

# NeuroAnatomy

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# Brainstem 1

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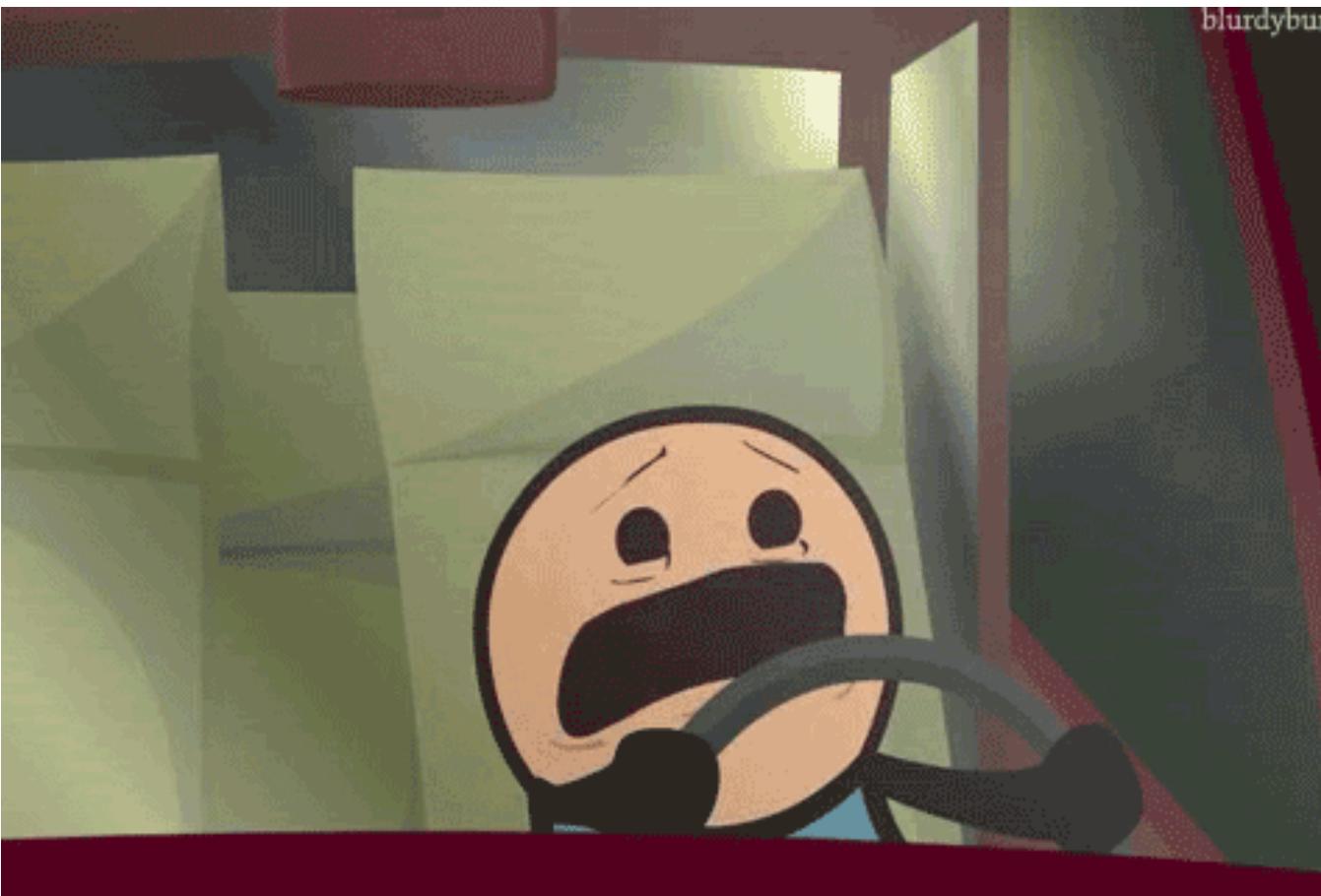
SEPTEMBER 30TH, 2025

# Objectives

At the end of the lecture you will:

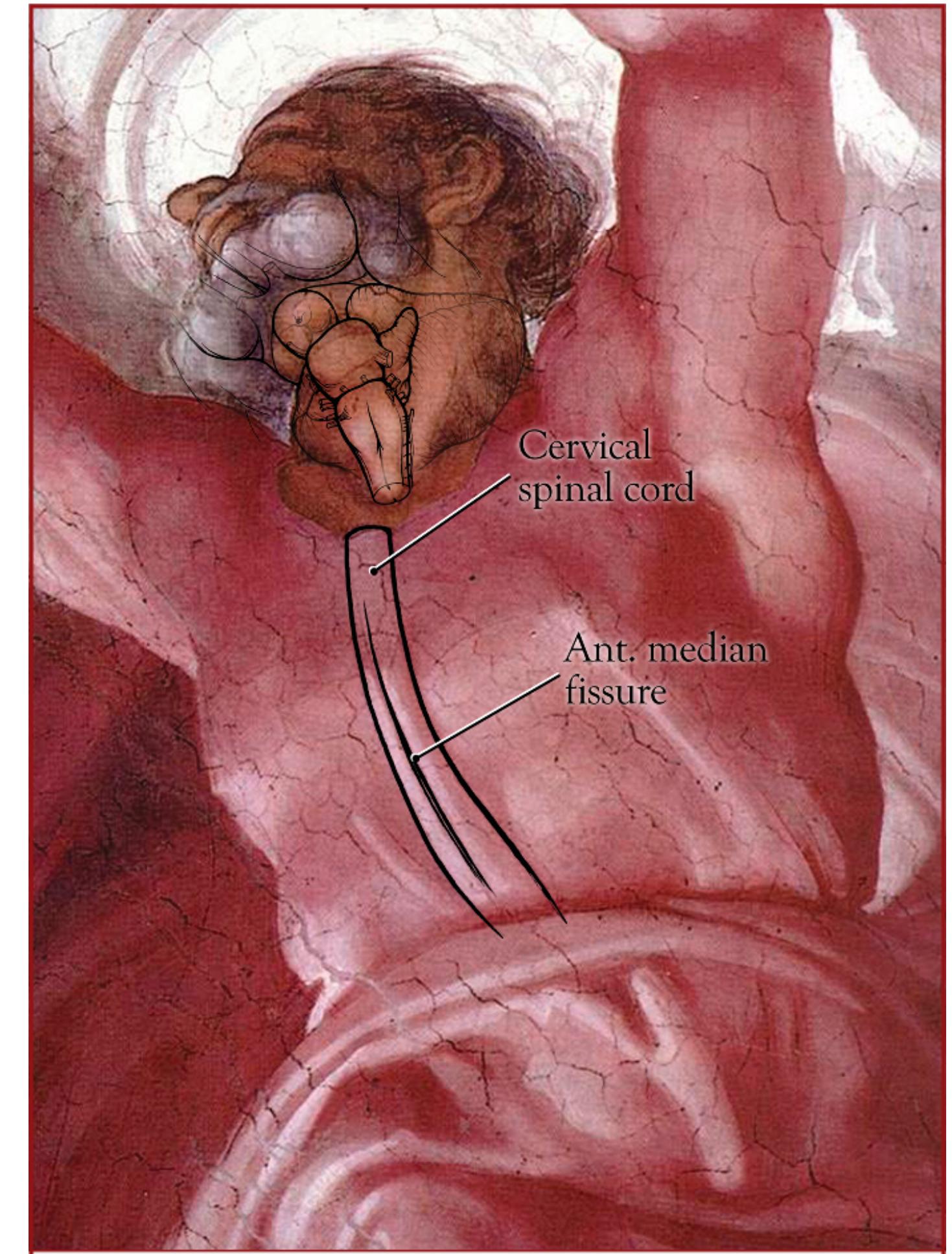
- Be familiarized with the gross anatomy of Brainstem
- Recognize the different levels of Brainstem in histological preparations
- Identify the histological features present at each level of brainstem
- Identify and locate white matter tracts traveling along the brainstem

# BrainStem



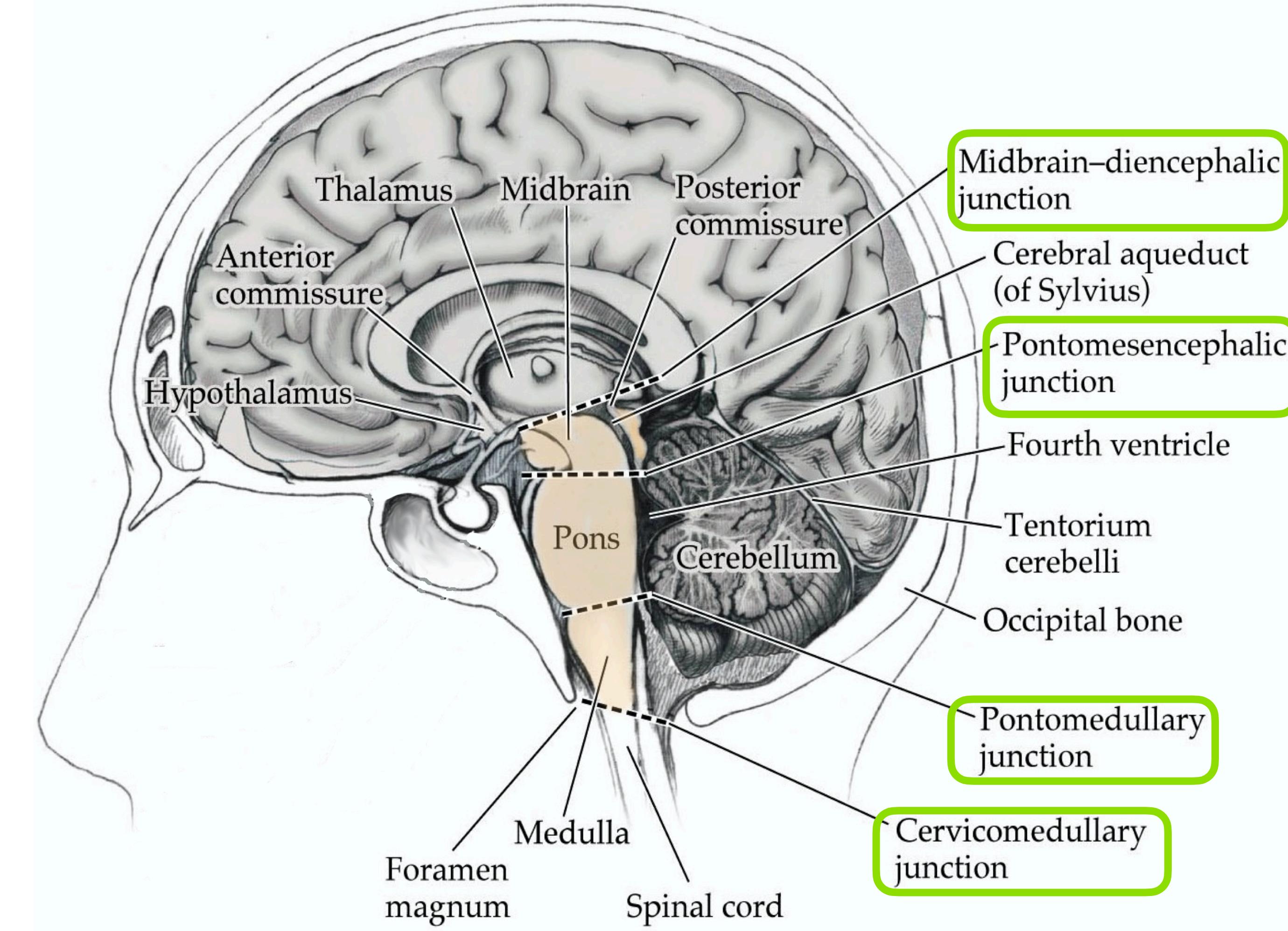
Don't panic.... Brainstem is manageable and even enjoyable when studied in a logical sequence. Fasten your sit belts!

# Spinal cord to Brainstem



Brainstem and spinal cord share similar organizational features

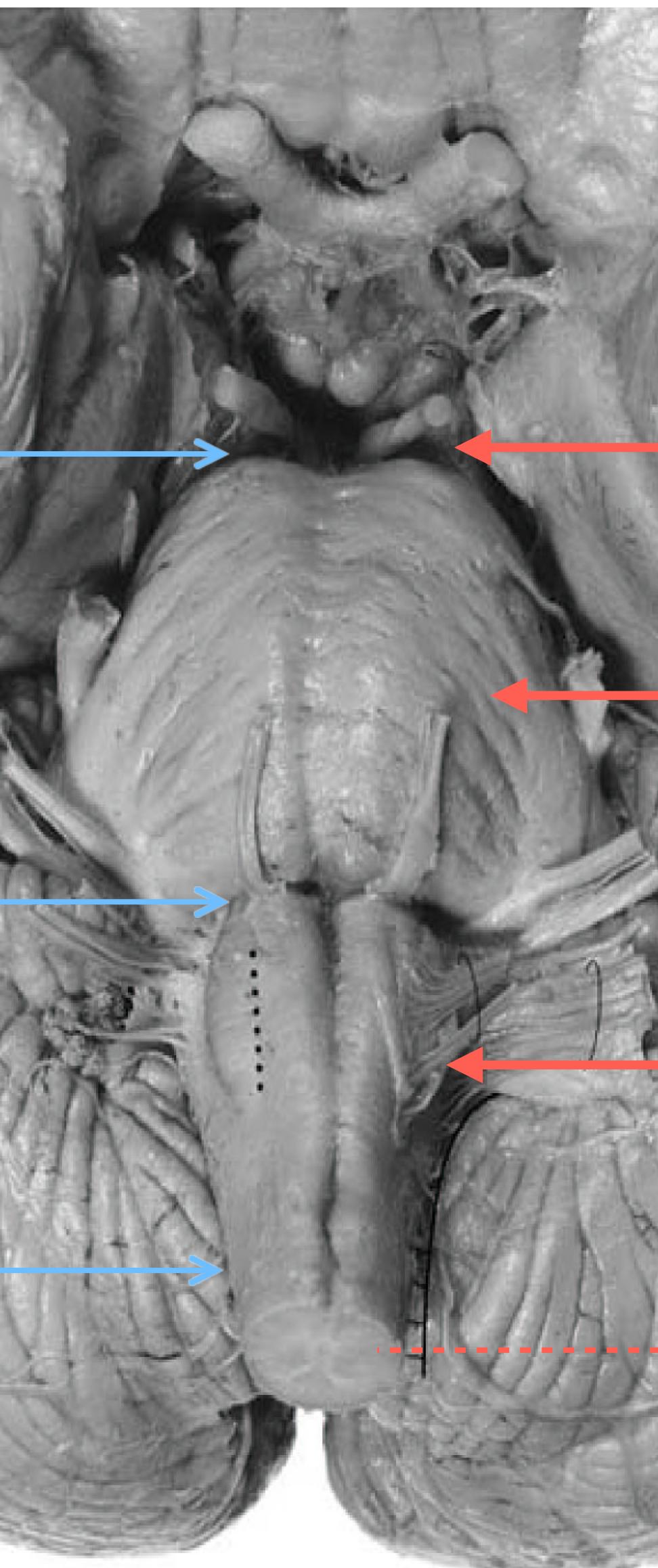
# Brainstem: medulla through midbrain



## LANDMARKS

# Brainstem Levels

Pontomesencephalic junction



Midbrain

Pons

Medulla

Pontomedullary junction



Cervicomedullary junction



Spinal Cord

# Functions at a Glance



## MIDBRAIN

Visual and auditory reflexes:  
Orienting reflexes

## PONS

Relay of information from the cochlea and vestibular apparatus:  
Control of movement and sensation from the face; control of mastication

## MEDULLA

Integration of breathing & swallowing: control of respiration: control of blood pressure;  
control of cortical arousal

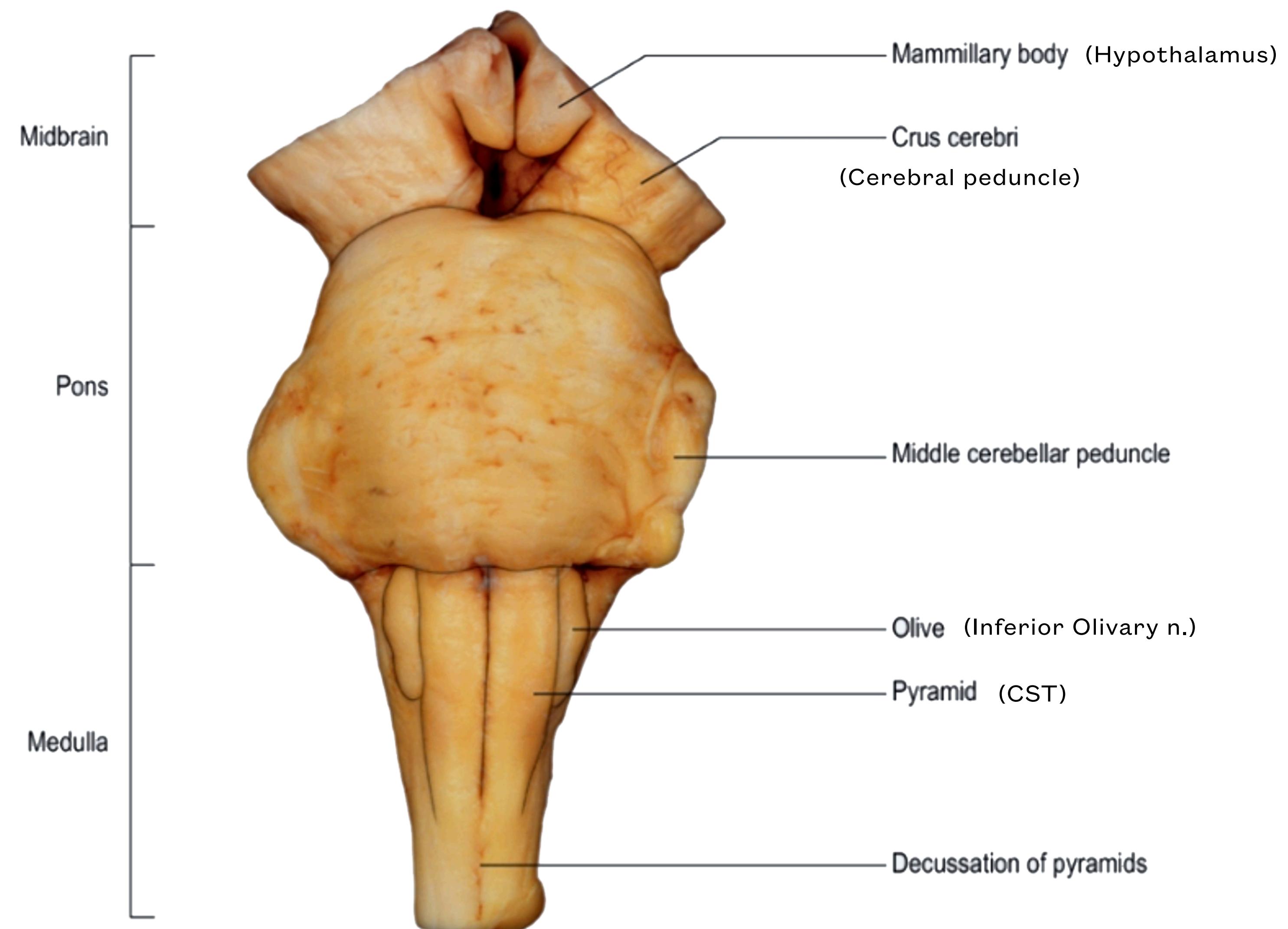
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# Gross Morphology

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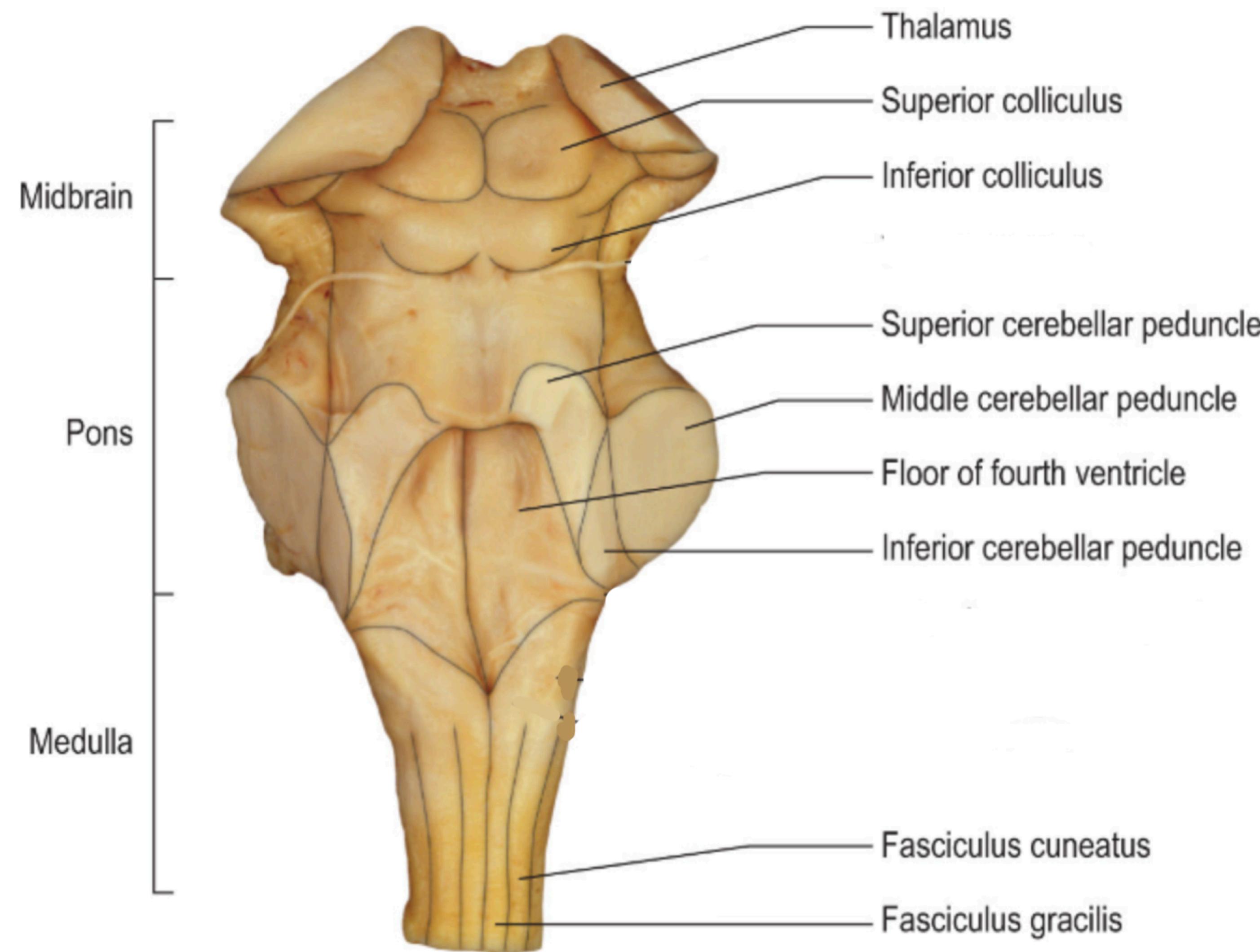
**EXTERIOR FEATURES**

# Ventral View



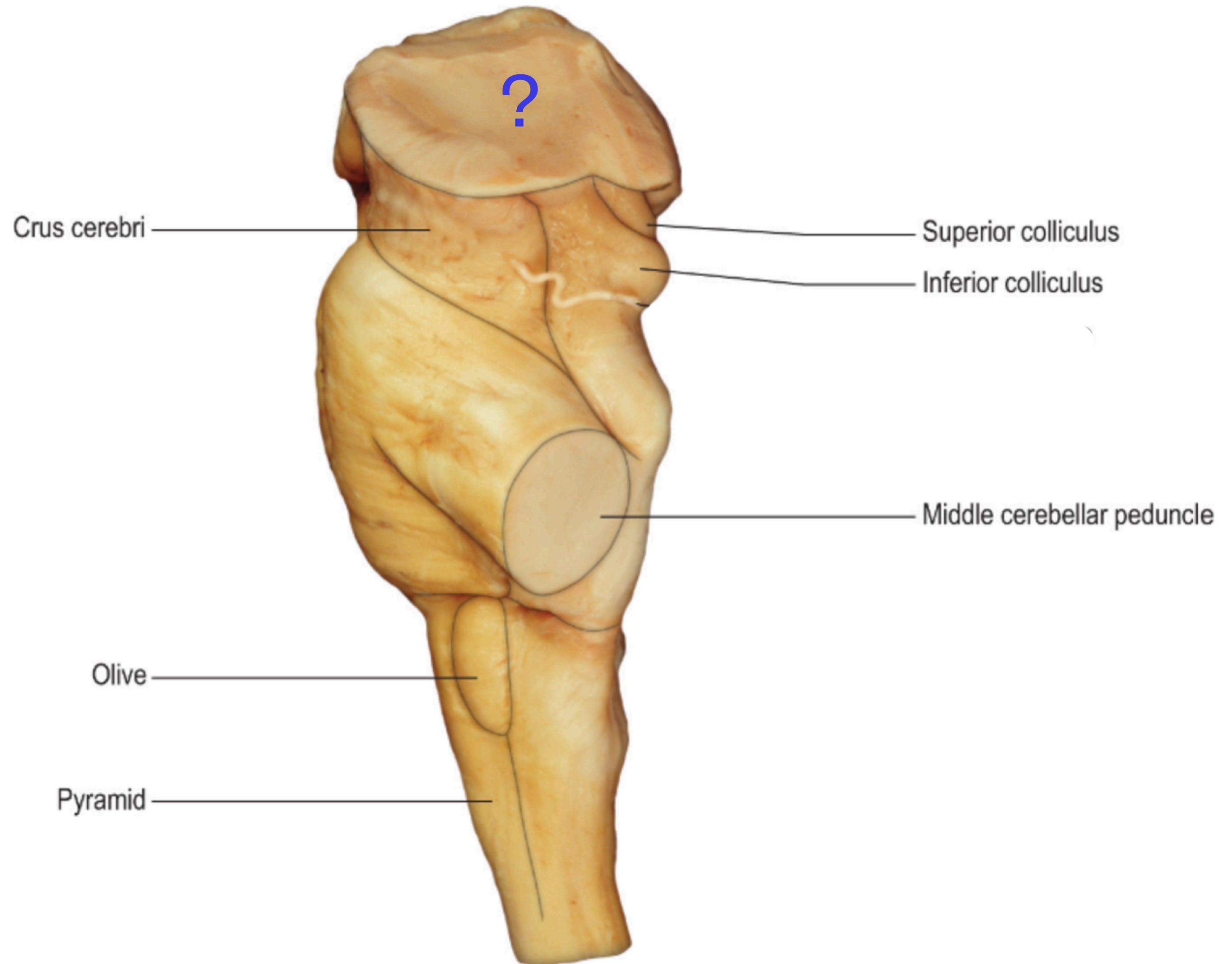
**CRUS CEREBRI = CEREBRAL PEDUNCLES**

# Dorsal View



POWERFUL CONNECTIVITY WITH CEREBELLUM

# Lateral View



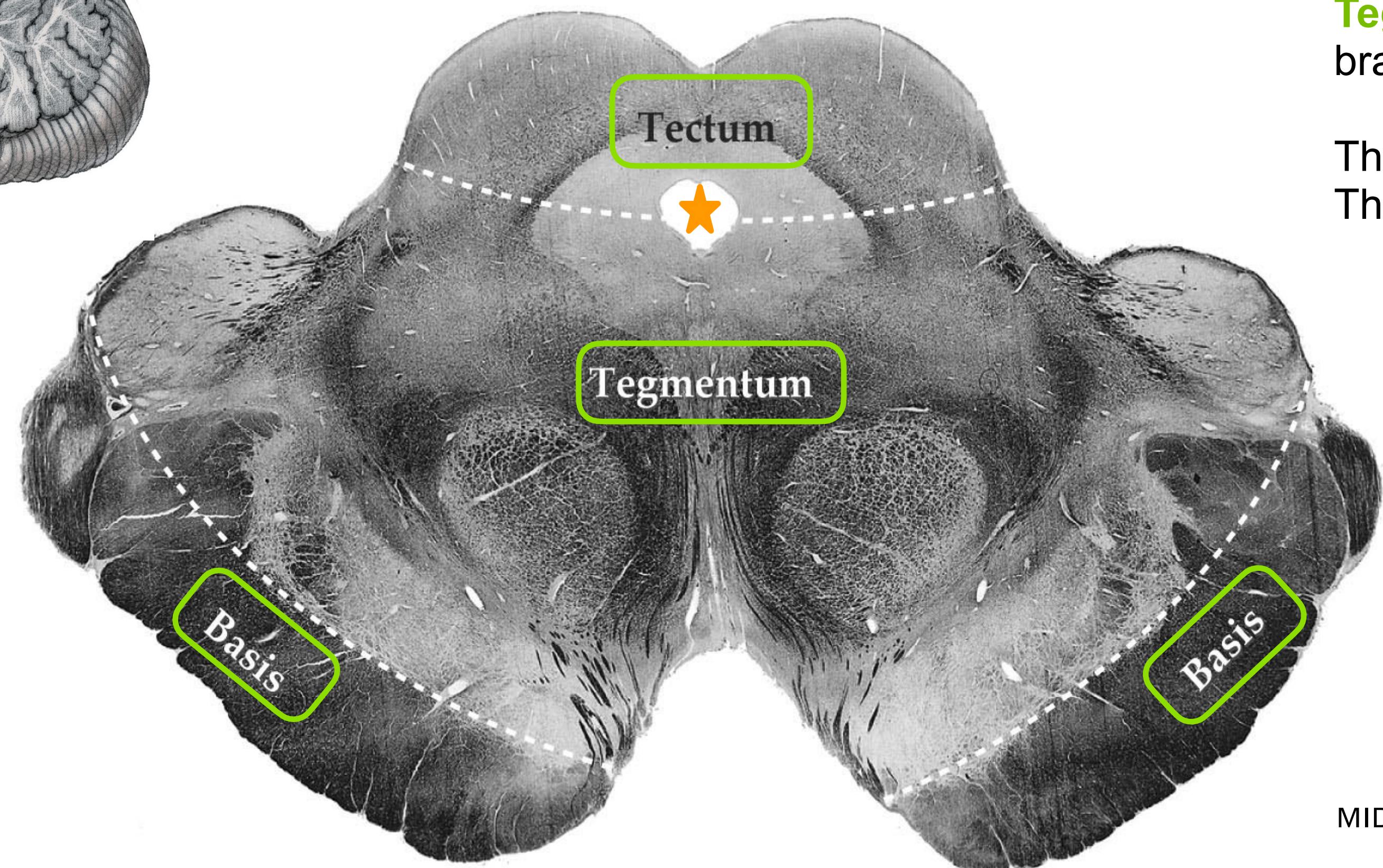
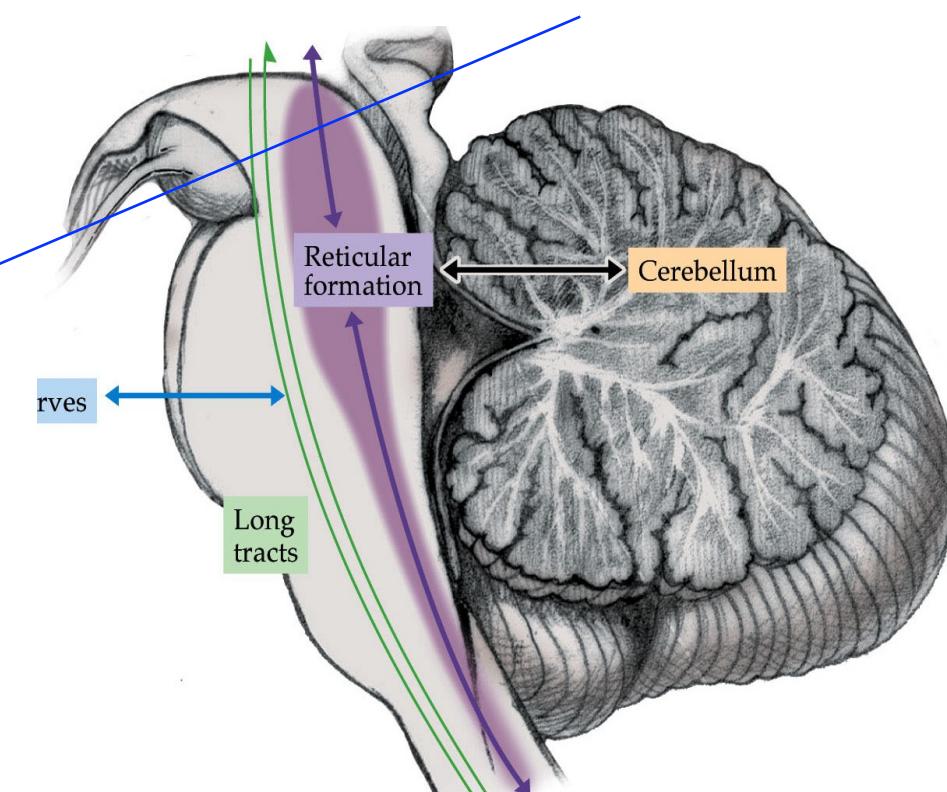
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# Recognizing Cross Sections

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**HORIZONTAL PLANE**

# Major sectors in Brainstem



**Tectum** - only present in midbrain, dorsal to ventricle (superior and inferior colliculi)  
**Tegmentum** and **Basis** - present at all levels of brainstem

The '**Basis**' is largely (ventral) white matter  
The '**Tegmentum**' is just ventral to ventricle

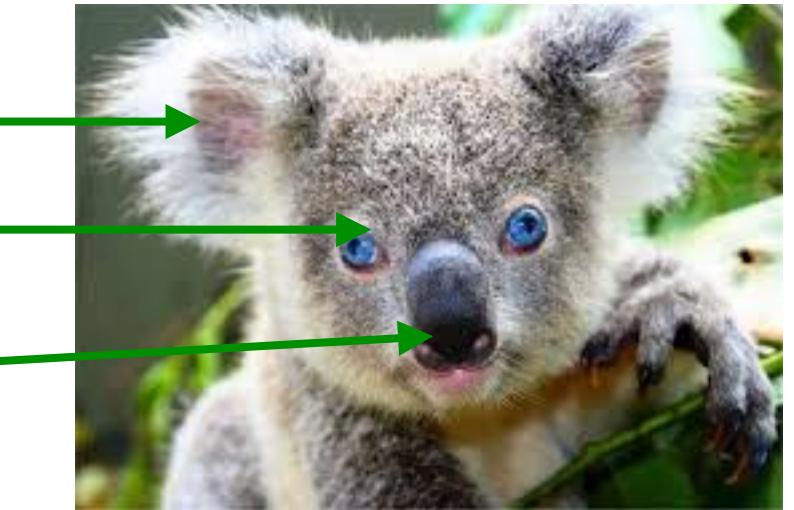
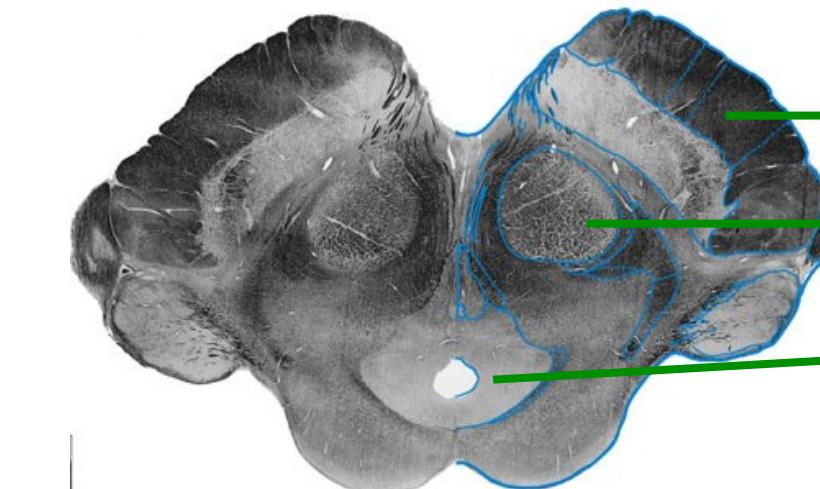
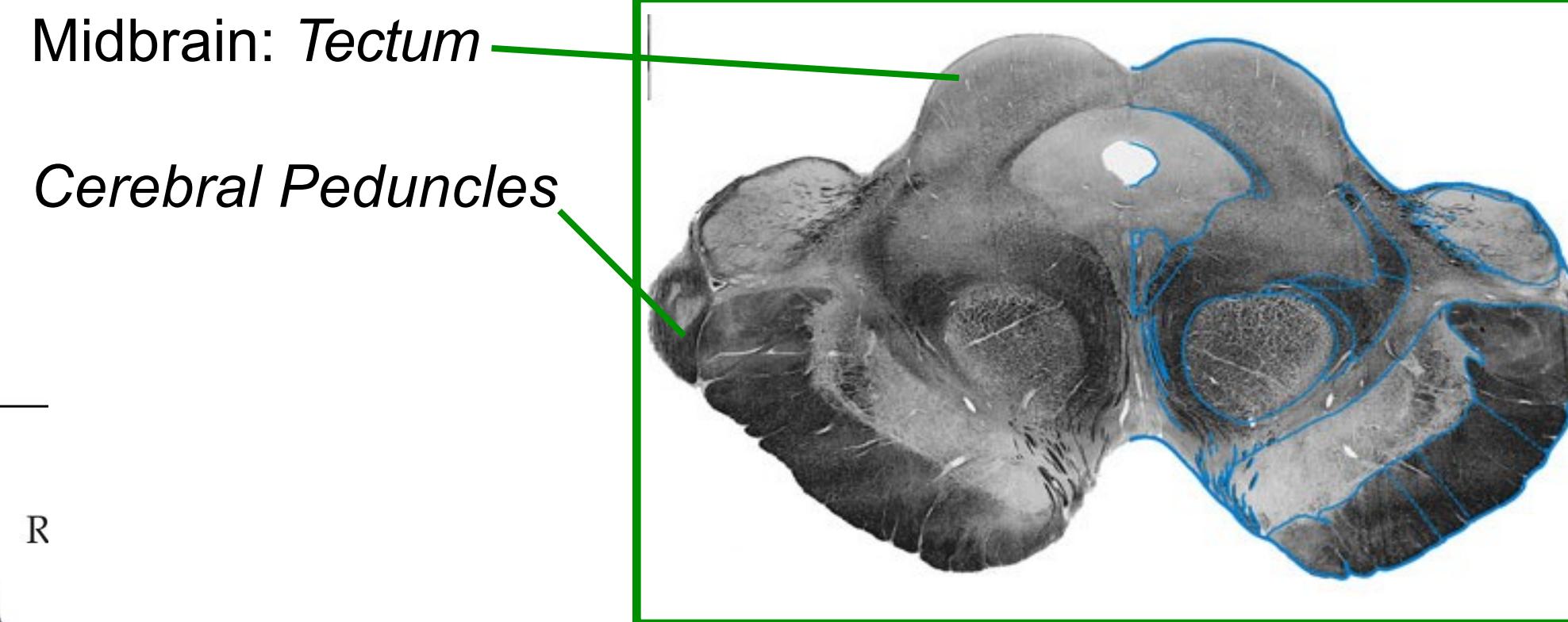
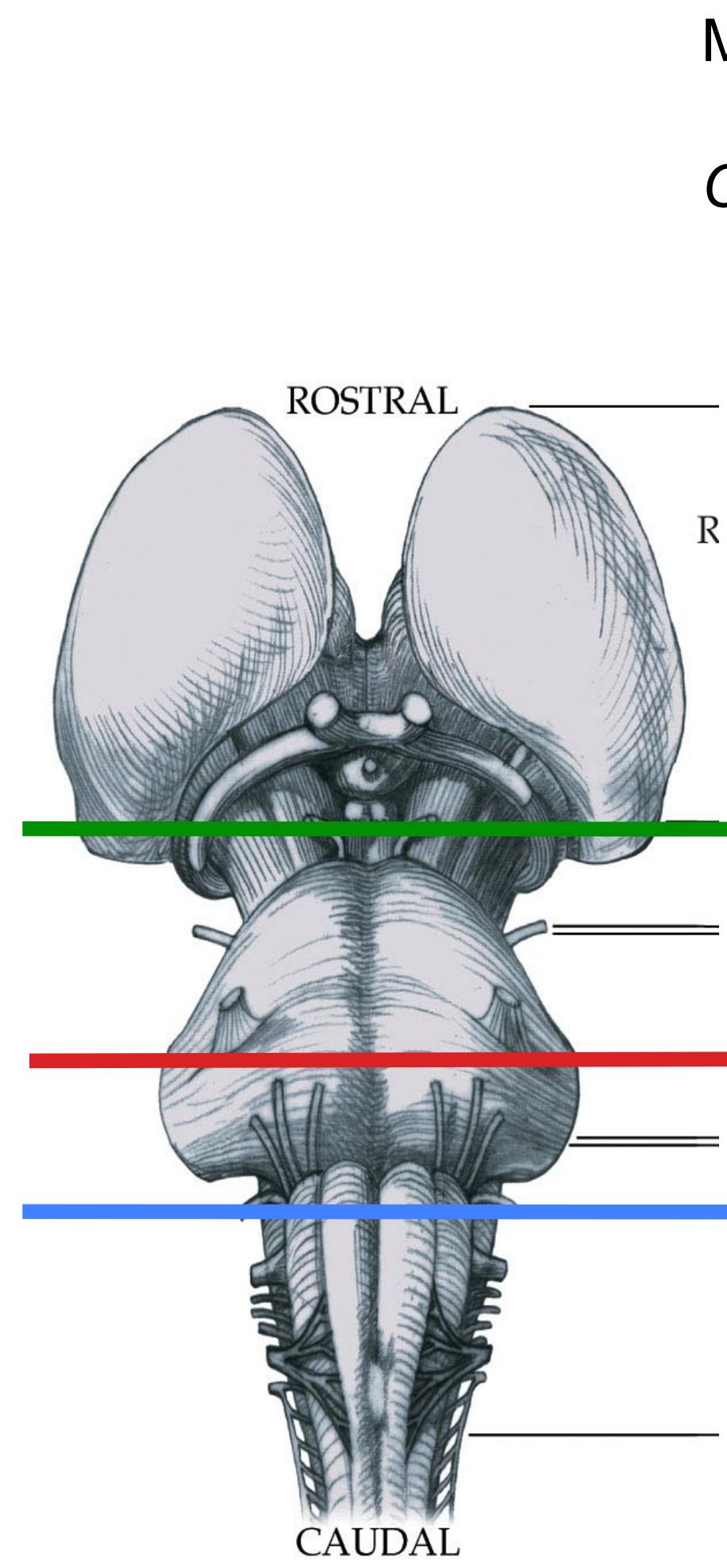
MIDBRAIN EXAMPLE

# Brainstem Sectors

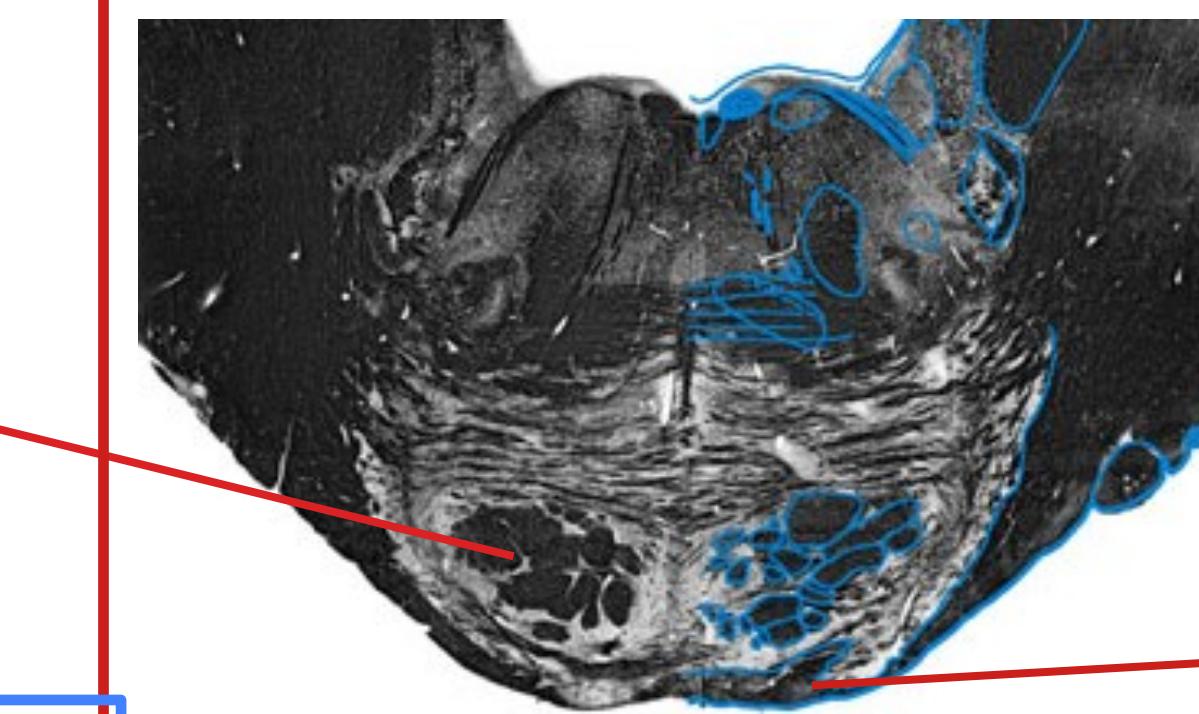
**Tectum:** • above ventricle (tectum = ‘roof’)  
• only present in midbrain  
• includes superior and inferior colliculi

**Tegmentum:** • core of brainstem at all levels  
• ventral to the ventricle  
• includes cranial nerves and other nuclei, major tracts, reticular formation

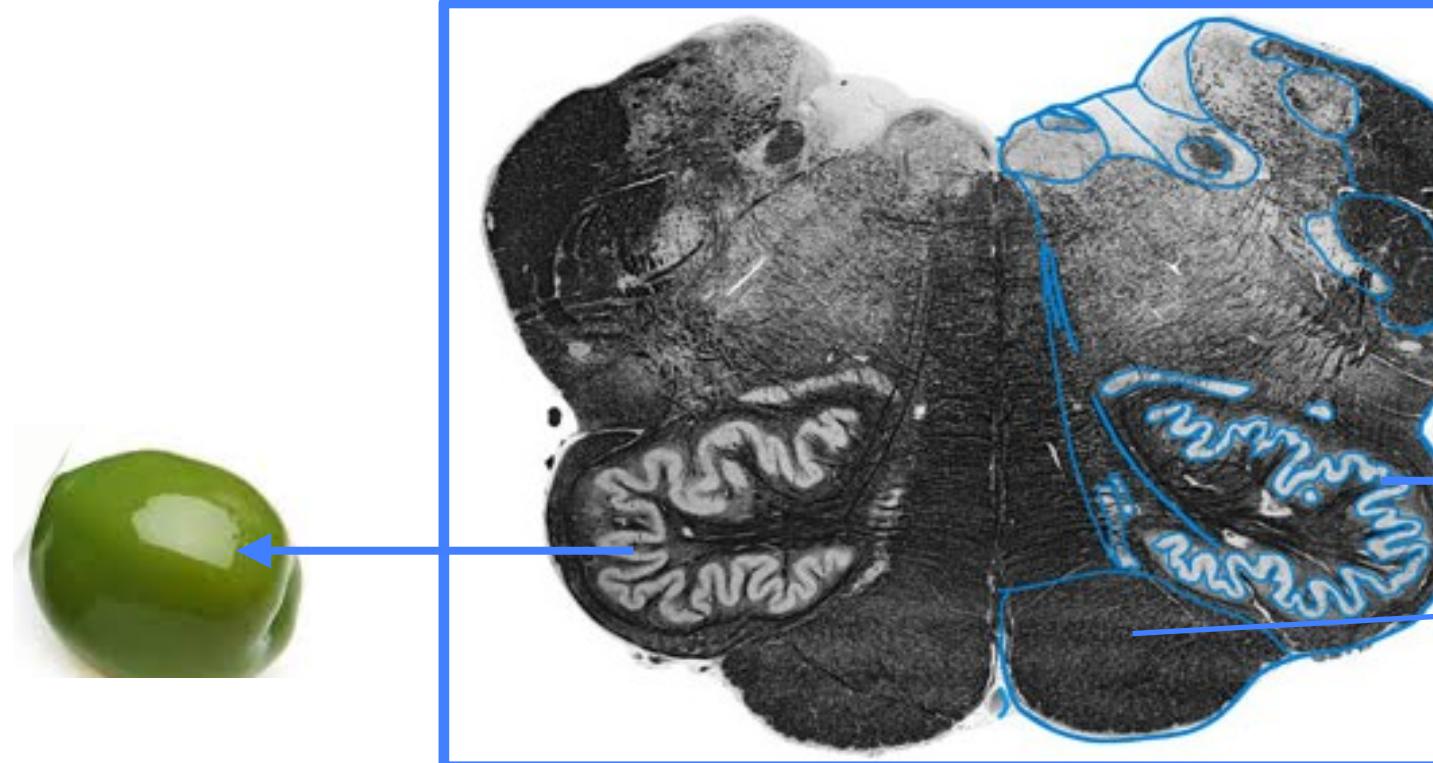
**Basis:** • white matter on the ventral side of brainstem  
• present at all levels of brainstem  
• contains corticospinal tract axons



Pons:  
CST



Medulla:  
Inferior Olive  
Pyramids



Important

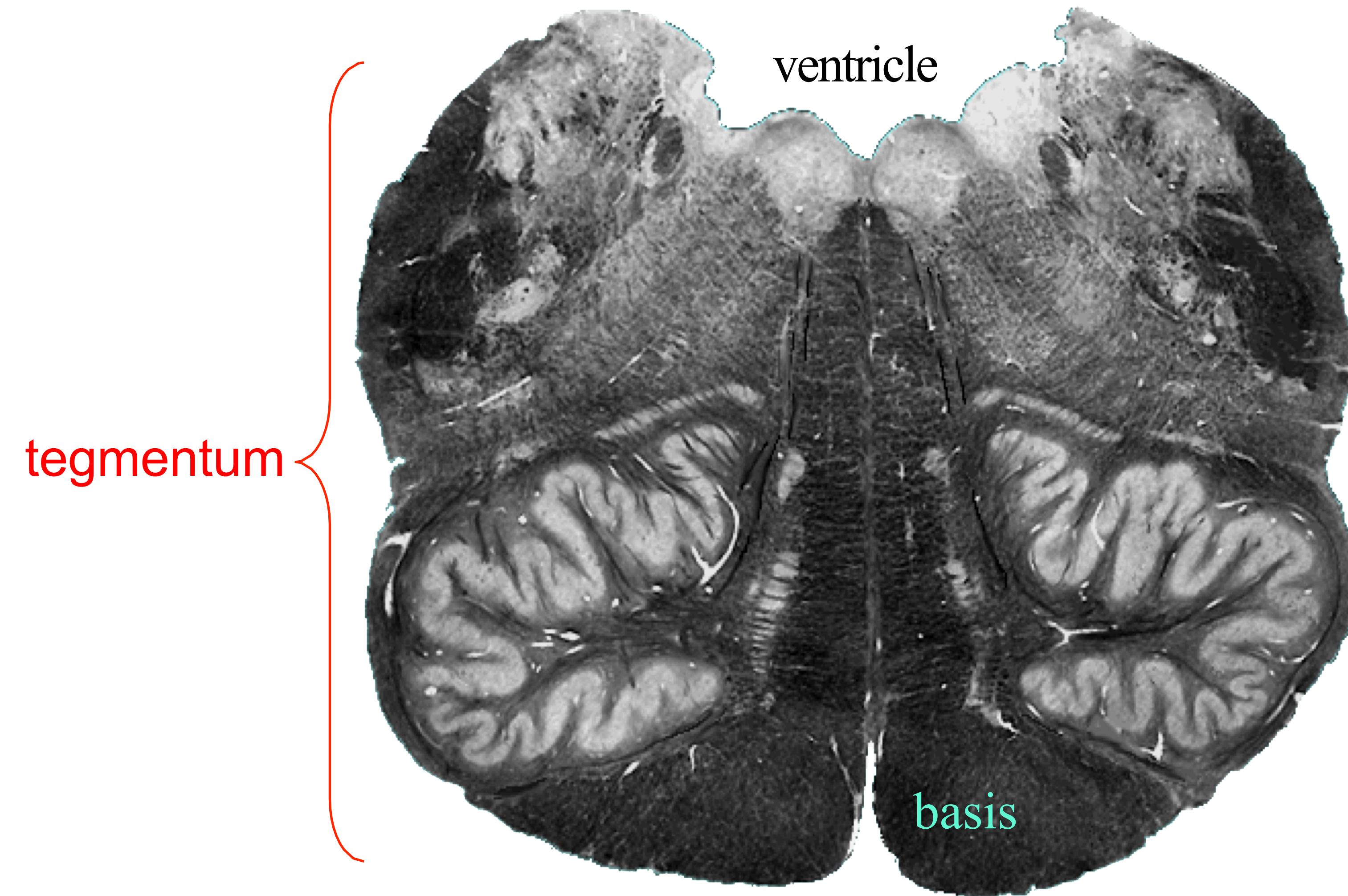
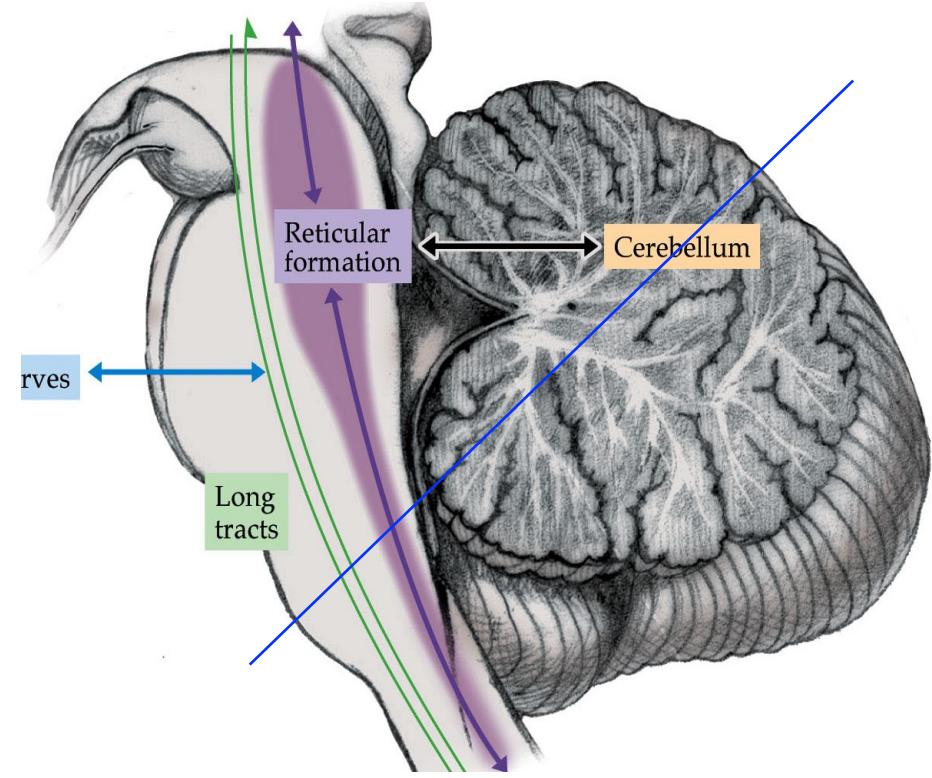
## REGIONAL LANDMARKS

# Features Present at all Levels



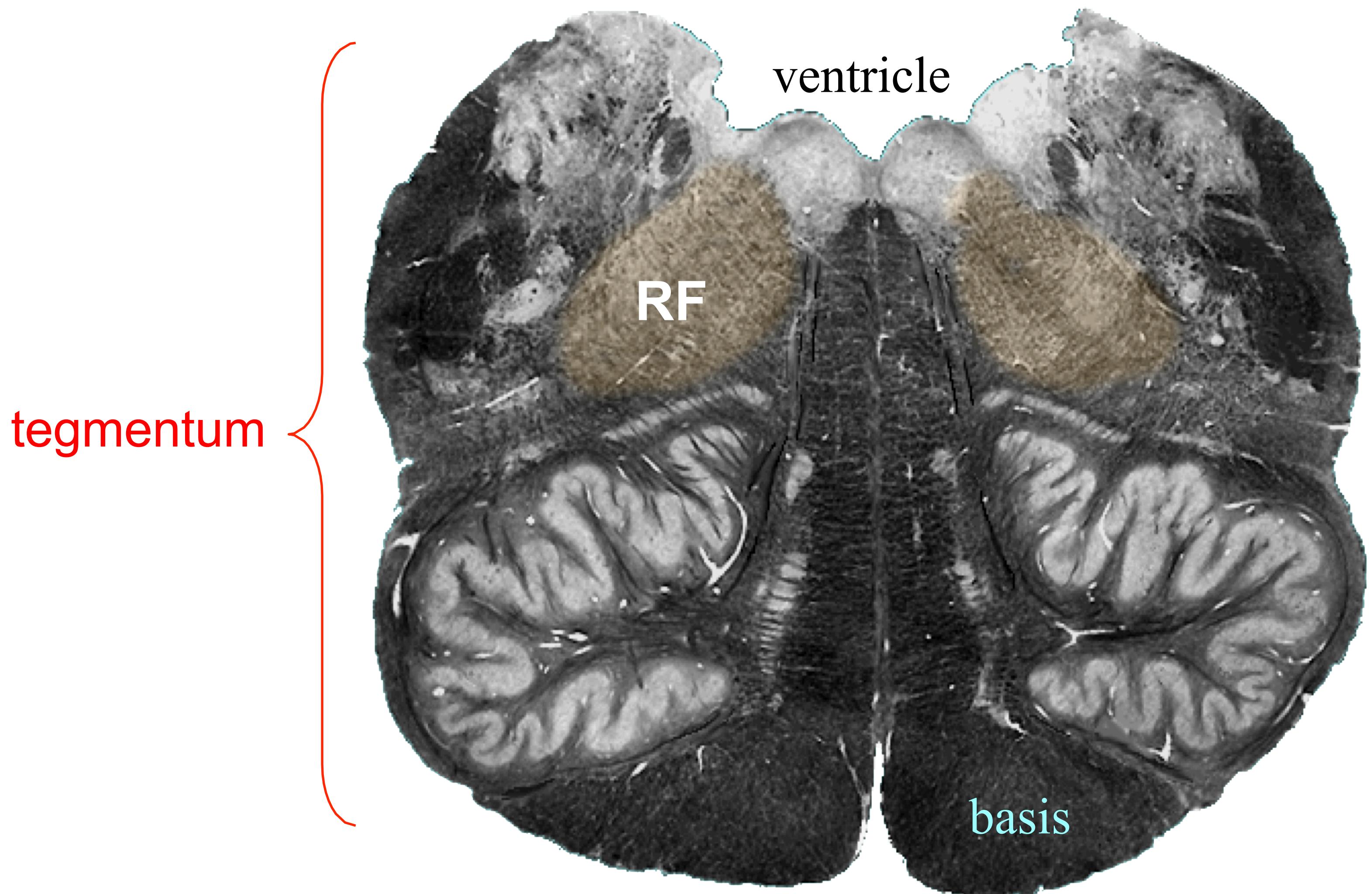
- **Ventricular space** (names differ by level)
- Core containing **Reticular Formation** (arousal, muscle tone)
- **Long tracts** (axonal systems) including
  - Ascending somatosensory projections (e.g., from spinal cord to thalamus)
  - Descending motor projections (e.g., from cerebral cortex to spinal cord)
- **Cranial nerve (CN) nuclei and nerves**
  - CNs are comparable to spinal nerves but for head and neck

# Adding up Sectors and Features



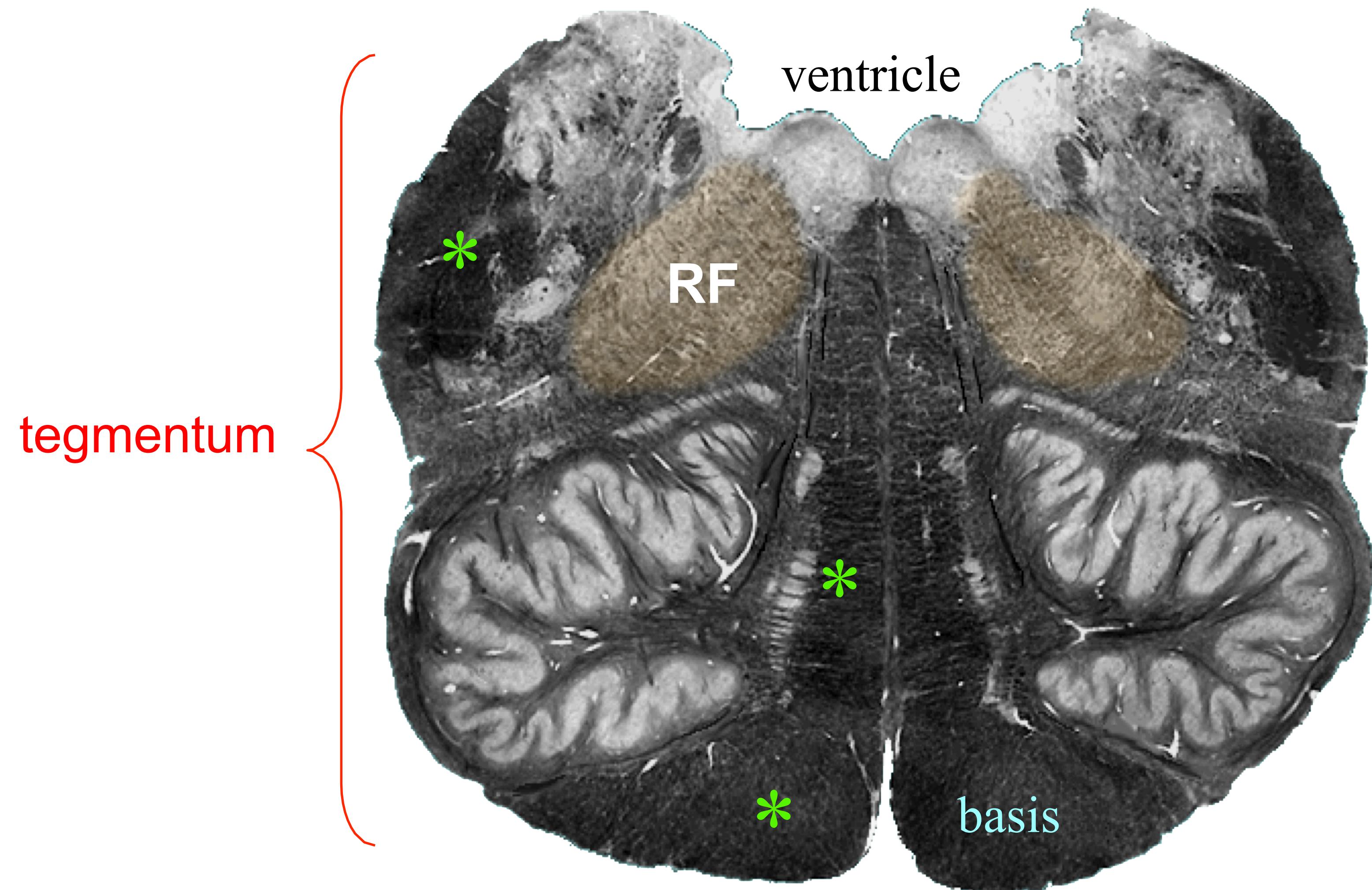
WHERE IS THE TECTUM?

# Reticular Formation

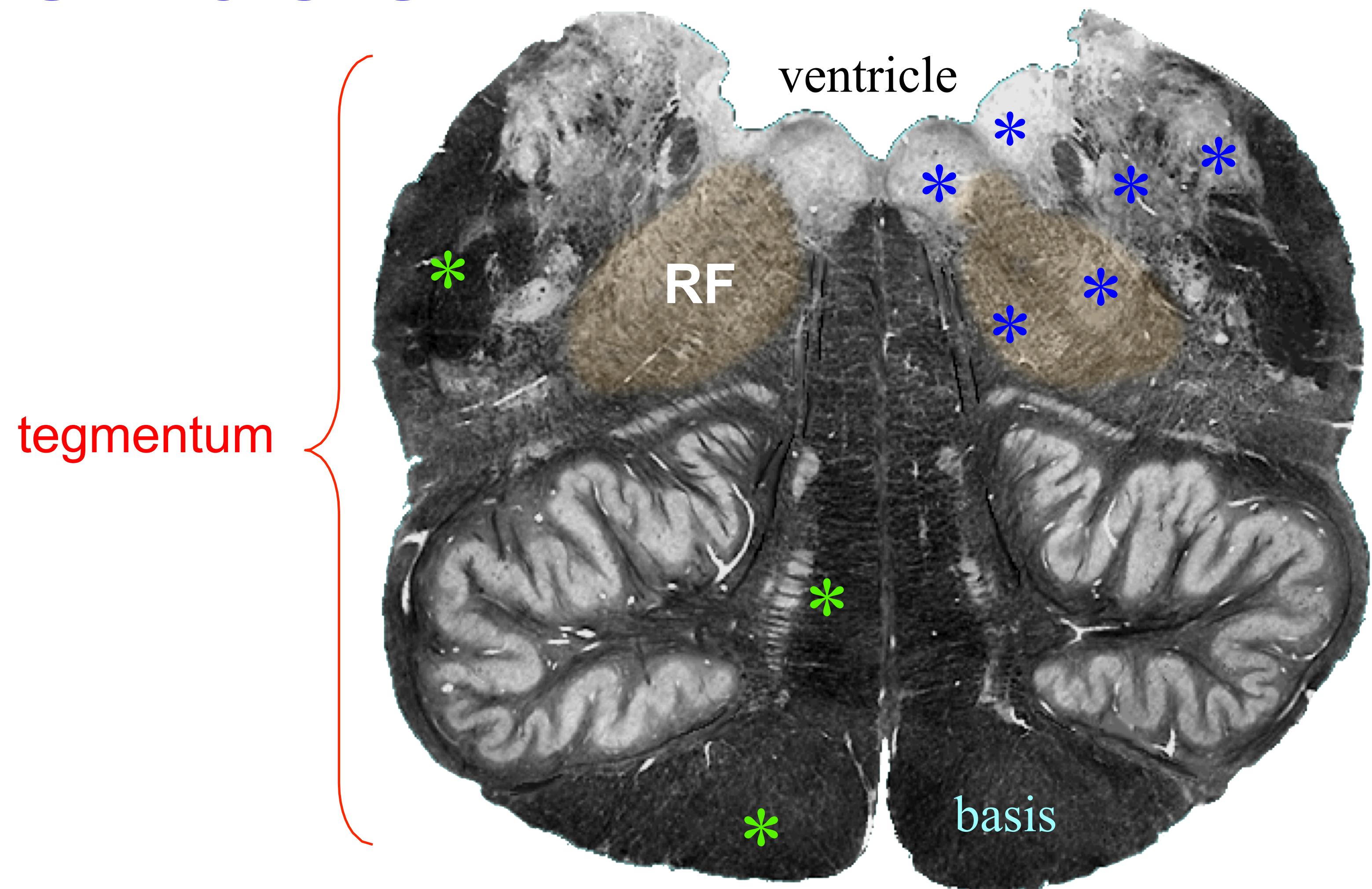


IN TEGMENTUM

# White Matter Tracts



# Cranial Nerve Nuclei

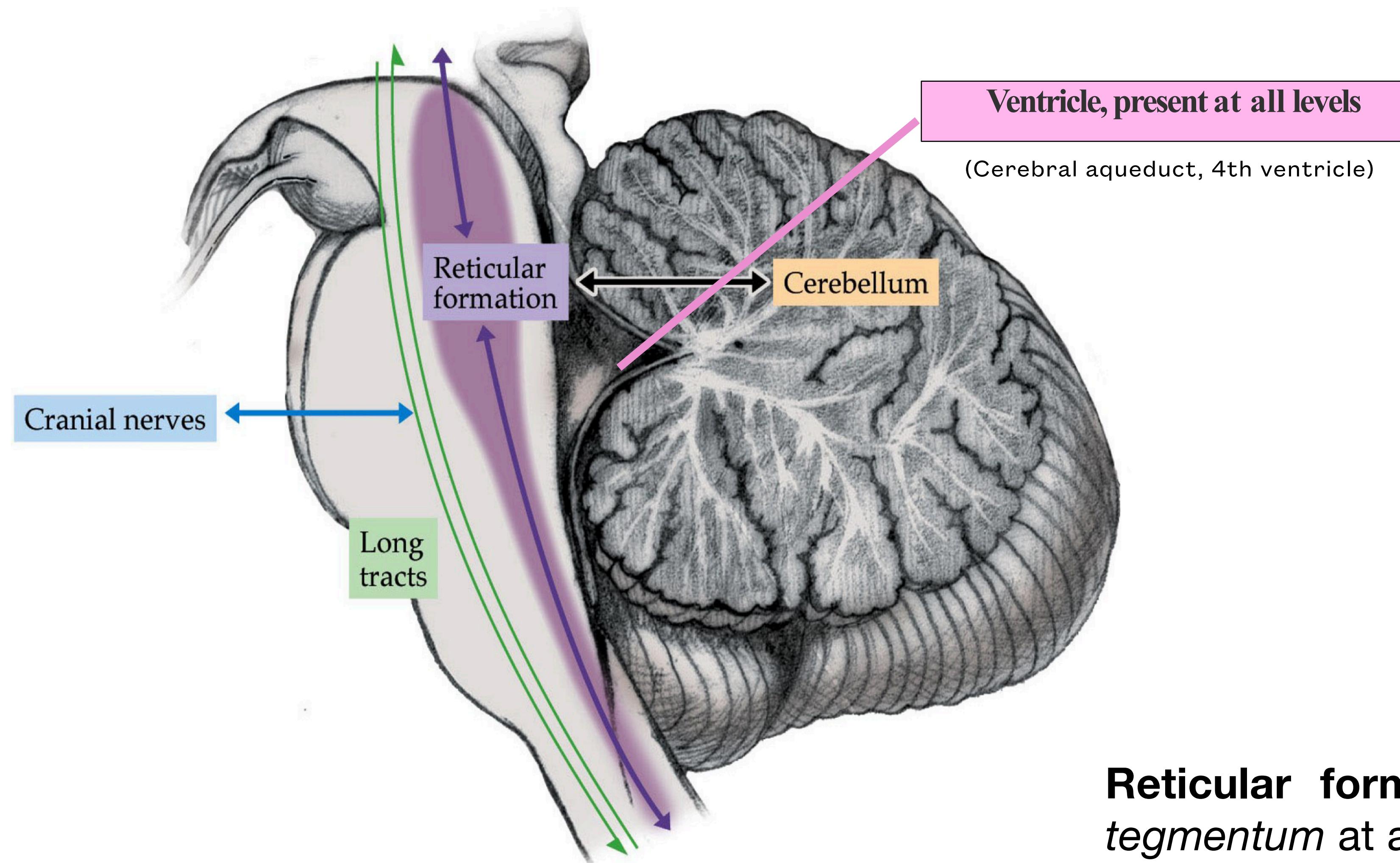


OH GOODIE!

# Features Present at all Levels

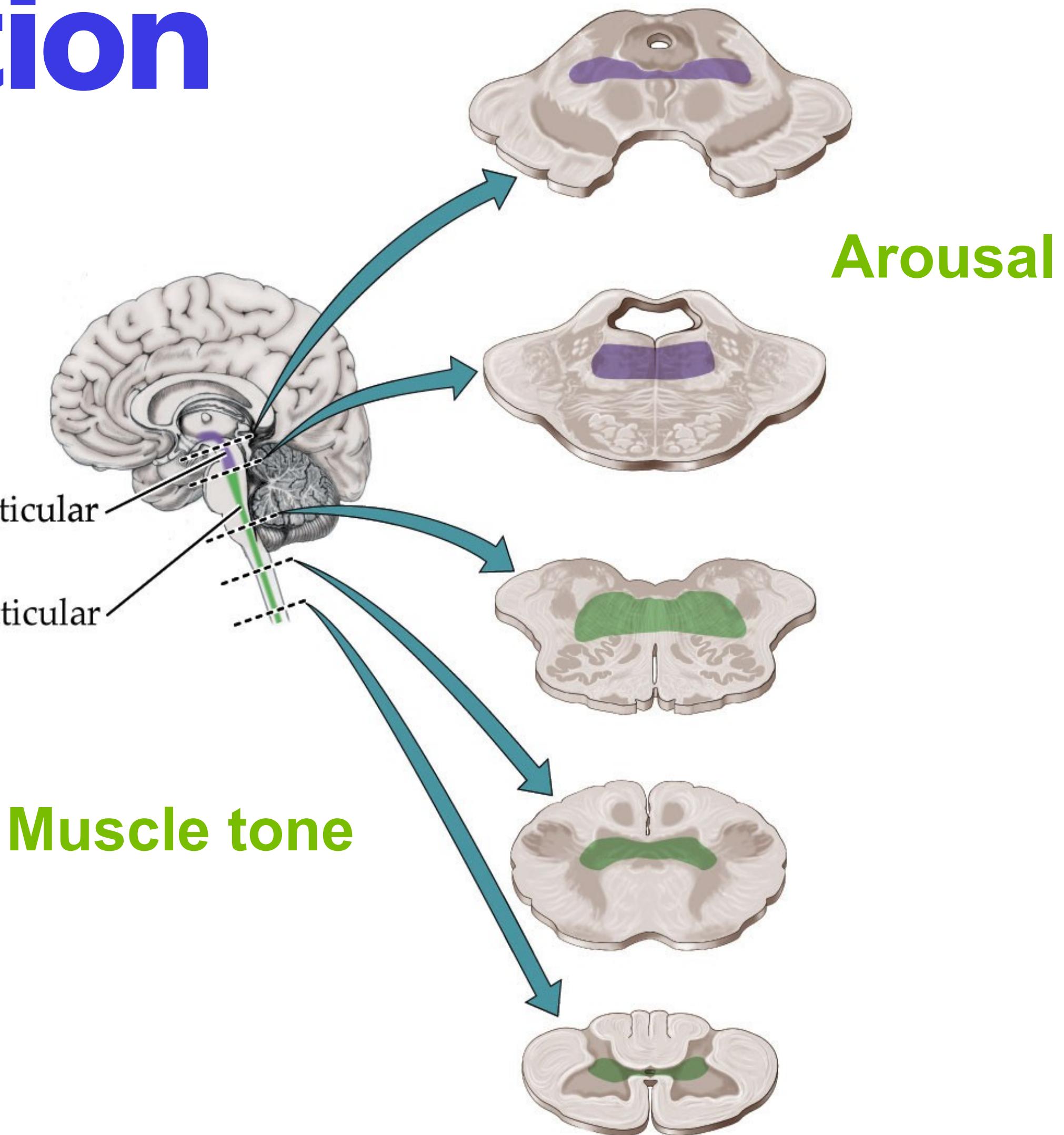
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# Reticular Formation



**Reticular formation** is located in the *tegmentum* at all brainstem levels

# Reticular Formation



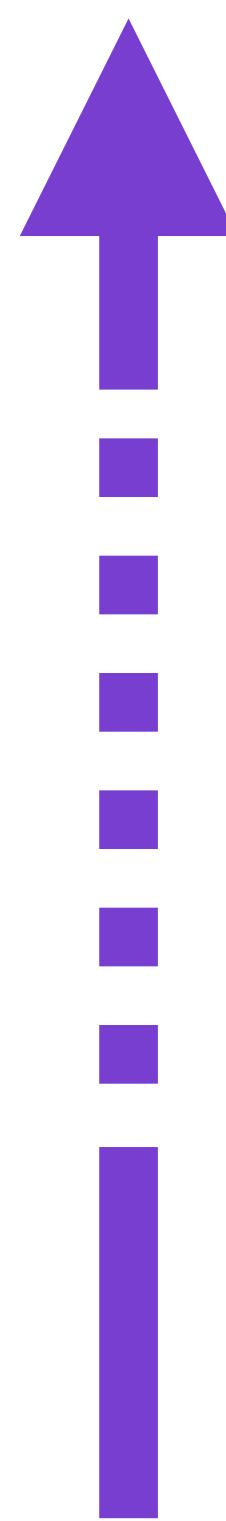
Important

ROSTRAL AND CAUDAL

# Features Present at All Levels

- *Ventricular space* (names differ by level)
- Core containing *Reticular Formation* (arousal, muscle tone...)
- ***Long tracts*** (axonal systems) including
  - Ascending somatosensory projections (e.g., from spinal cord to thalamus)
  - Descending motor projections (e.g., from cerebral cortex to spinal cord)
- *Cranial nerve nuclei and nerves*
  - CN are comparable to spinal nerves but for head and neck

# Dorsal Column System



The 3rd order axons ascend via the thalamic radiations to terminate in somatosensory cortices

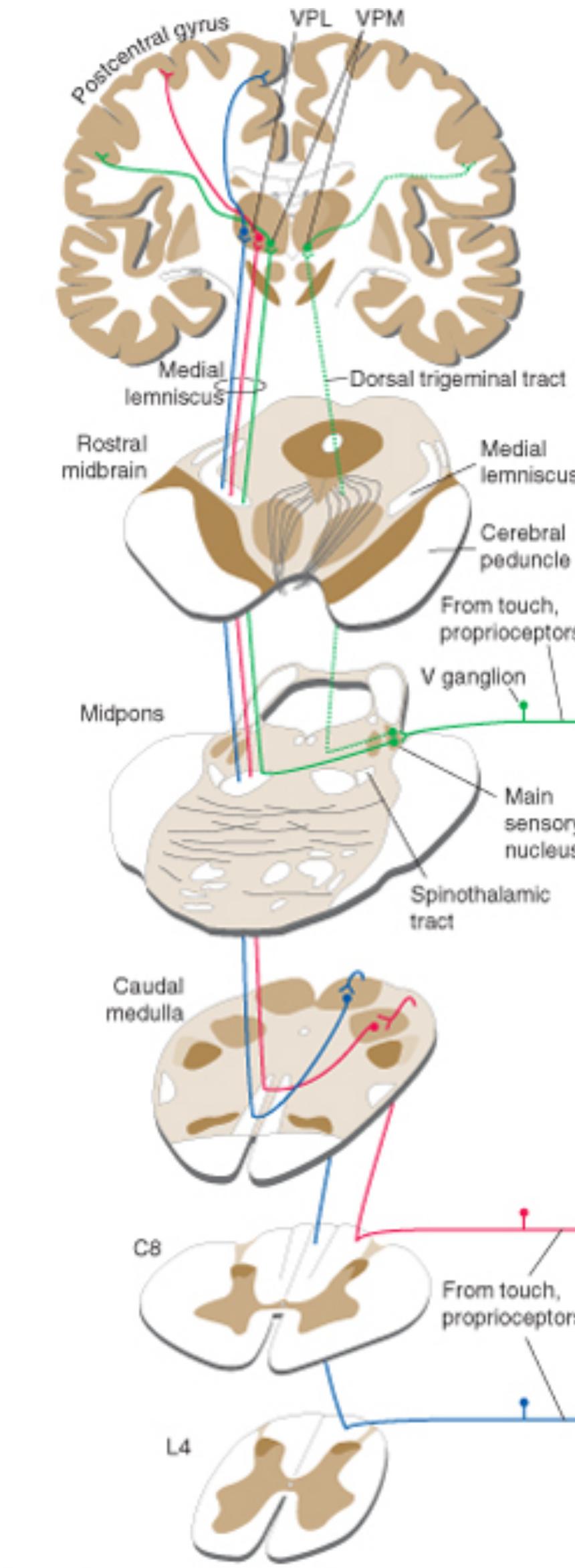
The 2nd order axons ascend via the medial lemniscus to terminate in the thalamus

2nd order axons decussate in medulla

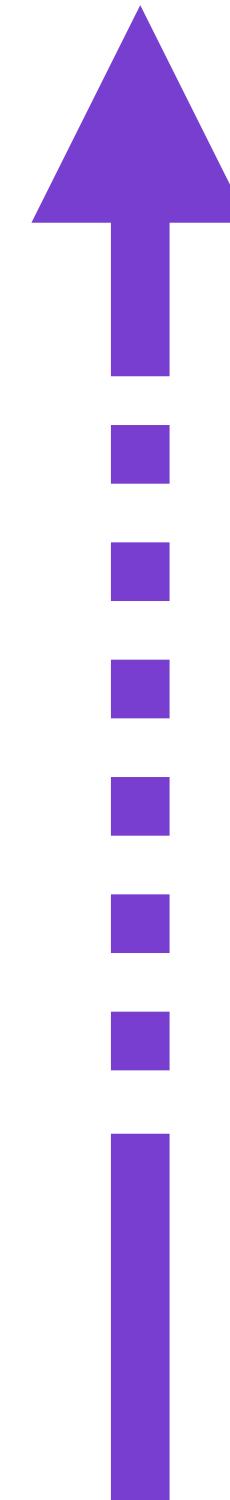
Synapse in n. Gracilis and Cuneatus in medulla

Sensory axons enter and ascend in the fascicles gracilis and cuneatus

Synapse in n. Gracilis and n. cuneatus in caudal medulla



# Spinothalamic Tract

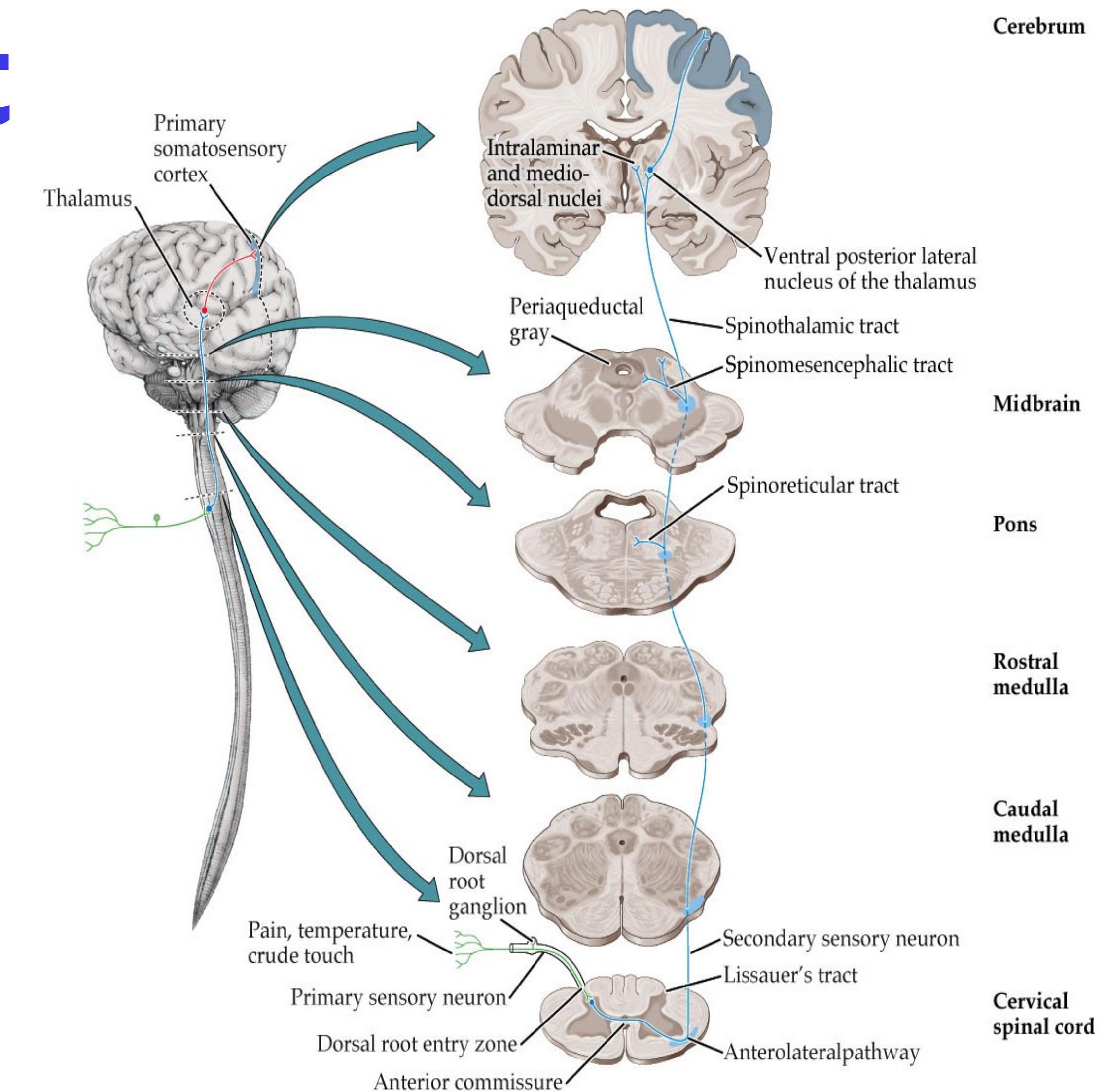


The 3rd order axons ascend via the thalamic radiations to terminate in somatosensory cortices

The 2nd order axons ascend to terminate in the thalamus (hence, 'spinothalamic')

2nd order axons decussate in the spinal cord

Sensory axons synapse ipsilaterally in spinal cord neurons



**ASCENDING**

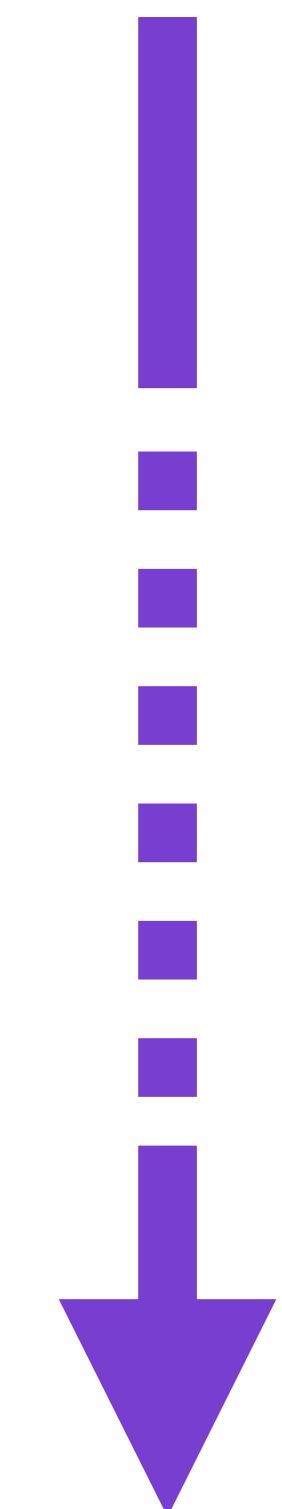
# Corticospinal Tract

It originates in motor cortical regions

Almost all, decussates at the spino-medullary junction

It terminates in LMN and interneurons in the spinal cord

Innervates trunk (bilaterally) and limbs (contralateral)



Cortex

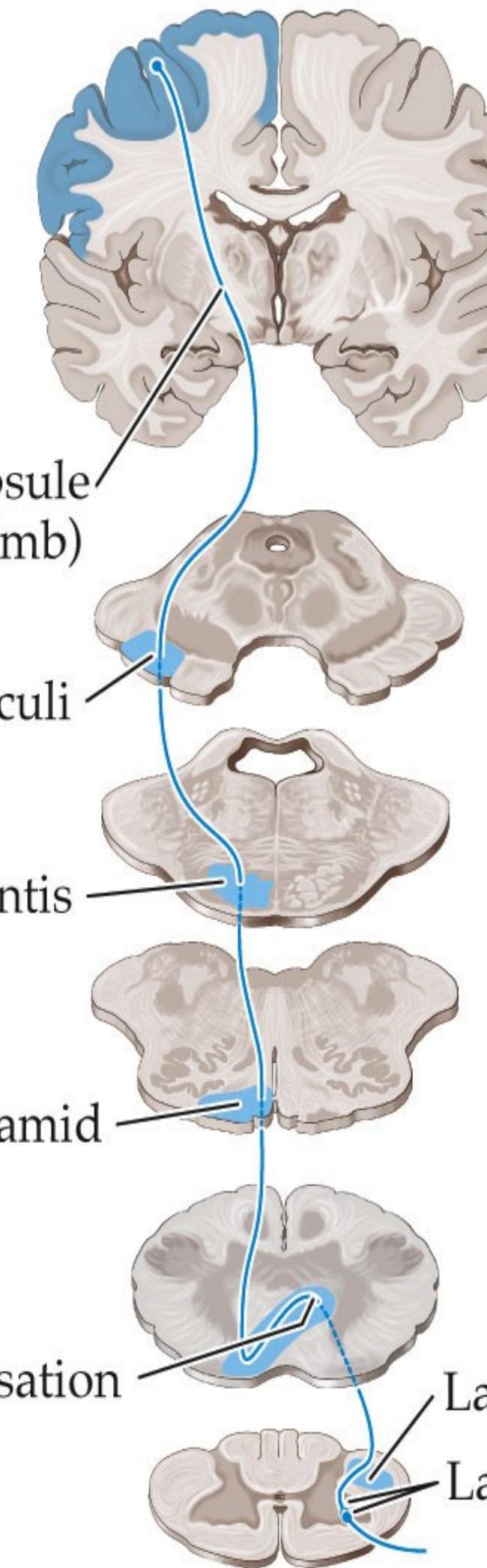
Midbrain

Pons

Rostral medulla

Cervicomедullary junction (decussation)

Spinal cord



(A) Lateral corticospinal tract

# Thanks for your Attention

