ANATOMY OF THE CEREBRUM

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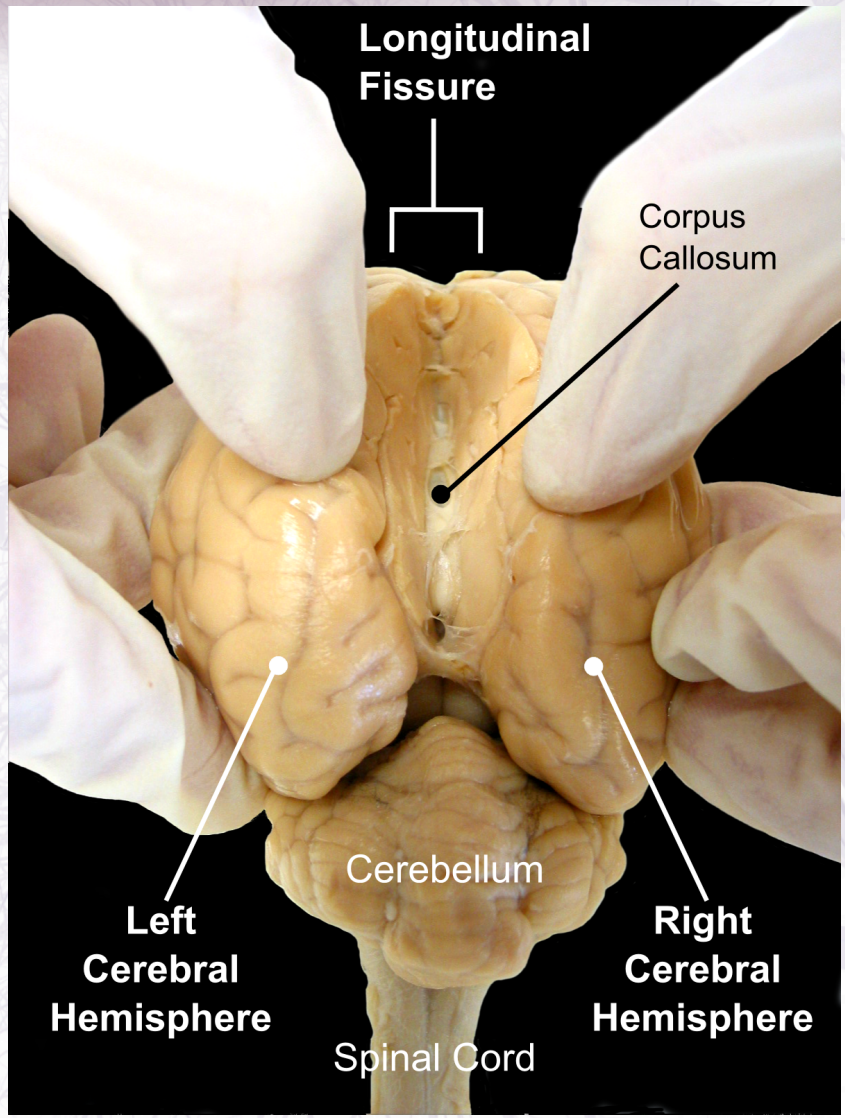
Introduction:

- Forms **most** of the forebrain (prosencephalon)

- Divided into 2 parts which have a fold of **dura** mater lodged between them called the falx cerebri (in the median longitudinal fissure)

- Has 3 surfaces: superolateral, medial, and inferior(tentorial)
  - Tentorium (related to fold of dura matter called Tentorium cerebri that separated cerebrum superiorly and cerebellum inferiorly)

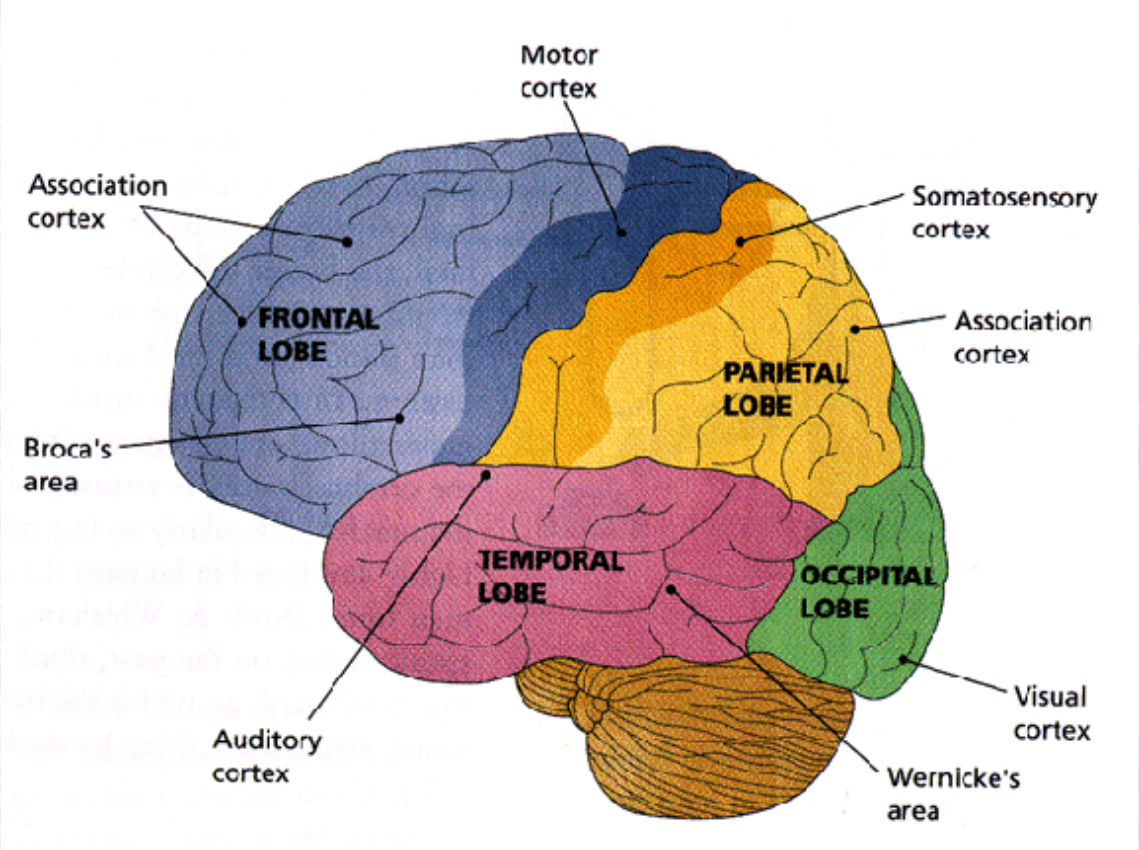
- Cavity within **each** hemisphere: lateral ventricle
  - The first formation of CSF in lateral ventricle



Lobes:

- **Separated by 3 Sulci (fissures) :** central, sylvian (lateral), and parieto-occipital

- **Lobes:** frontal, parietal, temporal, occipital. The limbic lobe is a physiological entity that is added to their functional classification (it is located on the medial surface)



Functions of lobes:

Frontal lobe:
Motor functions, motivation, aggression, smell, mood (limbic part of frontal)

Central sulcus:
b/t frontal &parietal

Parietal lobe:
Reception/evaluation of sensory information

parieto-occipital sulcus :
b/t parietal, occipital

Lateral sulcus:
b/t frontal, parietal, temporal

Occipital lobe:
Visual processing

Temporal lobe:
Smell, hearing, memory, abstract thoughts

* Limbic system functions: emotion, memory, linking conscious intellect with unconscious activity

Anatomy and Functional Areas of the Brain

Functional Areas of the Cerebral Cortex

1 Visual Area:
- Sight
- Image recognition
- Image perception

2 Association Area
- Short-term memory
- Equilibrium
- Emotion

3 Motor Function Area
- Initiation of voluntary muscles

4 Broca's Area
- Muscles of speech

5 Auditory Area
- Hearing

6 Emotional Area
- Pain
- Hunger
- "Fight or flight" response

7 Sensory Association Area

8 Olfactory Area
- Smelling

9 Sensory Area
- Sensation from muscles and skin

10 Somatosensory Association Area
- Evaluation of weight, texture, temperature, etc. for object recognition

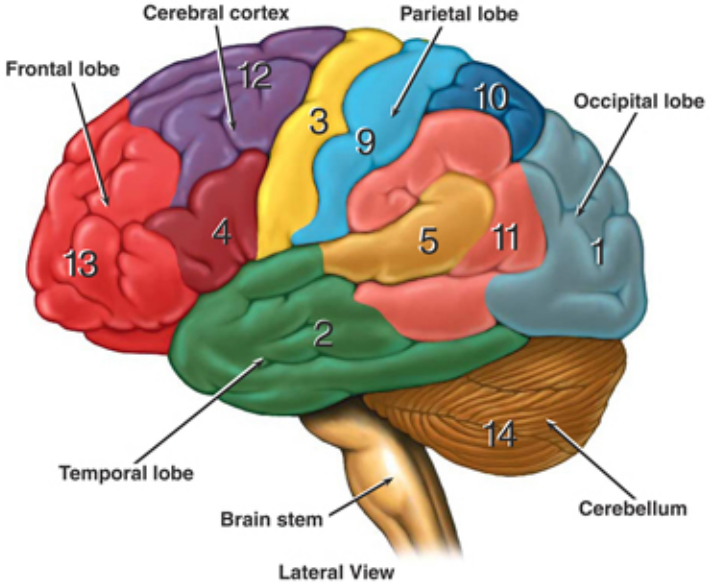
11 Wernicke's Area
- Written and spoken language comprehension

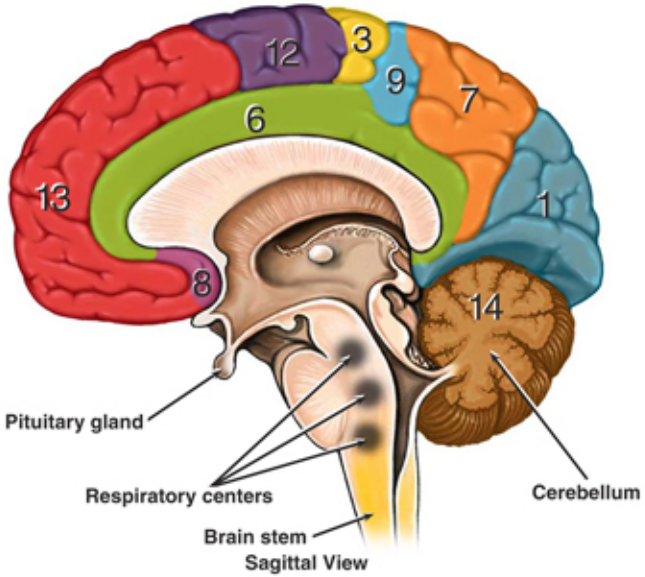
12 Motor Function Area
- Eye movement and orientation

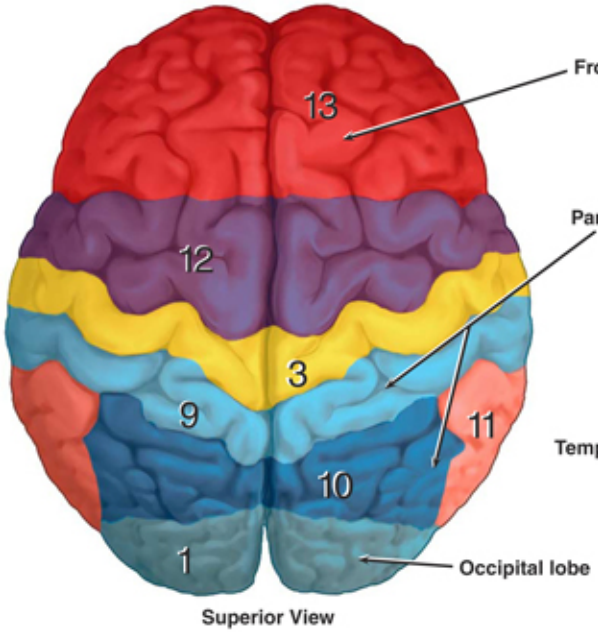
13 Higher Mental Functions
- Concentration
- Planning
- Judgment
- Emotional expression
- Creativity
- Inhibition

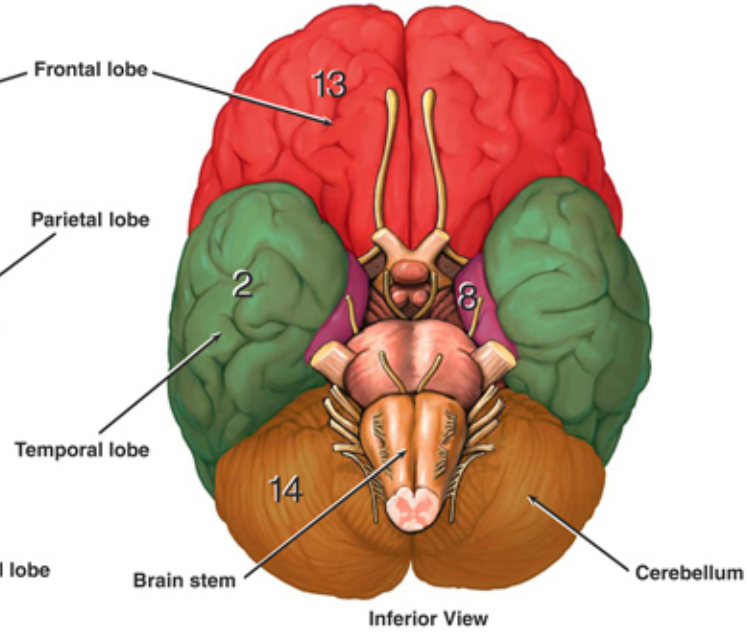
Functional Areas of the Cerebellum

14 Motor Functions
- Coordination of movement
- Balance and equilibrium
- Posture





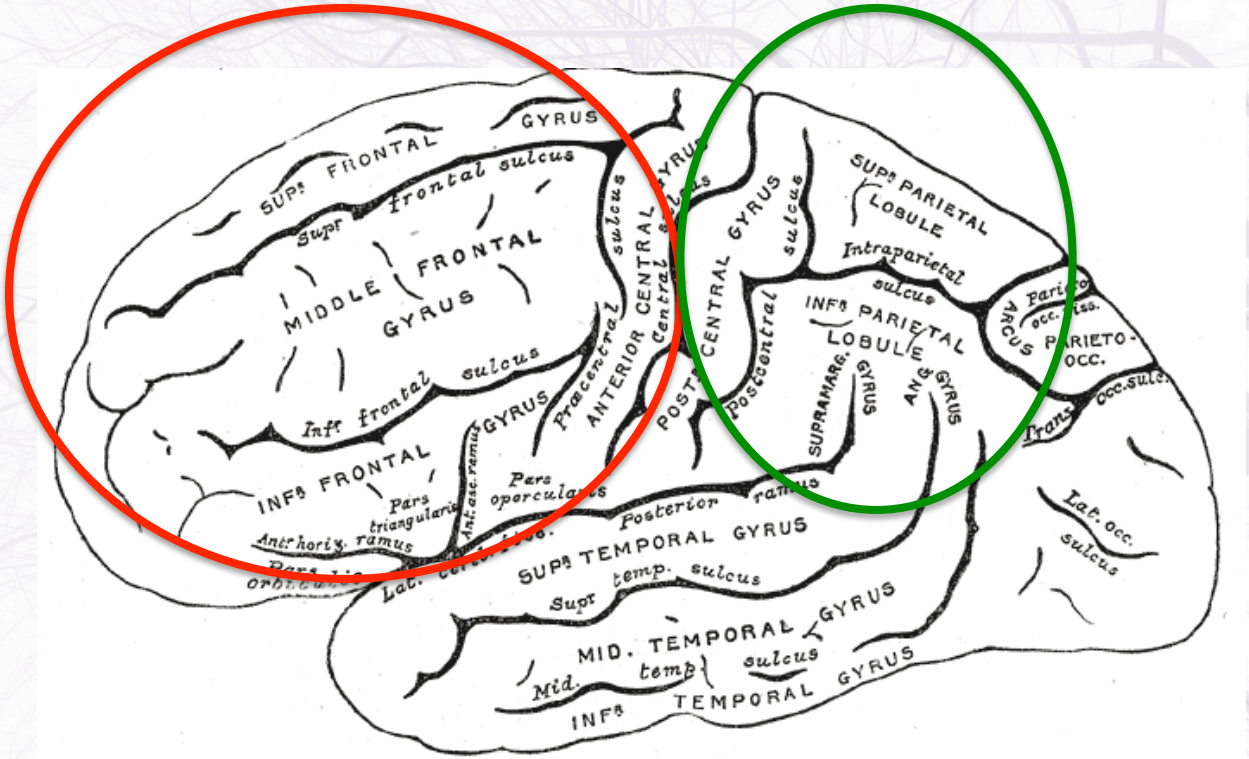




Gyri and Sulci:

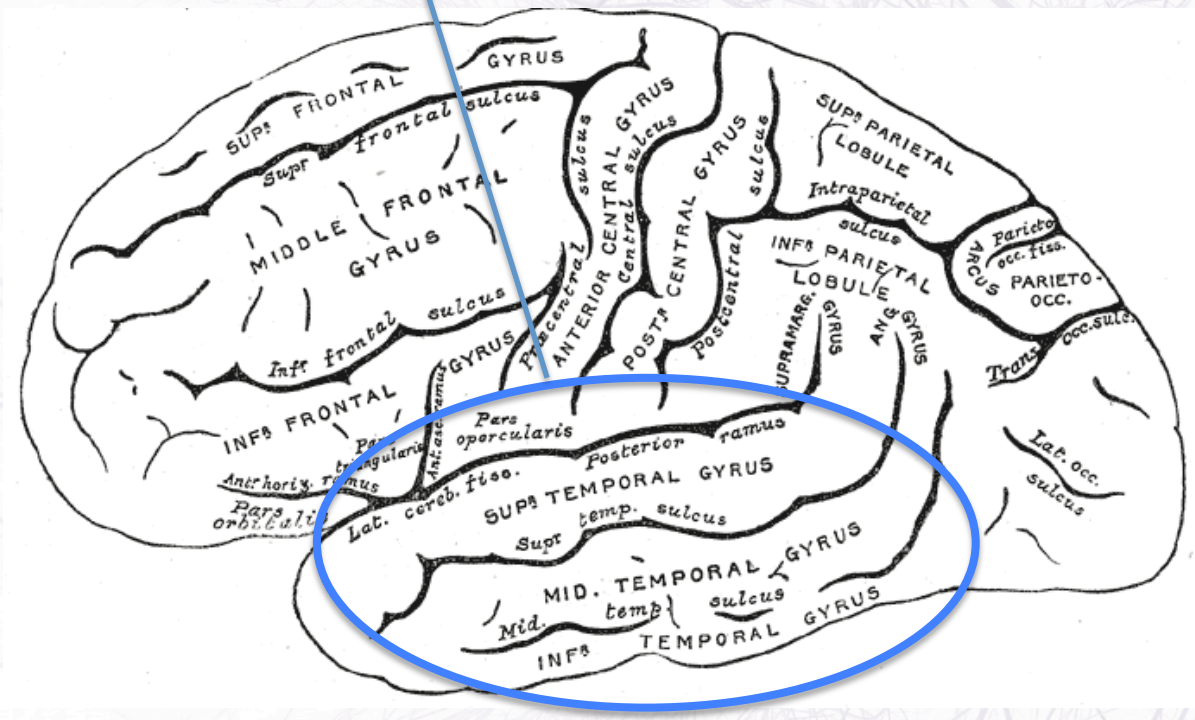
Frontal lobe gyri:
Precentral – superior/middle/ inferior frontal gyri (divided by superior/inferior frontal sulci)

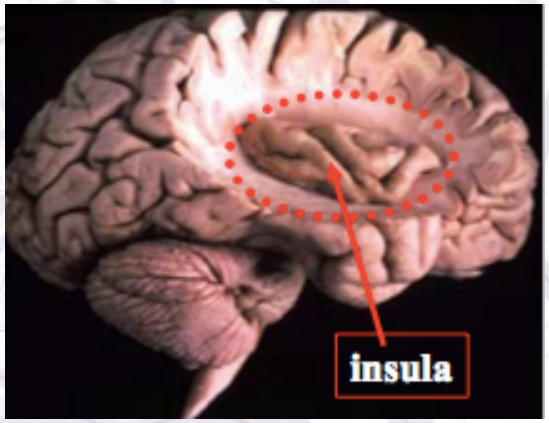
Parietal lobe gyri:
Post central – superior/inferior parietal lobules (divided by intraparietal sulcus)



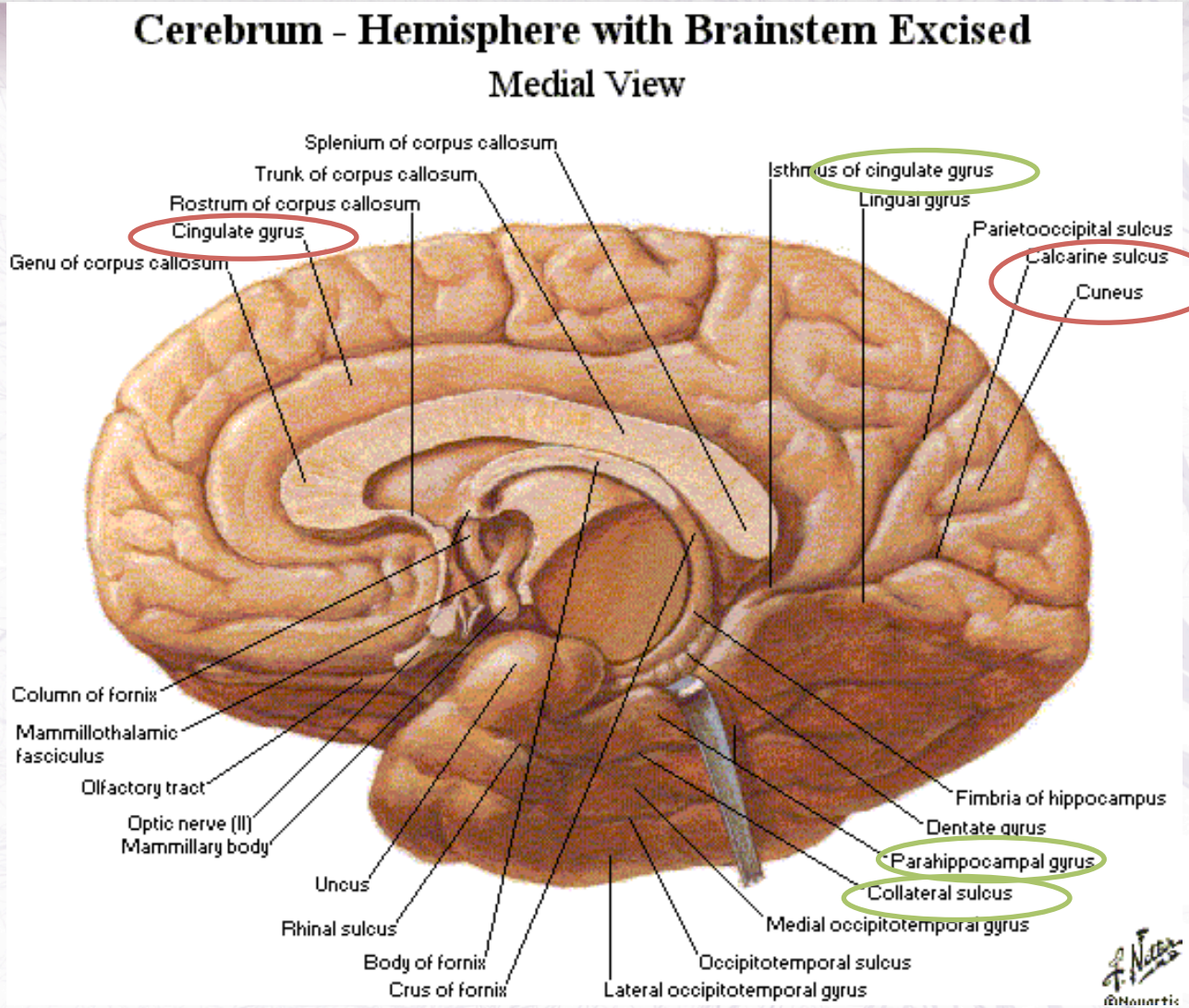
Temporal lobe gyri: superior/ middle/inferior temporal gyri (separated by superior/inferior temporal sulci)

* **insula:** the gyrus in the depth of the lateral fissure, covered by parts other lobes (oppercula)





Medial Surface of cerebrum:



*cingulate sulcus around corpus callosum

Brodmann's area

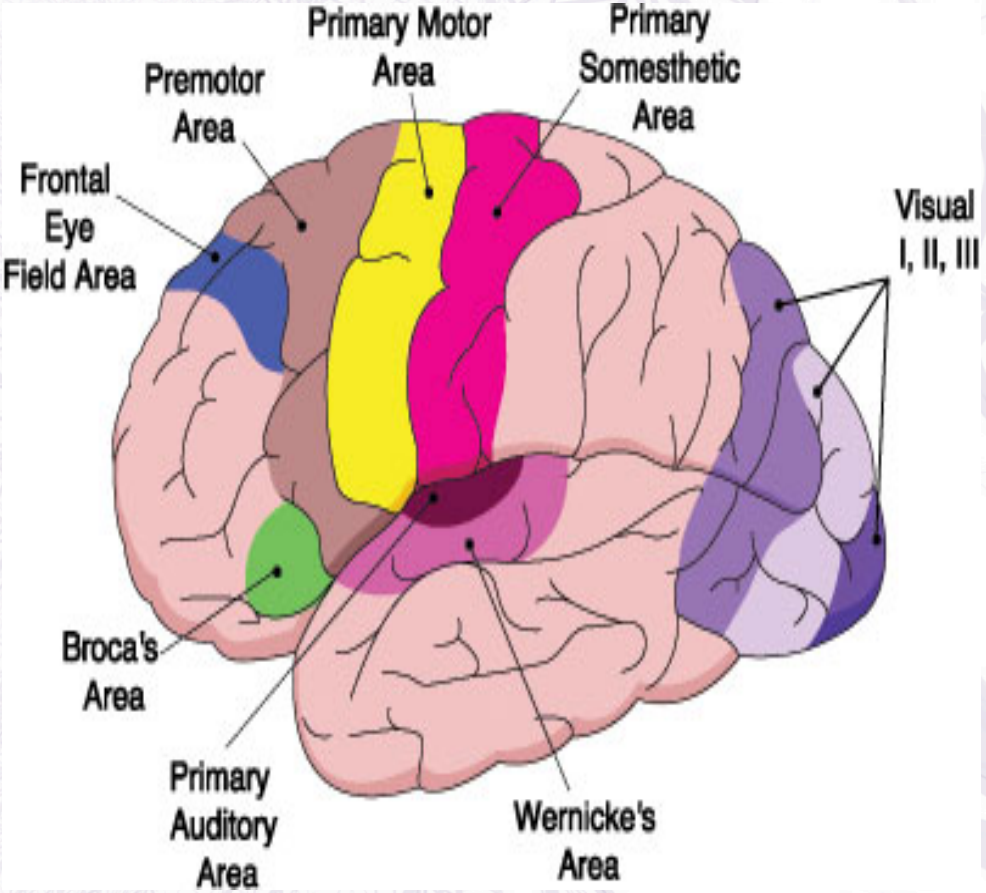
Frontal Lobe:

- **Premotor Cortex:** anterior to precentral gyrus (Brodmann's area 6)
- coordination of motor function
- Lesion: movement without coordination

- **Primary Motor Area:**
- in precentral gyrus (area 4)
- Start motor function
- Lesion : paralysis

- **Prefrontal cortex:** extensive region in frontal lobe anterior to premotor area)

- **broca's (motor speech) area:** inferior frontal gyrusof the dominant hemisphere (area 44 and 45)
- lesion loss of speech
- **Frontal eye field:** middle frontal gyrus (area 8)



Parietal Lobe:

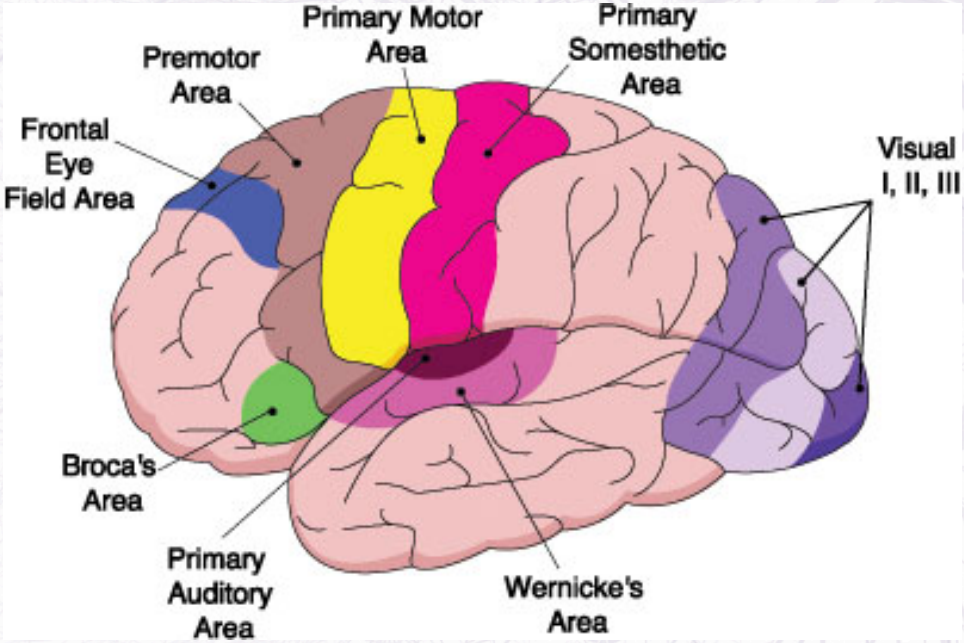
- **Primary somatosensory area:** postcentral gyrus (areas 1,2,3)

- **Parietal association cortex:** behind somatosensory cortex

Occipital Lobe:

- **Primary visual cortex:** on medial surface surrounding calcarine sulcus (area 17)

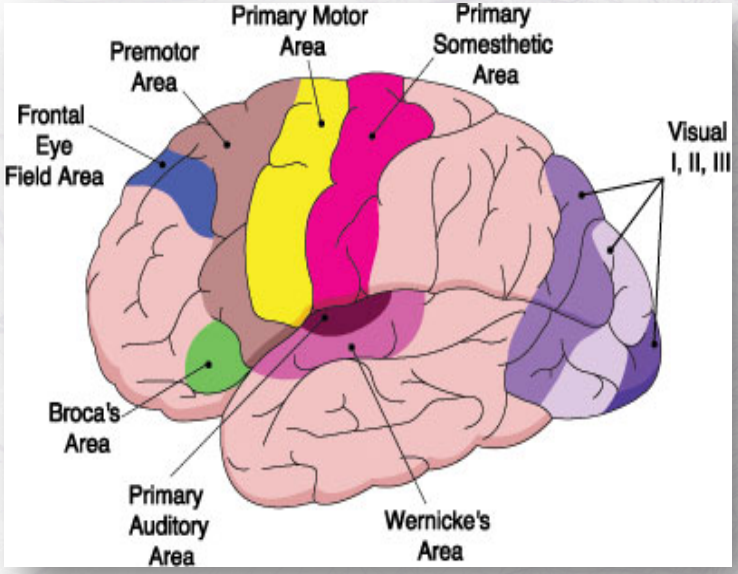
- **Visual assos. cortex:** around primary visual cortex (area 19)



Temporal Lobe:

- **Primary auditory cortex:** **located in the superior surface of the superior temporal gyrus (area 41,42)**

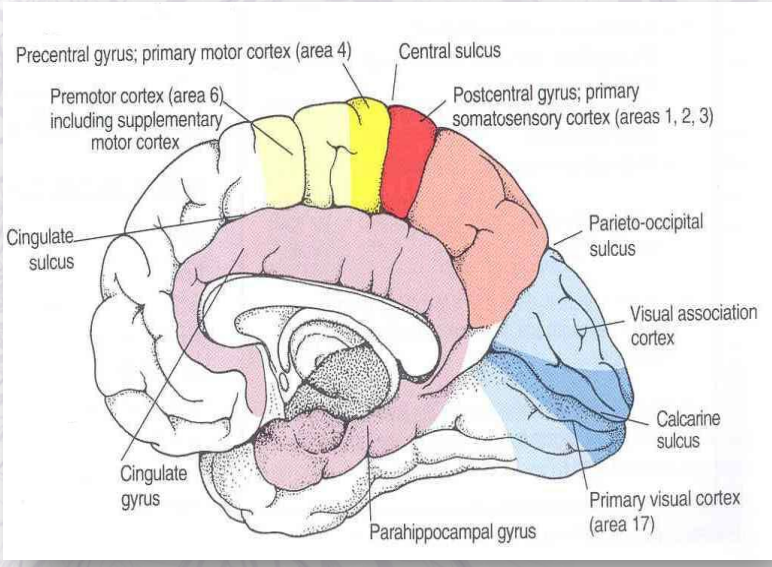
- **Auditory association cortex:** **located immediately around the primary auditory cortex (also includes Wernick's area 22)**



Parahippocampal gyrus: :

- **located in the inferomedial part of temporal lobe.**
  - ❖ **hippocampus**
  - ❖ **amygdala**

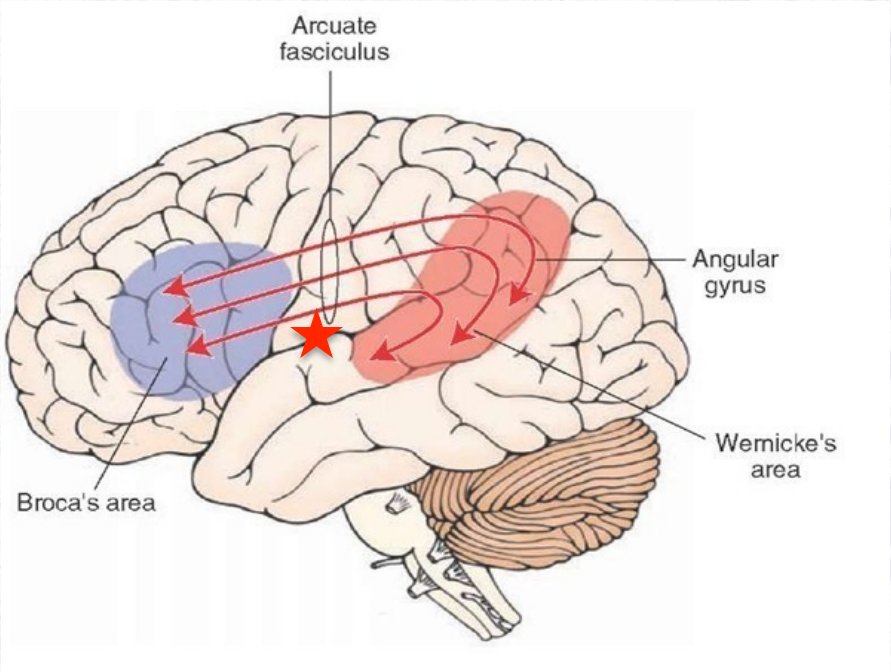
} parts of limbic system



Language area

Organized around the lateral fissure ★

Broca's area : concerned with aspects of language



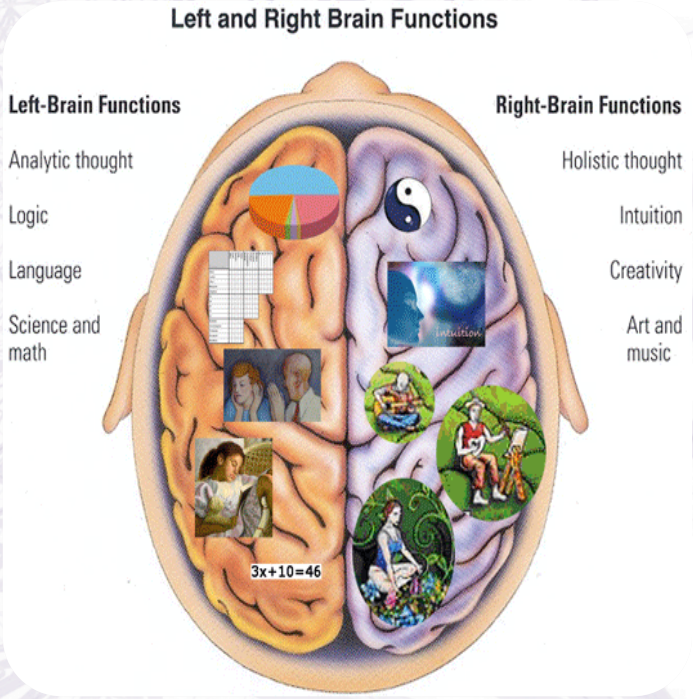
Angular gyrus & supraspinal gyrus : important in naming , reading , writing and calculation

These gyri is found in the inferior parietal lobule

Wernicke's area : comprehension of the spoken words

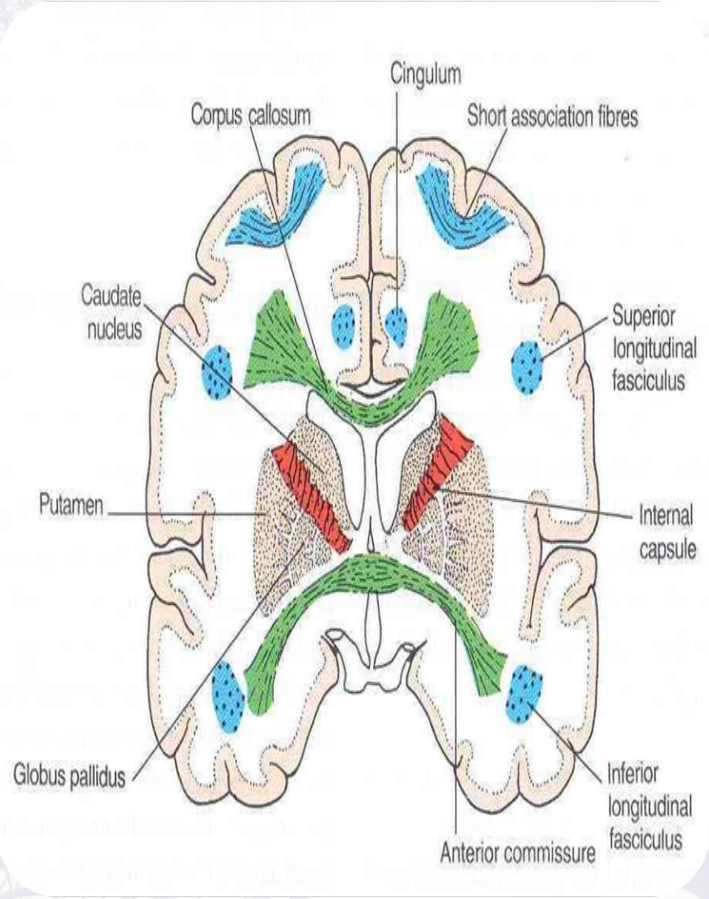
Hemispheric Dominance

The localization of speech centers & mathematical ability is the criterion for defining the dominant cerebral hemisphere	
Right handed	In 96% of normal right-handed individuals the left hemisphere dominant .
Left handed	In the 70% of normal left-handed individuals also the left hemisphere dominant .
Establishing of Cerebral dominance	during the first few years after birth.



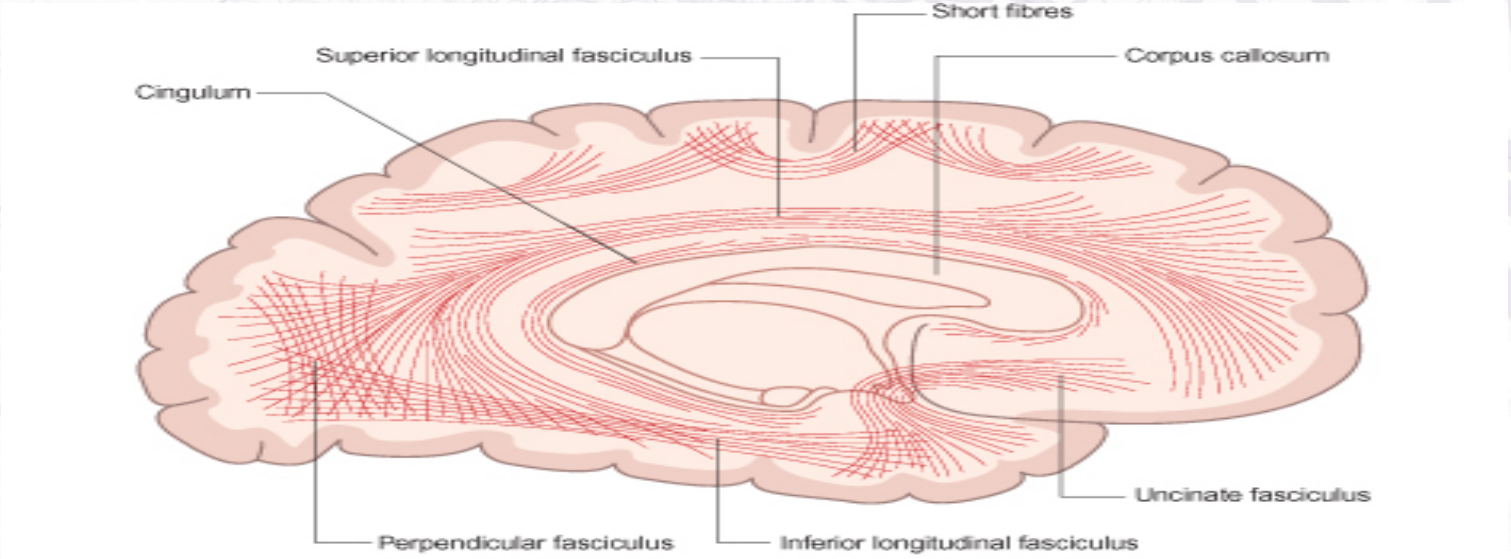
Fibers :

Location & Components of the white matter :	Underlies the cortex, contains : • nerve fibers •neuroglia cells •blood vessels	
Origin & termination of the nerve fibers :	The nerve fibers originate, terminate or sometimes both, within the cortex.	
Classification of the nerve fibers depends on what ?	It depends on their origin & termination	
Types of nerve fibers		
Association fibers: Unite different parts of the same hemisphere	**Commissural fibers:** Connect the corresponding regions of the two hemispheres	**Projection fibers:** Consist of afferent and efferent fibers of the cerebral cortex



Association Fibers :

Types :	• Short association fibers : connect adjacent gyri . • Long association fibers : connect more distant parts .			
Long association fibers :				
1.Uncinate fasciculus: connects frontal to temporal lobe	2. Superior longitudinal fasciculus: connects the frontal, occipital, parietal, and temporal lobes	3. Arcuate fasciculus: connect gyri in frontal to temporal lobes	4. Inferior longitudinal fasciculus: connects occipital to temporal pole	5. Cingulum: connects frontal & parietal lobes to the para-hippocampal gyrus and adjacent temporal gyri



Commissural Fibers :

Connect the corresponding regions of the two hemispheres

1.Corpus :Callosum	2.Anterior commissure:	3.Posterior Commissure:	4.Hippocampal Commissure: (commissure of fornix).
Connects the corresponding regions of the two hemispheres ➢It is shorter craniocaudally than is the hemisphere	connects the inferior and middle temporal gyri & the olfactory regions of the two hemispheres	connects the left and right midbrain. Important in the bilateral pupillary reflex	connects the two hippocampi with each other

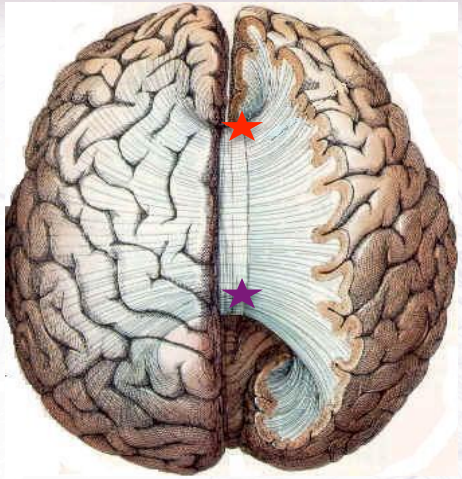
The temporal lobes are connected by the anterior commissure not by corpus callosum

It is divided into

- forceps minor (anterior forceps): The callosal fibers linking the frontal poles(curve forward)(Genu&Rostrum)
- forceps major (posterior forceps) : The callosal fibers linking the occipital poles (curve backward)(Splenium)

Cont. :

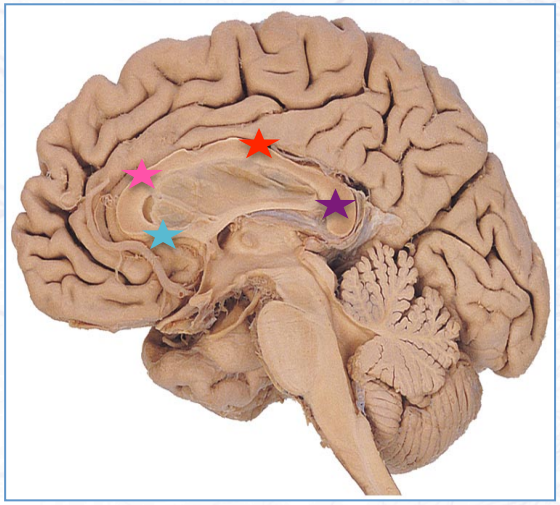
Corpus Callosum



- Anterior forceps
- Posterior forceps

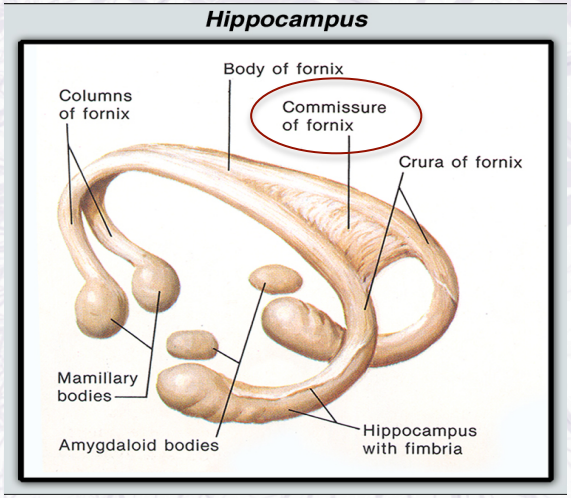
Anterior & posterior commisure

- Corpus callosum
- Anterior commissure
- Thalamus
- Posterior commisure



Parts of Corpus Callosum

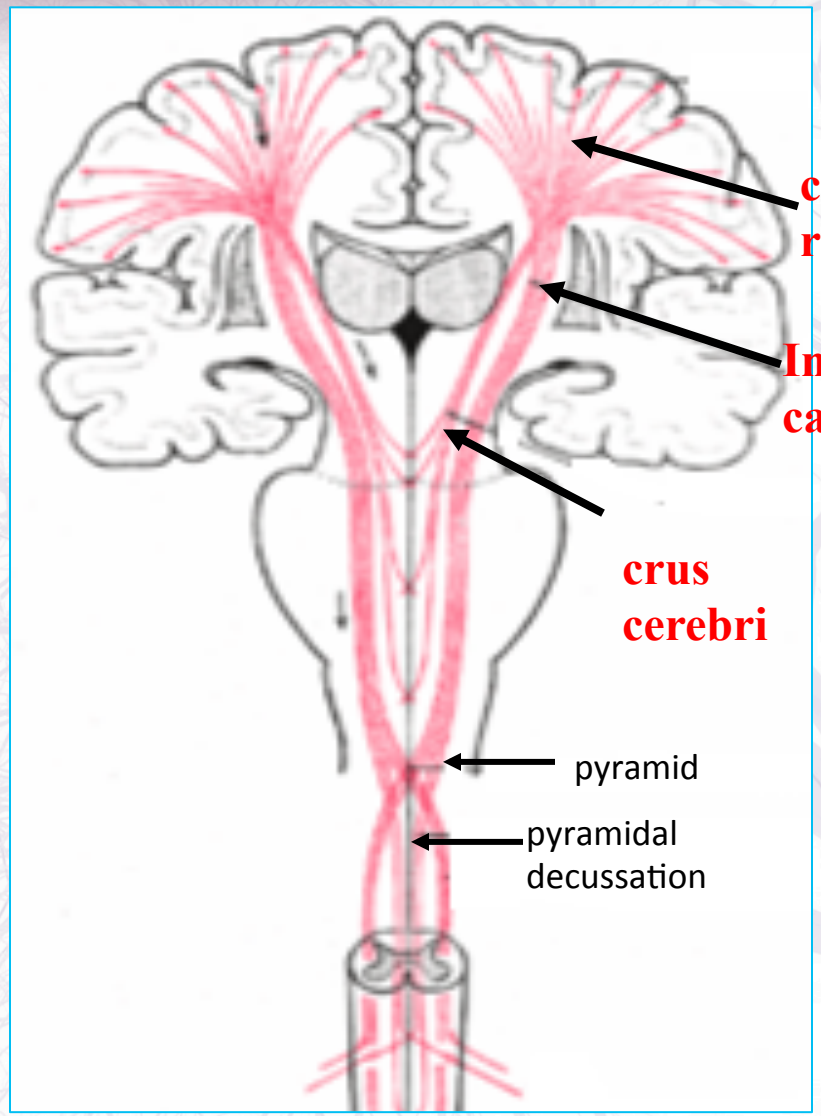
- Body
- Genu
- Rostrum
- Splenium



Hippocampal Commissure

projection Fibers :

Components	Afferents & efferents of the cerebral cortex (b/t cortex & spinal cord)
Course in the cerebral cortex	•fibers are arranged radially as the corona radiata. •Then the fibers converge downward, form internal capsule, between thalamus and basal ganglia
Course in the brain stem	Continue in : • the crus cerebri of the midbrain . • the basilar part of pons • pyramid of medulla oblongata

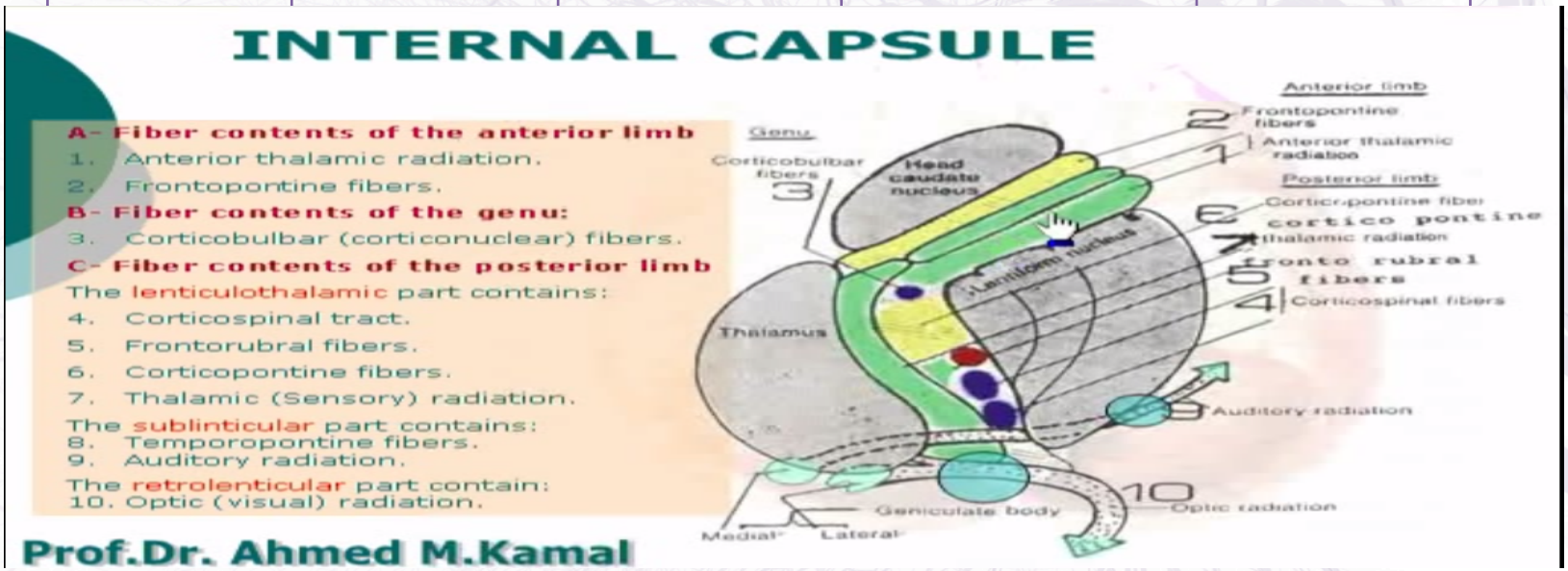


Internal Capsule :

Bundle of projection fibers, passes through the interval between the thalamus and the basal ganglia

Parts of the internal capsule :

1.Anterior limb:	2.Genu:	3. Posterior limb:	4.Retrolenticular part:	5. Sublenticular part :
•Thalamocortical •Frontopontine fibers	corticobulbar fibers *Motor fibers from cortex to CN nuclei in brainstem Responsible of head& neck movement *	•Corticospinal fibers •Corticobulbar fibers •Thalamocortical fibers	Geniculocalcarine fibers (visual fiber related to lateral ventricle) Child with ↑CSF ➔ loss of vision	geniculo-temporal fibers



BRAIN ANATOMY & http://youtu.be/Uv2bcyijGqU

MCQs

1) Which lobe is responsible for visual processing ? A. Frontal lobe B. Temporal lobe C. Occipital lobe	2) Which of the followings sulci is found in the frontal lobe ? A. Precentral sulcus B. Lateral sulcus C. Postcentral sulcus
3) Damaging which of the following lobes will affect on the motor function : A. Occipital lobe B. Frontal lobe C. Parietal lobe	4) Establishing of the cerebral dominance occurs : A. Before berth B. Few years after berth C. At the age of 20
5) Classification of the nerve fibers depends on : A. Origin B. Termination C. Both A & B	6) Connects corresponding regions of the two hemisphere : A. Association fibers B. Commissural fibers C. Projection fibers
7) Corpus callosum connects the corresponding regions of the two hemisphere except : A. The occipital lobes B. The frontal lobes C. The temporal lobes	8) The temporal lobes are connected by : A. Anterior commisure B. Posterior commisure C. Corpus callosum

ANS :

1.c

2.a

3.b

4.b

5.c

6.b

7.c

8.a