PSYCH 260/BBH 203

Neuroanatomy II

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2022-02-01 09:23:03

Prelude (7:06)

(Wellcome Collection, 2012)

Prelude (1:22)

(ctdalilah, 2006)

Today's topics

- Announcement
  - Quiz 1 on Thursday
  - Neuroanatomy resources
    - BrainFacts.org 3D brain
    - Harvard Brain Atlas
- Warm-up
- More neuroanatomy

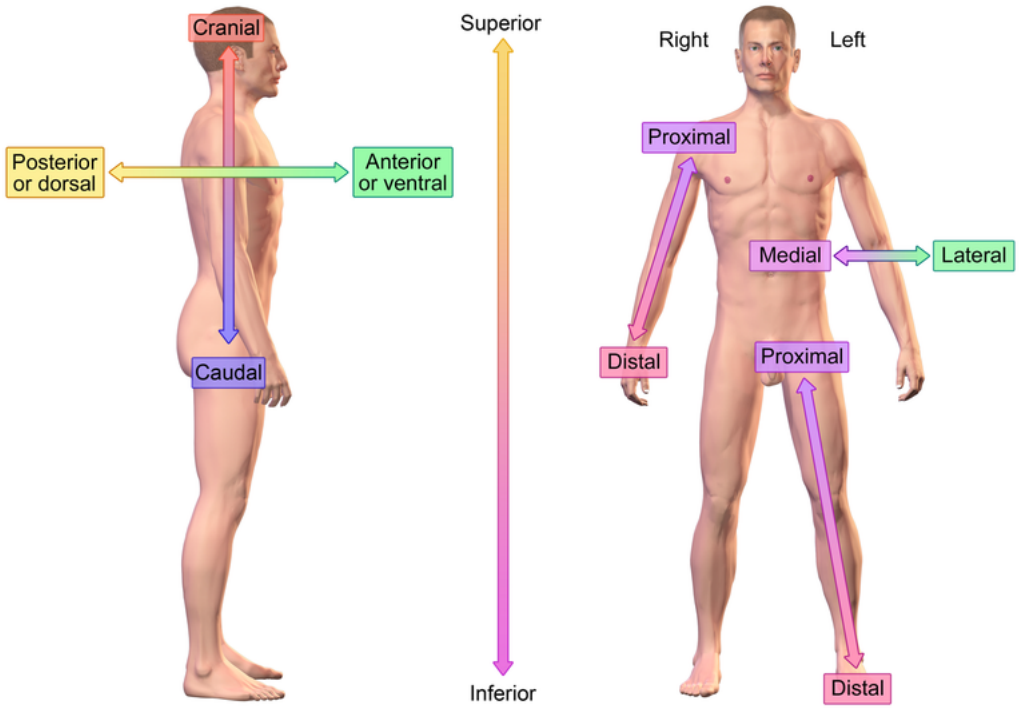
Warm-up

Neural structures that are “belly-ward” from the spinal cord are also called…

- A. Dorsal
- B. Ventral
- C. Medial
- D. Rostral

Neural structures that are “belly-ward” from the spinal cord are also called…

- A. ~~Dorsal~~
- B. Ventral
- C. ~~Medial~~
- D. ~~Rostral~~



Lateral view

Anterior view

Directional References

The blood/brain barrier is especially thin in which hindbrain area?

- A. Pons
- B. 4th ventricle
- C. Cerebellum
- D. Medulla oblongata (medulla)

The blood/brain barrier is especially thin in which hindbrain area?

- A. ~~Pons~~
- B. ~~4th ventricle~~
- C. ~~Cerebellum~~
- D. Medulla oblongata (medulla)

Which of the cerebral ventricles is most caudal (closest to the spinal cord)?

- Cerebral aqueduct
- Lateral ventricles
- 3rd ventricle
- 4th ventricle

Which of the cerebral ventricles is most caudal (closest to the spinal cord)?

- ~~Cerebral aqueduct~~
- ~~Lateral ventricles~~
- ~~3rd ventricle~~
- 4th ventricle

More neuroanatomy

Organization of the brain

Major division	Ventricular Landmark	Embryonic Division	Structure
Forebrain	Lateral	Telencephalon	*Cerebral cortex*
			Basal ganglia
			Hippocampus, *Amygdala*
	Third	Diencephalon	*Thalamus*
			Hypothalamus
Midbrain	Cerebral Aqueduct	Mesencephalon	*Tectum*, *Tegmentum*

Organization of the brain

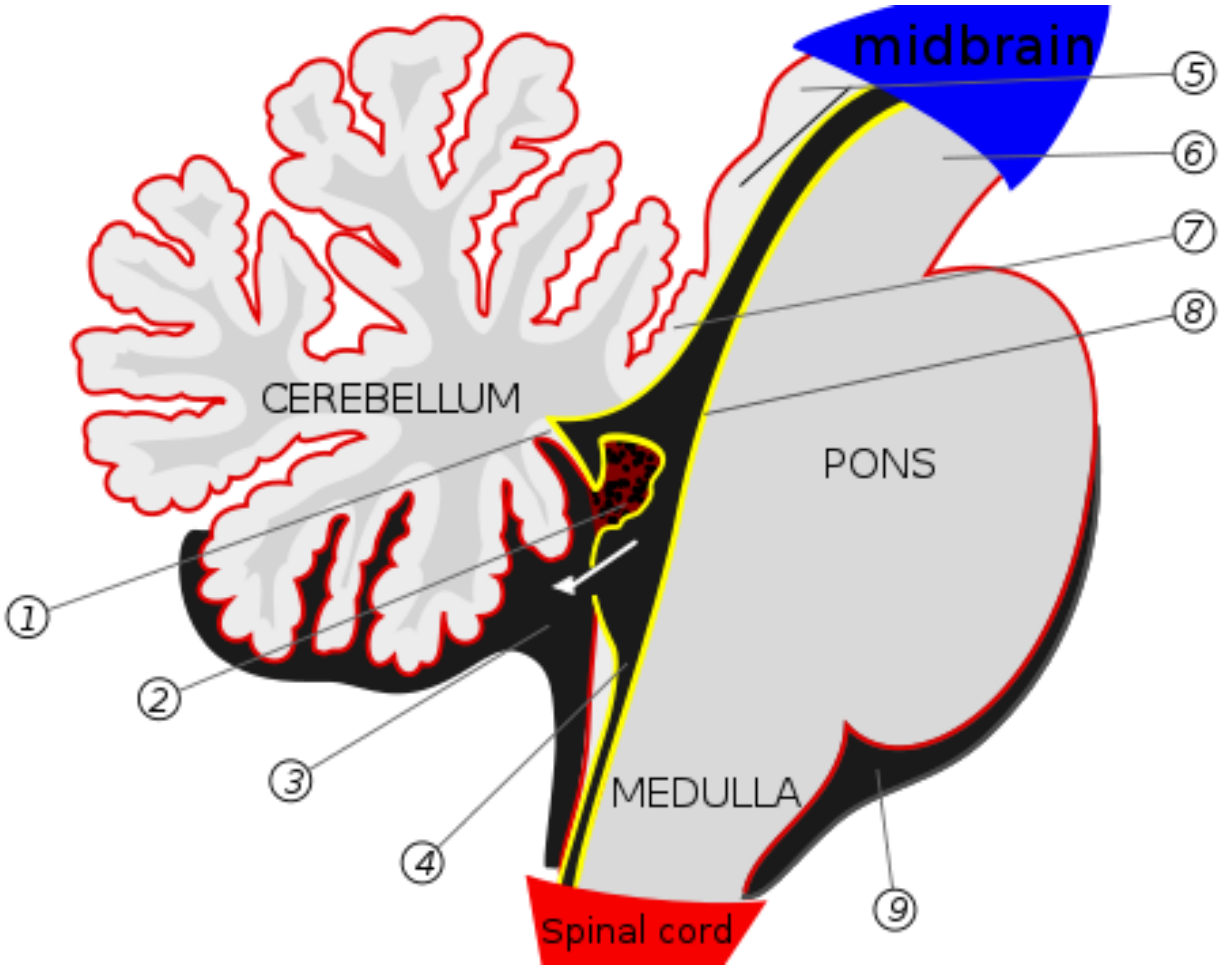
Major division	Ventricular Landmark	Embryonic Division	Structure
Hindbrain	4th	Rhombencephalon	*Cerebellum*, *pons*
	–		*Medulla oblongata*

Hindbrain

Structures adjacent to 4th ventricle

- Medulla oblongata
- Cerebellum
- Pons

Hindbrain



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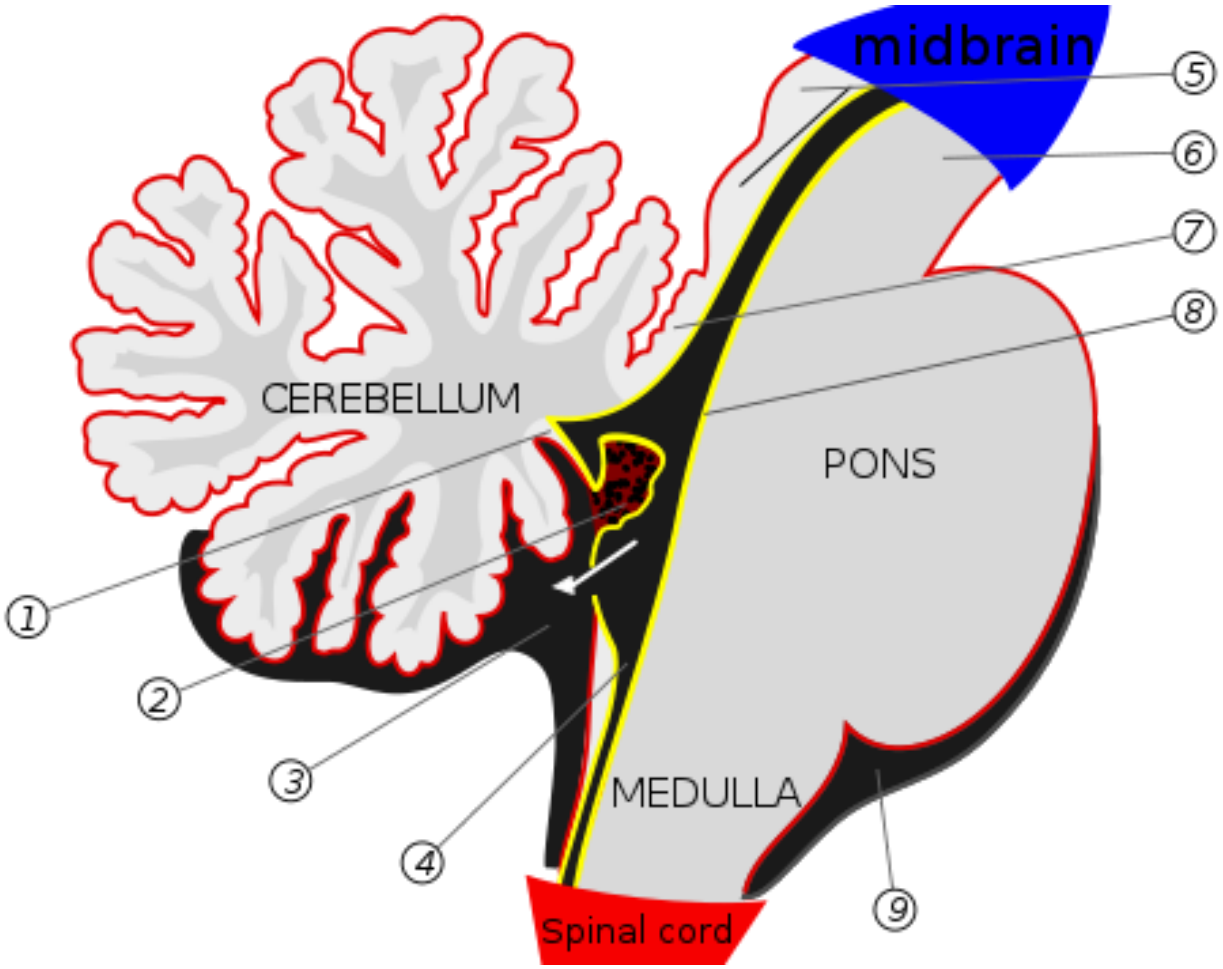
Medulla oblongata



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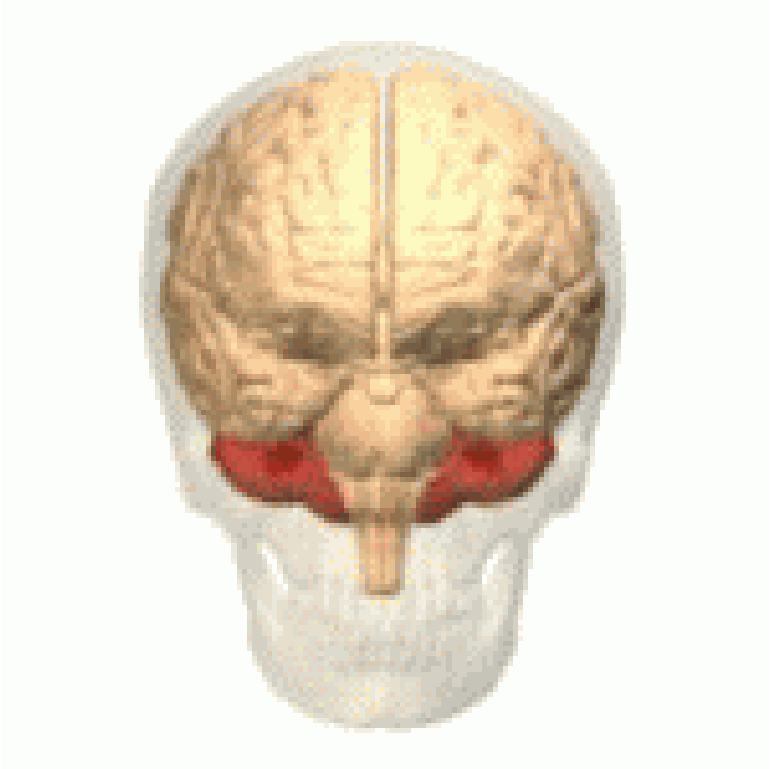
- Fibers of passage (to/from spinal cord)
- Cranial nerves VI-XII
- Cardiovascular regulation
- Muscle tone

Cerebellum

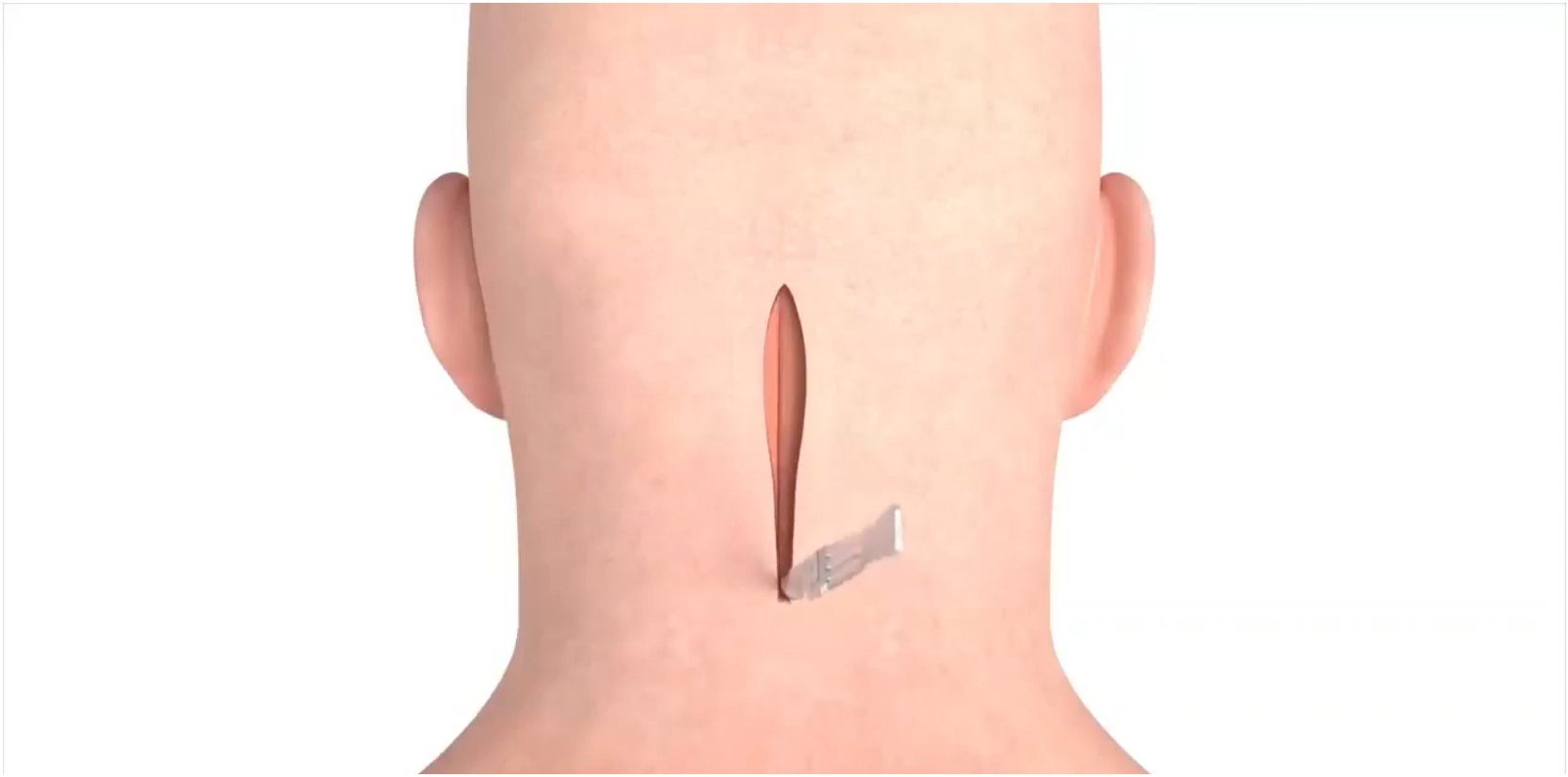
- “Little brain”
- Dorsal to pons
- Movement coordination, classical conditioning (associative learning), + ???



https://en.wikipedia.org/wiki/Cerebellum

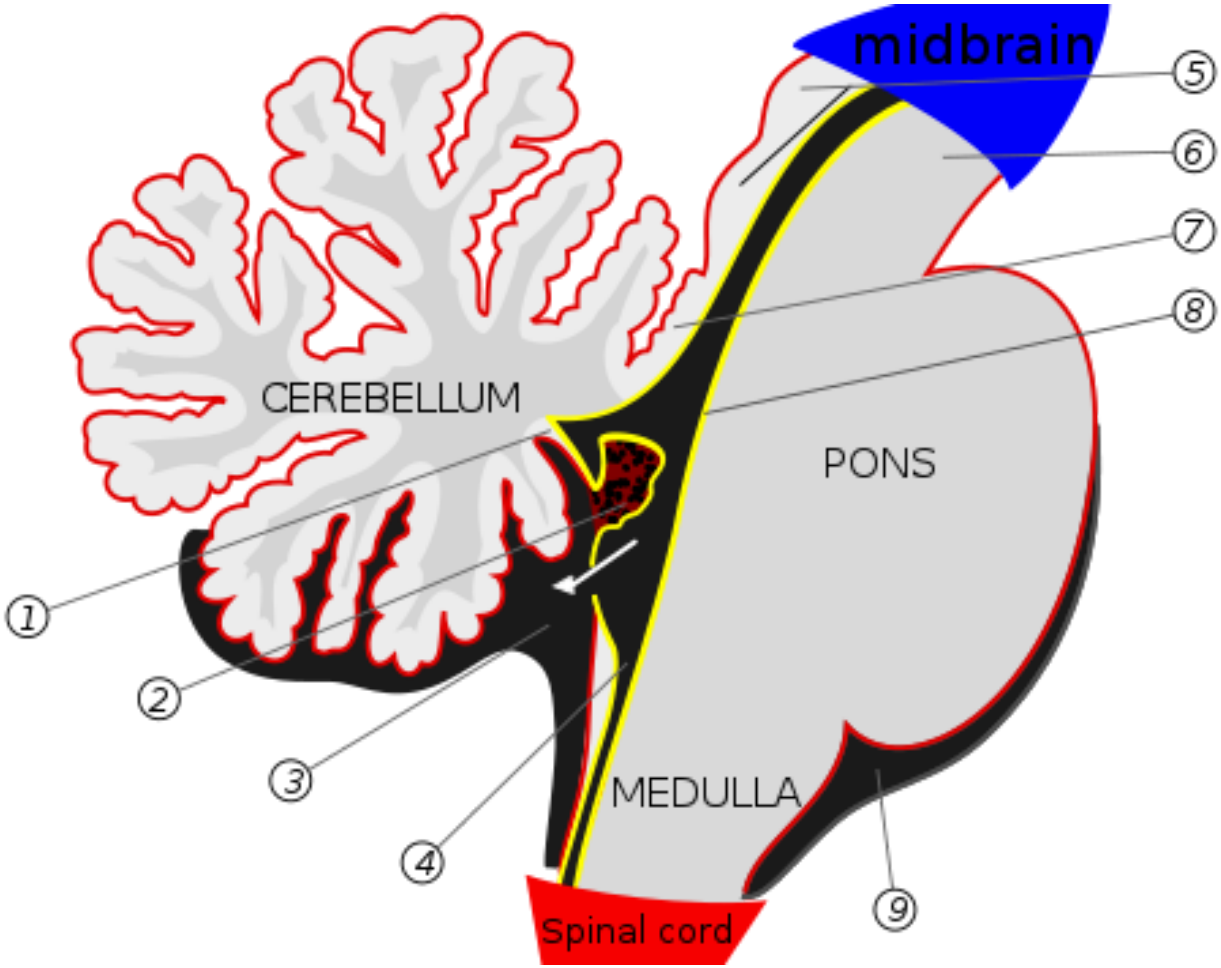
r/interestingasfuck • Posted by u/NotABedlessPro 9 days ago /r/ALL

How a craniectomy is performed to remove a tumor from the brain.



Pons

- Bulge on brain stem
- Neuromodulatory nuclei
- Relay to cerebellum
- Cranial nerve V



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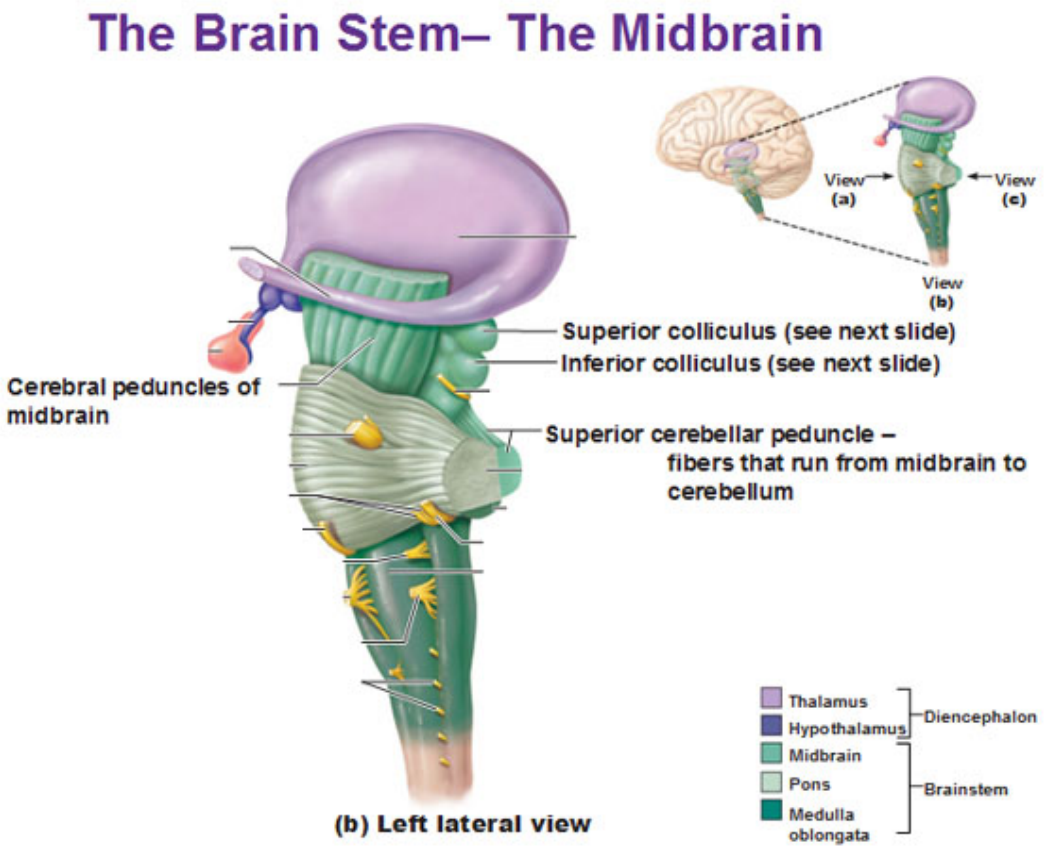
Midbrain



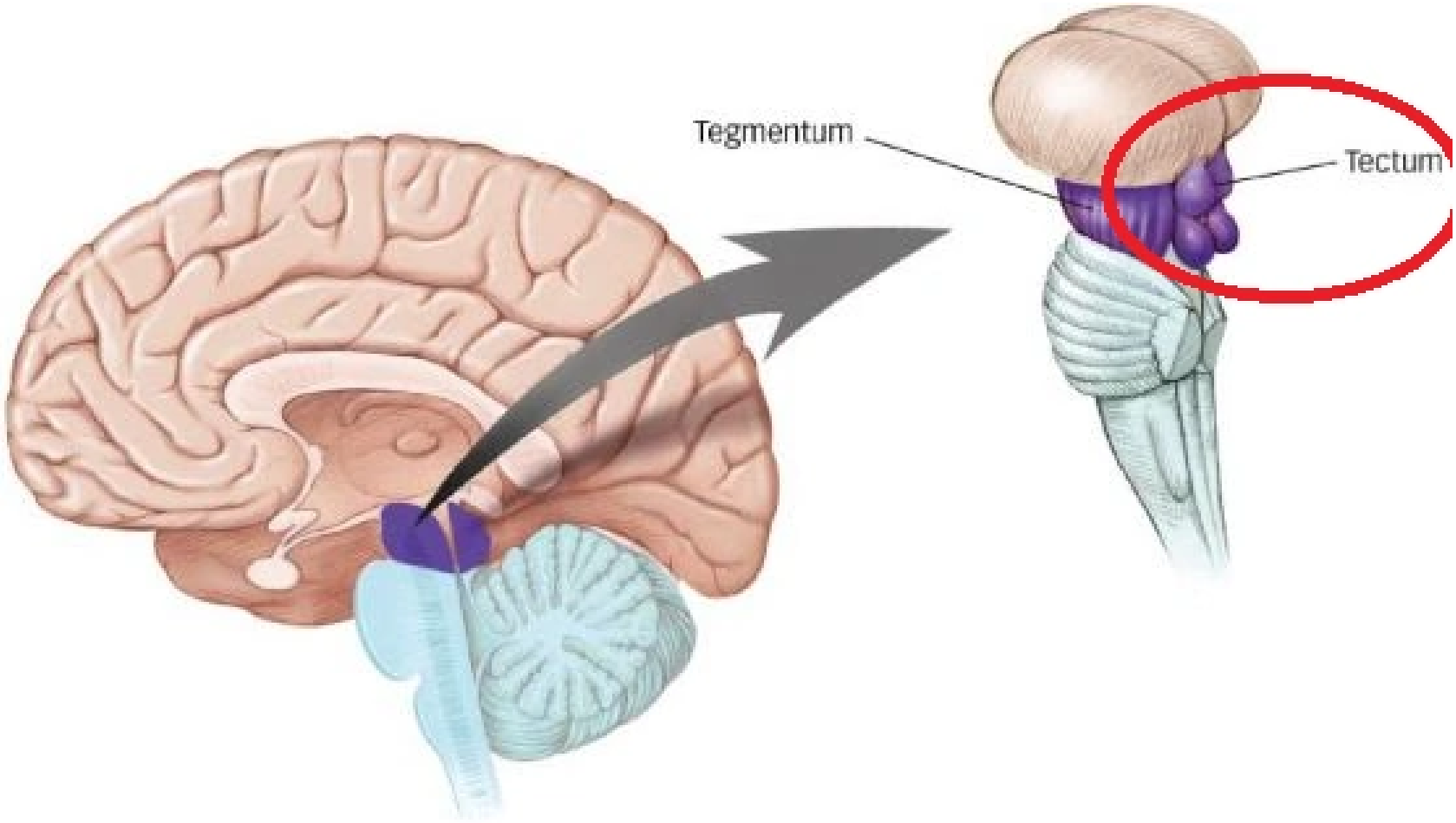
http://antranik.org/wp-content/uploads/2011/11/the-brain-stem-mid-brain-left-lateral-view-superior-colliculus-inferior-cerebellar-peduncle.jpg

Midbrain components

Tectum

Tegmentum

Midbrain



https://vignette.wikia.nocookie.net/brain-for-ai/images/b/bd/Tectum.png/revision/latest?cb=20170613125935

Tectum

- Tectum -> “roof”
- *Superior colliculus* (reflexive orienting of eyes, head, ears)
- *Inferior colliculus* (sound/auditory processing)

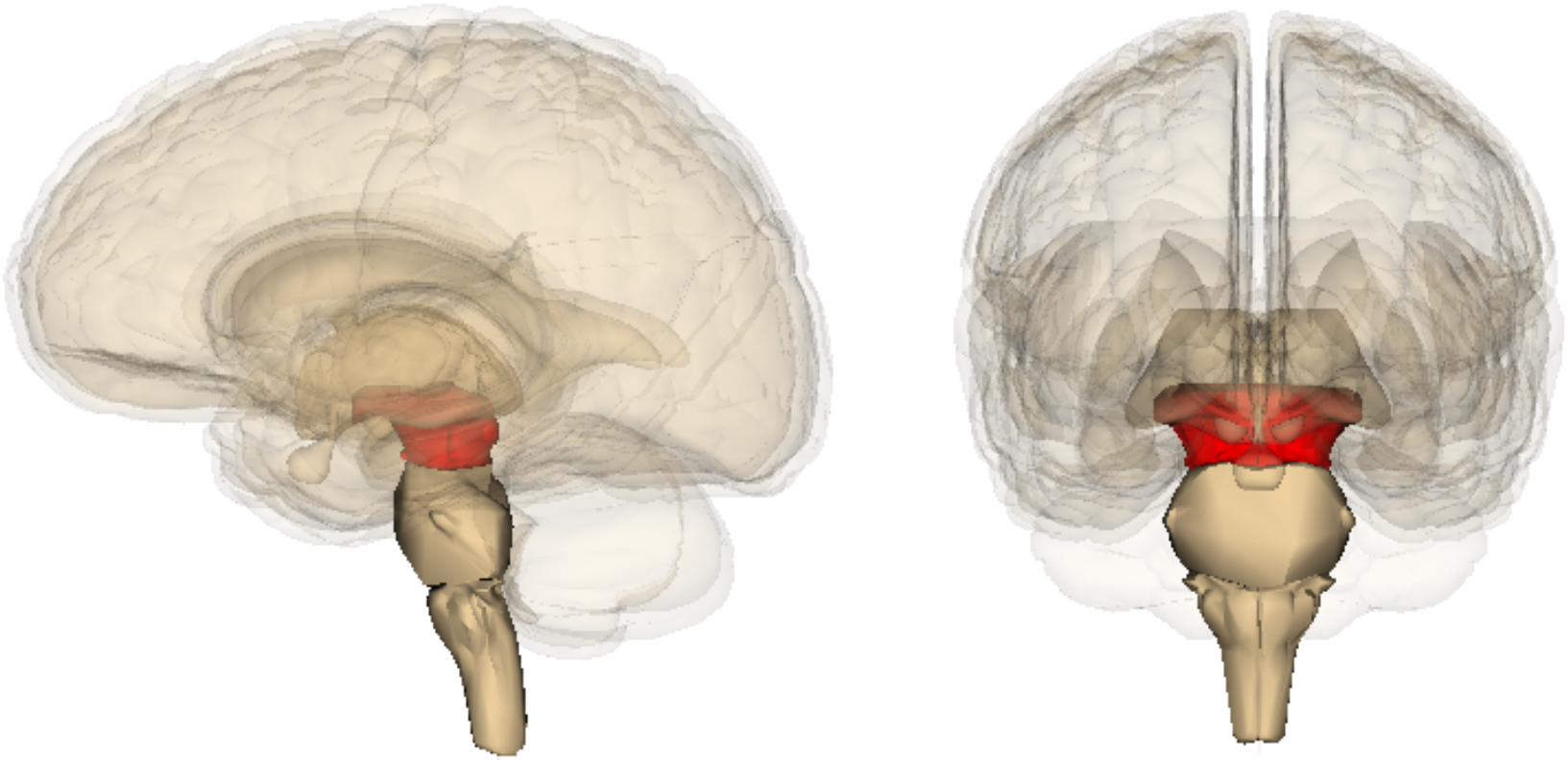
Tegmentum

- Tegmentum -> “floor”
- Species-typical movement sequences (e.g., cat: hissing, pouncing)
- Cranial nerves III, IV

Tegmentum

- *Nuclei* that release modulatory neurotransmitters ("neuromodulators")
  - *Dopamine (DA)*
  - *Norepinephrine (NE)*
  - *Serotonin (5-HT)*

Forebrain



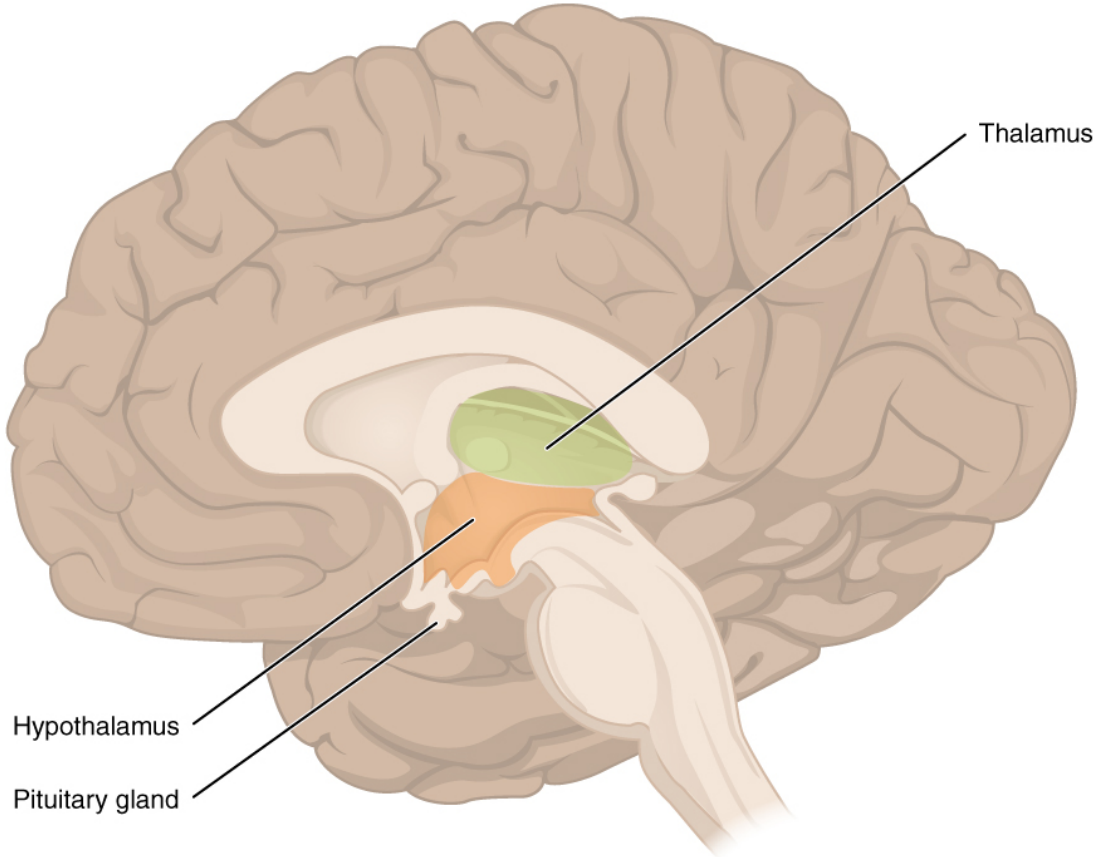
(Samanthi, 2019)

Forebrain Components

Diencephalon (“between” brain)

Telencephalon

Diencephalon

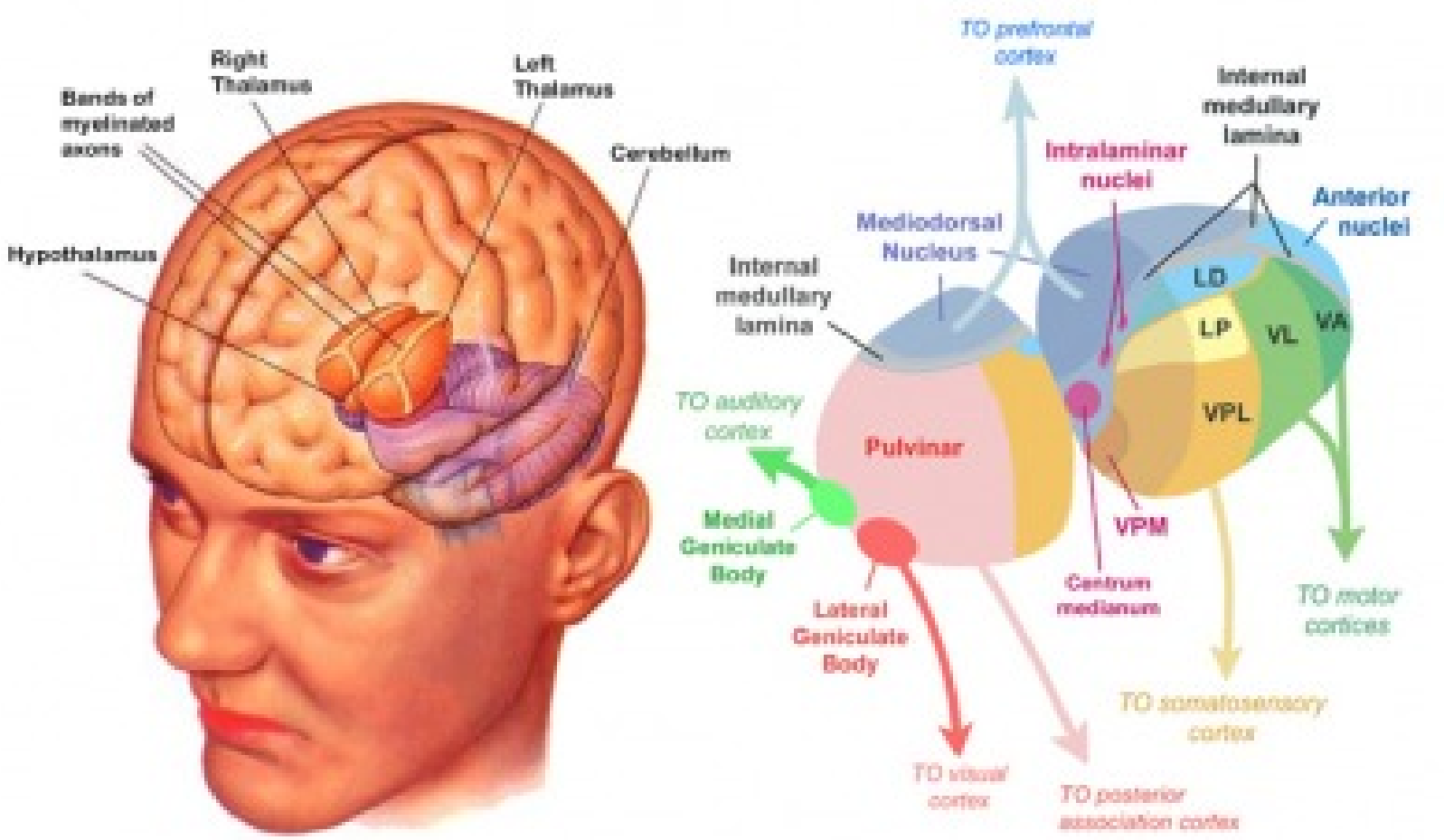


https://upload.wikimedia.org/wikipedia/commons/a/a0/1310_Diencephalon.jpg

Diencephalon Components

- *Thalamus*
- *Hypothalamus*

Thalamus



http://neurobiologychapter3.weebly.com/uploads/1/4/1/8/1418733/5118342.jpg?401x231

Thalamus functions

- Input to cortex
- Functionally distinct nuclei (collection of neurons)
  - *Lateral geniculate nucleus (LGN)*, vision
  - *Medial geniculate nucleus (MGN)*, audition

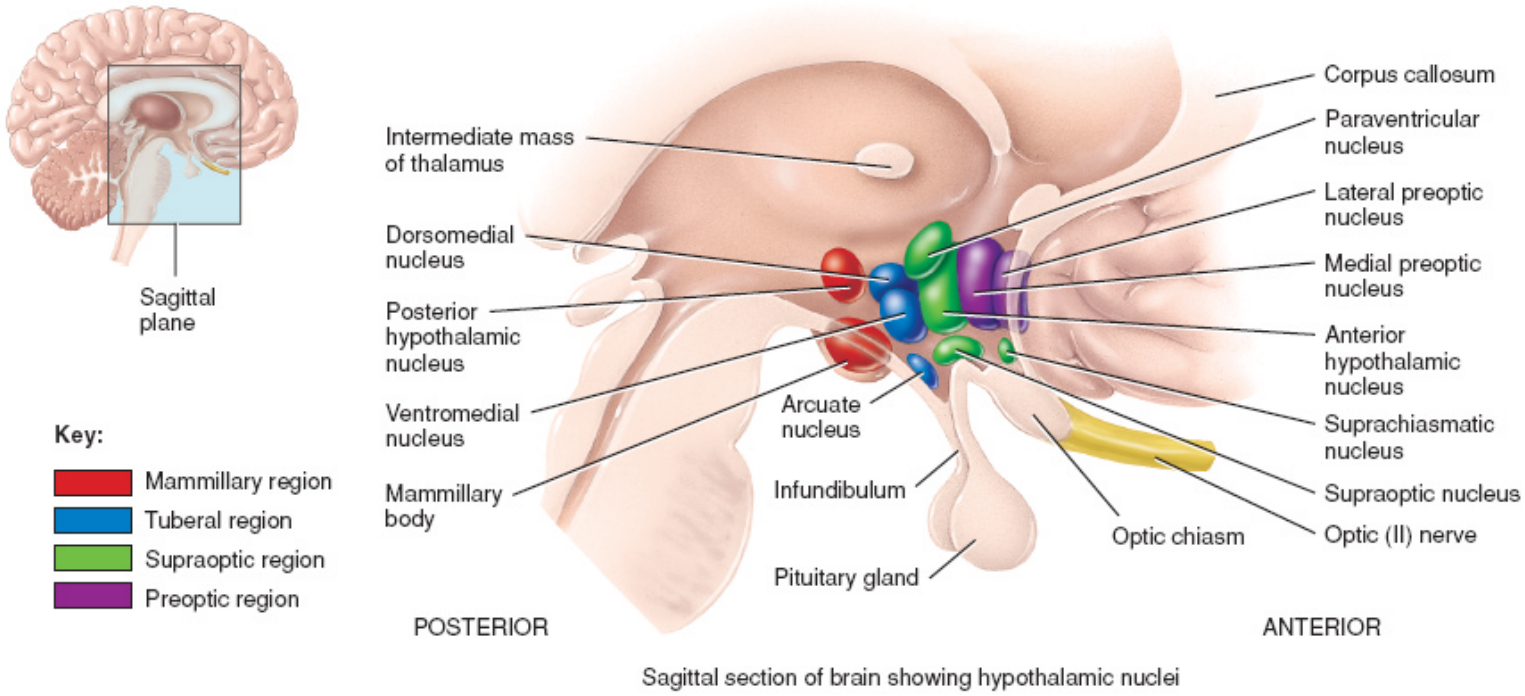
Hypothalamus

- Five Fs: fighting, fleeing/freezing, feeding, and reproduction
- Controls *Autonomic Nervous System (ANS)*
  - Sympathetic branch
  - Parasympathetic branch

Hypothalamus

- Controls *endocrine system* via *pituitary gland* (“master” gland)
  - *Anterior pituitary* (indirect release of hormones)
  - *Posterior* (direct release of hormones)
    - *Oxytocin*
    - *Vasopressin*

Hypothalamus



Sagittal section of brain showing hypothalamic nuclei

http://higheredbcs.wiley.com/legacy/college/tortora/0470565101/hearthis_ill/pap13e_ch14_illustr_audio_mp3_ar

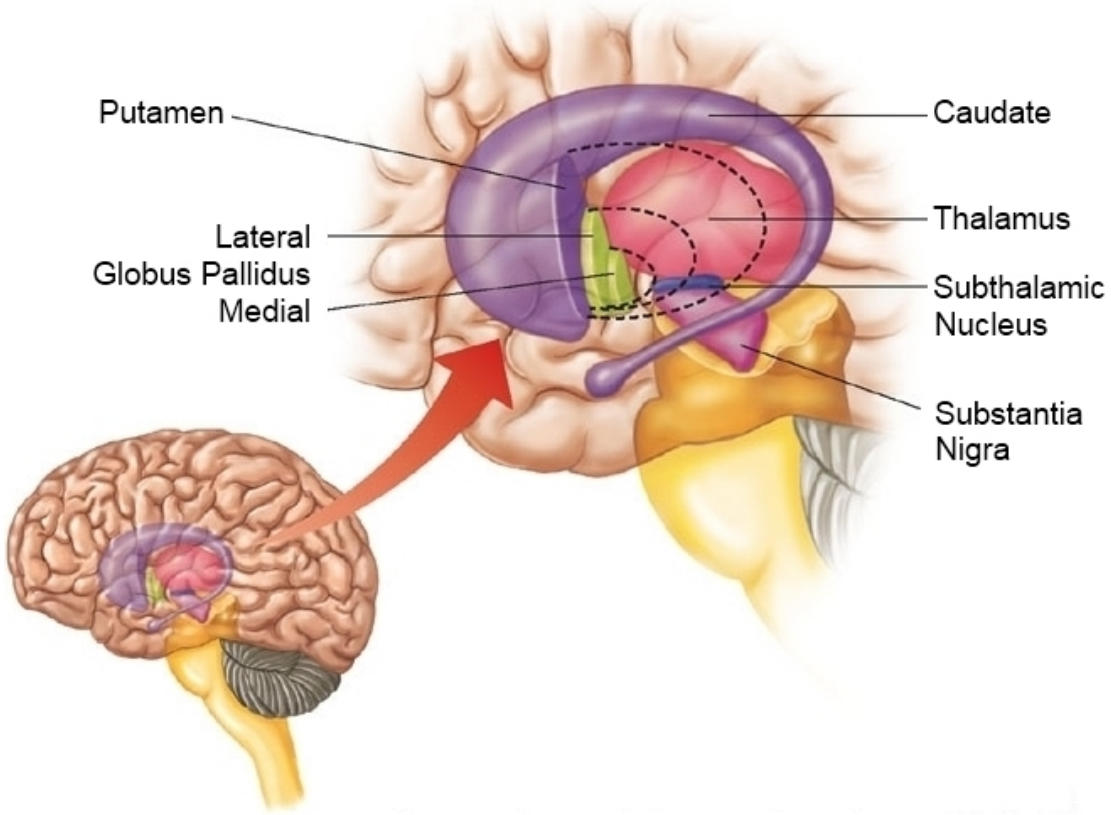
Telencephalon components

- Basal (not basil) ganglia
- Hippocampus
- Amygdala
- Cerebral cortex

Basal ganglia

- Skill and habit learning
- Sequencing of movement
- Example: Parkinson’s Disease

Basal ganglia



http://humanphysiology.academy/Neurosciences%202015/Images/5/basalganglia%20sehati_org.jpeg

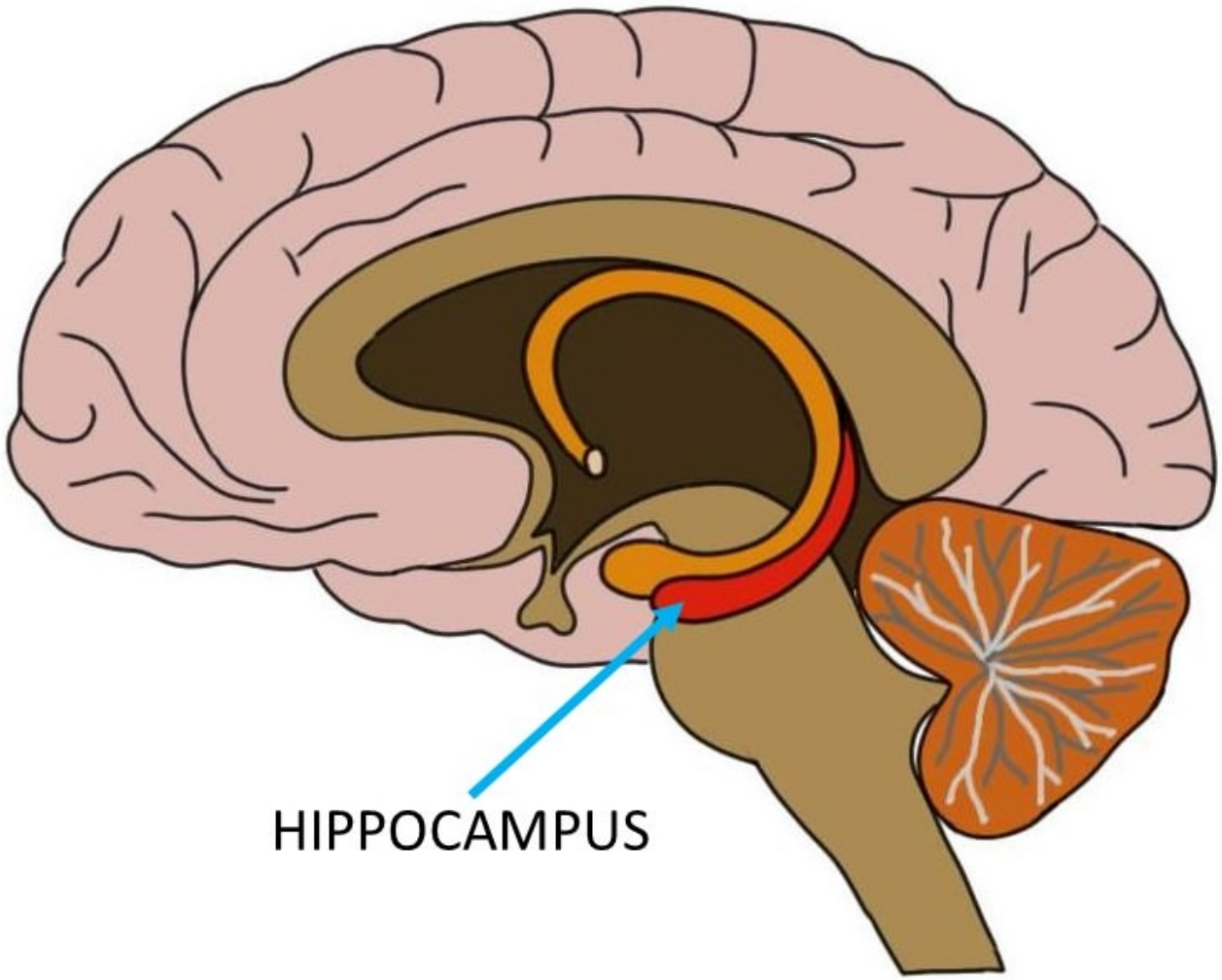
Basal ganglia

- Striatum
  - Dorsal
    - Caudate nucleus
    - Putamen
  - Ventral
    - Nucleus accumbens (NAcc)

Basal ganglia

- Globus pallidus
- Subthalamic nucleus
- Substantia nigra (in tegmentum)

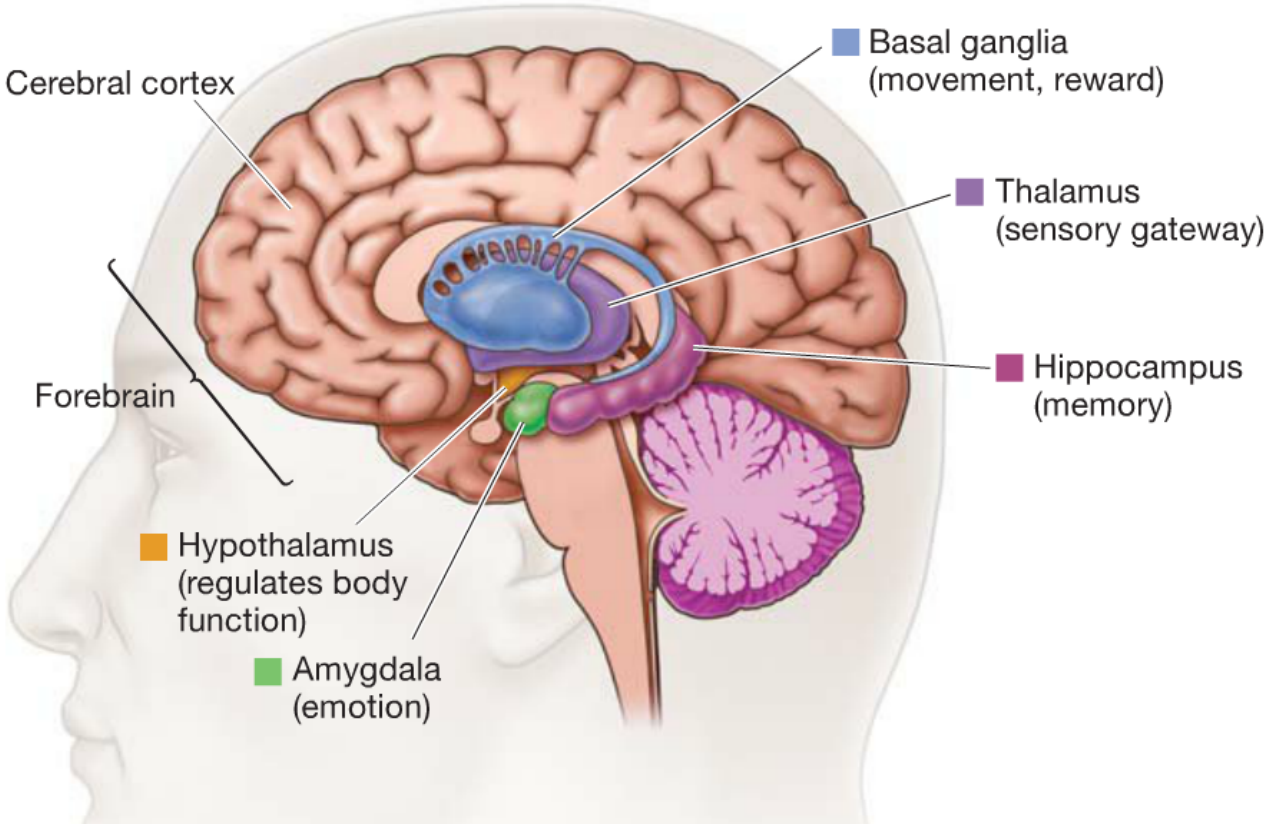
Hippocampus



Hippocampus

- From Greek for “sea horse”
- Immediately lateral to (inferior) lateral ventricles
- Memories of specific facts or events, spatial locations
- Implicated in Alzheimer’s Disease
- Fornix projects to hypothalamus
- Mammillary bodies

Amygdala



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Amygdala

- “almond”
- Physiological state, behavioral readiness, affect
- NOT the fear center! (LeDoux, 2015).

Next time…

- Neuroanatomy III (The cerebral cortex and beyond…)
- Quiz 1

References

ctdalilah. (2006, October). Pinky and the brain-brainstem. Youtube. Retrieved from https://www.youtube.com/watch?v=snO68aJTOpM

LeDoux, J. (2015, August 10). The Amygdala Is NOT the Brain's Fear Center. *Psychology Today*. Retrieved from https://www.psychologytoday.com/blog/i-got-mind-tell-you/201508/the-amygdala-is-not-the-brains-fear-center

Samanthi. (2019, May). Difference between forebrain midbrain and hindbrain. https://www.differencebetween.com/difference-between-forebrain-midbrain-and-hindbrain/; Differencebetween.com. Retrieved from https://www.differencebetween.com/difference-between-forebrain-midbrain-and-hindbrain/

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