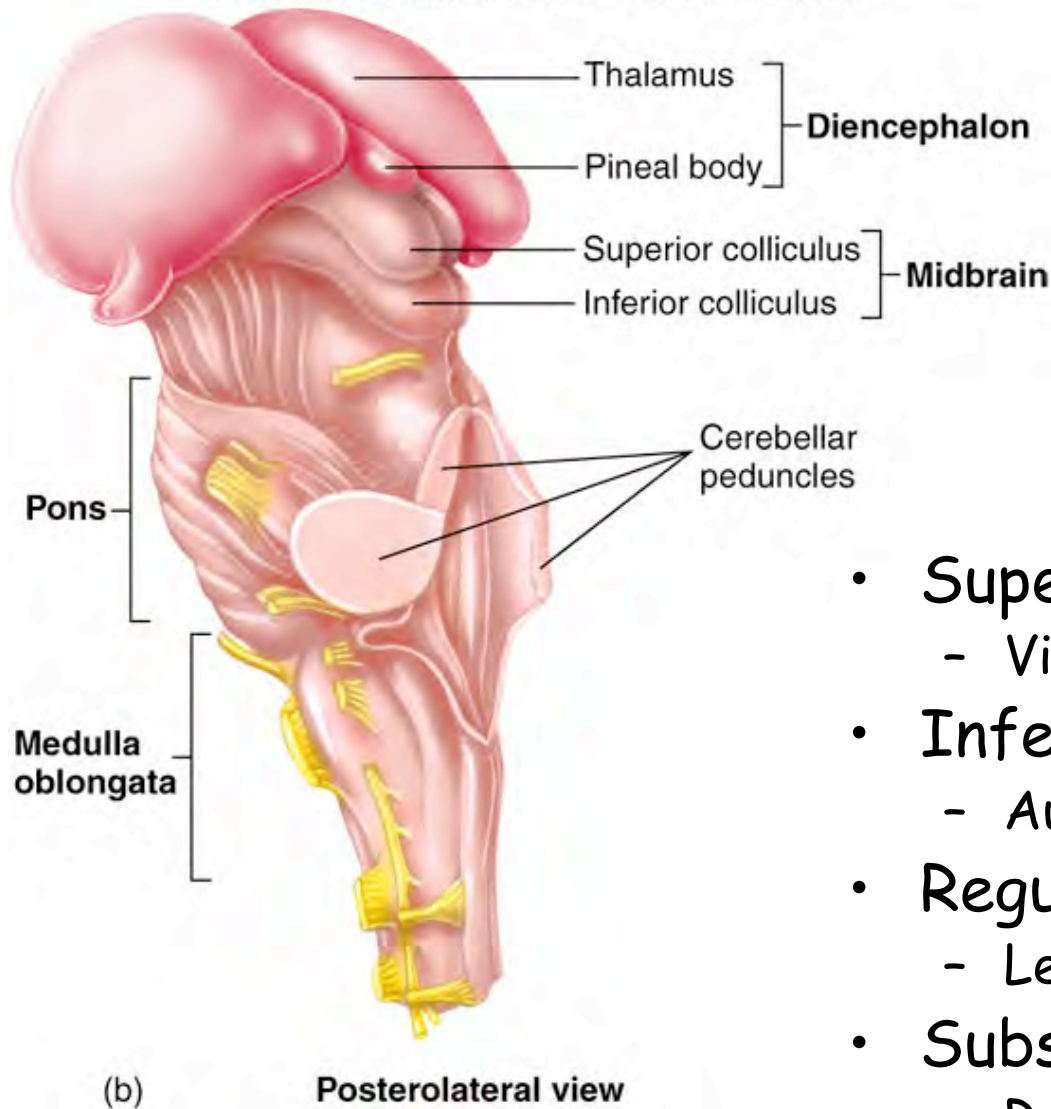
# Medulla Oblongata

- **Regulatory Nuclei:**
  - heart & respiratory rate, blood pressure, coughing, sneezing, vomiting, swallowing, balance, coordination, digestion
- **Pyramids:**
  - Descending motor nerves; conscious control of skeletal muscle



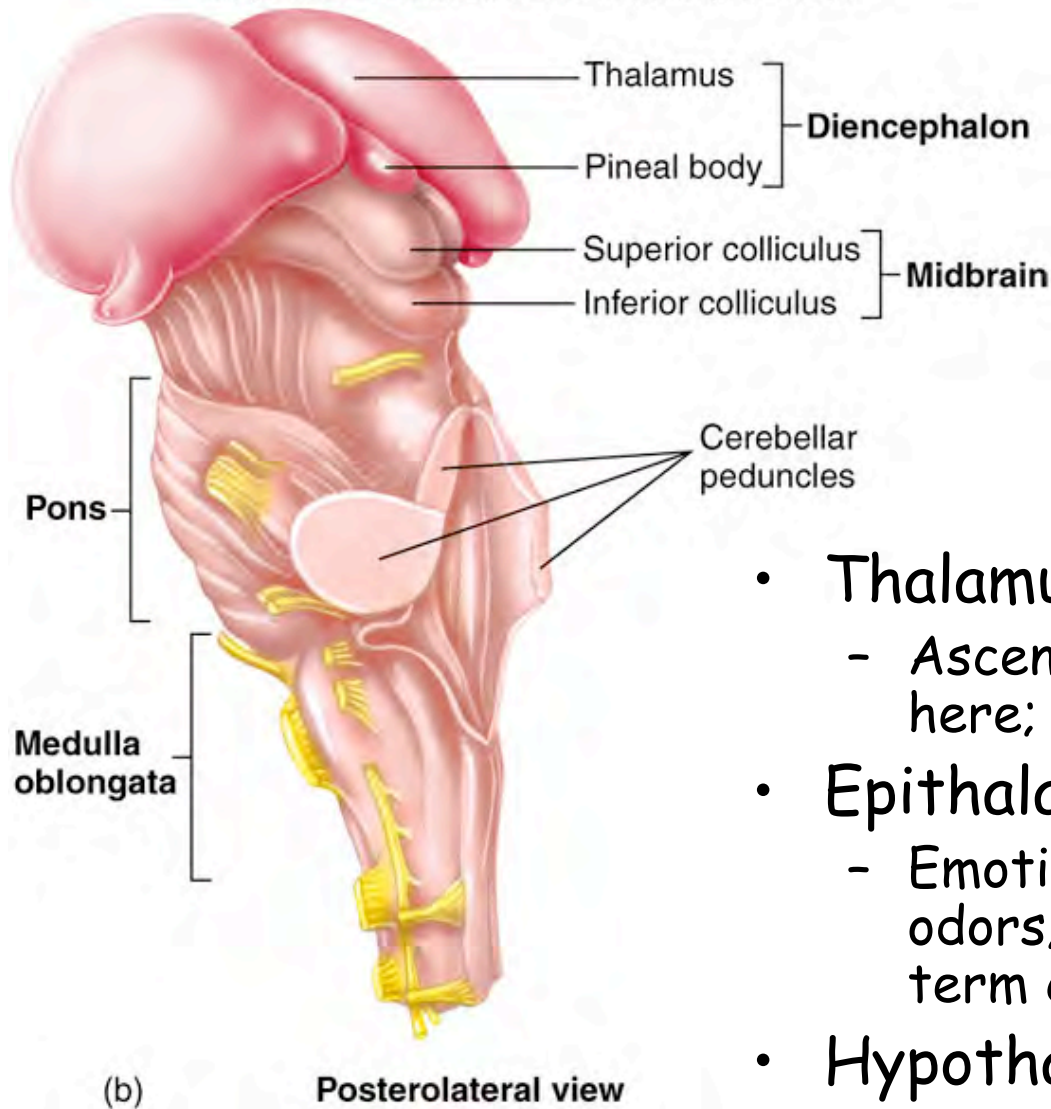
# Pons

- Ascending & descending tracts
- Relay nuclei:
  - Share info between cerebrum & cerebellum
- Regulatory nuclei:
  - Chewing & salivation; respiration



# Midbrain

- Superior colliculi
  - Visual reflex
- Inferior colliculi
  - Auditory reflex & nerve tracts
- Regulatory nuclei
  - Lens shape, pupil diameter
- Substantia nigra
  - Regulates body movements

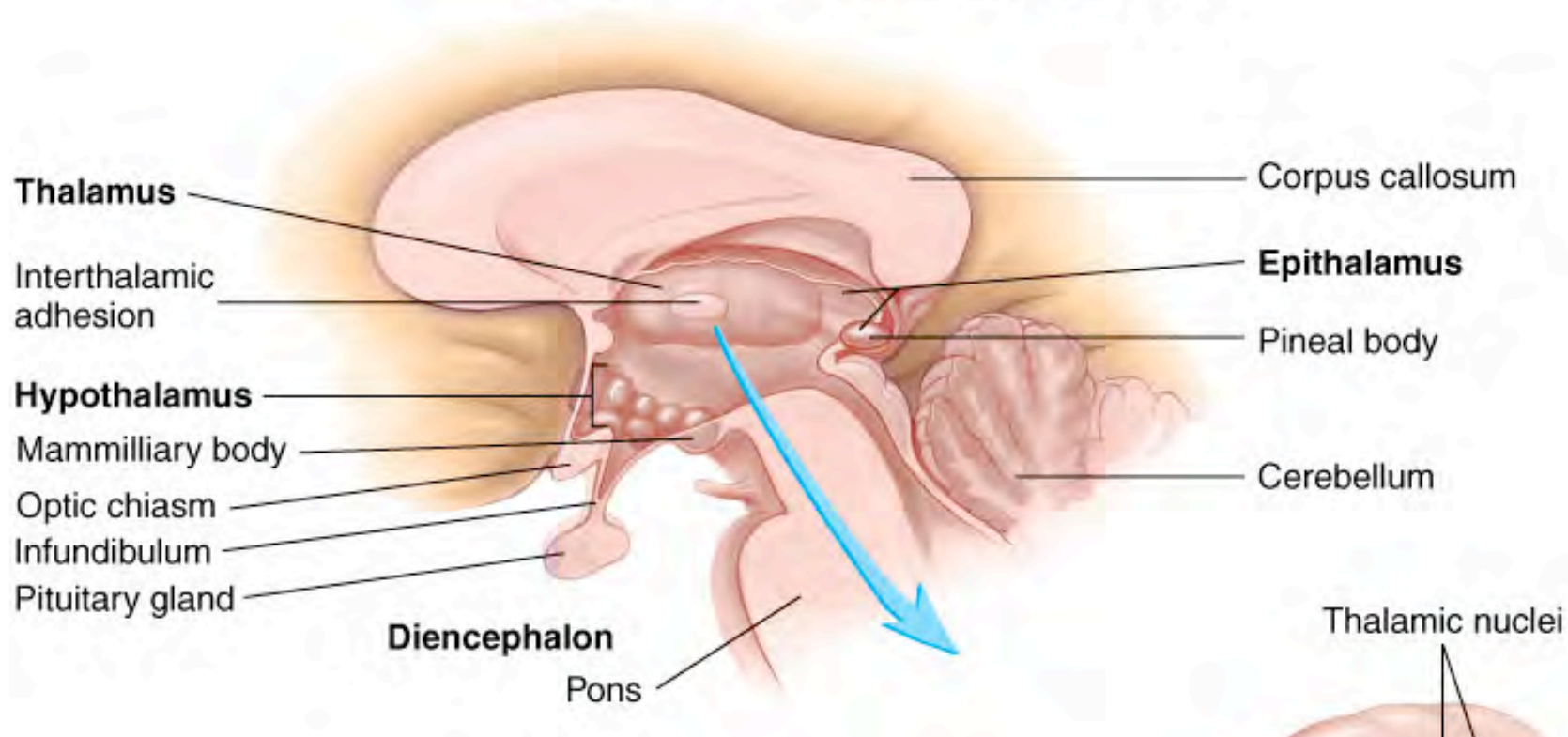


# Diencephalon

- **Thalamus**
  - Ascending sensory neurons synapse here; project to cerebrum
- **Epithalamus**
  - Emotional & visceral response to odors; **pineal body** regulates long-term cycles
- **Hypothalamus**
  - Maintaining homeostasis via hormone release

# Diencephalon

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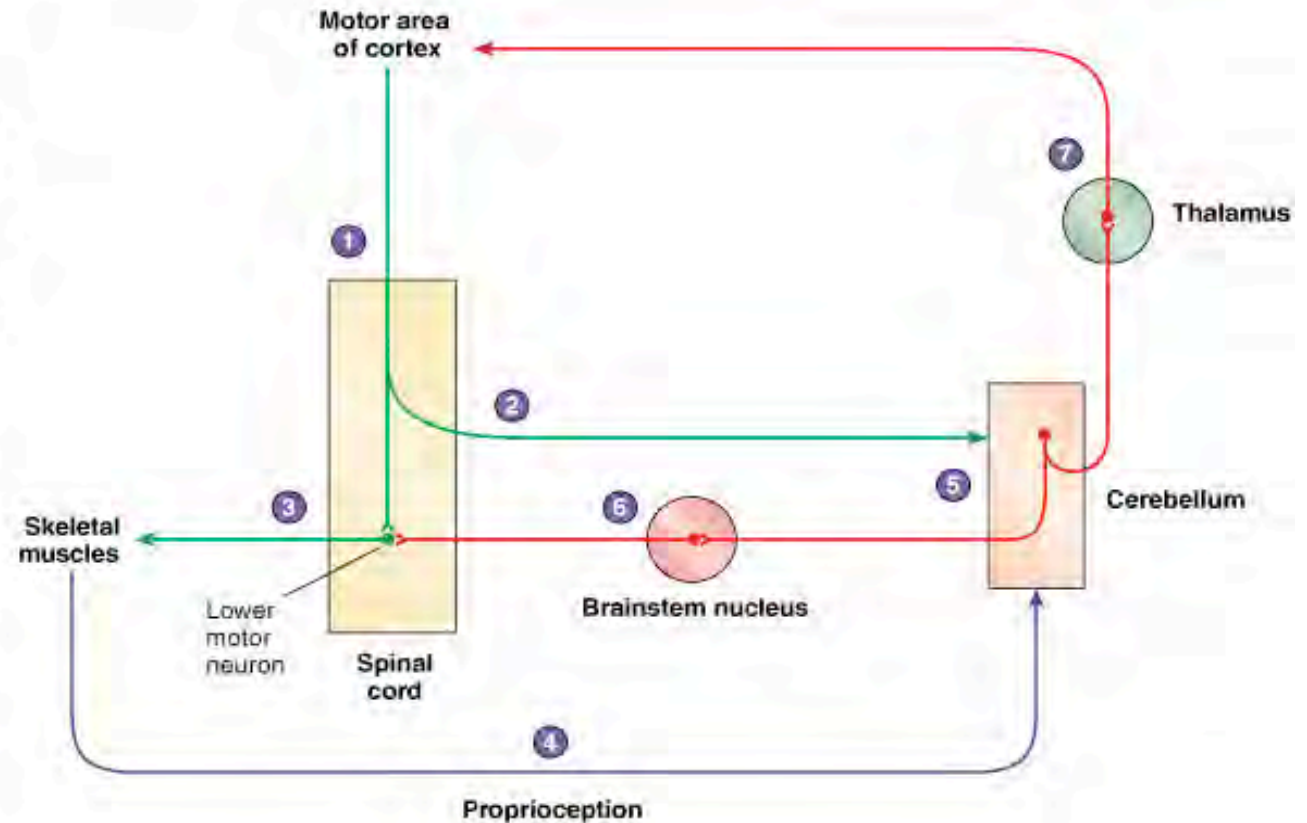
# Cerebellum

- Gray and white matter
- Balance; maintains muscle tone; coordinates fine muscle movement
- **Comparator:** integrates proposed movements with current body position to produce smooth, exact movement
- Involved in learning new balance-intensive activities
  - Riding a bike, yoga, climbing

# Movement & Body position

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1. The motor area of the cerebral cortex sends action potentials to lower motor neurons in the spinal cord.
2. Action potentials from the motor cortex inform the cerebellum of the intended movement.
3. Lower motor neurons in the spinal cord send action potentials to skeletal muscles, causing them to contract.
4. Proprioceptive signals from the skeletal muscles and joints to the cerebellum convey information concerning the status of the muscles and the structure being moved during contraction.
5. The cerebellum compares the information from the motor cortex to the proprioceptive information from the skeletal muscles and joints.
6. Action potentials from the cerebellum to the spinal cord modify the stimulation from the motor cortex to the lower motor neurons.
7. Action potentials from the cerebellum are sent to the motor cortex, which modify its motor activity.

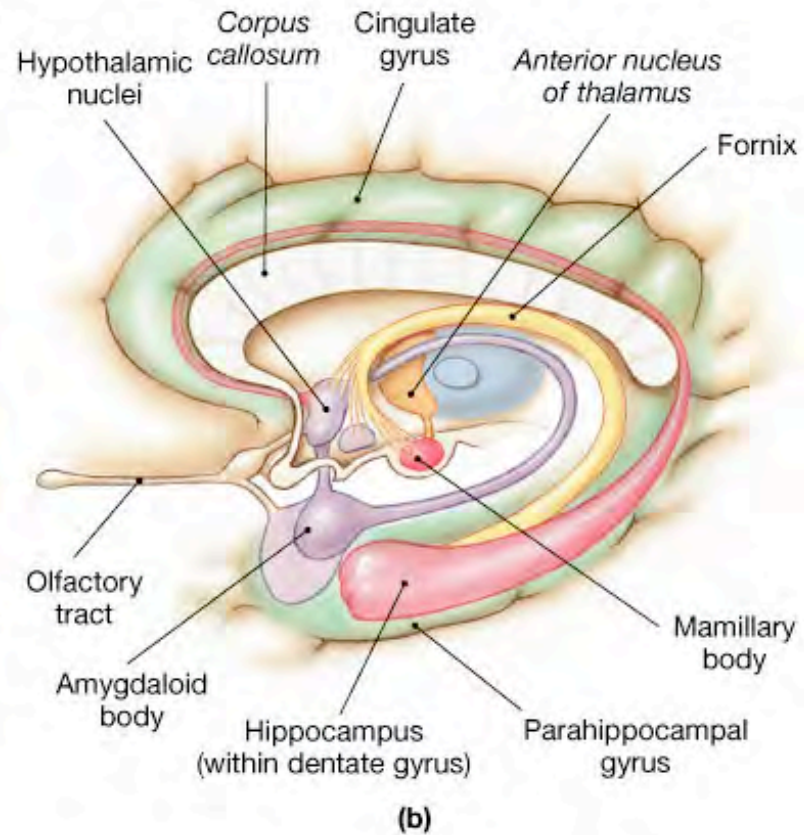
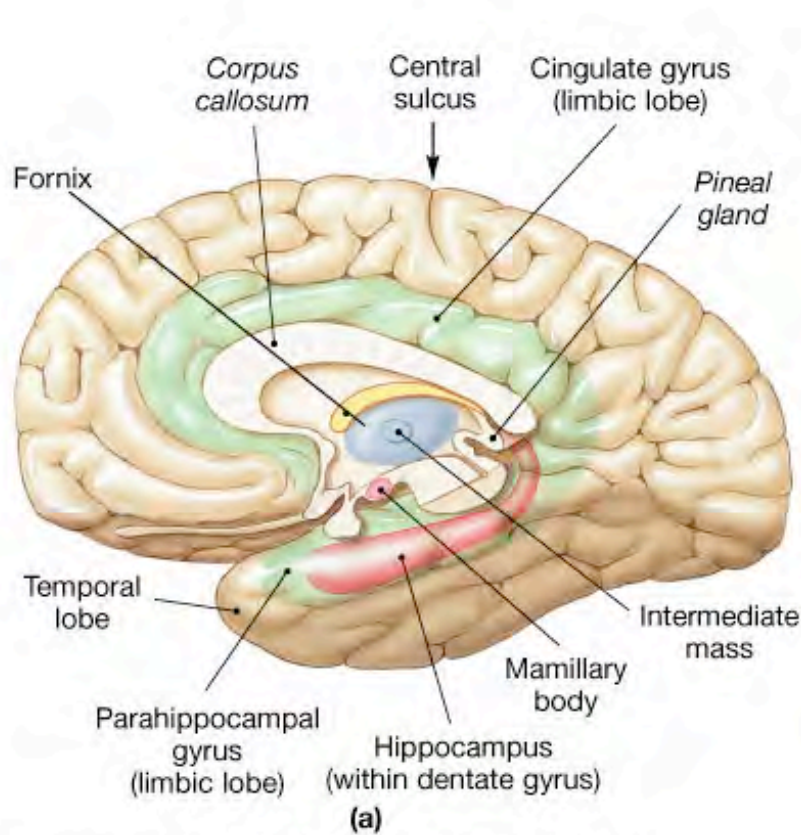


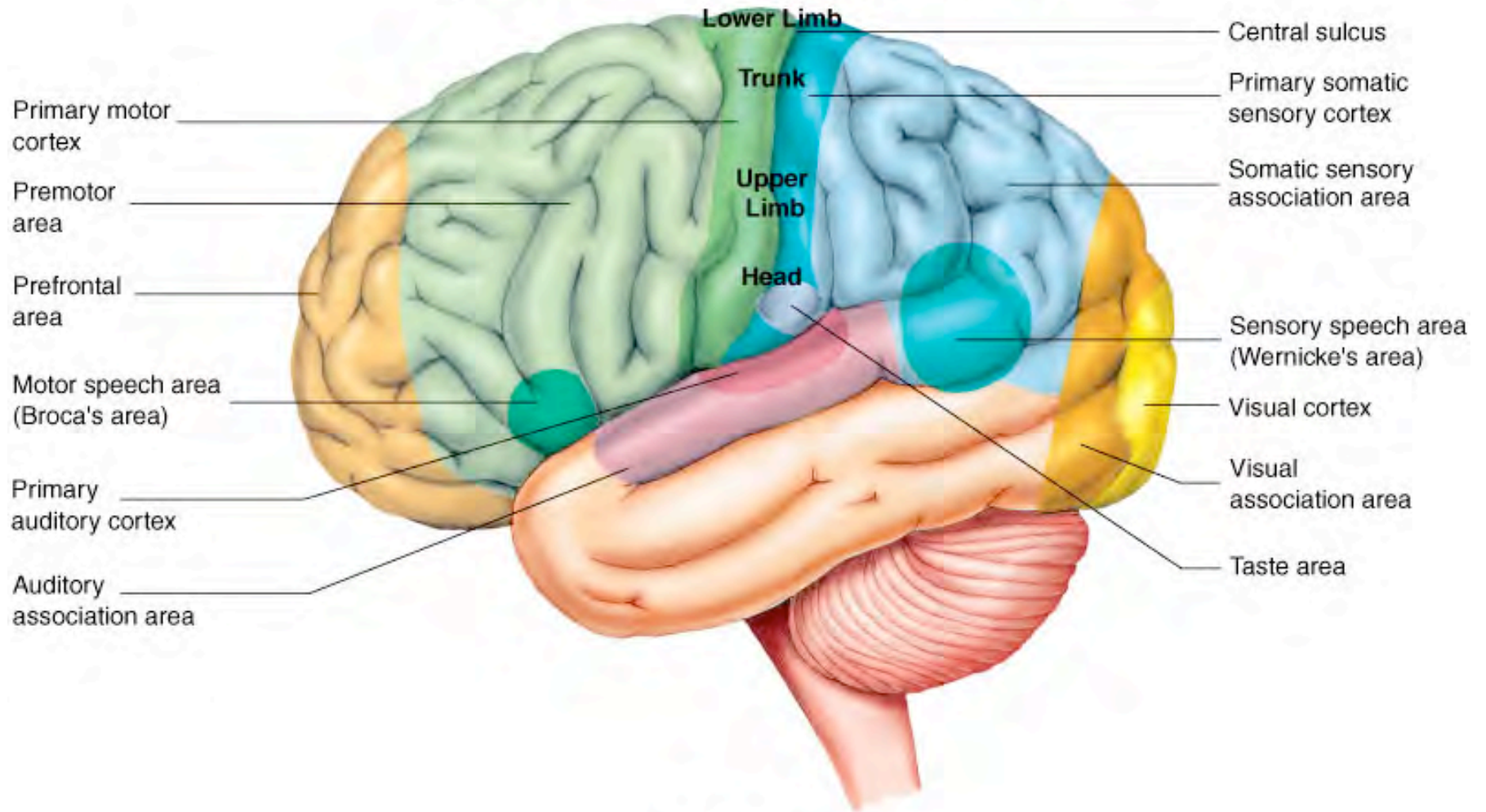


# Limbic System

- Facilitates memory storage & retrieval
- Establishes & drives emotional states
- Links conscious with unconscious and autonomic functions of the brain stem

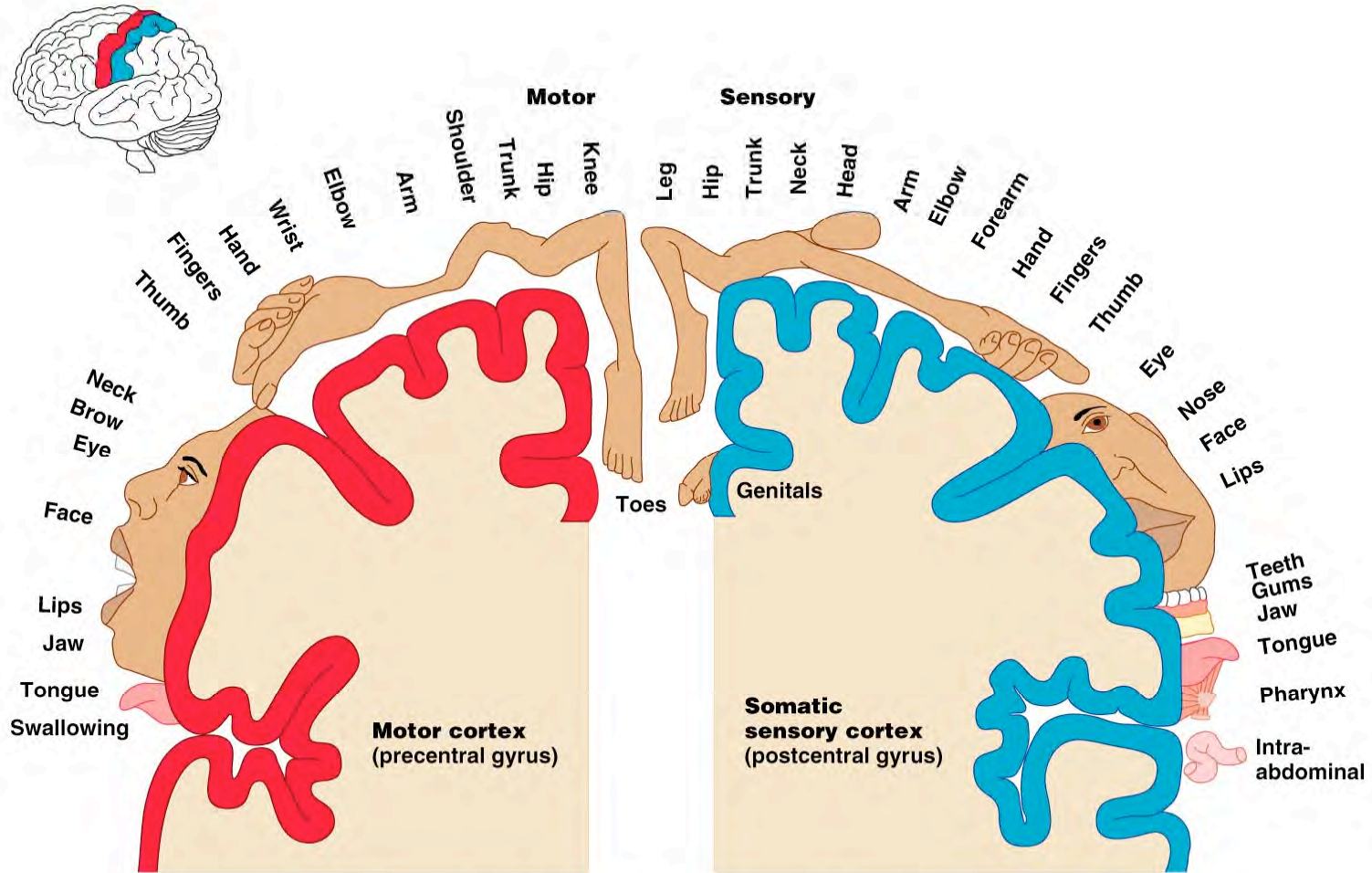
# Limbic System





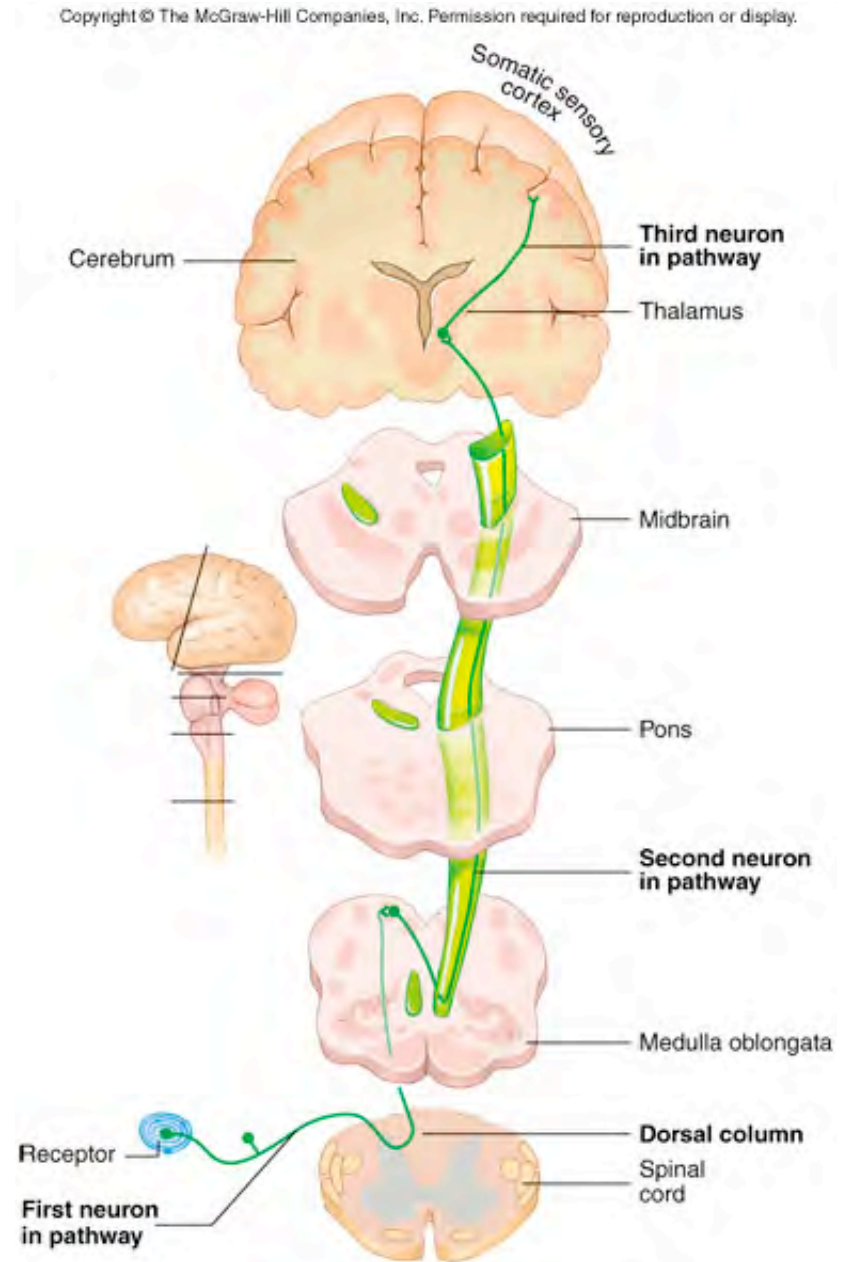
Lateral view

# Cerebral Space



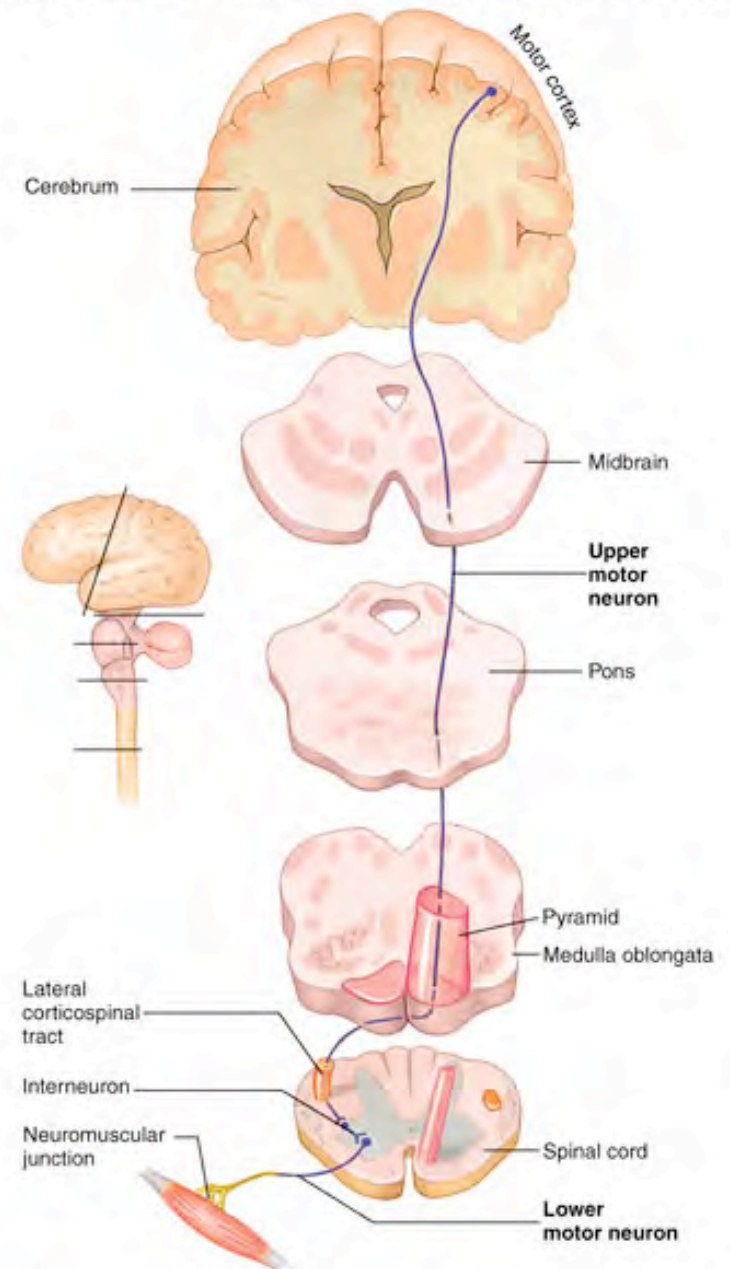
# Ascending somatosensory pathway

- Crossover in MO, to opposite side of body
- Synapse in thalamus
- Projection to cerebral cortex

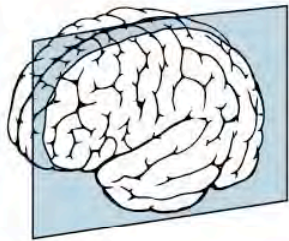


# Descending Motor pathway

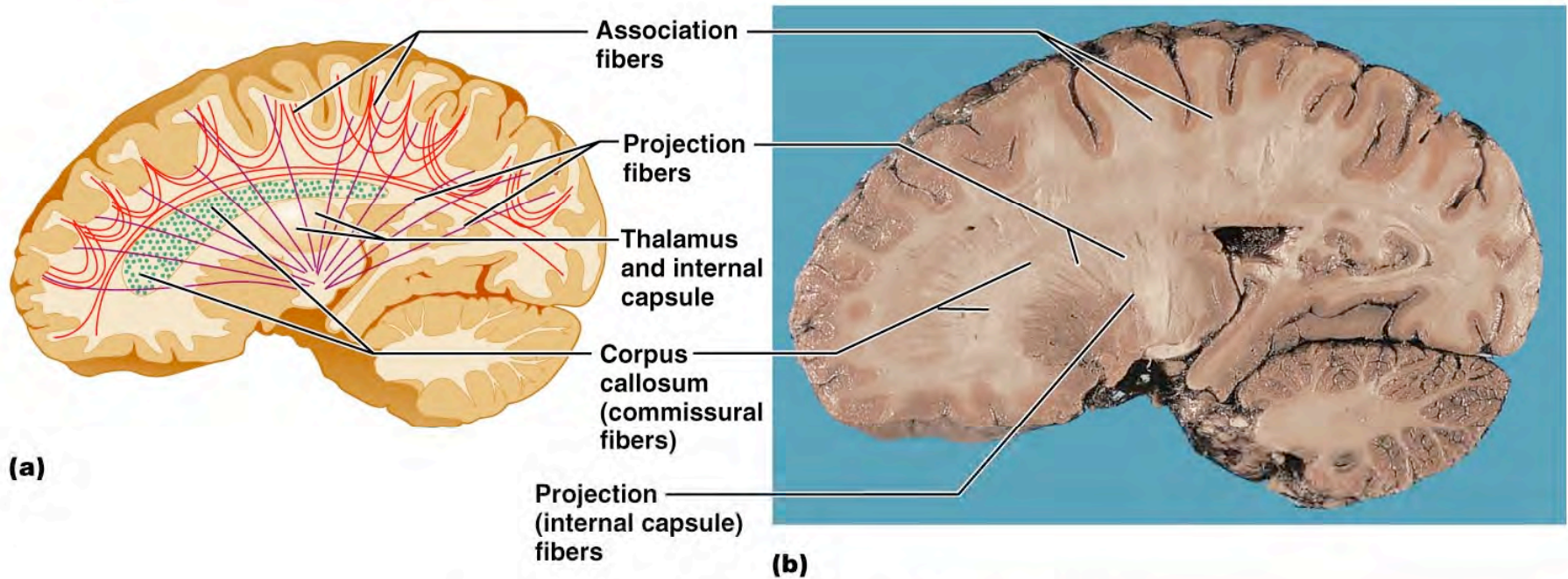
- Project from motor cortex
- Crossover @ lower MO
- Synapse in spinal cord
- Project to effector



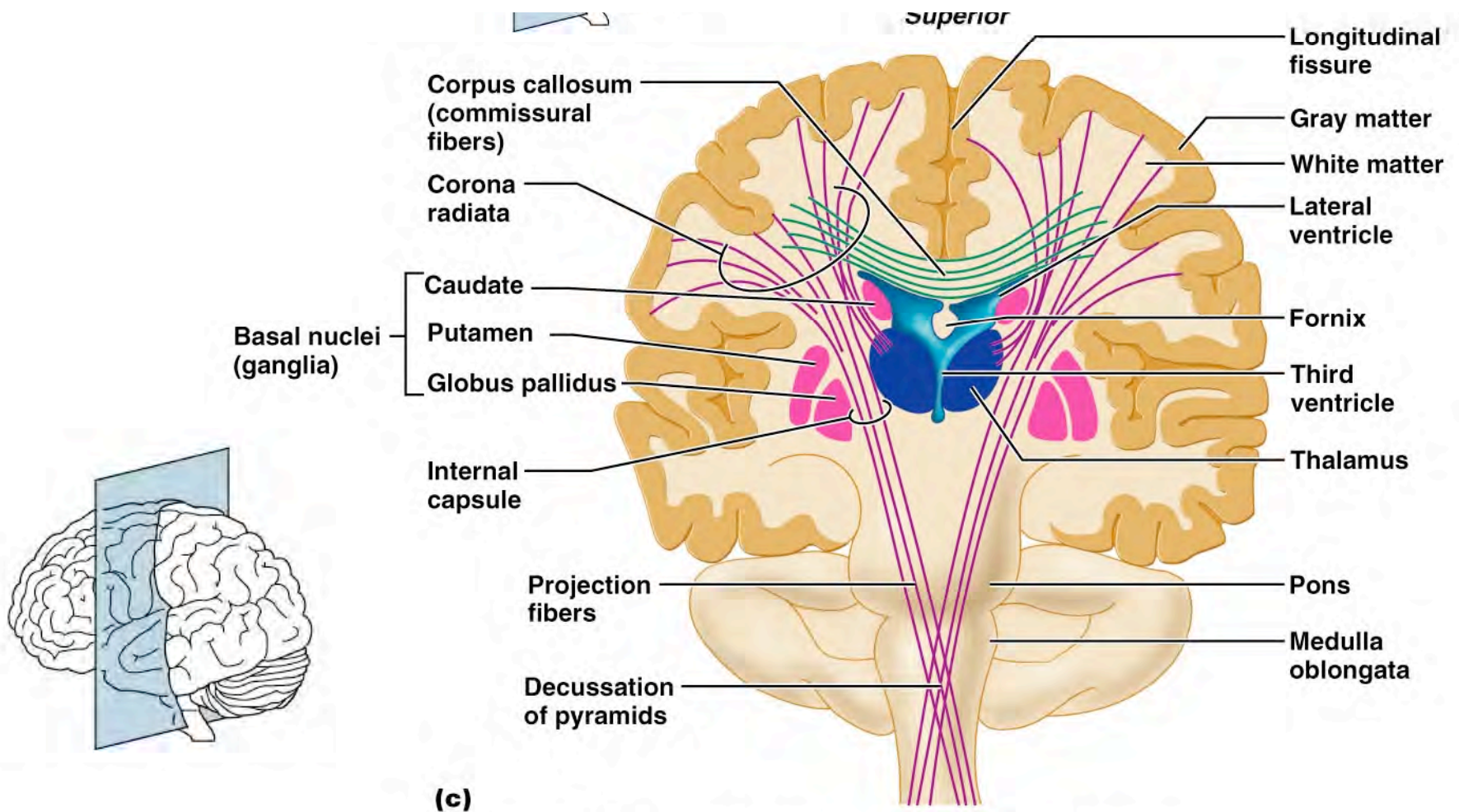
# Axons connect CNS - CNS and CNS - PNS



Association, commissural, projection



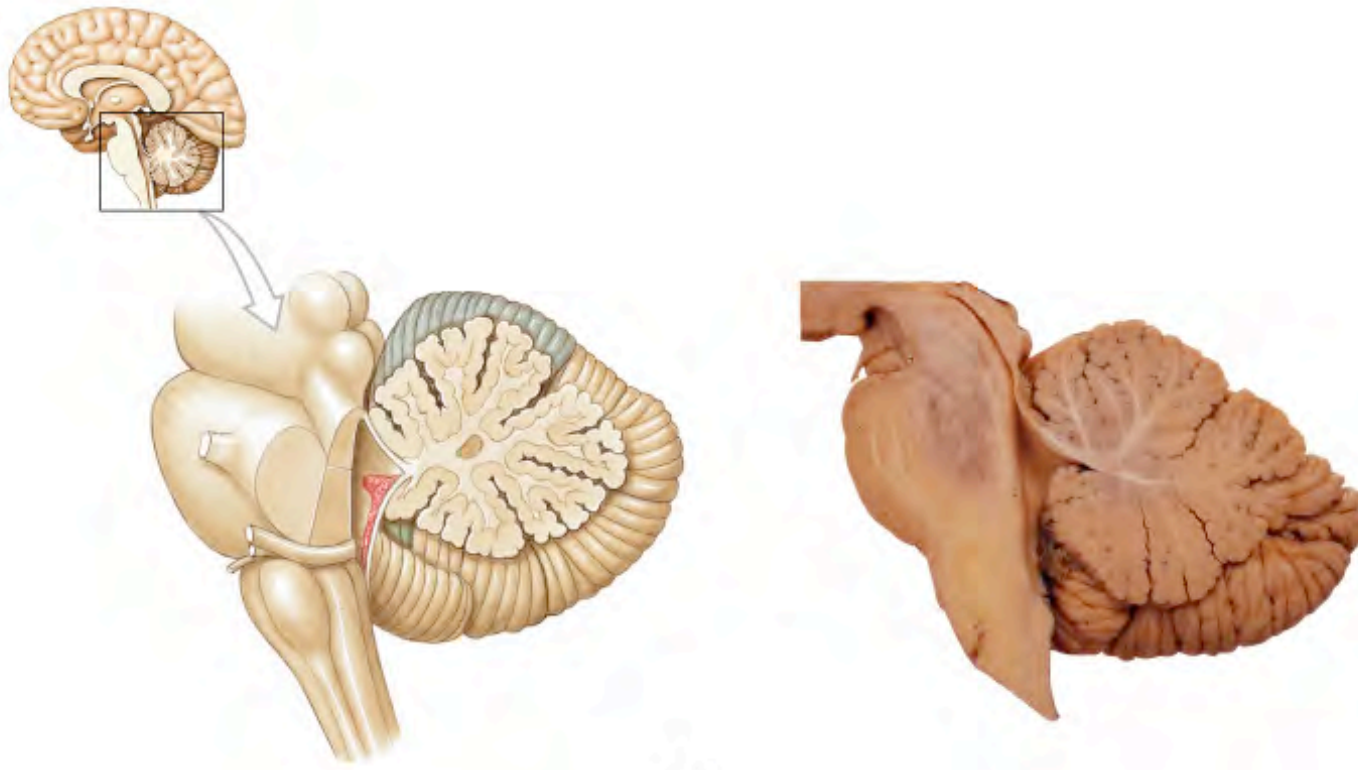
# Axons connect CNS - CNS and CNS - PNS





# Cerebellum

Controls skeletal muscle contractions



# Cerebrum & its Regions

Complex info.

Processing

- Conscious thought
- Reasoning
- Memory creation & storage

