

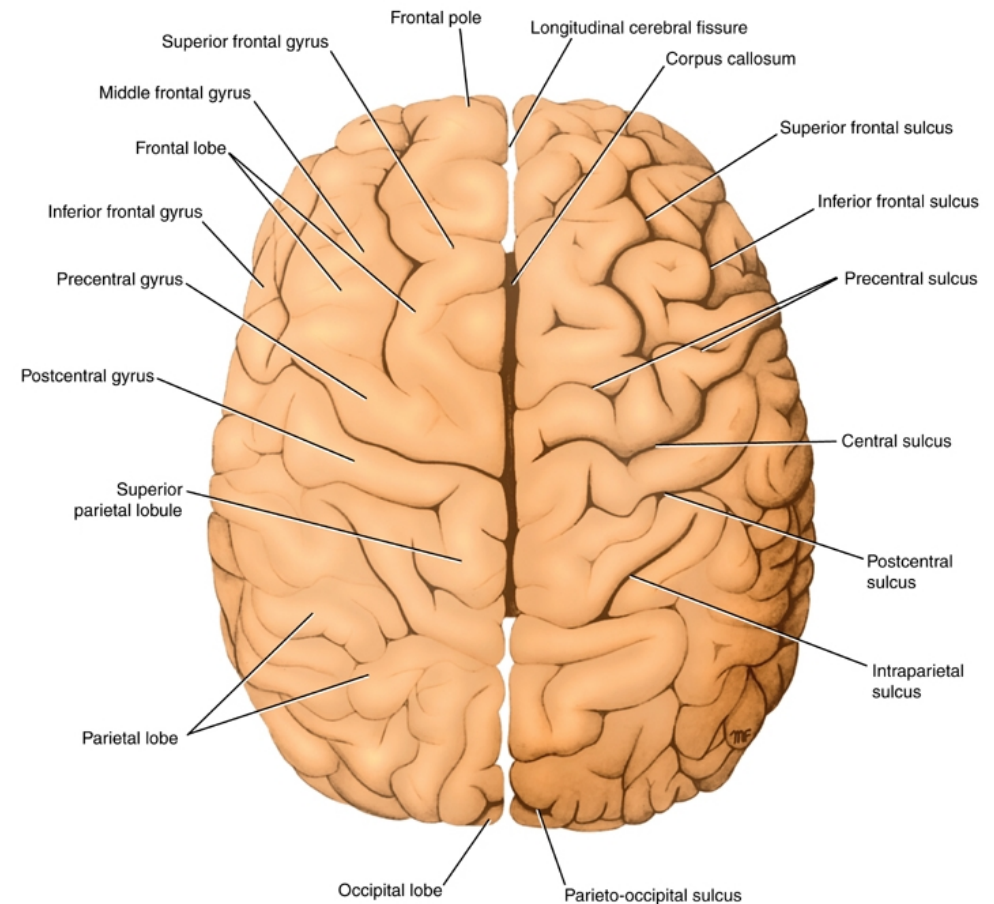
Cerebral Cortex

Lecture Objectives

- Describe the organization of the cerebral cortex.
- Locate the motor, sensory and other cortical areas.
- Describe the cortical areas related to the written and spoken language.
- Identify the components of the medial temporal lobe and the hippocampal formation.
- Identify the structures in coronal, sagittal and horizontal sections of brain.

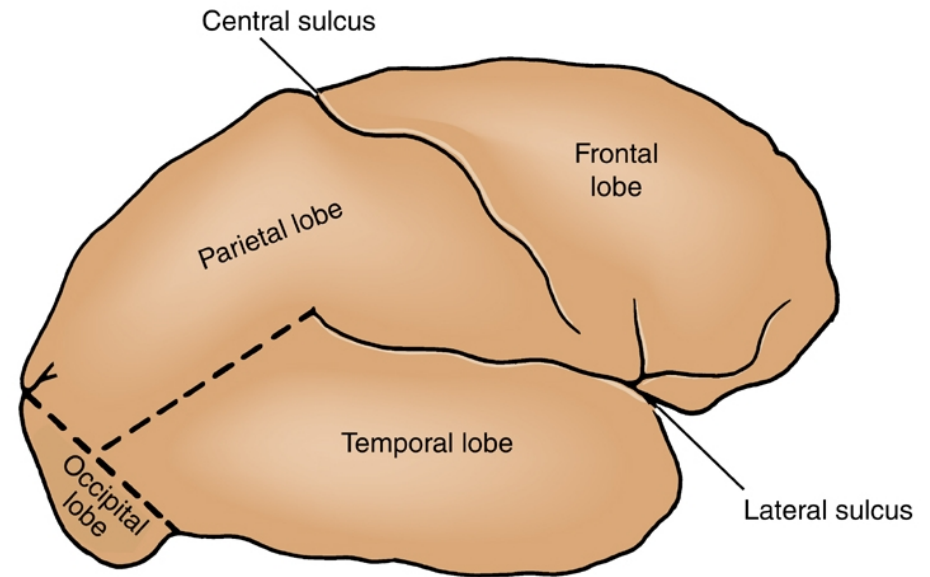
Cerebral Hemispheres

- Longitudinal fissure separates left & right cerebral hemispheres
- Cerebral cortex is gray matter overlying white matter
 - 2-4 mm thick containing billions of cells
 - grew so quickly formed folds (gyri) and grooves (sulci or fissures)
- Corpus callosum is band of white matter connecting left and right cerebral hemispheres
- Each hemisphere is subdivided into 4 lobes



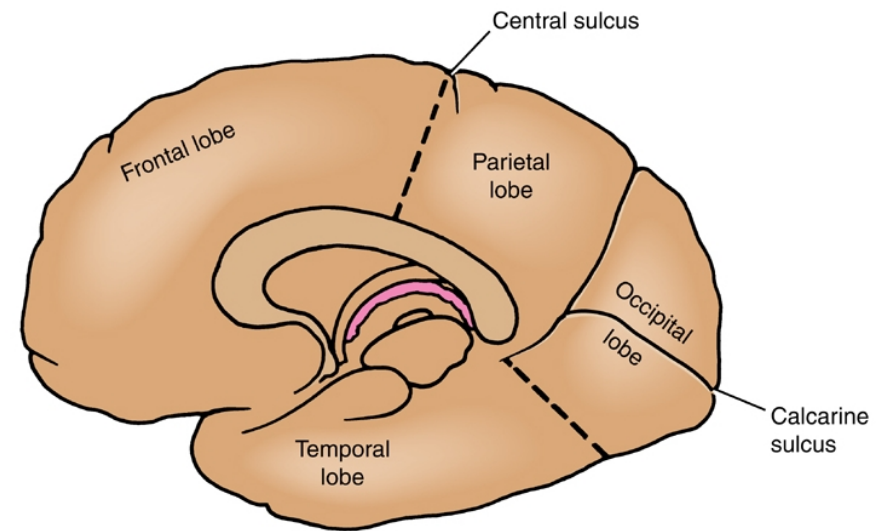
Cerebral Lobes

- Longitudinal fissure
- Lateral sulcus (of Sylvius)
- **Frontal lobe**
- Central sulcus (of Rolando)
- **Parietal lobe**
- Parieto-occipital sulcus
- **Occipital lobe**
- Preoccipital notch
- Calcarine sulcus
- **Temporal lobe**
- **Insula**



A

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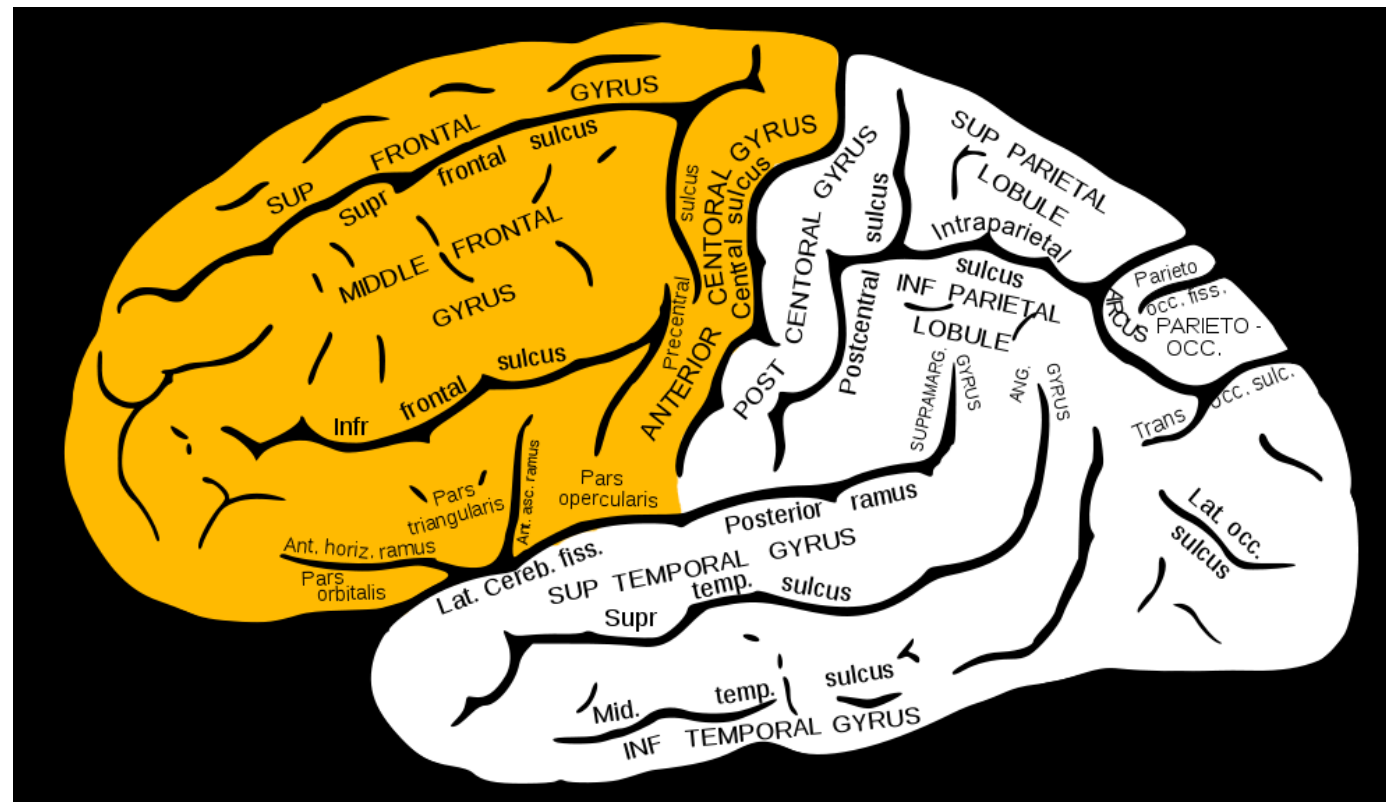


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Frontal Lobe: Laterally

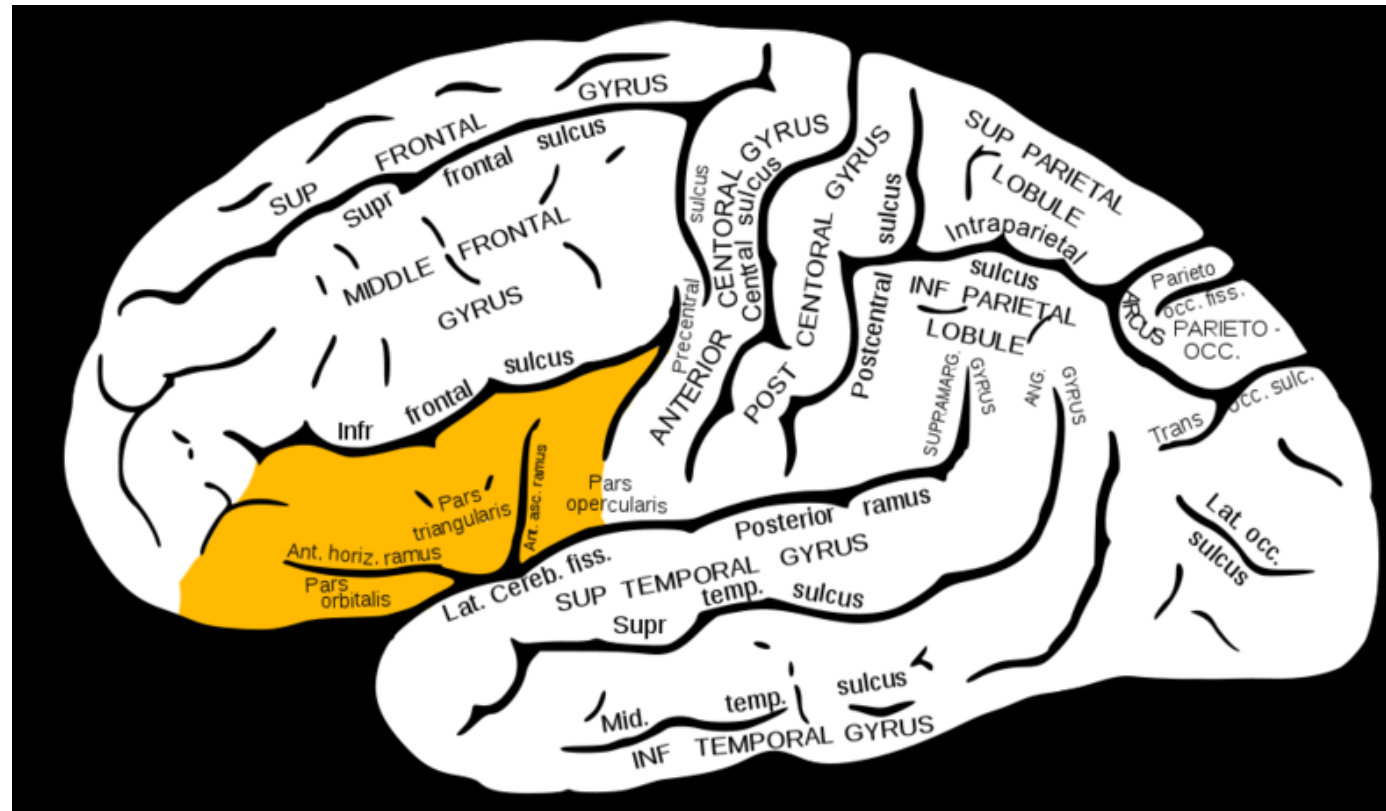
- Central Sulcus
 - Precentral gyrus
- Precentral sulcus
 - Superior frontal gyrus
- Superior frontal sulcus
 - Middle frontal gyrus
- Inferior frontal sulcus
 - Inferior frontal gyrus



Frontal Lobe: Laterally

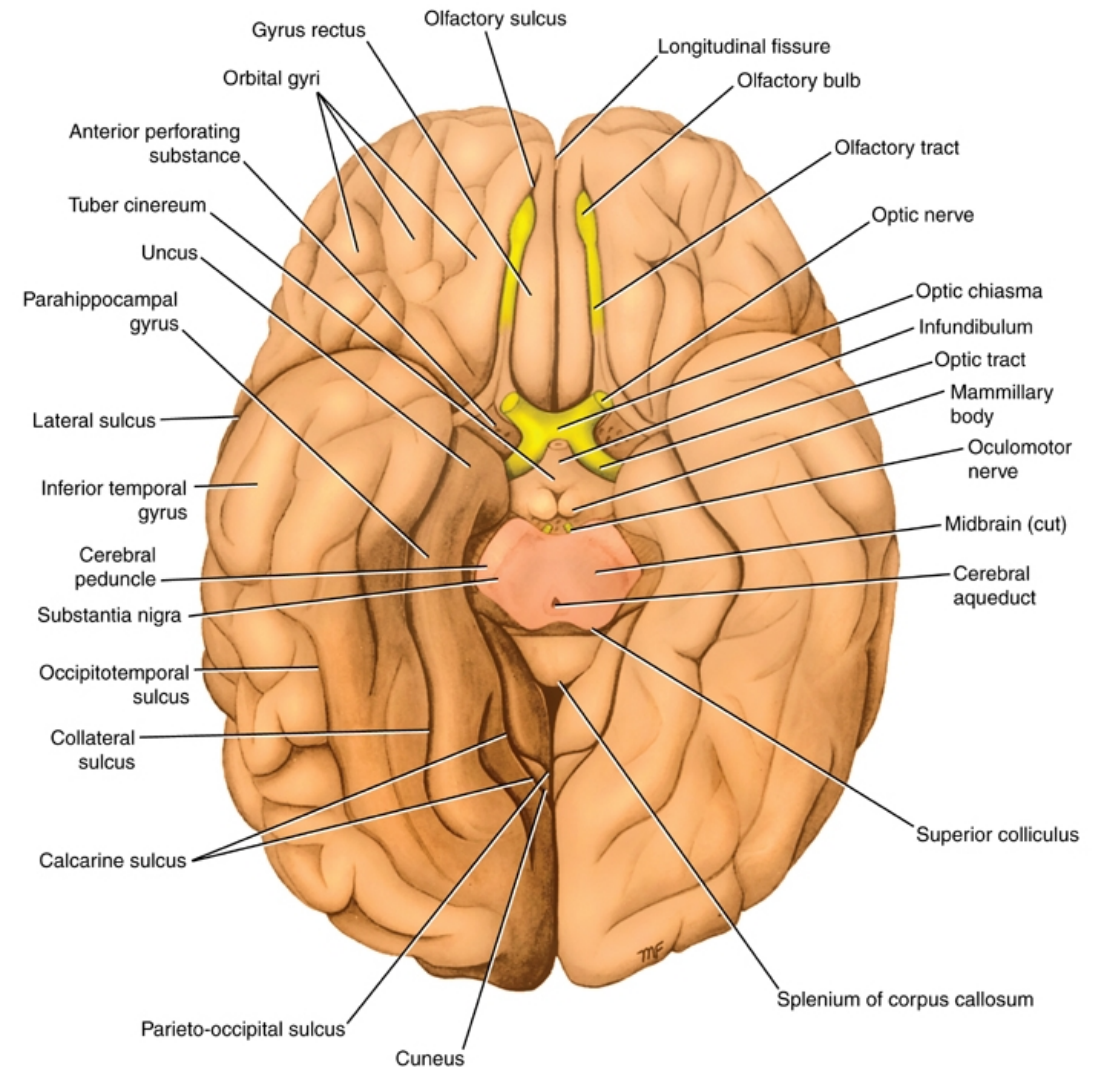
- Inferior frontal gyrus
 - Orbital gyri
 - Anterior horizontal ramus
 - Triangular gyrus*
 - Anterior ascending ramus
 - Opercular gyrus*

*form speak (Broca's) area



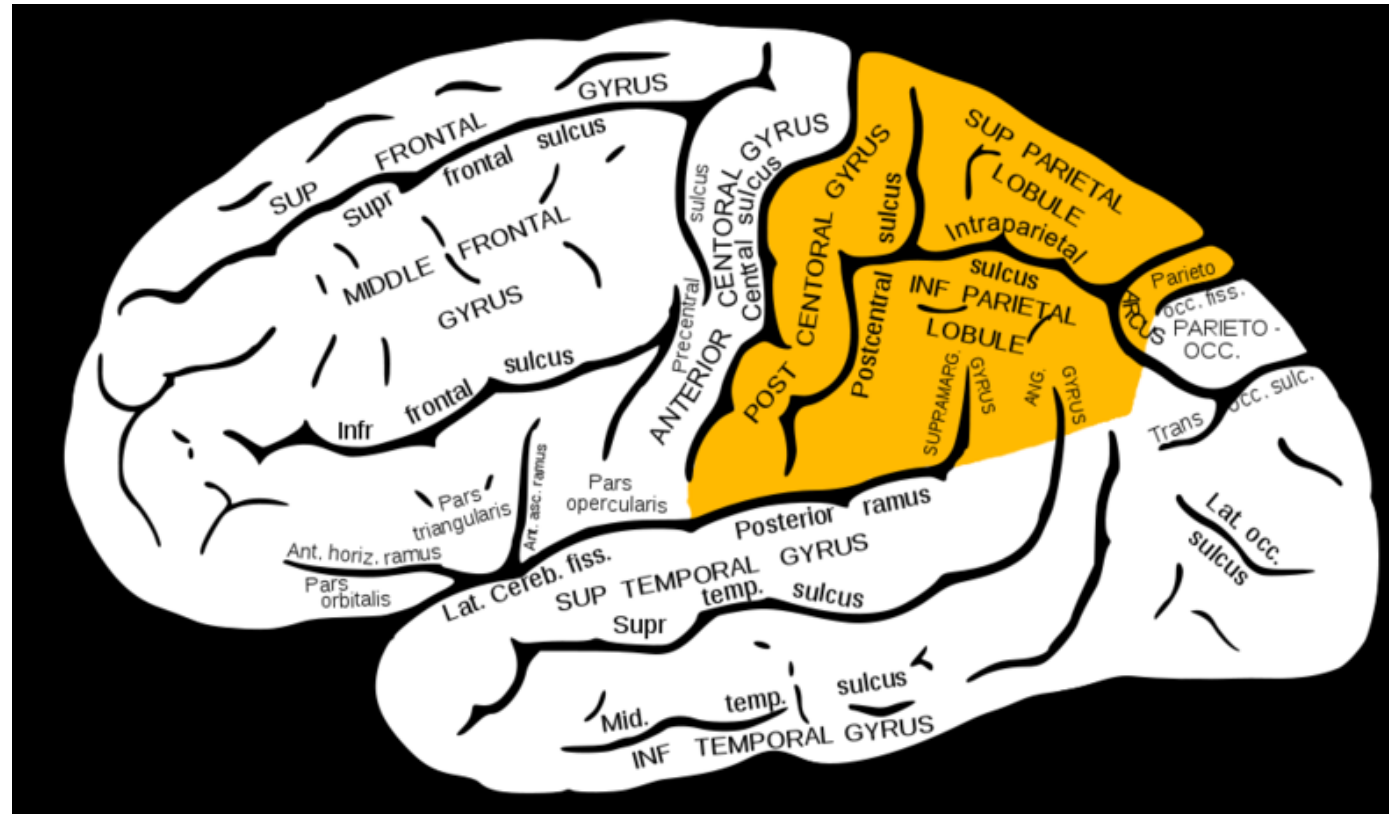
Frontal Lobe: Inferiorly

- Rectus (straight) gyrus
 - Most medial
- Olfactory sulcus
 - Olfactory bulb
 - Olfactory tract
- Medial & lateral olfactory striae
- Anterior perforating substance
- Orbital gyri



Parietal Lobe: Laterally

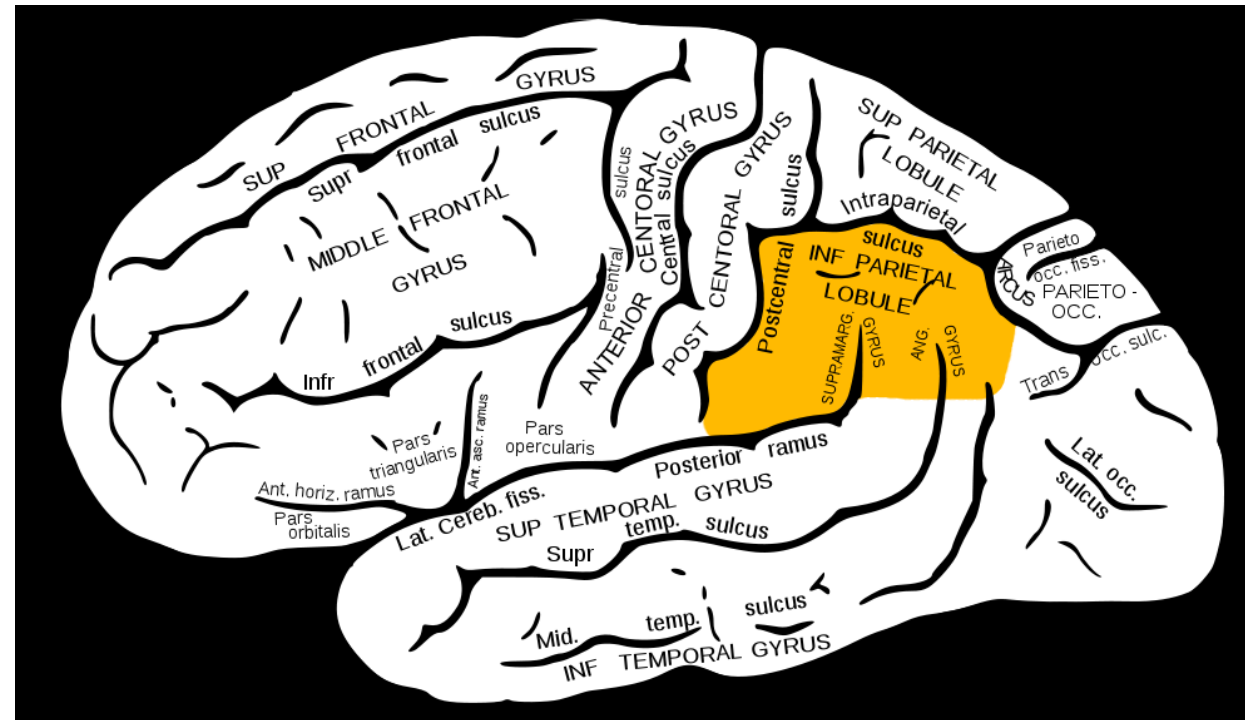
- Central sulcus
 - Postcentral gyrus
- Postcentral sulcus
 - Superior parietal lobule
- Intraparietal sulcus
 - Inferior parietal lobule



Parietal Lobe: Laterally

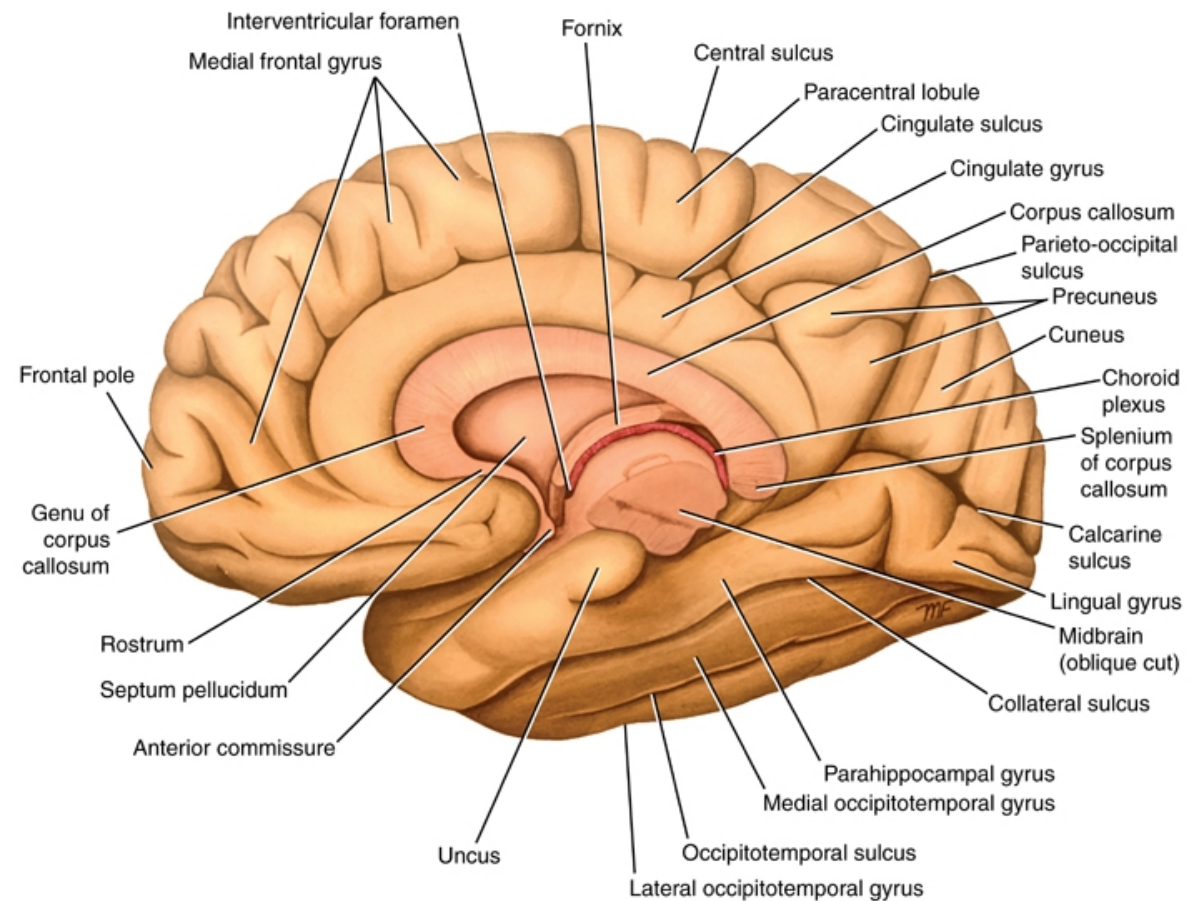
- Inferior parietal lobule
 - Supramarginal gyrus*
 - Lateral sulcus
 - Angular gyrus*
 - Superior temporal sulcus

*form language (Wernicke's) area



Occipital Lobe: Medially

- Lingual gyrus
 - Calcarine sulcus
- Cuneus
 - Parieto-occipital sulcus
- Precuneus (parietal lobe)



Temporal Lobe: Laterally

➤ Lateral sulcus

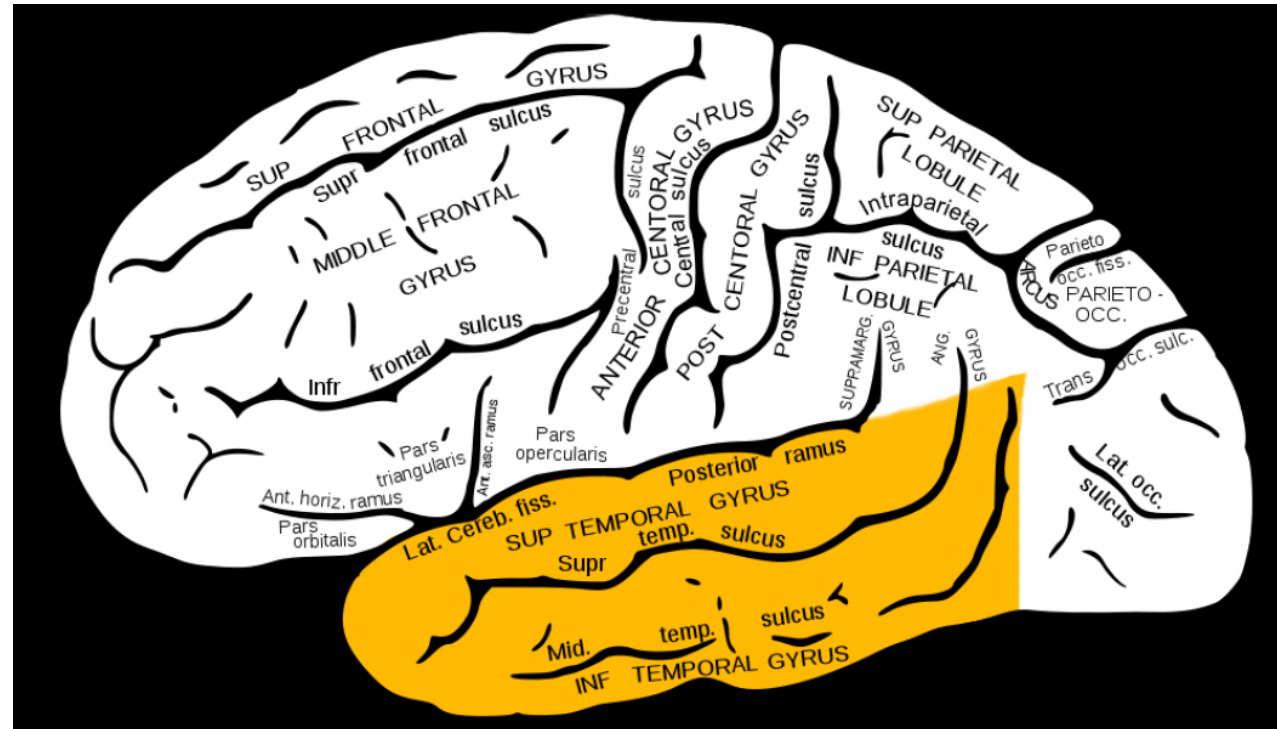
- Superior temporal gyrus
 - Transverse temporal gyri (of Heschl)
 - Buried in the lateral fissure
 - Primary auditory cortex

➤ Superior temporal sulcus

- Middle temporal gyrus

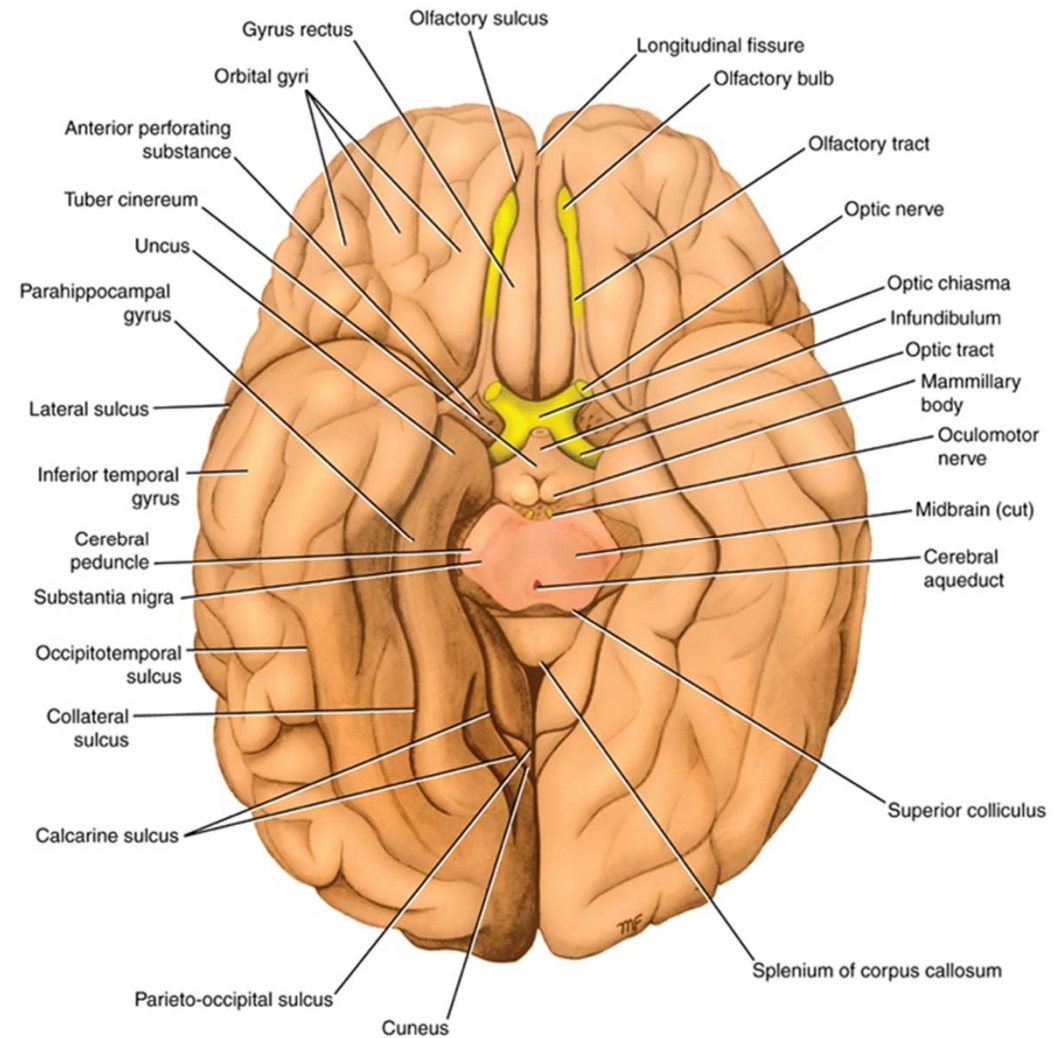
➤ Middle temporal sulcus

- Inferior temporal gyrus



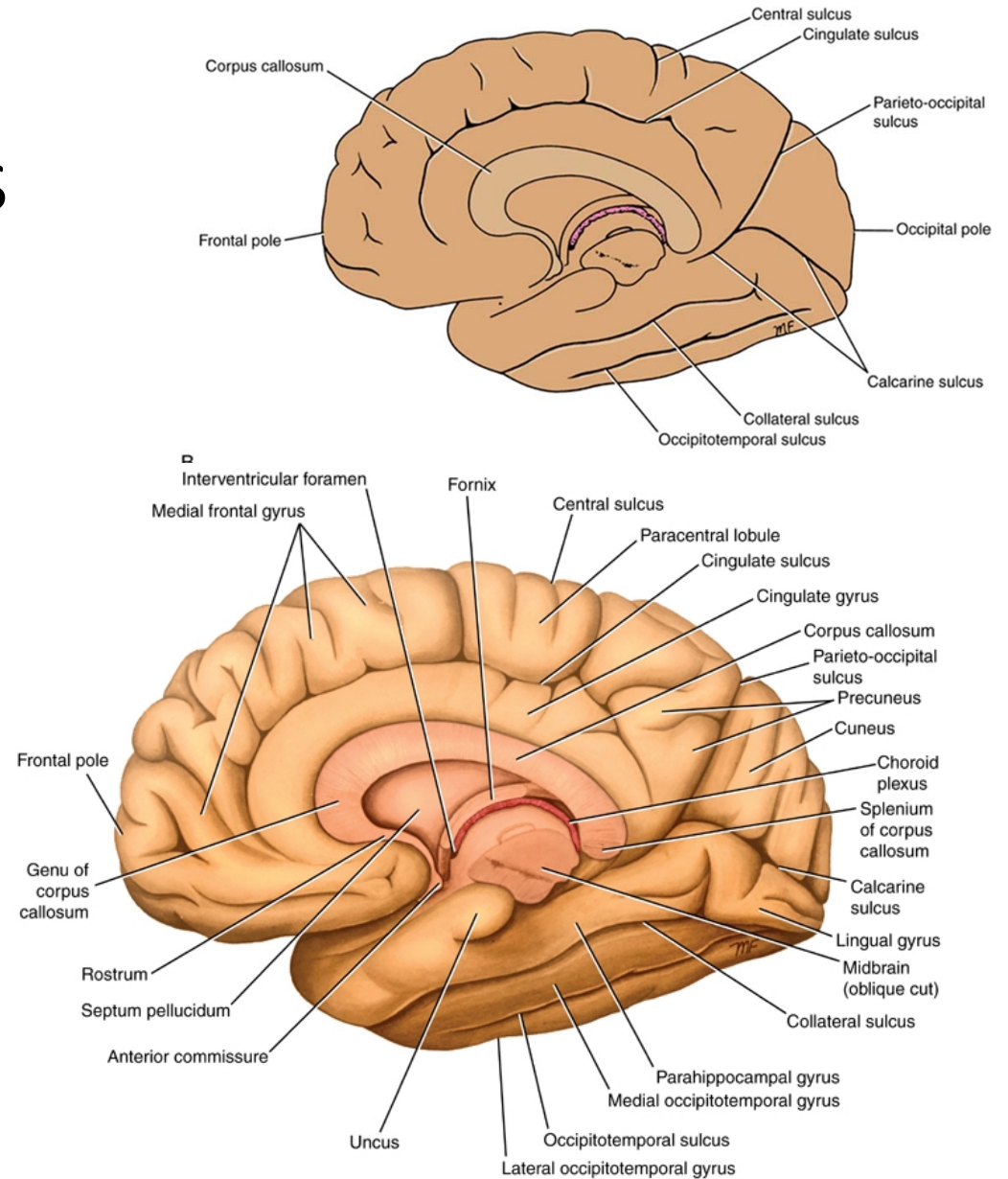
Temporal Lobe: Inferiorly

- Inferior temporal gyrus
 - Most lateral
- Occipitotemporal sulcus
- Occipitotemporal gyrus (fusiform gyrus)
 - Extend to the occipital lobe
- Collateral sulcus
- Parahippocampal gyrus
 - Most medial
 - Uncus
 - Small medial extension



Main Medial Structures

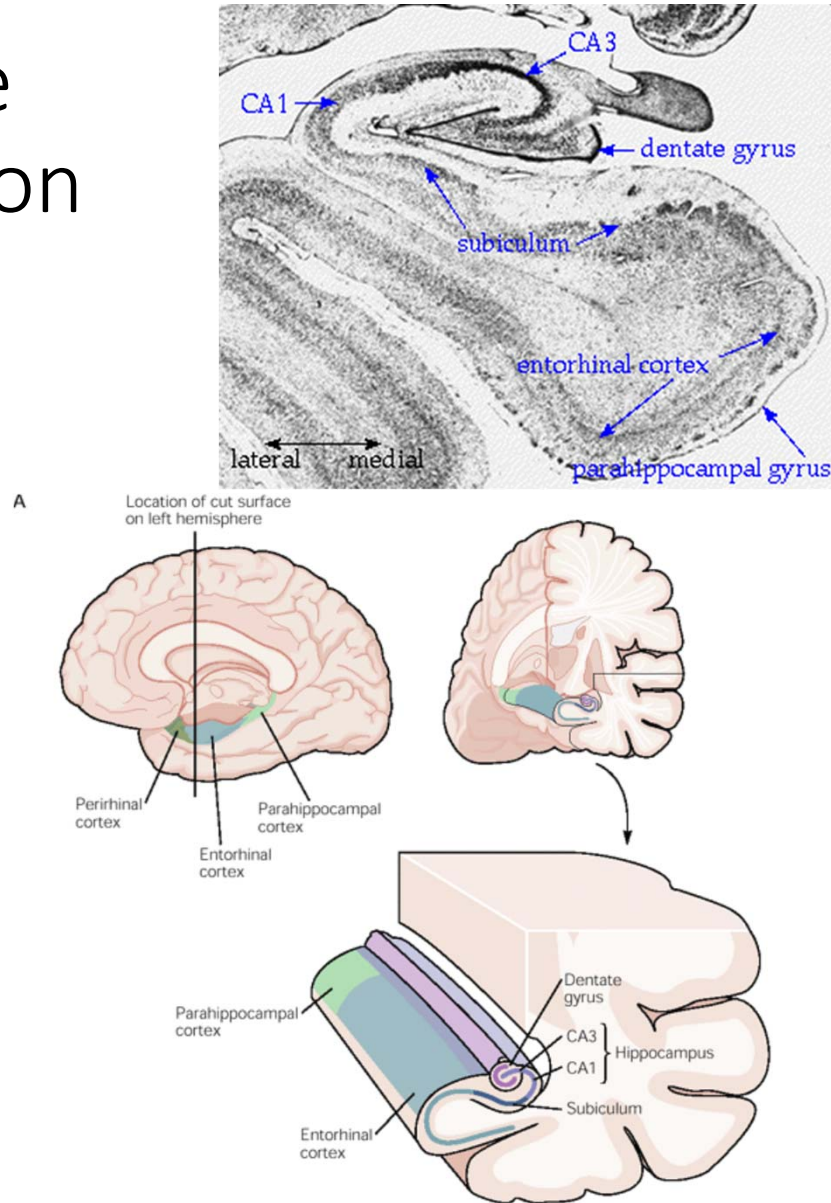
- Corpus callosum
 - parts
- Callosal sulcus
- Cingulate gyrus
 - Continue with the parahippocampal gyrus
- Cingulate sulcus
- Paracentral lobule
- Medial frontal gyrus



Medial Temporal Lobe Hippocampal Formation

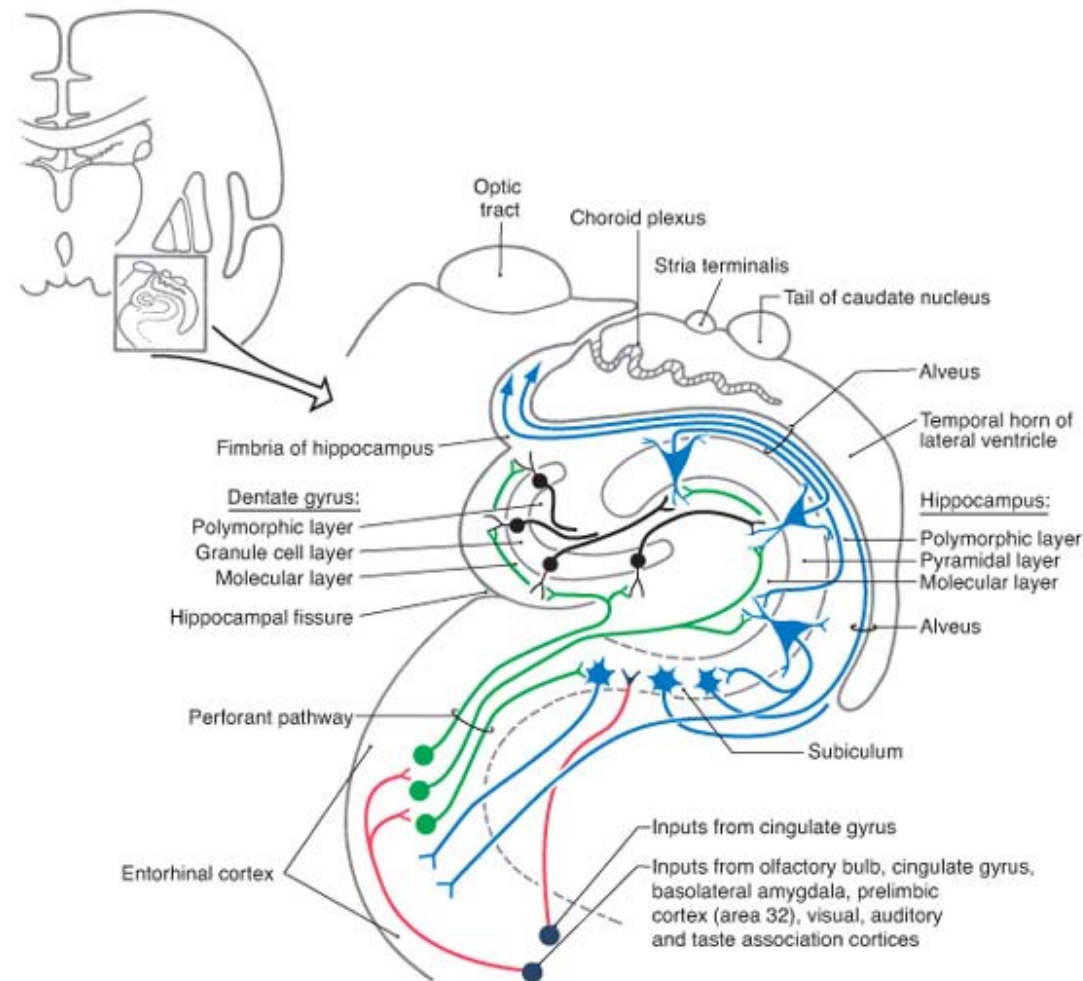
➤ Collateral sulcus

- Parahippocampal gyrus
 - Perirhinal cortex
 - Entorhinal cortex
 - Parahippocampal cortex
 - Subiculum
- ## ➤ Hippocampal sulcus
- Hippocampus (cornu ammonis)
 - CA1, CA2, CA3
 - Dentate gyrus



Hippocampus

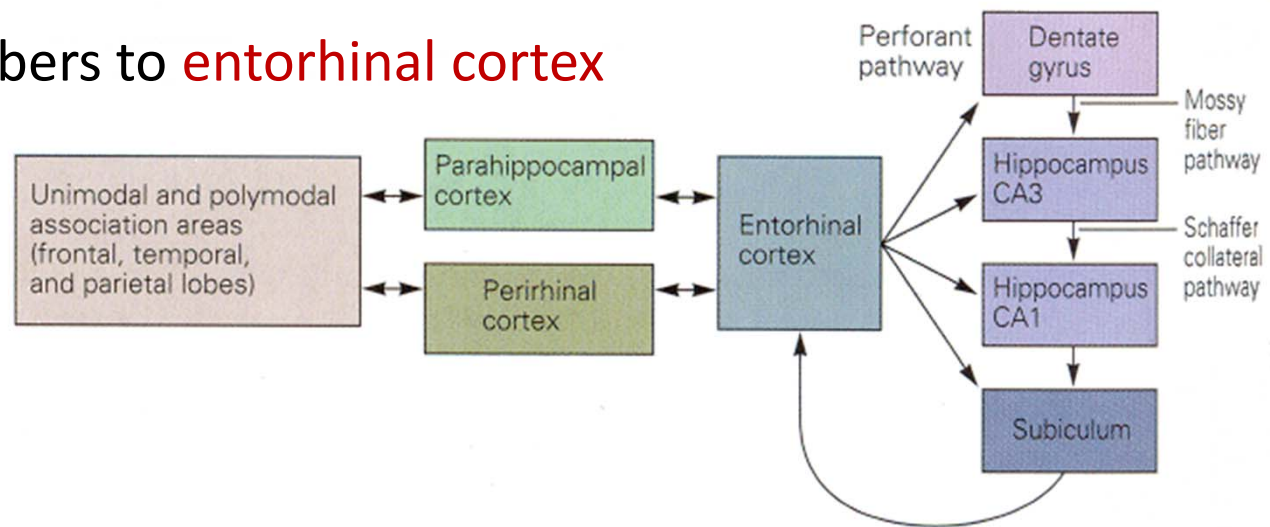
- The hippocampal cortex has 3 layers
 - Molecular layer at the center
 - Consists of interacting axons & dendrites
 - Prominent pyramidal cell layer of large neurons
 - Polymorphic layer containing axons, dendrites & interneurons
- The dentate gyrus has 3 layers like hippocampus but the pyramidal cell layer is replaced by granule cell layer



Hippocampal Formation

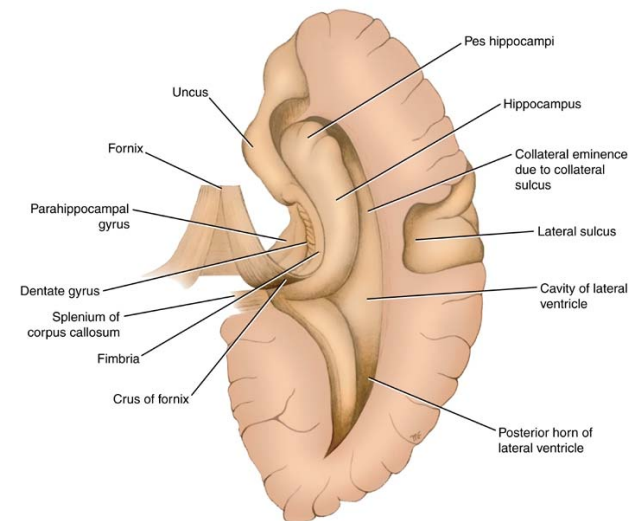
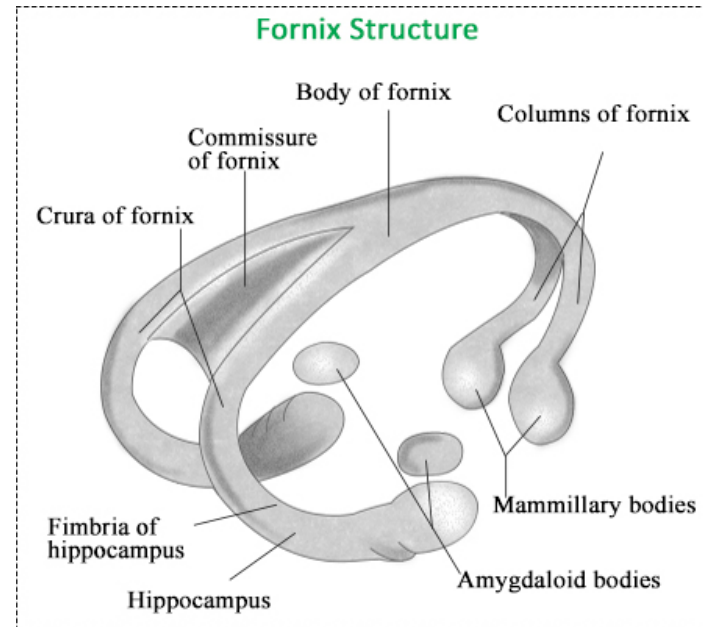
Intrinsic Circuitry

- Most of the hippocampal afferent come from the **entorhinal cortex** (**perforant pathway**)
- Granule cells in the **dentate gyrus** sends dense fibers (**Mossy fibers**) to CA3
- **CA3** pyramidal neurons send fibers through the fornix (alveus) and collaterals (**Schaffer collaterals**) to the CA1
- **CA1** sends fibers to subiculum
- **Subiculum** sends fibers to **entorhinal cortex**



Fornix

- Alveus
 - Efferent fibers of hippocampus to fornix
- Fimbria of hippocampus
- Fornix
 - Parts
 - Crura (posterior columns)
 - Body
 - Columns (anterior columns)
- Mamillary bodies

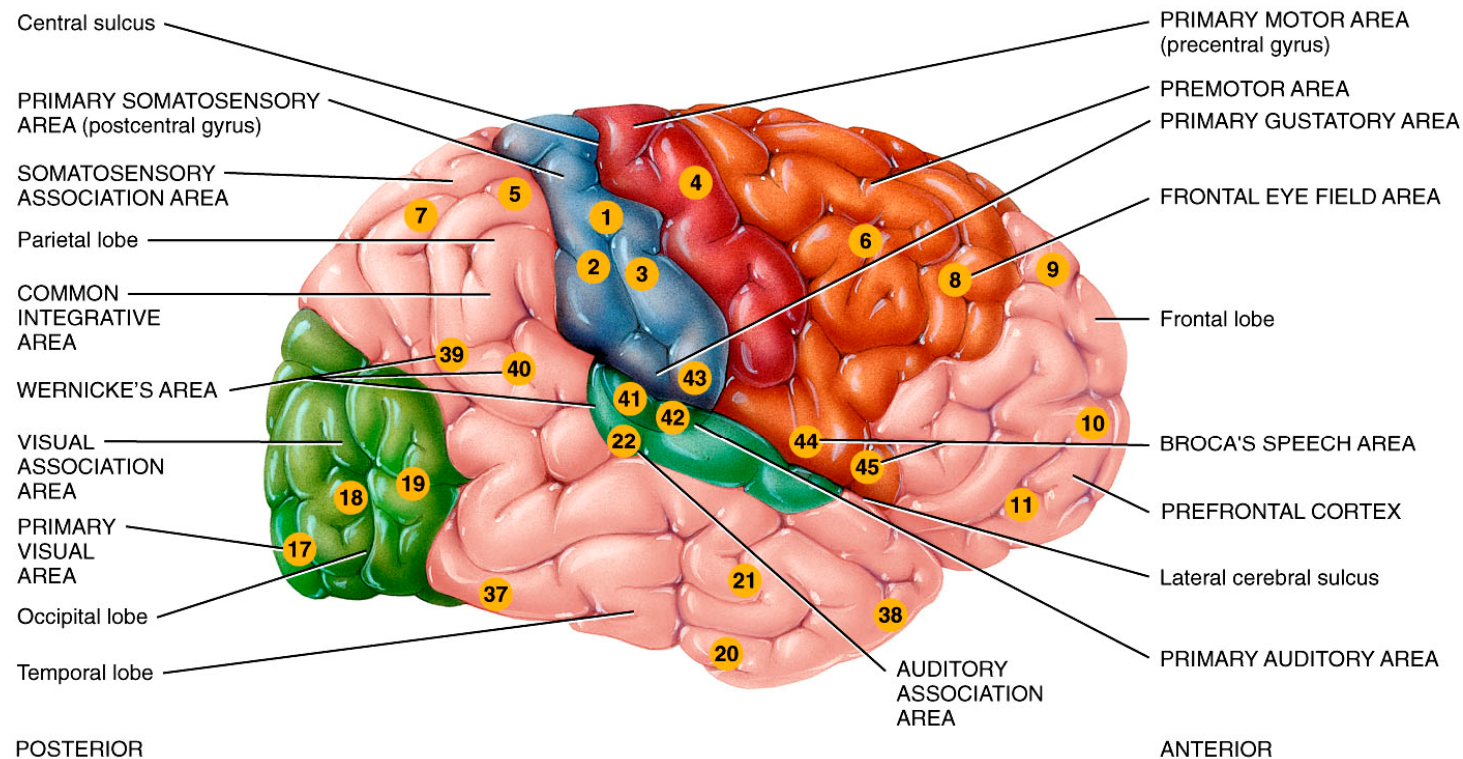


Functional Organization of the Cerebral Cortex:

Sensory Areas

- Primary somatosensory area- postcentral gyrus.
- Primary visual area- occipital lobe.
- Primary auditory area- temporal lobe.
- Primary gustatory area- base of the postcentral gyrus.
- Primary olfactory area- temporal lobe.

Functional Organization of the Cerebral Cortex: Sensory Areas



Lateral view of right cerebral hemisphere

Figure 14.15 Tortora - PAP 12/e
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Functional Organization of the Cerebral Cortex: Motor Areas

- Primary motor area- precentral gyrus.
- Broca's speech area- left cerebral hemisphere.

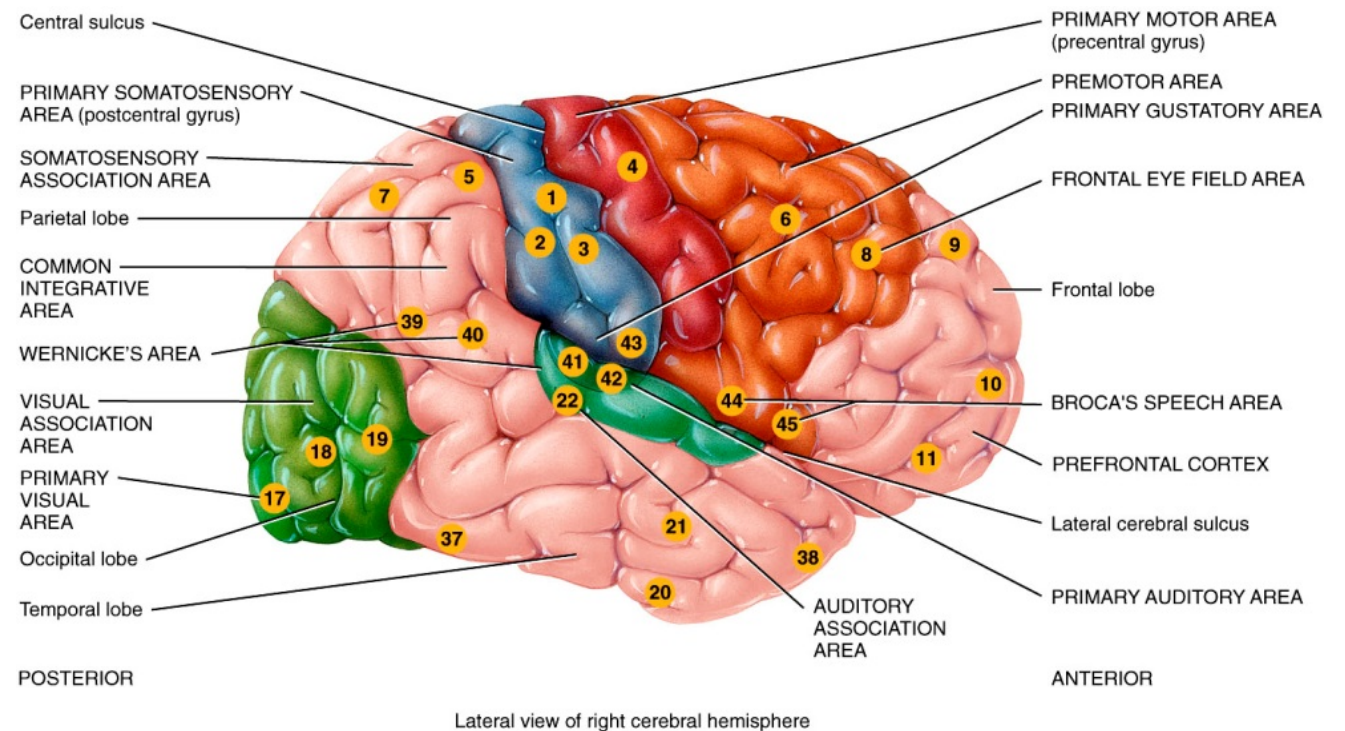


Figure 14.15 Tortora - PAP 12/e
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Functional Organization of the Cerebral Cortex: Association Areas

- Somatosensory association area- posterior to primary somatosensory area.
- Visual association area- occipital lobe.
- Auditory association area- temporal lobe.
- Wernicke's area- left temporal and parietal lobes.
- Prefrontal cortex- anterior portion of the frontal lobe.

Brodmann Numbers

- Area 17 Primary visual cortex
- Areas 18 & 19 Secondary visual cortex
- Area 4 Primary motor cortex
- Area 6 Premotor area
- Area 3, 1, & 2 Somatosensory cortex
- Areas 41 & 42 Auditory cortex
- Areas 44 & 45 Broca's area
- Areas 39 & 40 Wernicke's area
- Area 8 Frontal eye field

Somatotopic Organization of Cortex (Homunculus)

