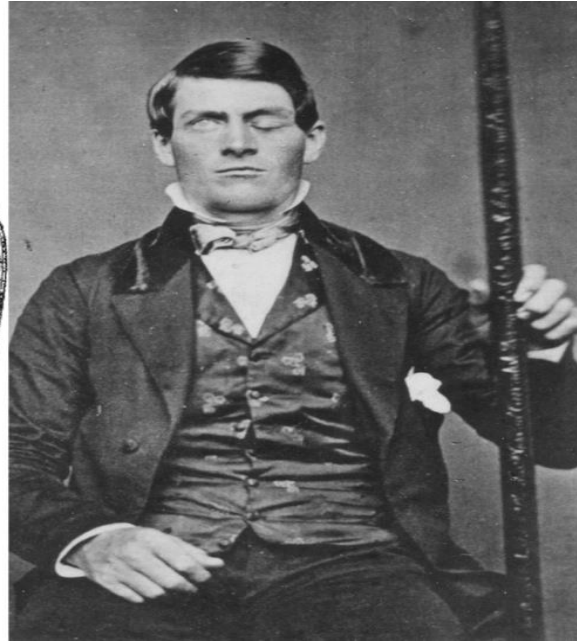
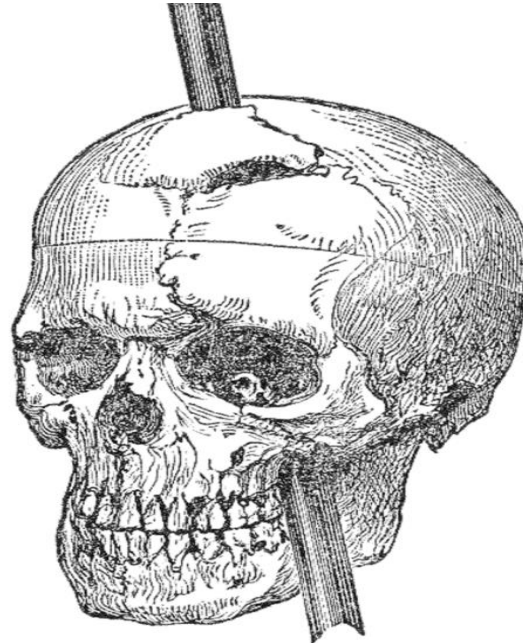


# What the Brain Looks Like

# Brain Parts



# Phineas Gage



Iron rod went through skull in work accident. It changed his personality and led to understanding of how different parts of brain control different functions and emotions. The rest of the story, rarely mentioned, is that over time his normal personality returned.

# Brain Research



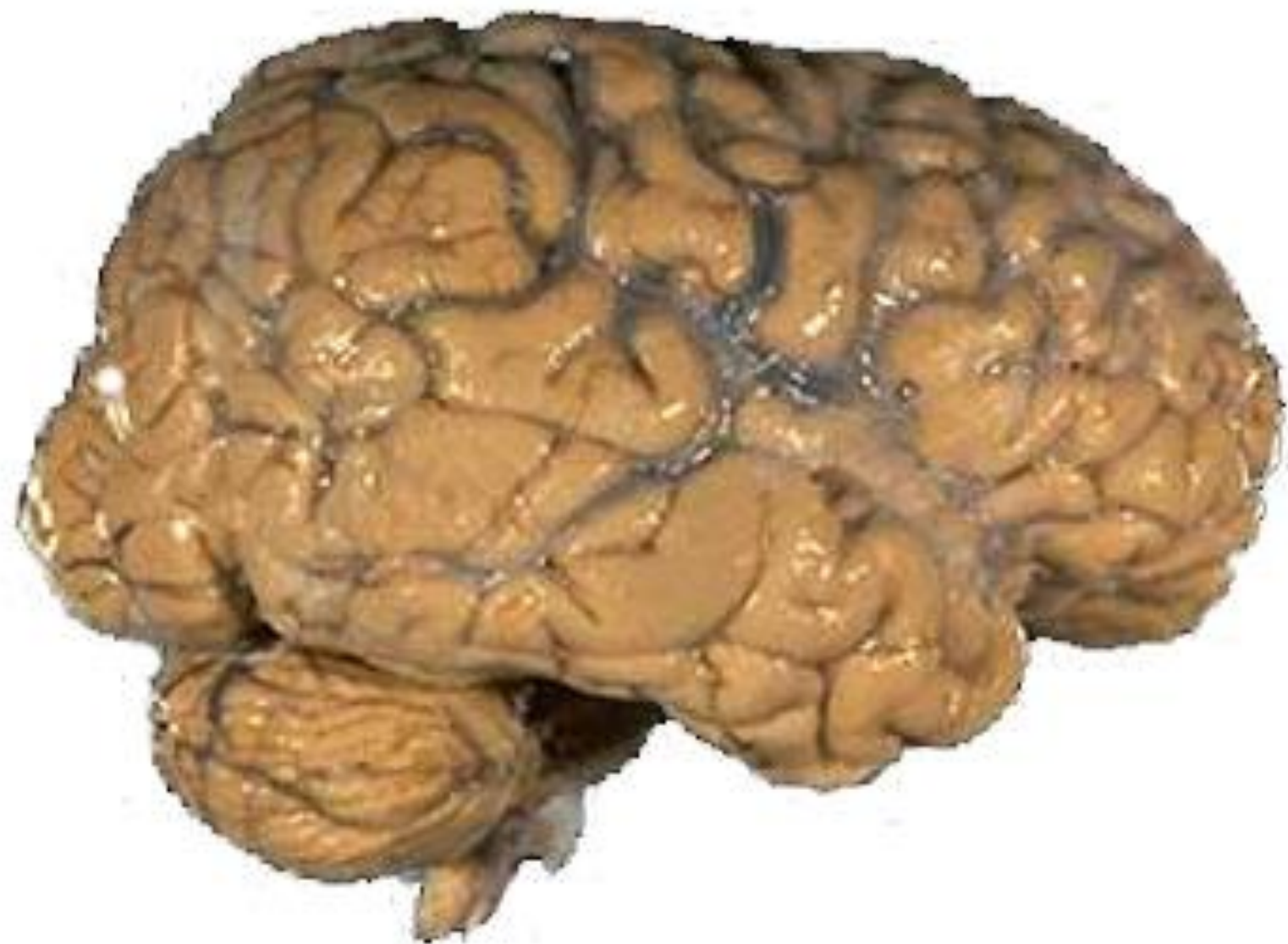
- As the result of Phinea Gage, people realized that different parts of the brain control different functions.
- Until recently, that was the bulk of the research.
- We now realize it is much more complicated with almost every part involved in multiple functions, multiple parts involved in virtually every function, and constant changes.
- For simplicity we will often talk about parts as having specific functions but please understand that is overly simplistic.

# Forget Reptile, Limbic, and Neocortex

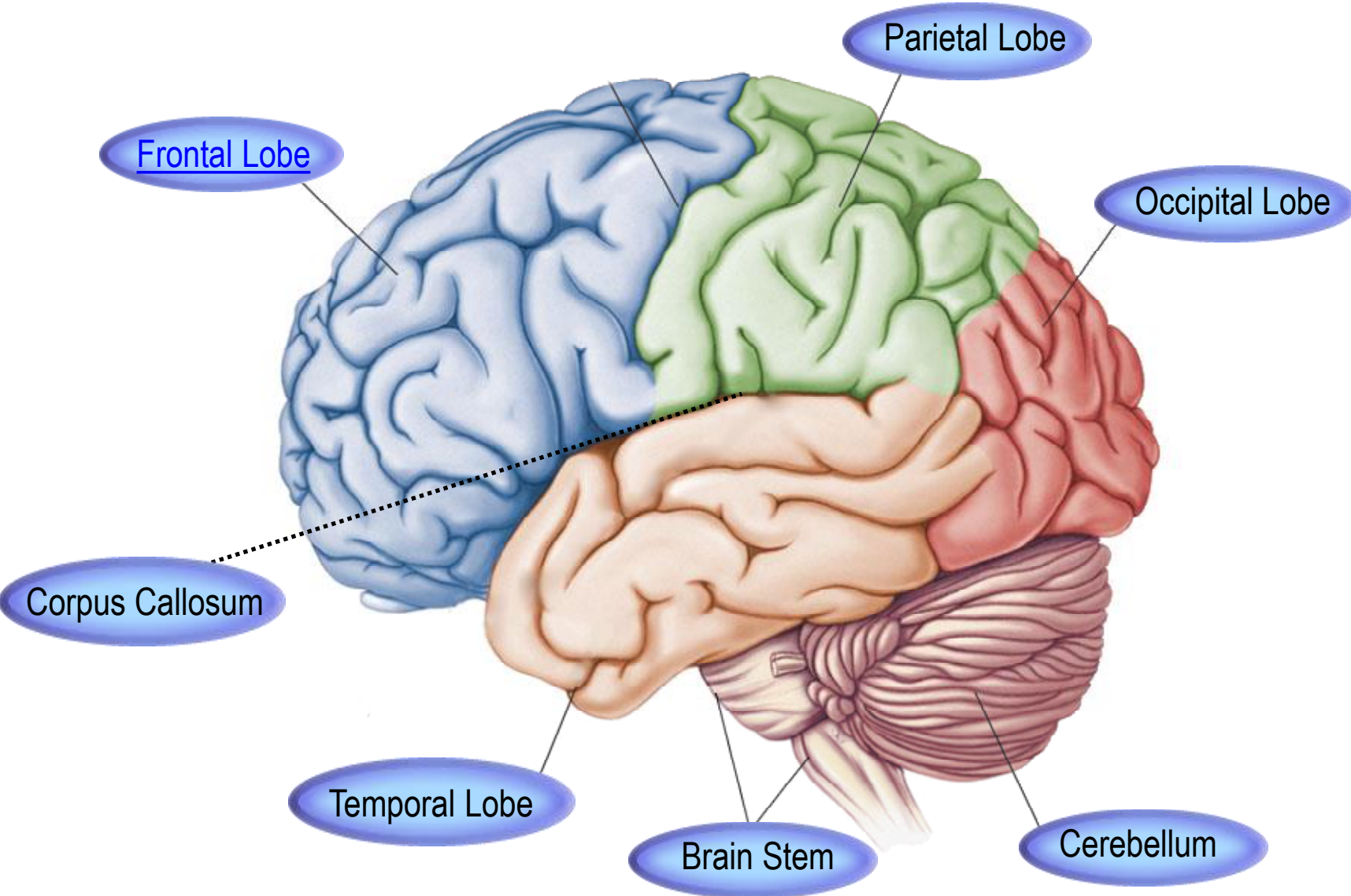
Historic classifications that have proven to be wildly inaccurate.

Divisions are inaccurate as applied to both humans and animals, including reptiles.





# Parts & Functions of the Human Brain





## Frontal Lobe

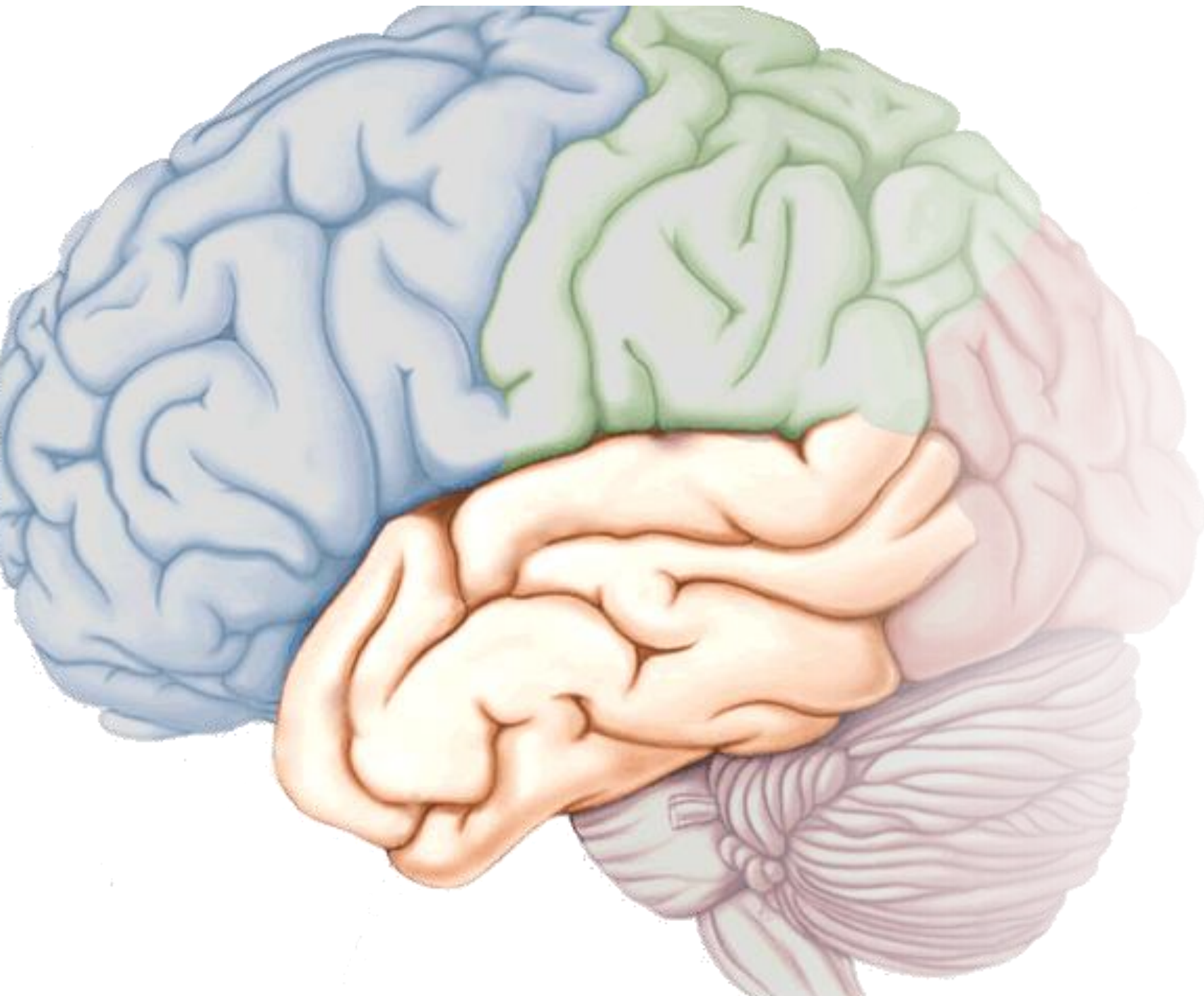
- Found under your forehead.
- Center of reasoning, planning, some parts of speech, movement (motor cortex), emotions, and problem solving.





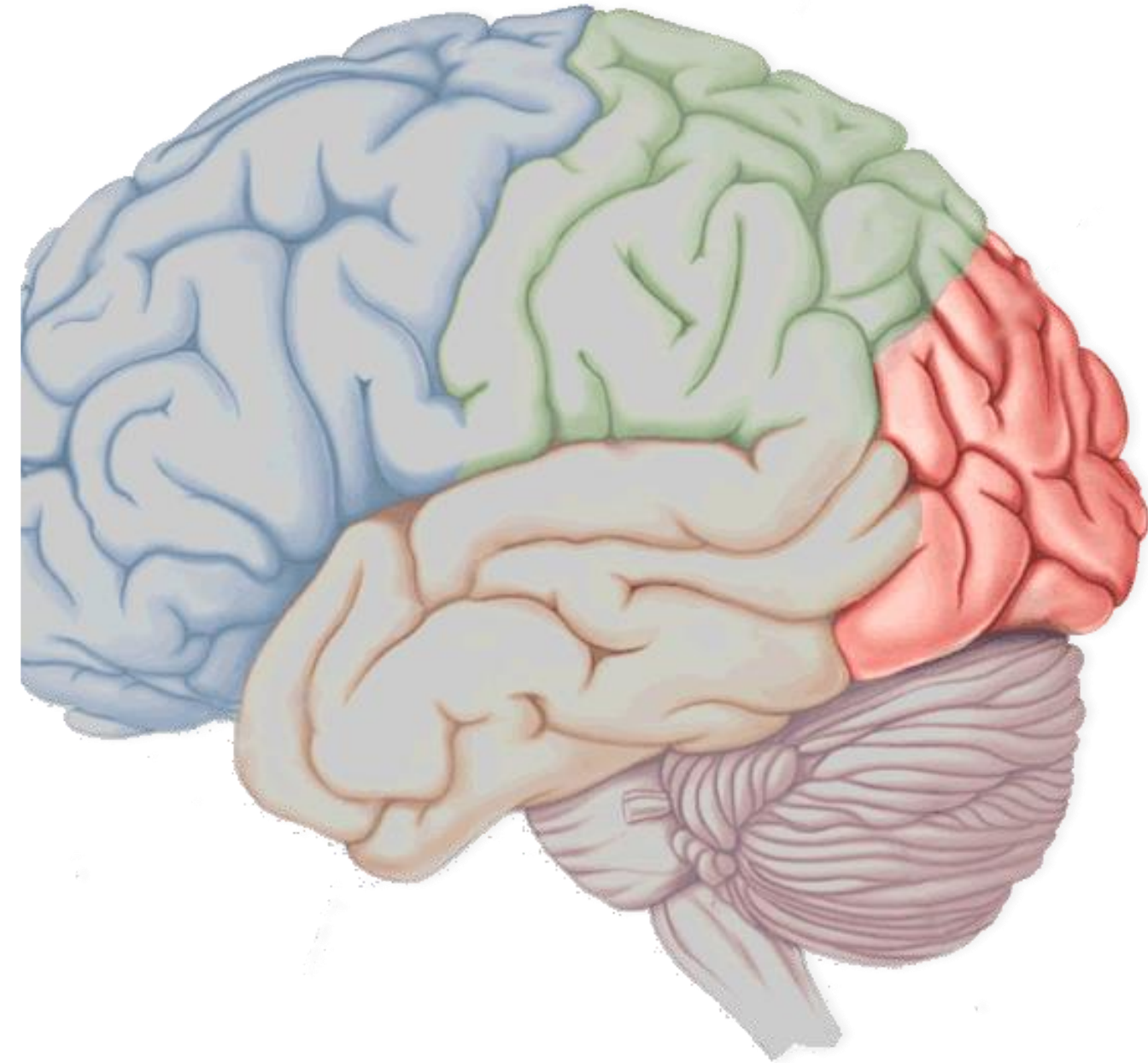
## Parietal Lobe

- Found on the top of your head.
- Receives sensory input from the skin. (touch, pressure, temperature, & pain)



## Temporal Lobe

- Found on the sides of your head above your ears.
- Functions include speech perception, hearing, some types of memory



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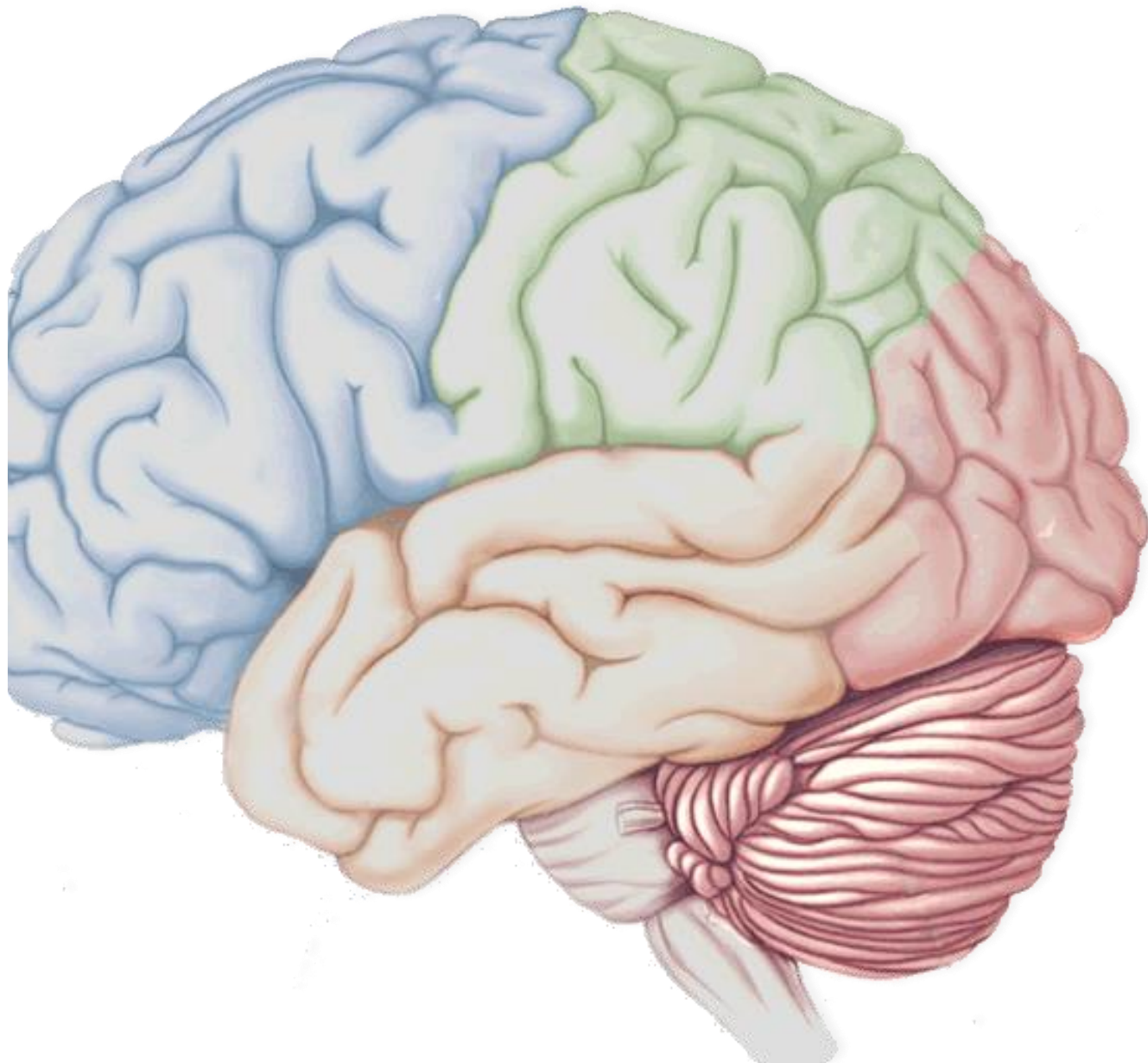
## Occipital Lobe

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Found at the back of your head

Receives input from the eyes

Often referred to as the visual cortex



## Cerebellum

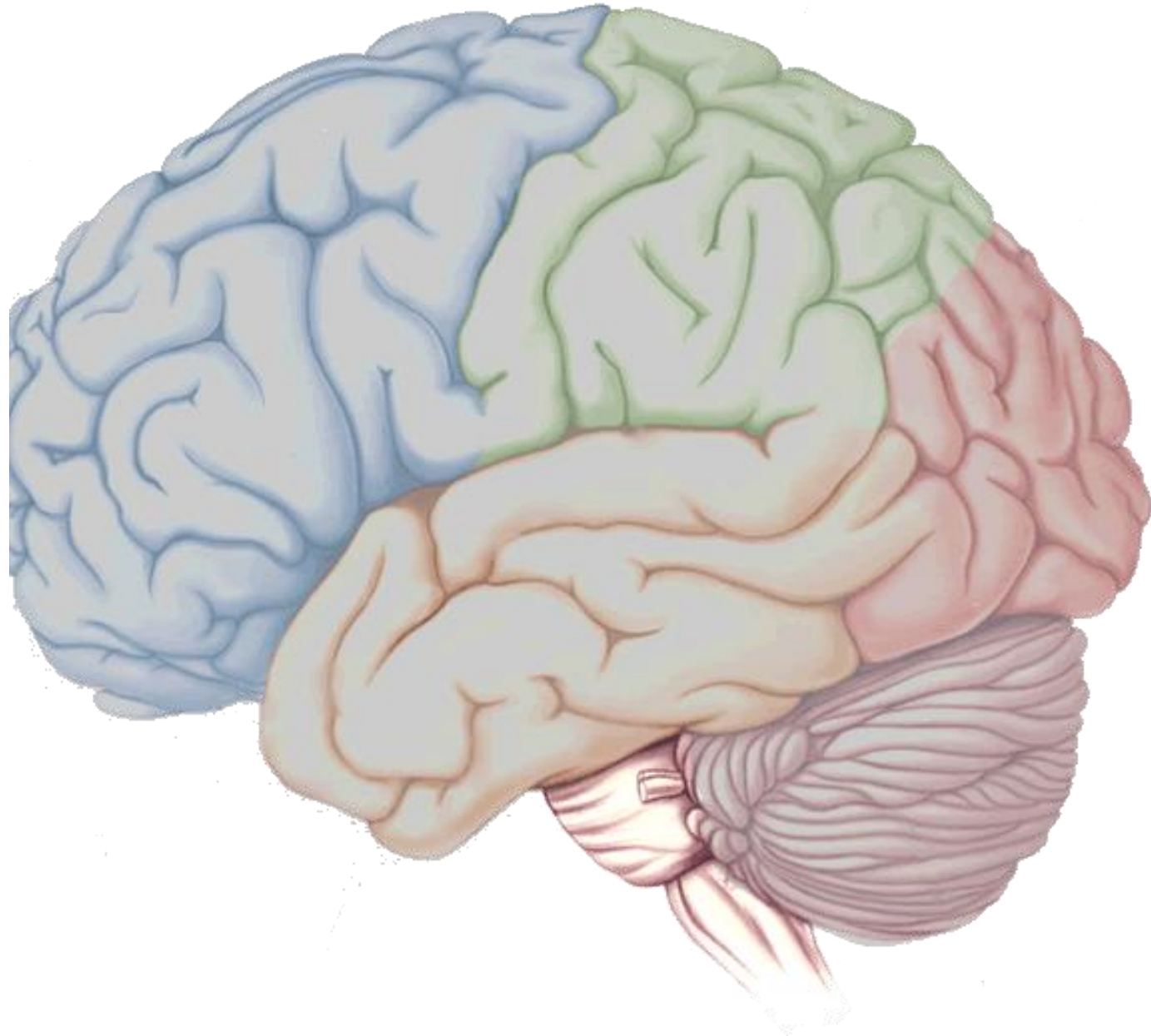
Found at the at the back of your head under the cerebrum.

Means “little brain”

Responsible for movement, balance, posture.

Often takes over learned activities- Like riding a bike!

# Brainstem



Most basic part of your brain.

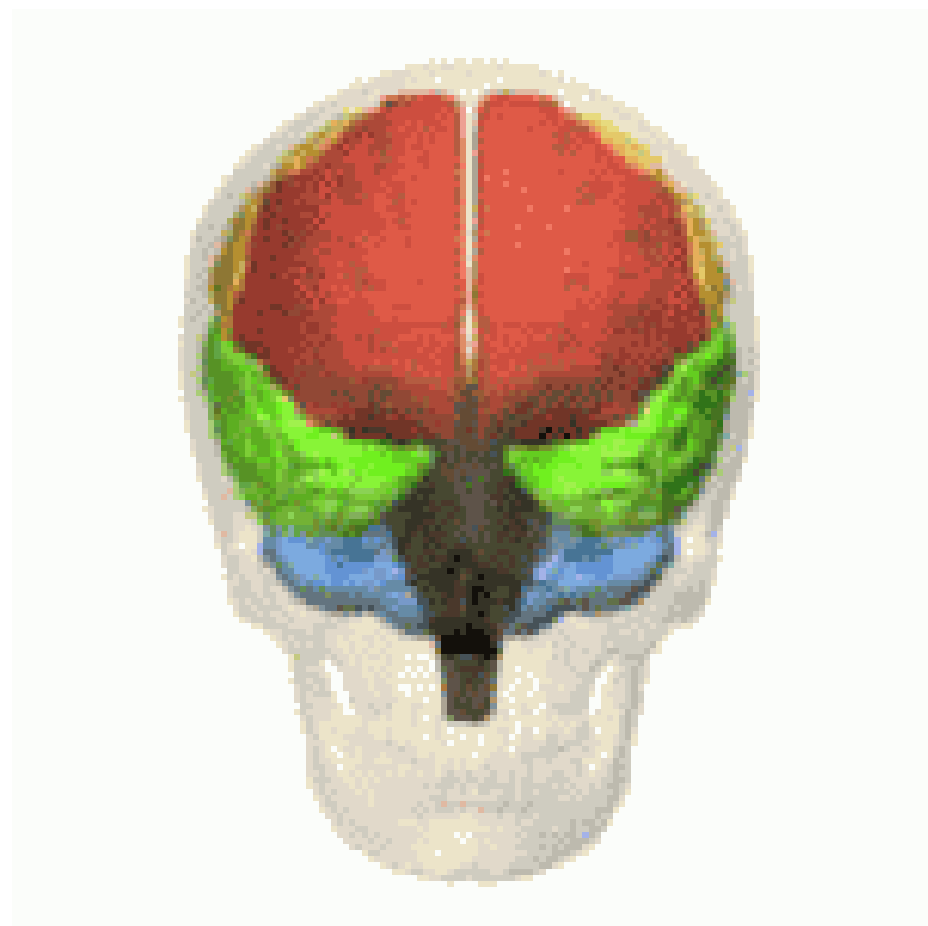
Controls functions essential to life (breathing, digesting, eliminating waste, sleeping, maintaining body temperature...)

Maintains life without "thinking" (or so we used to think)

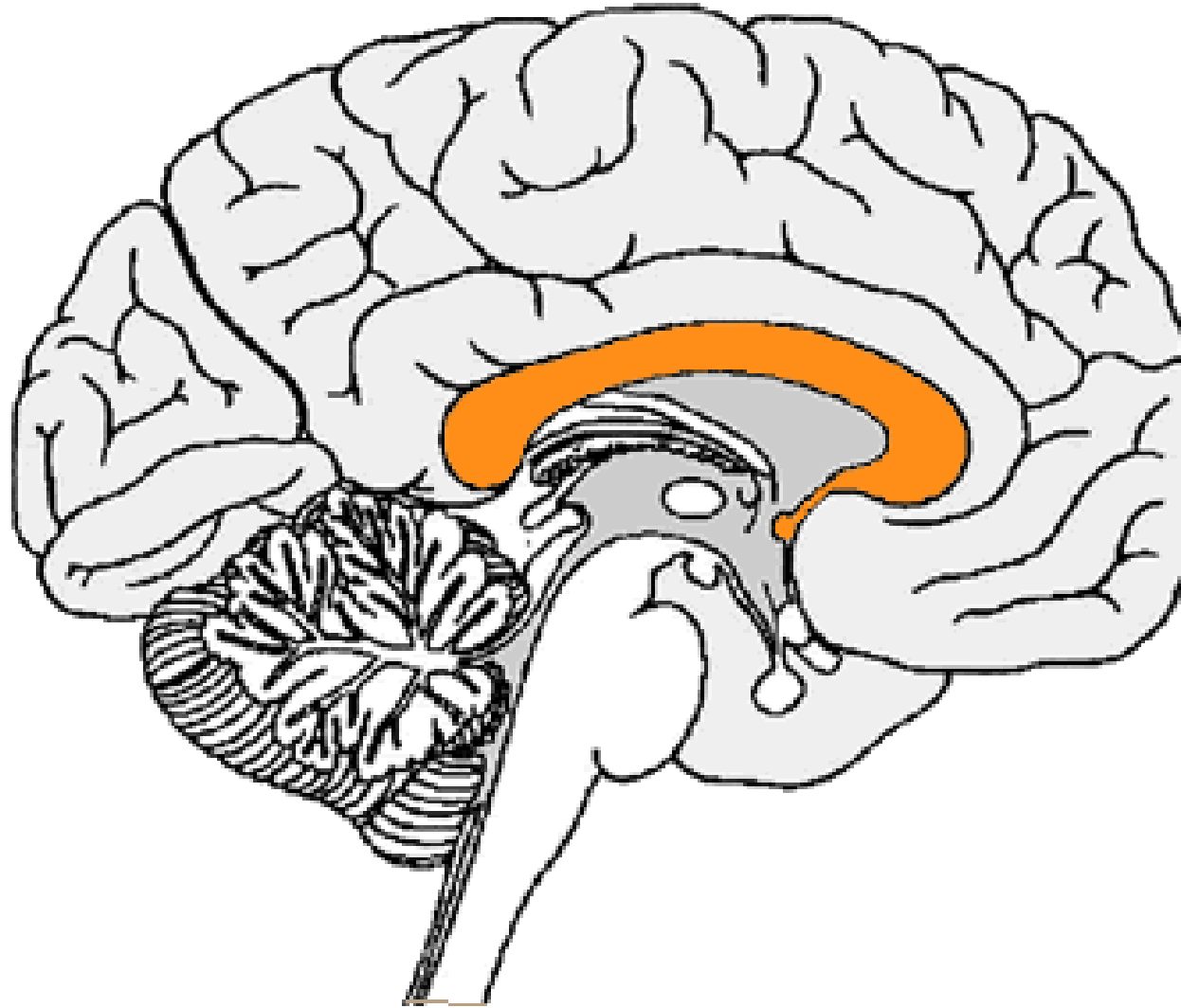


The brain has two nearly identical hemispheres connected by the corpus callosum

Most of the components we discuss exist on both sides



# Corpus Callosum

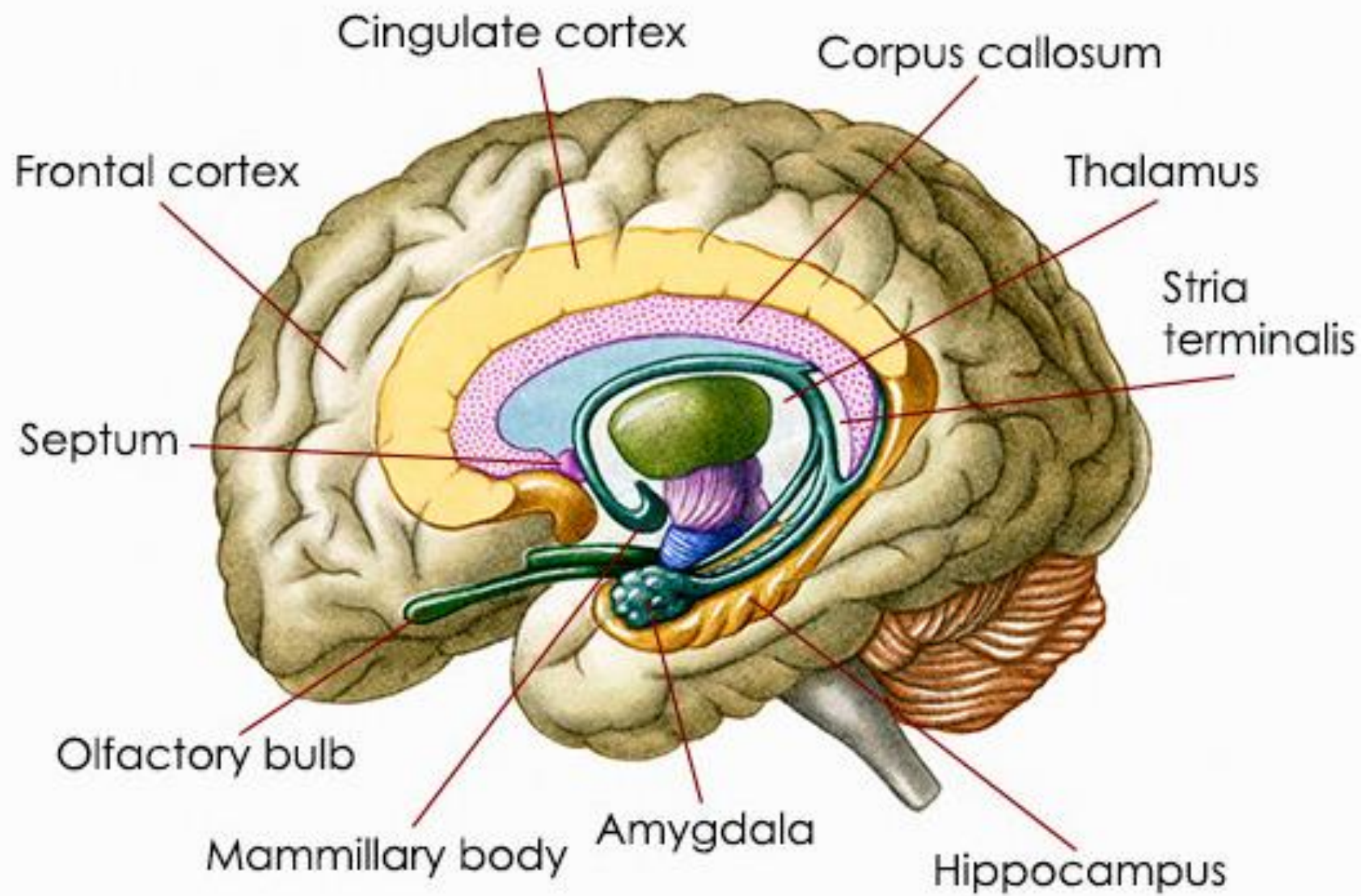


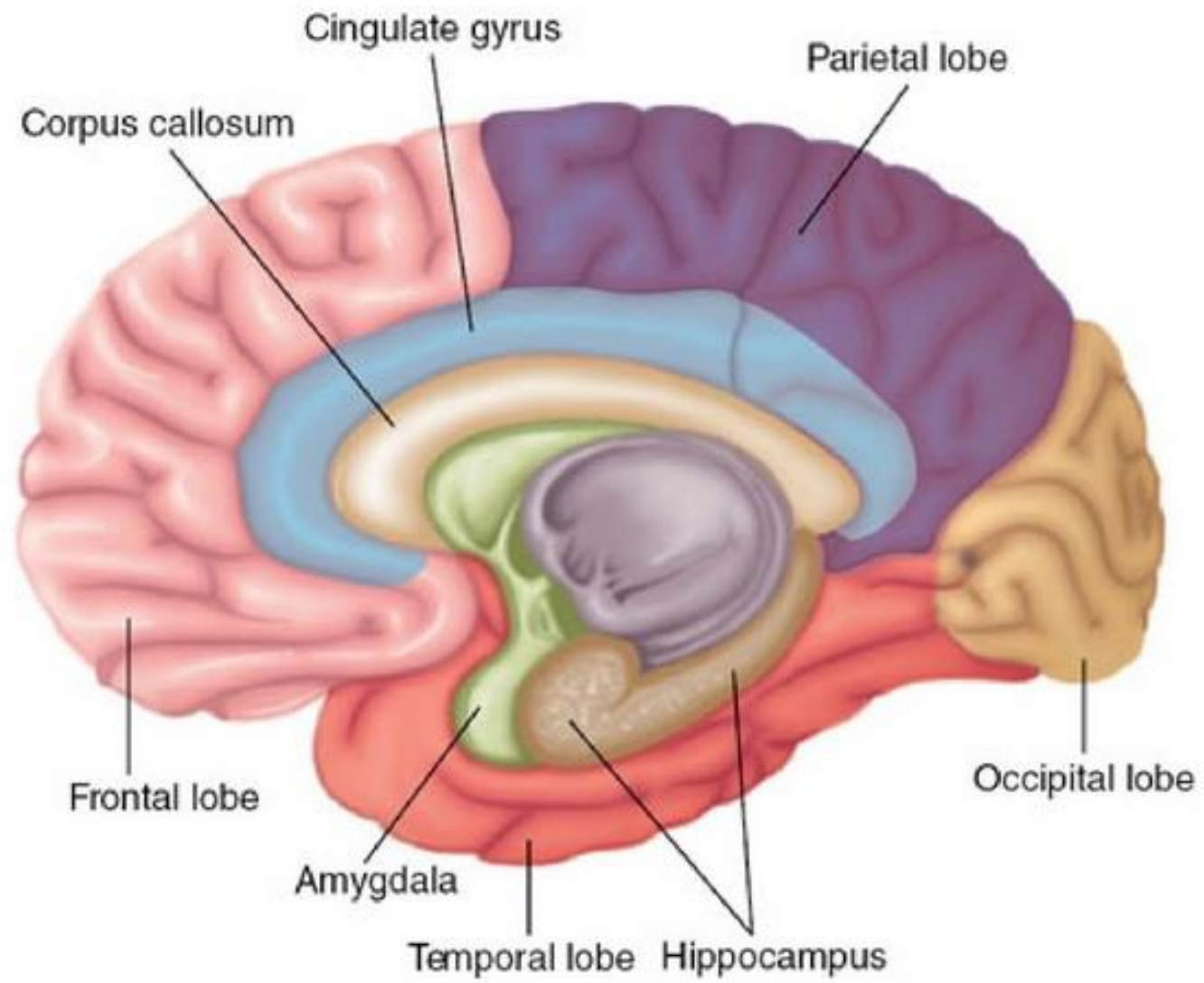
This is located centrally between the left and right hemispheres of your brain.

It is a bundle of fibers that connects the left and right hemispheres.

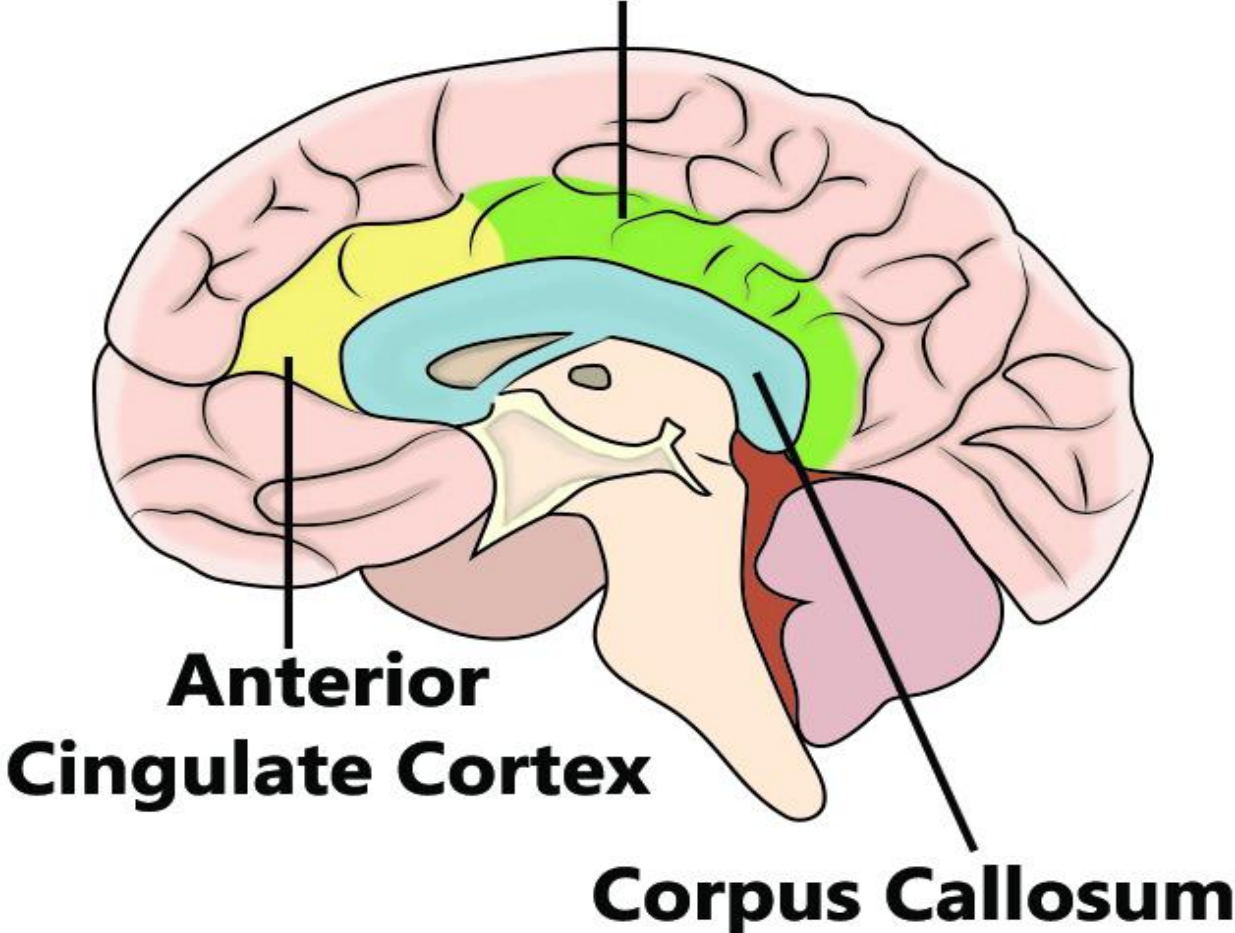
It is believed this area is involved in creativity and problem solving.

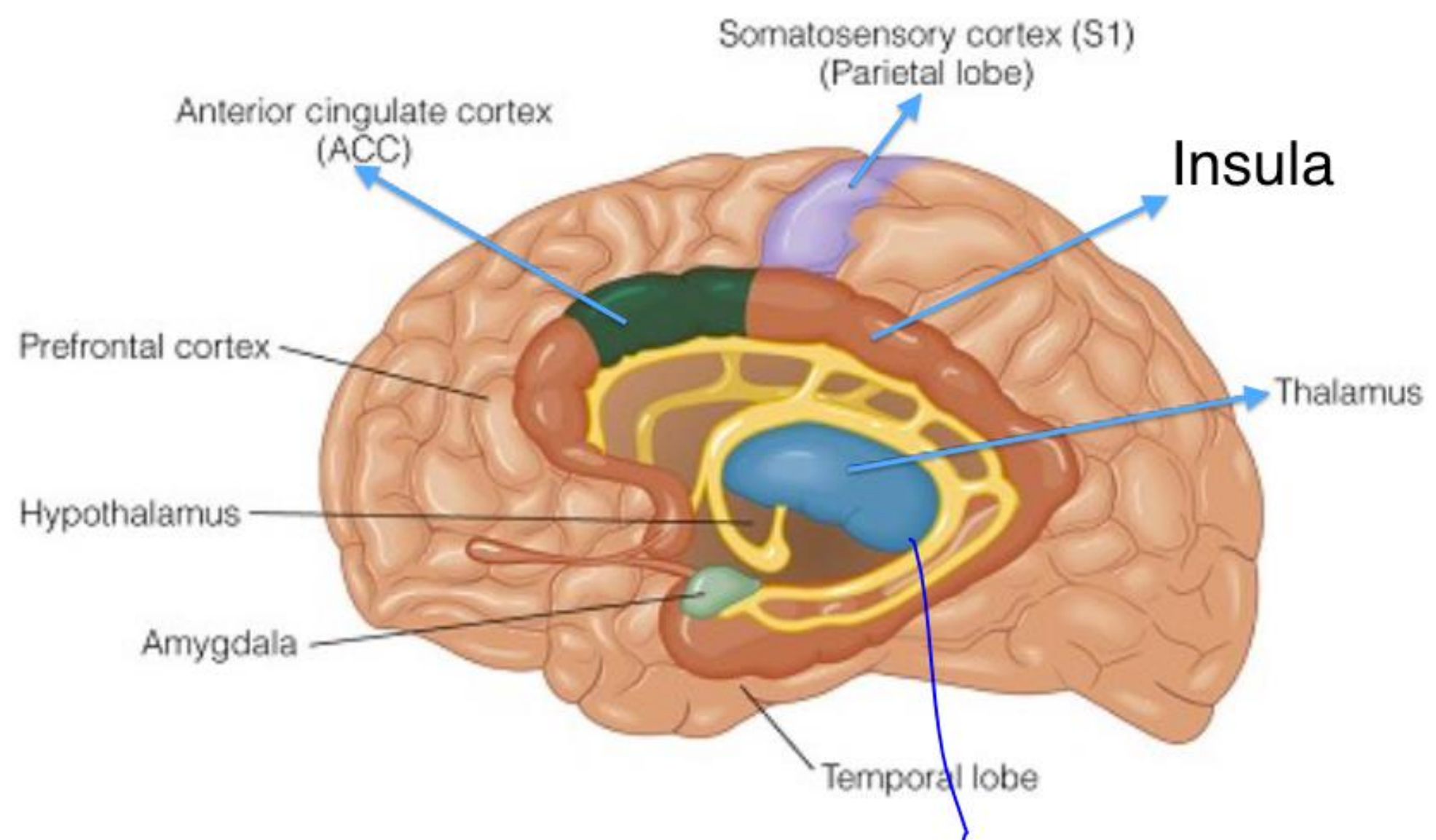


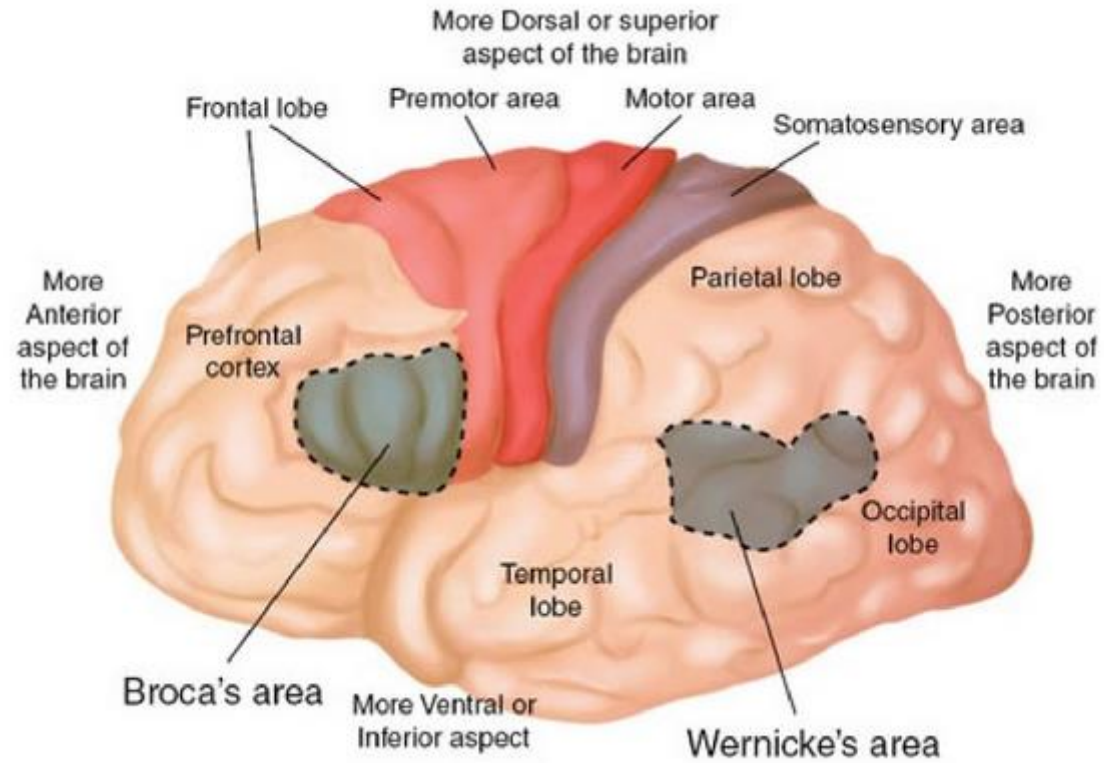




# Posterior Cingulate Cortex





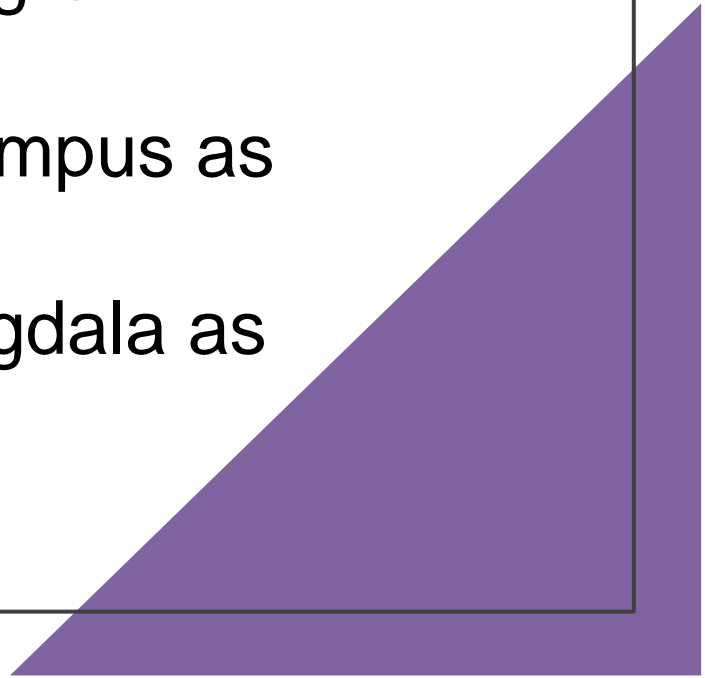


**Broca's Area – Expression**

**Wernicke's Area - Comprehension**

# Amygdala and Hippocampus

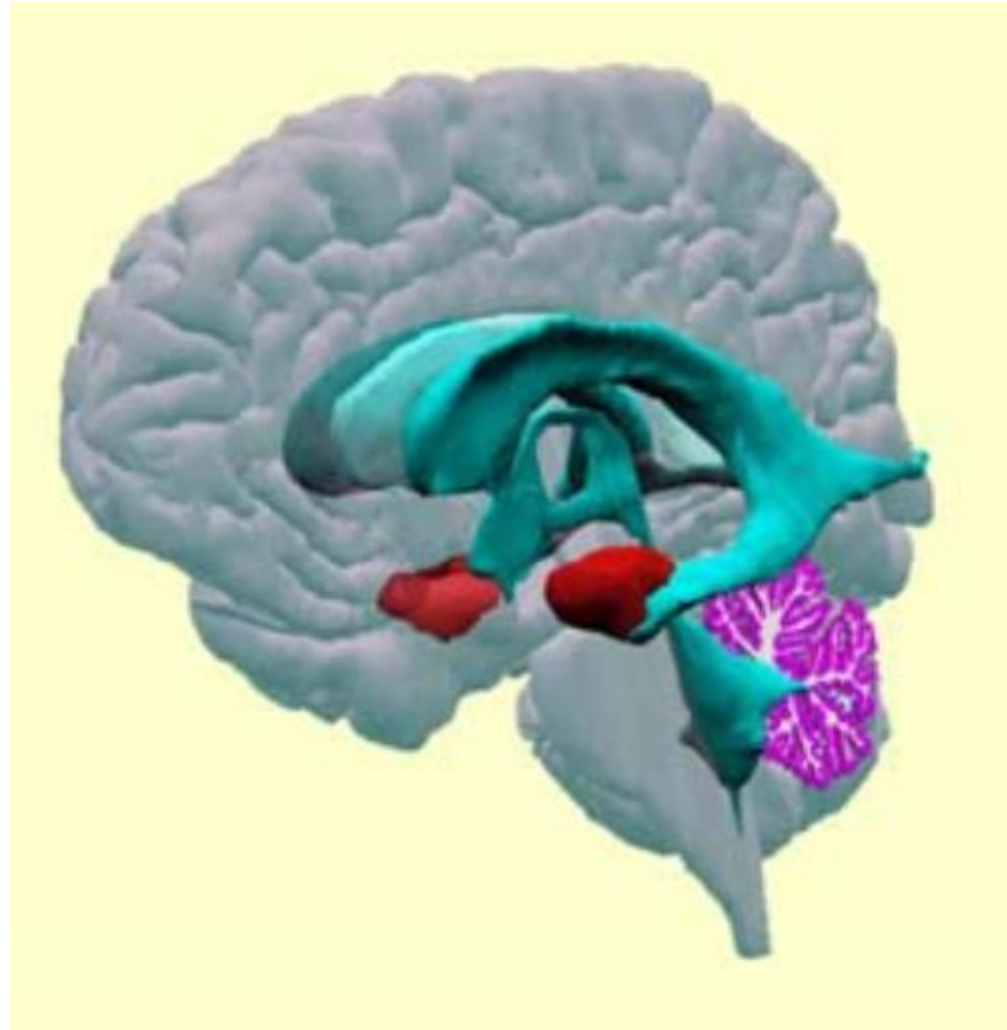
- Much of our focus will be on these two brain components
- Possibly the only parts of the brain that can grow throughout our lives, but can also shrink
- It is overly simplistic but think of the hippocampus as the seat of memory
- Similarly over simplistic but think of the amygdala as the seat of emotions, particularly fear



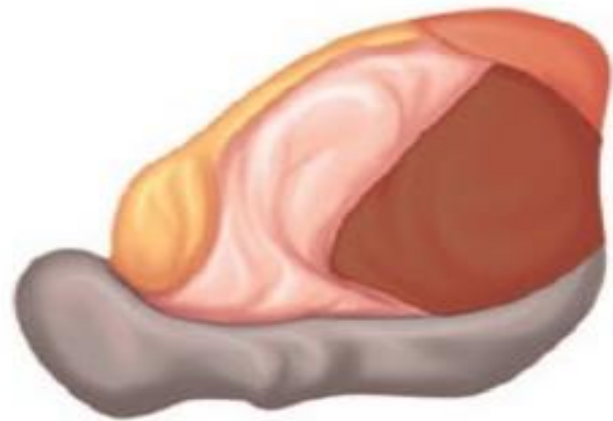
# Hippocampus – Greek for Seahorse



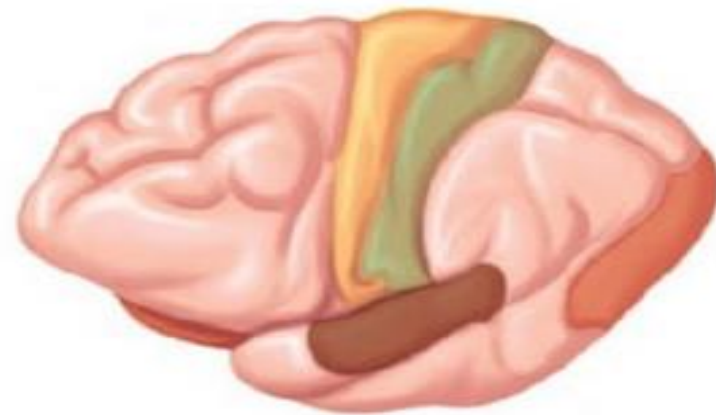
# Amygdala – Greek for Almond








Rat



Chimpanzee



Human

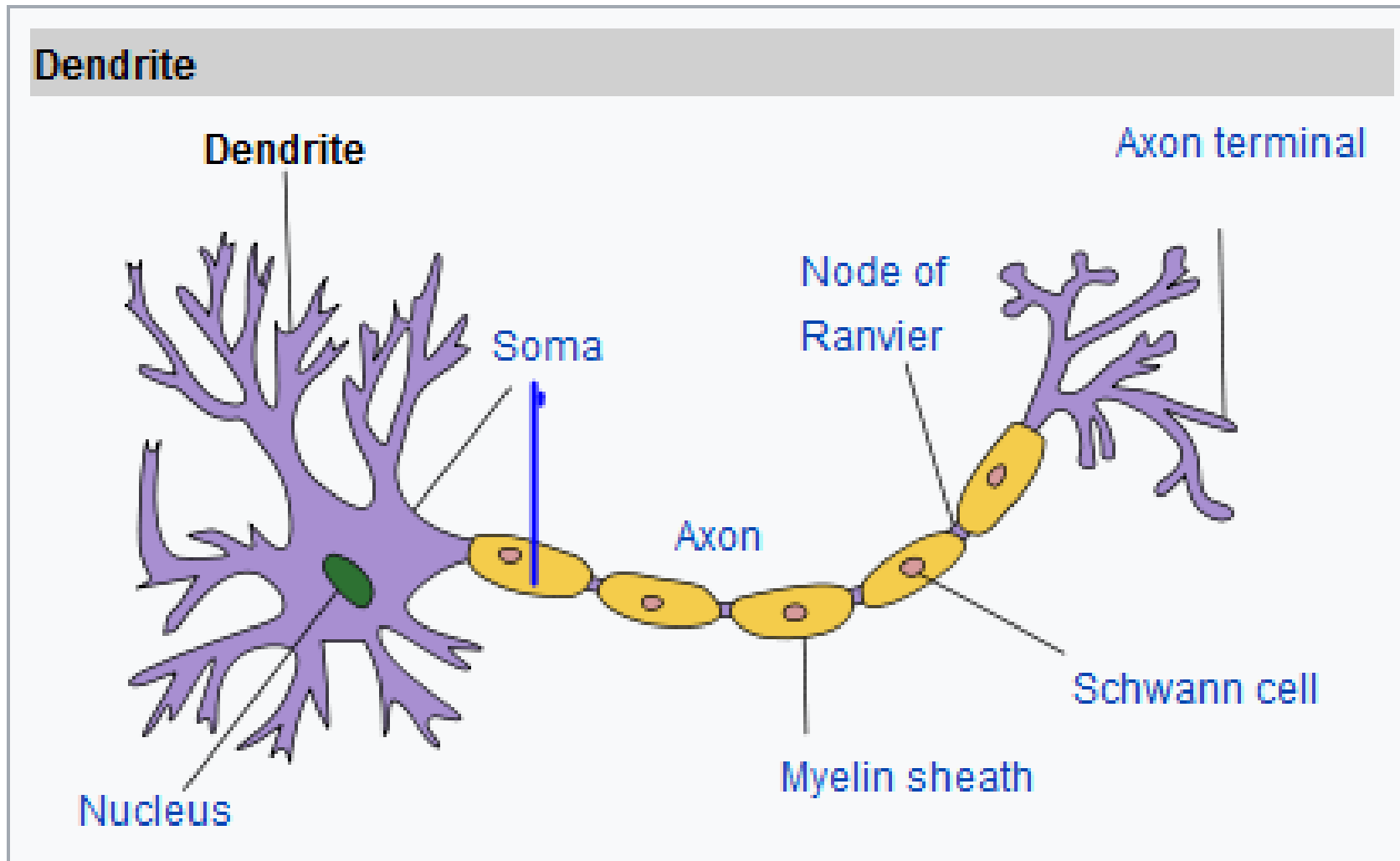
-  Motor
-  Auditory
-  Somatosensory

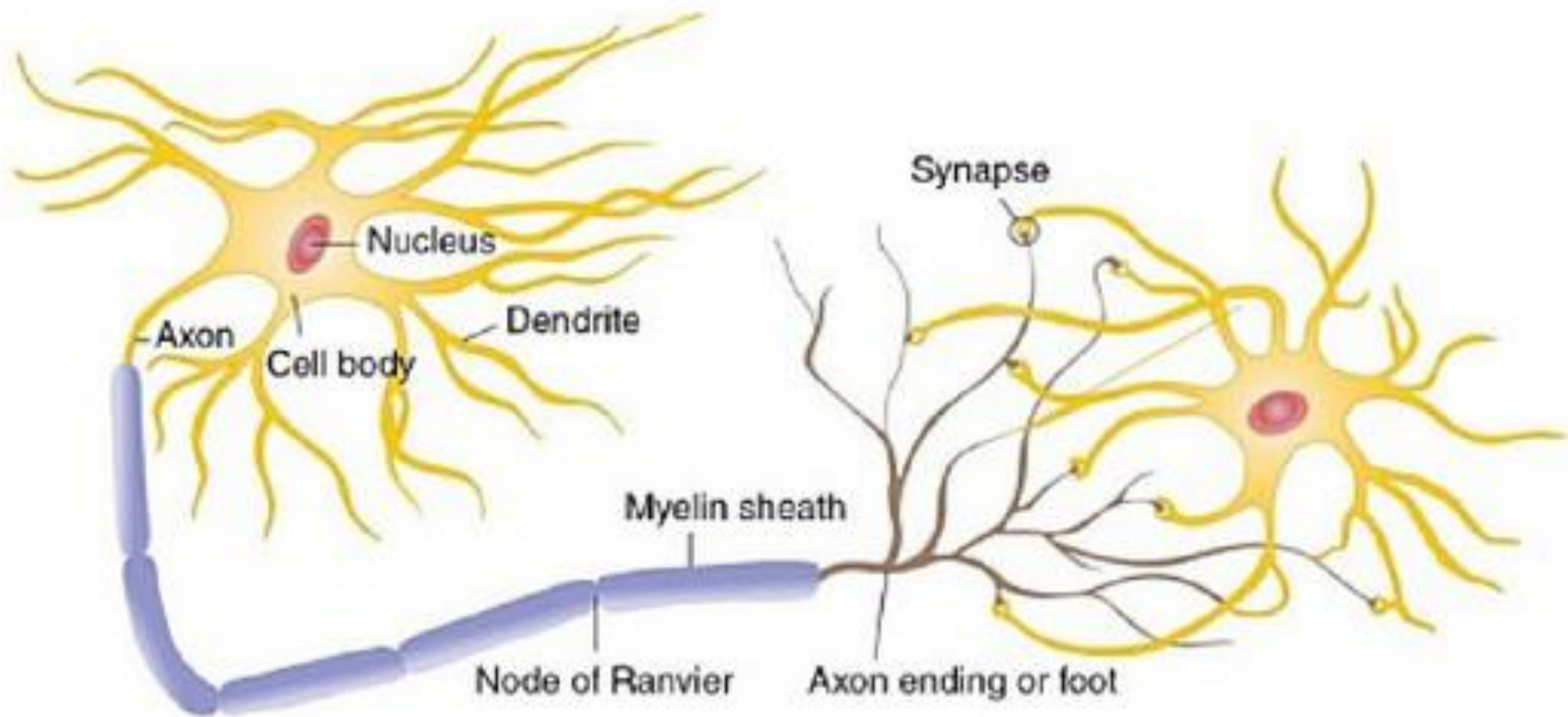
-  Olfactory
-  Visual
-  Uncommitted cortex

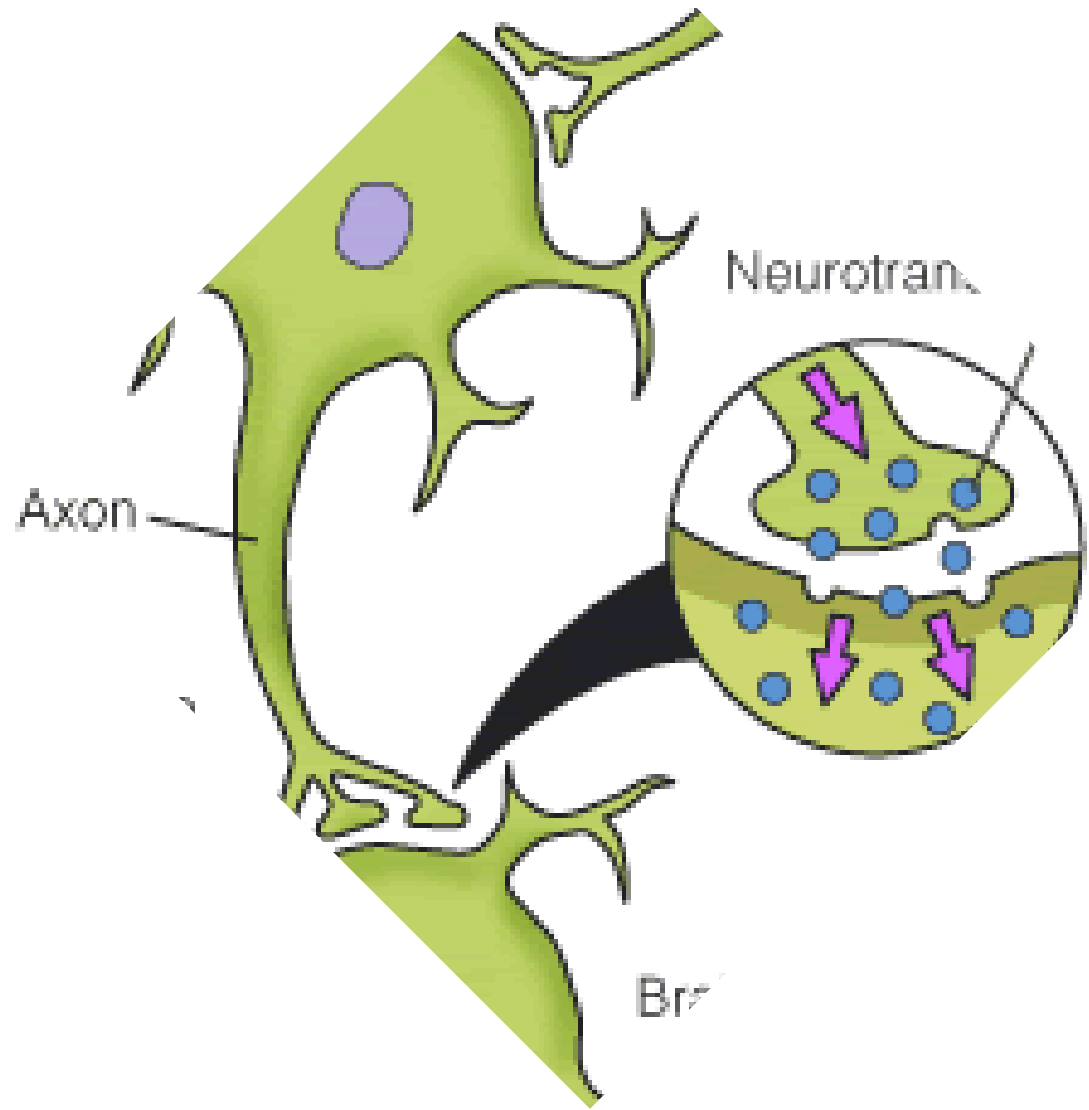
# Neurogenesis

- Neurogenesis refers to the growth of new neurons.
- Unlike virtually all other human cells, neurons stay with us for our whole lives.
- Major exceptions are early year changes of new growths followed by pruning away and neurons in the amygdala and hippocampus.
- On the other hand, connections through dendrites and synapses undergo massive change.

## Structure of a typical neuron





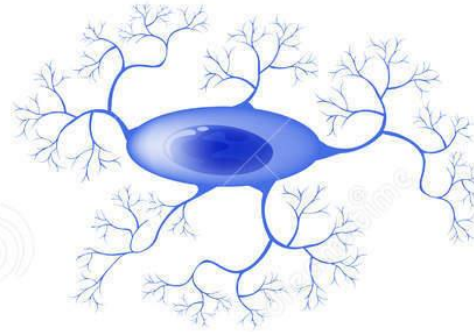


# GLIAL CELLS

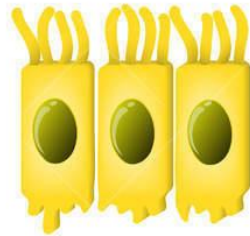
*Oligodendrocytes*



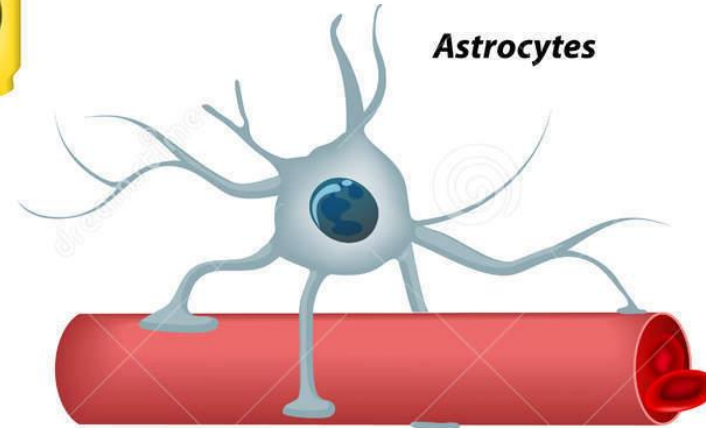
*Microglia*



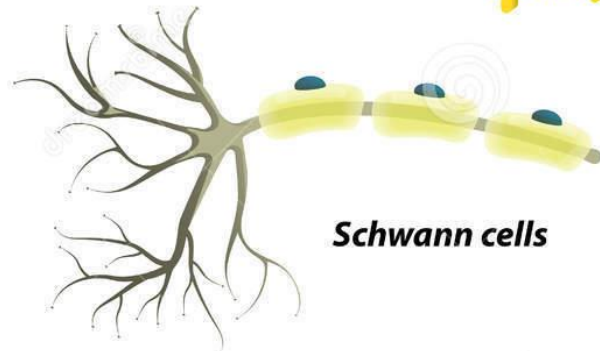
*Ependymal cells*



*Astrocytes*



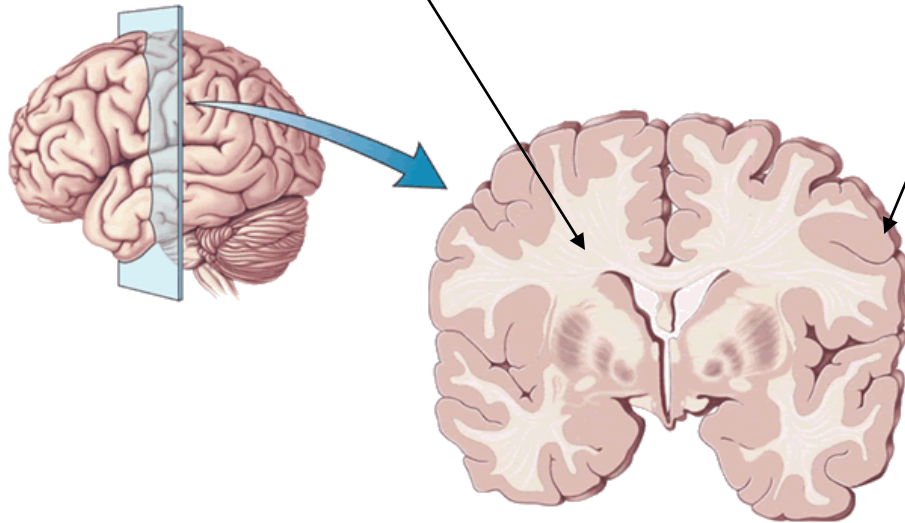
*Schwann cells*



# White Matter

White in color due to [myelin](#) sheath.

Generally responsible for carrying information



# Gray Matter

Gray/red in color due to the lack of [myelin](#) sheath.

Generally responsible for processing information. Most nerve impulses are generated here.

# Changes in Neurons in Early Years





**36 weeks  
gestation**



**Newborn**



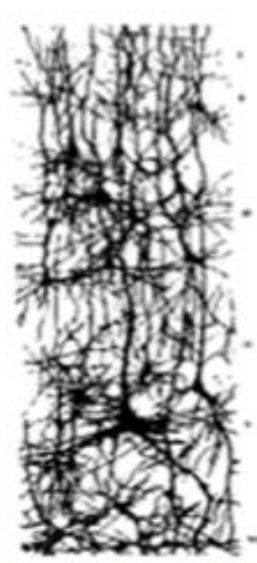
**3 months**



**6 months**



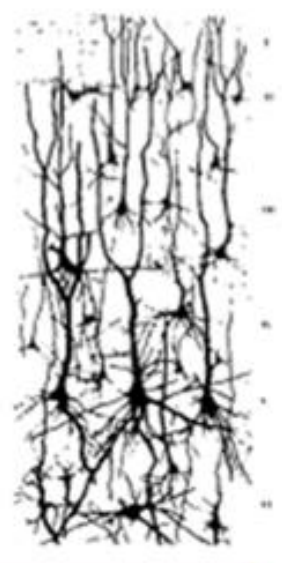
**2 years**



**4 years**



**6 years**



**Synapse formation**

**Synapse pruning**