

# Biopsychological Domain



# The Biological Bases of Behavior Chapter



# Module 07

# The Brain

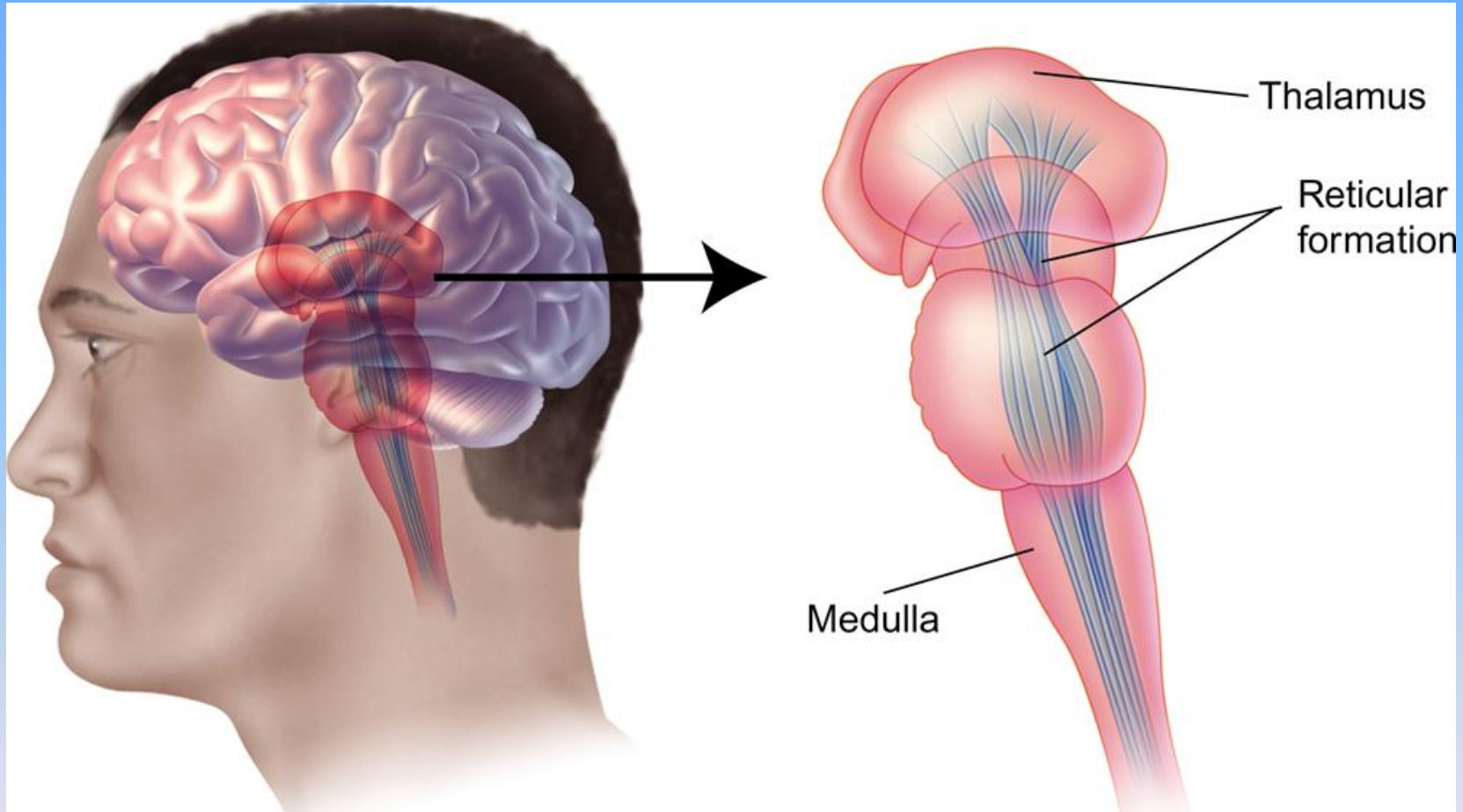
## Module 7: The Brain

# Lower-Level Brain Structures: The Brainstem

# Brainstem

- The oldest part and central core of the brain;
- It begins where the spinal cord swells as it enters the skull
- Is responsible for automatic survival functions

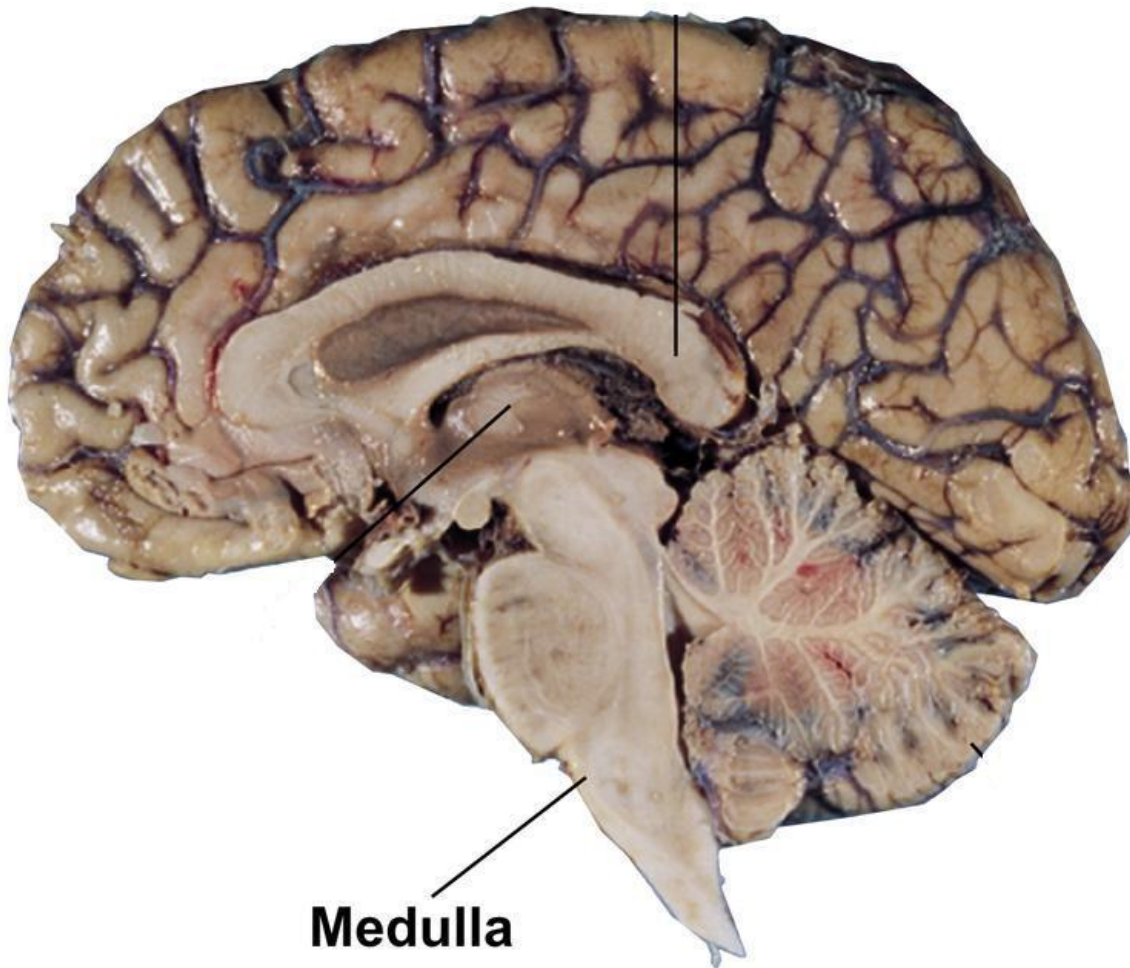
# Brainstem



# Medulla

- Located at the base of the brainstem
- Controls life-supporting functions like *heartbeat* and *breathing*
- Damage to this area can lead to death.

# Medulla





# Reticular Formation

- A nerve network in the brainstem that plays an important role in controlling *wakefulness* and *arousal*
- Extending up and down the spinal cord into the brain
- Controls an organism's level of *alertness*
- Damage to this area can cause a coma.

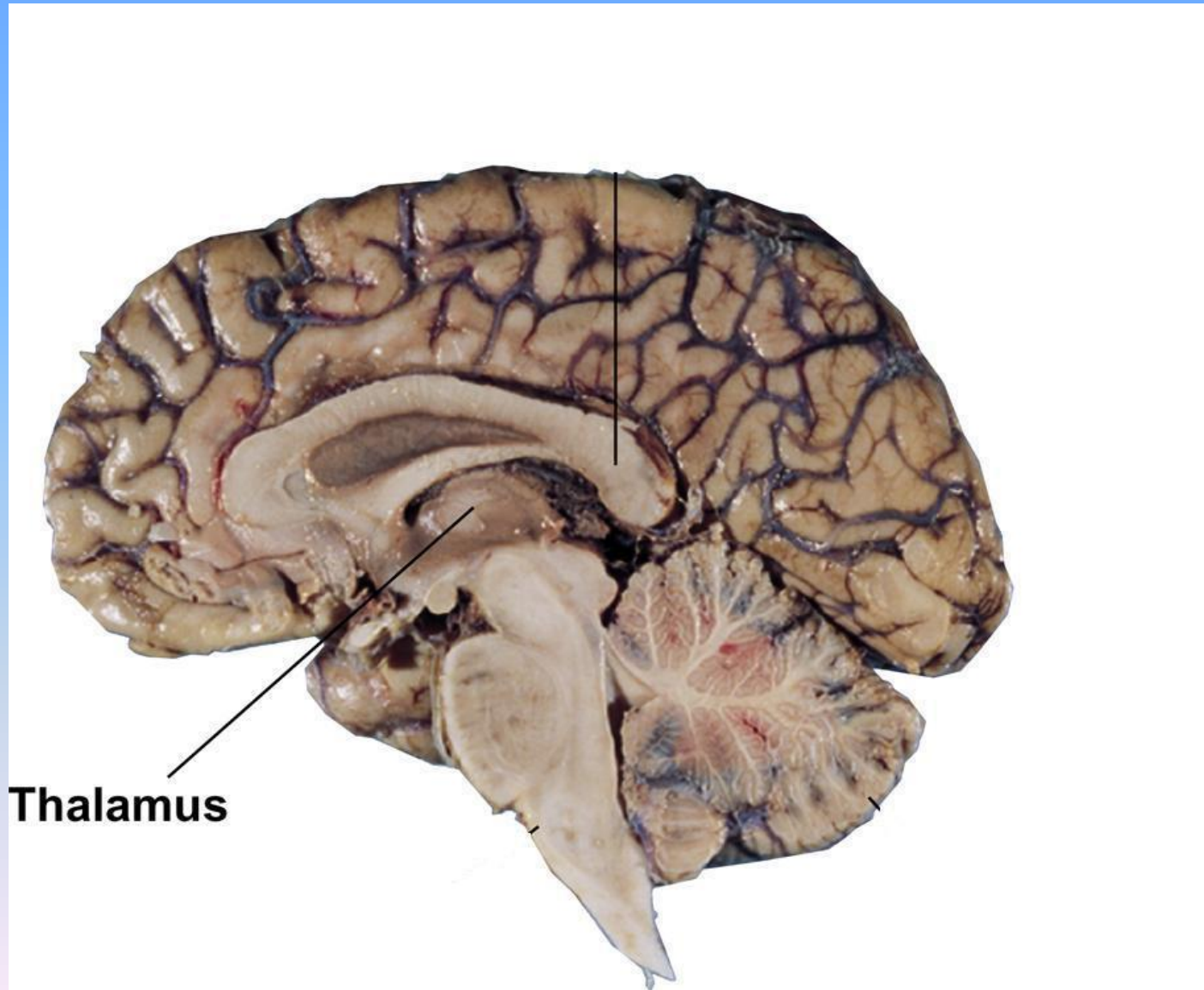
## Module 7: The Brain

# Lower-Level Brain Structures: The Thalamus

# Thalamus

- Sits atop the brainstem
- The brain's *sensory switchboard* –
- *Directs messages* to the sensory receiving areas in the cortex
- Thalamus is Greek for “inner chamber.”

# Thalamus



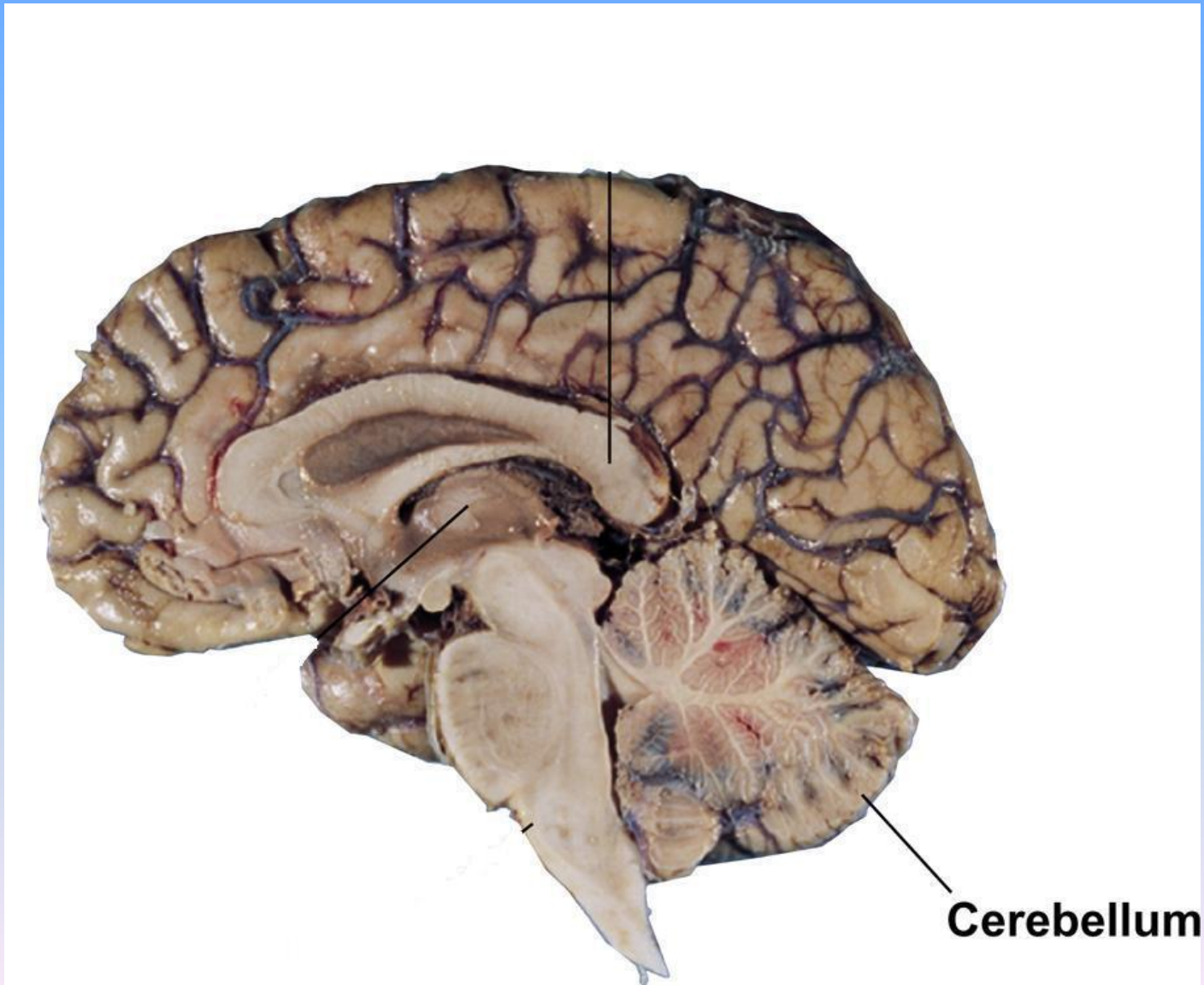
## Module 7: The Brain

# Lower-Level Brain Structures: The Cerebellum

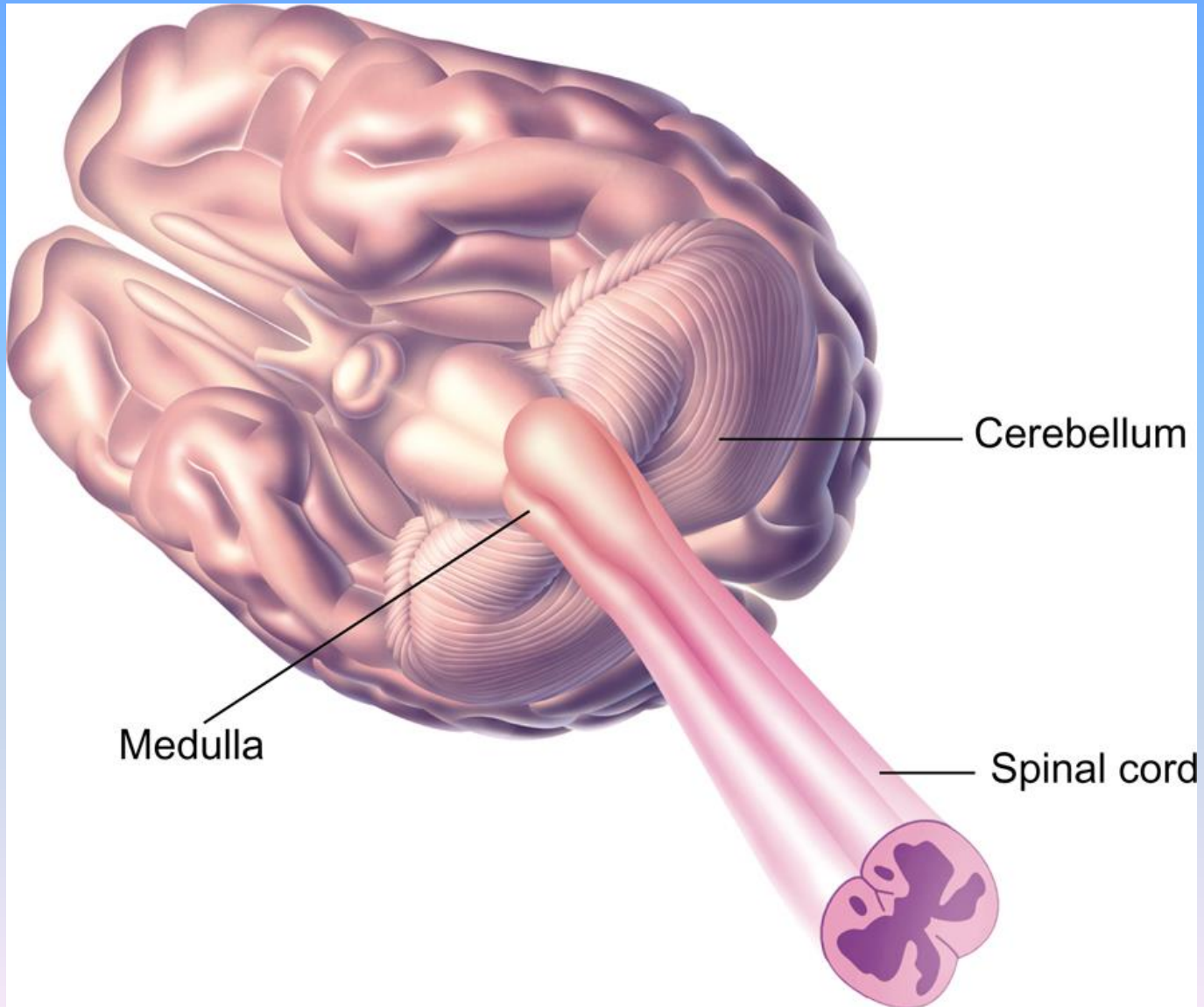
# Cerebellum

- Latin for the “little brain”
- Attached to the *rear of the brain*
- Helps coordinate *voluntary movements* and *balance*
- If damaged, the person could perform basic movements but would lose *fine coordination skills*.

# Cerebellum



# Cerebellum





## Module 7: The Brain

# Lower-Level Brain Structures: The Limbic System

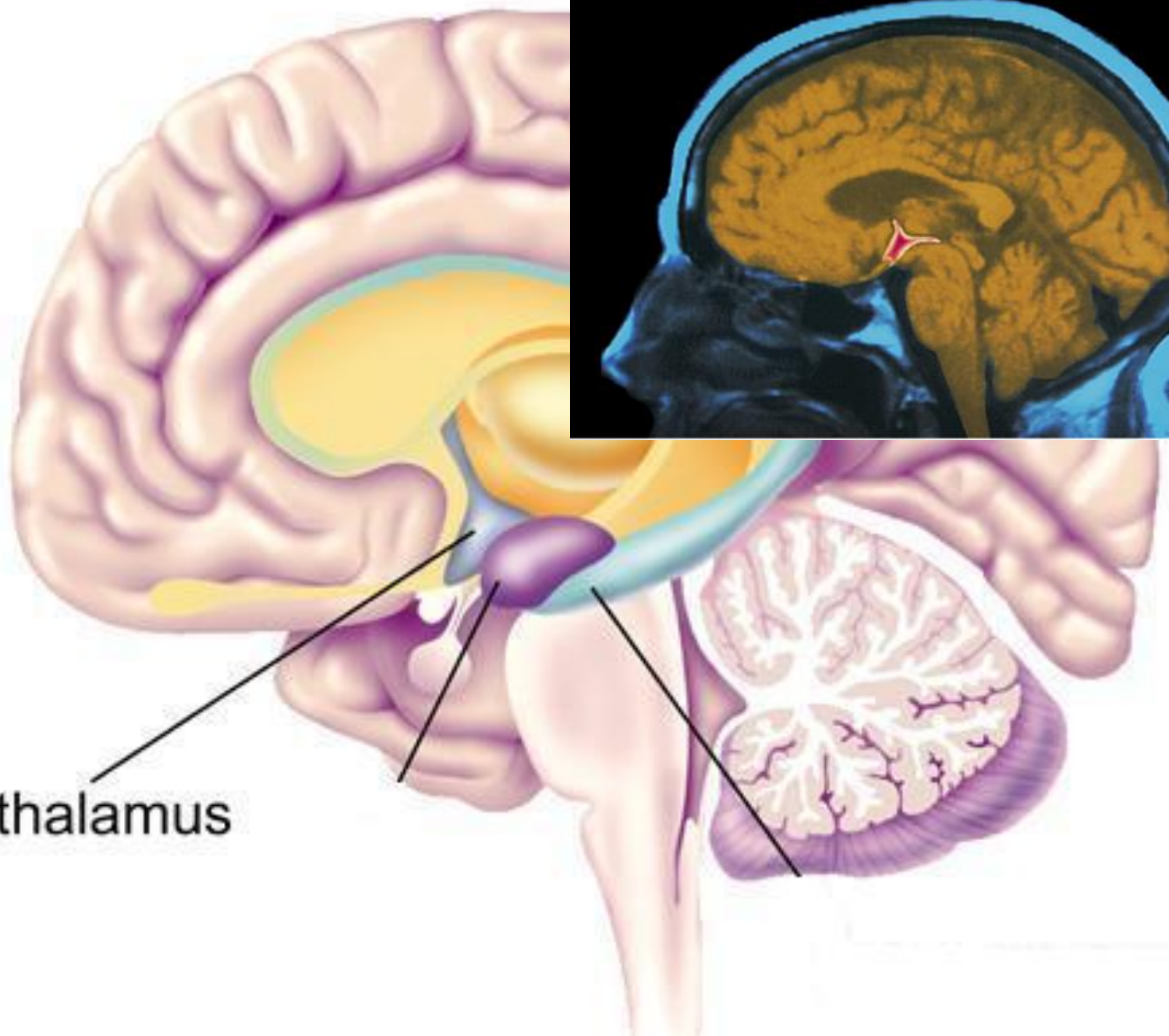
# Limbic System

- A ring of structures at the *border* of the brainstem and cerebral cortex
- Helps regulate memory, aggression, fear, hunger, and thirst
- Includes the *hypothalamus*, *hippocampus*, and *amygdala*

# Hypothalamus

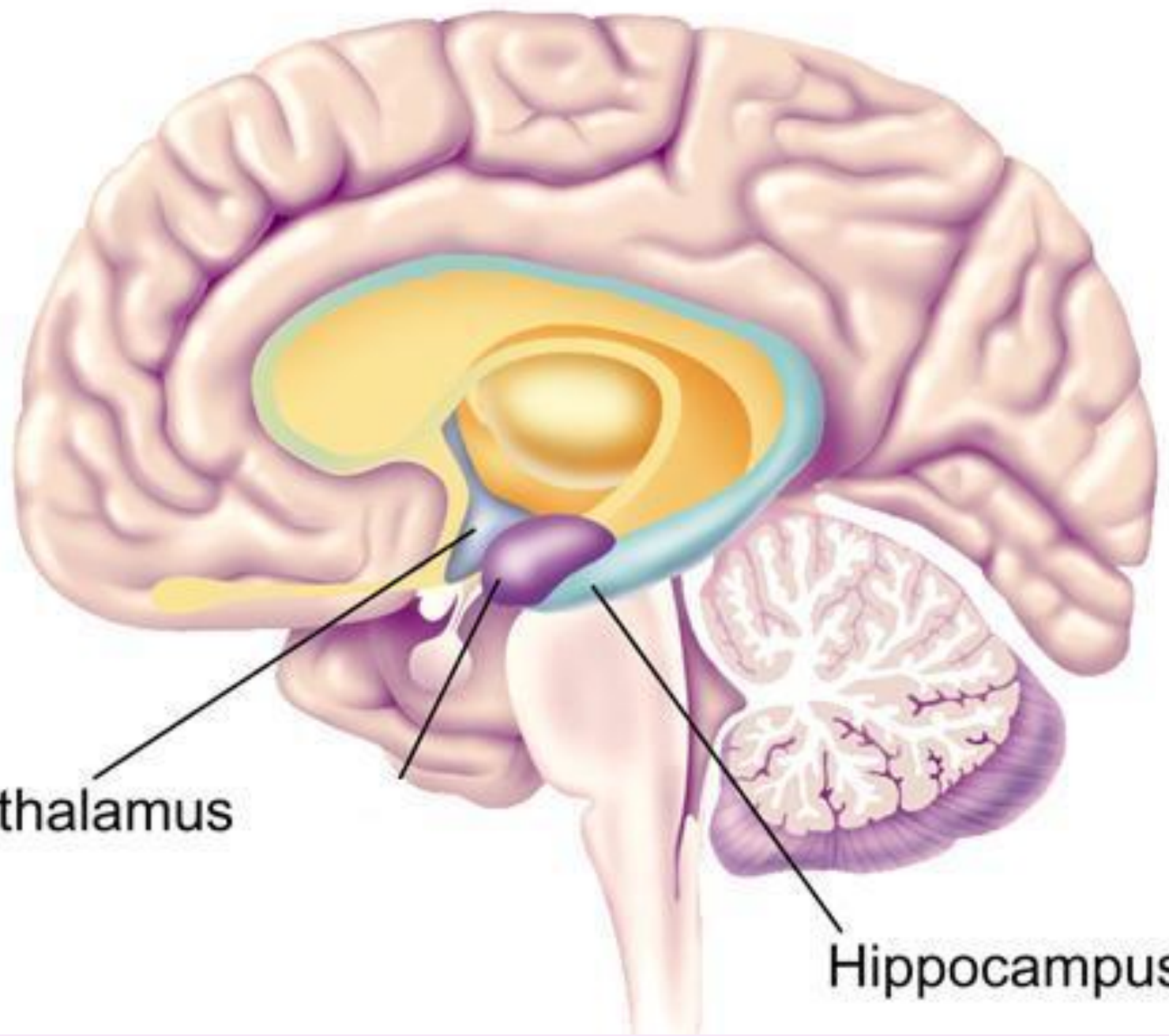
- A neural structure lying *below the thalamus*
- Regulates the body's maintenance activities such as; *eating, drinking, body temperature*, and it linked to emotion
- Plays a role in emotions, pleasure, and sexual function

Hypothalamus



# Hippocampus

- A neural center located in the limbic system that wraps around the back of the thalamus
- Helps *processing new memories* for permanent storage
- Looks something like a seahorse
  - Hippo is Greek for “horse.”

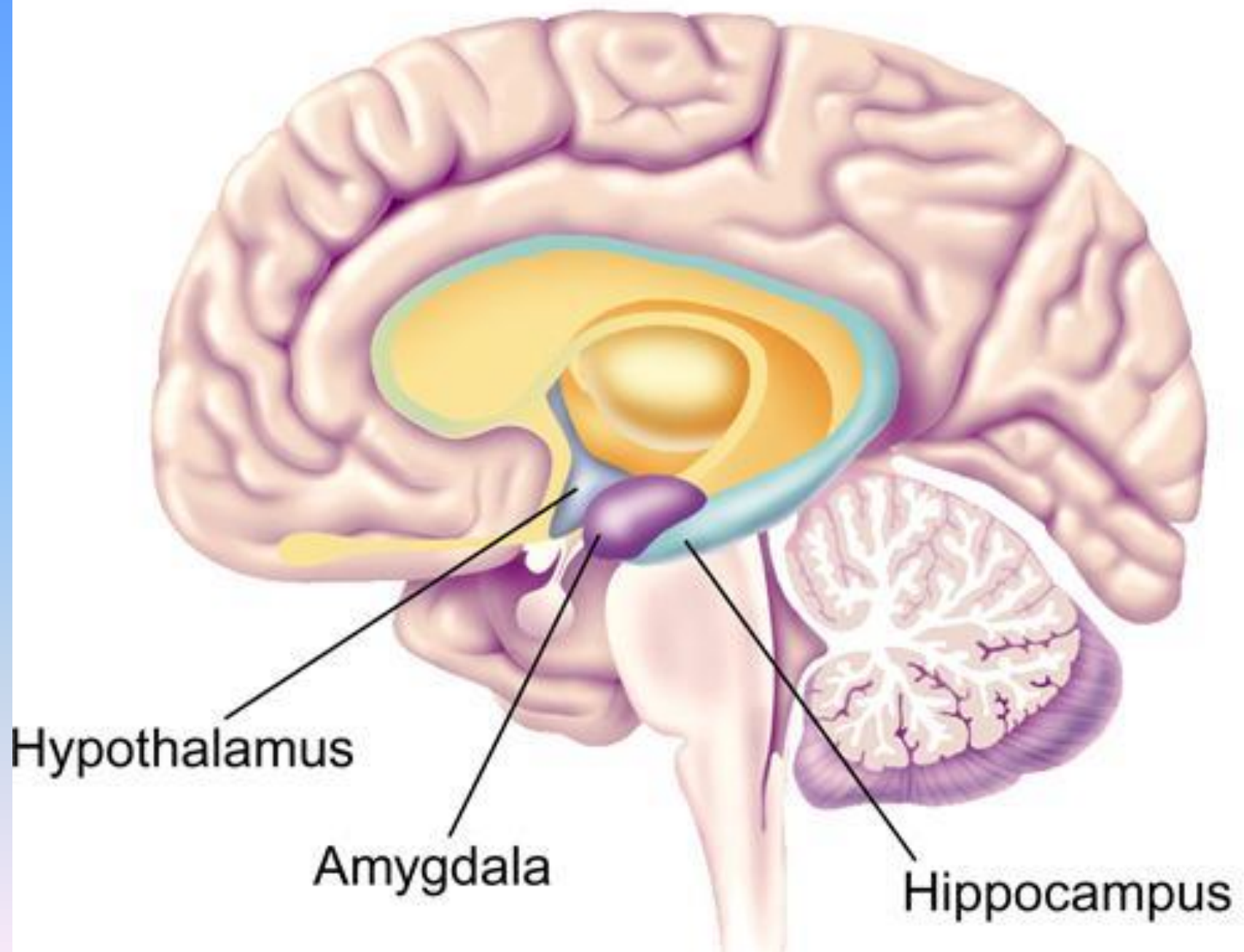


Hypothalamus

Hippocampus

# Amygdala

- Two almond shaped neural cluster in the limbic system
- Controls *emotional responses* such as *fear* and *anger*





## Module 7: The Brain

# The Cerebral Cortex

# Cerebral Cortex

- The intricate fabric of interconnected neurons that form the body's ultimate *control and information processing center*
- Covers the brain's lower level structures
- Contains an estimated 30 billion nerve cells
- Divided into *four lobes*

# Corpus Callosum

- The large band of neural fibers that *connects the two brain hemispheres* and allows them to communicate with each other
- Is sometimes *cut to prevent seizures*

# Corpus Callosum

Corpus callosum



# Longitudinal Fissure

- The long crevice that *divides the cerebral cortex into left and right hemispheres*
- This and other fissures in the brain create major divisions in the brain called lobes



Longitudinal  
fissure

# Frontal Lobes

- The portion of the cerebral cortex lying just behind the forehead
- Is involved in *planning* and *judgments*
- Includes the *motor cortex*

# Parietal Lobes

- The portion of the cerebral cortex lying on the top of the head and toward the rear
- Includes the *somatosensory cortex* and *general association areas* used in processing information
- Regions available for general processing, including mathematical reasoning
- Designated as the association lobes
- Behind the frontal lobes

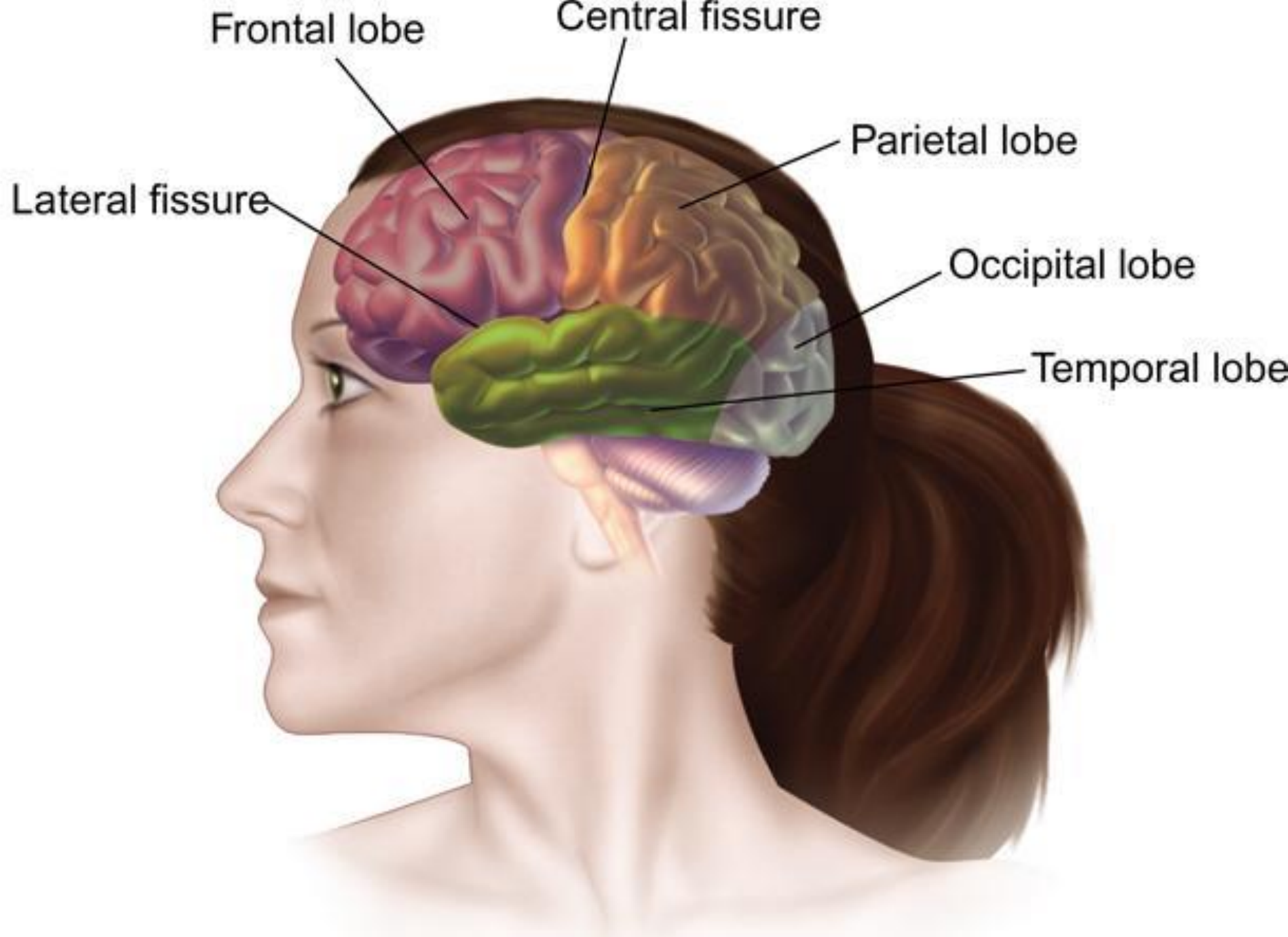


# Occipital Lobe

- The portion of the cerebral cortex lying at the *back of the head*
- It includes the primary *visual* processing areas of the brain

# Temporal Lobes

- Includes the *auditory (hearing)* areas of the brain
- Where sound information is processed
- Located roughly above the ears



# Motor Cortex

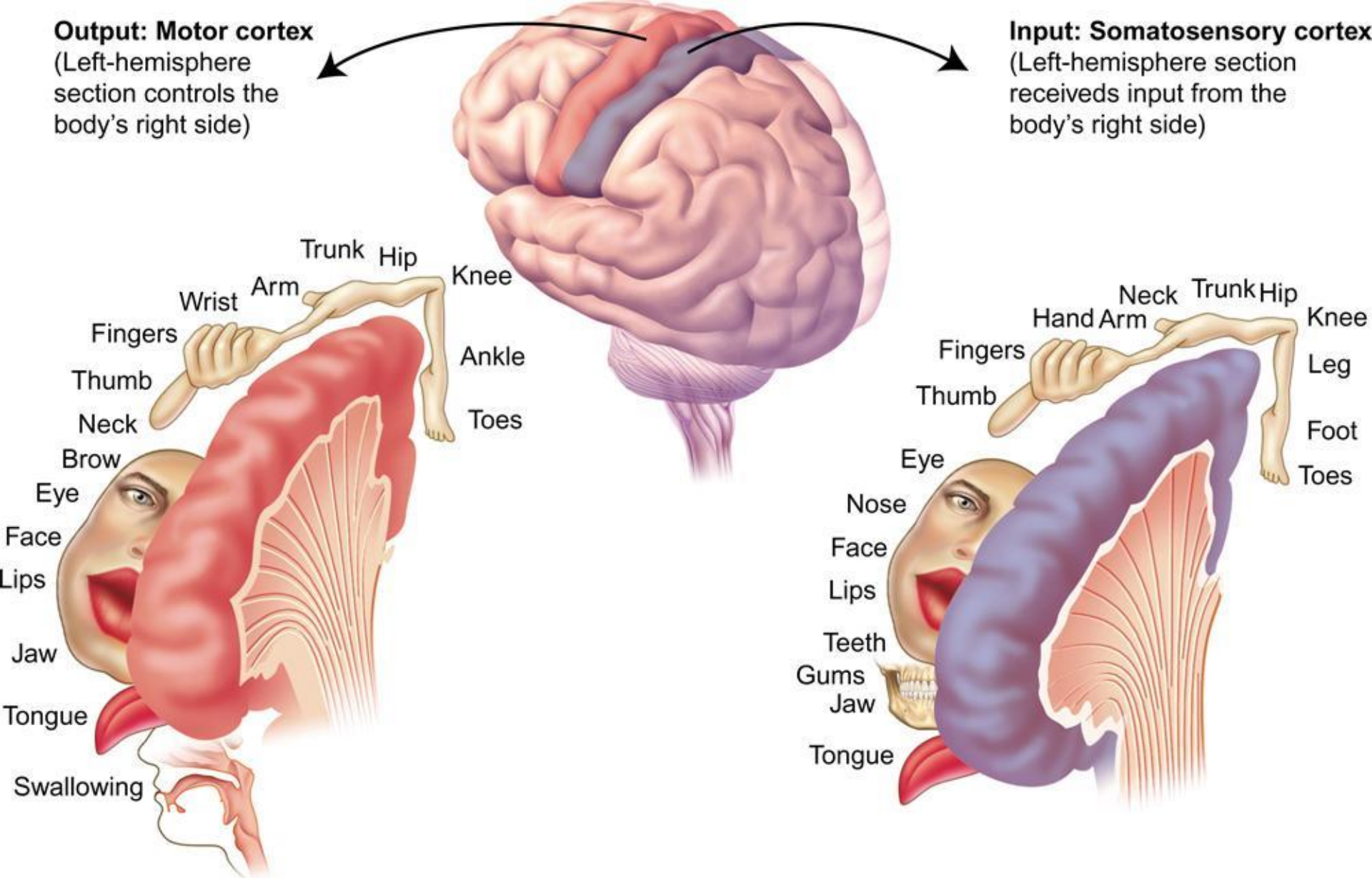
- The strip of brain tissue at the *rear of the frontal lobes*
- *Controls voluntary movement*
- Different parts of the cortex control different parts of the body.
- The motor cortex in the *left hemisphere controls the right side of the body and visa versa.*

# Somatosensory Cortex

- The brain are located in the front of the parietal lobes
- *Registers and processes body sensations*
- Soma is Greek for “body.”

**Output: Motor cortex**  
(Left-hemisphere section controls the body's right side)

**Input: Somatosensory cortex**  
(Left-hemisphere section receives input from the body's right side)



## Module 7: The Brain

# Differences Between the Two Hemispheres

# Hemispheric Differences

- “Left-brained” and “right-brained” debunked
- Brain is divided into two hemispheres but works as a single entity.
- Both sides continually *communicate via the corpus callosum*, except in those with split brains.



## Module 7: The Brain

# Differences Between the Two Hemispheres: Language and Spatial Abilities

# The Brain's Left Hemisphere

- For most people, *language functions* are in the *left hemisphere*.
- For a small percentage of people, language functions are in the right hemisphere.

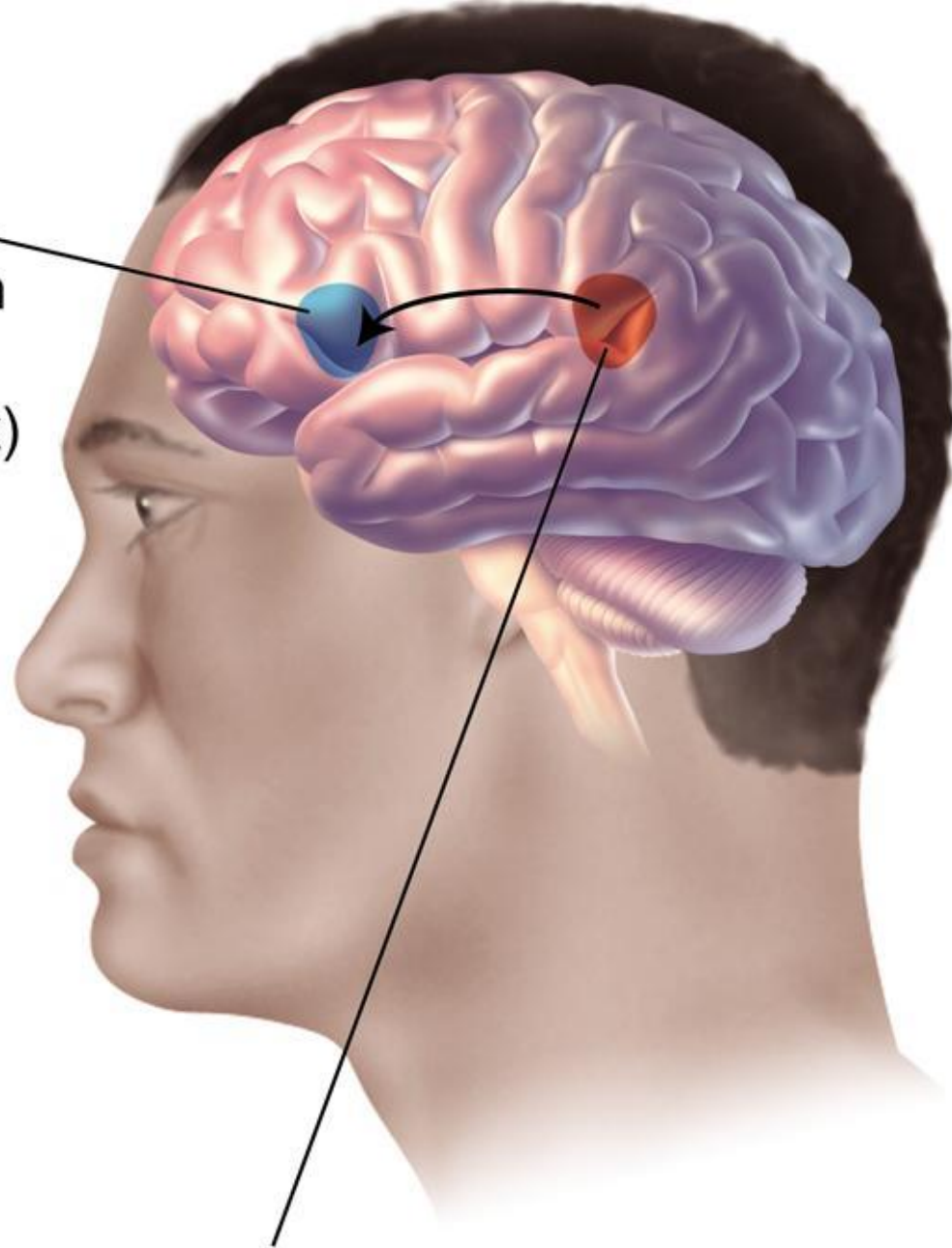
# Broca's Area

- The brain area of the *left frontal lobe*
- *Directs the muscle movements involve in speech*
- If damaged the person can form the ideas but cannot express them as speech

# Wernicke's Area

- A brain area of the *left temporal lobe*
- Involved in *language comprehension and expression*
- Our *ability to understand what is said* to us
- Usually in the left temporal lobe

**Broca's area**  
(controls speech  
muscles via  
the motor cortex)

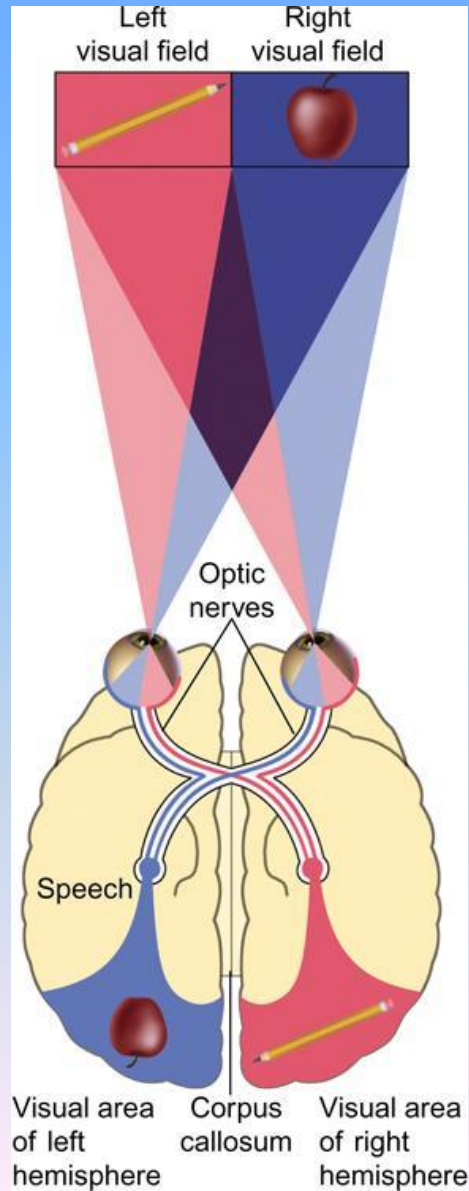


**Wernicke's area**  
(interprets auditory information)

# The Brain's Right Hemisphere

- Houses the brain's *spatial abilities*
- Our spatial ability allows us to *perceive* or *organize* things in a given space, *judge distance*, etc.
- Helps in making connections between words

# Split Brain Research



# Split Brain Research



"Look at the dot."



Two words separated by a dot are momentarily projected.

"What word did you see?"



or



"Point with your left hand to the word you saw."





# Split Brain Research



"Look at the dot."



Two words separated by a dot are momentarily projected.

"What word did you see?"



or



"Point with your left hand to the word you saw."



The End