

The cerebrum

On behalf of Phase A residents

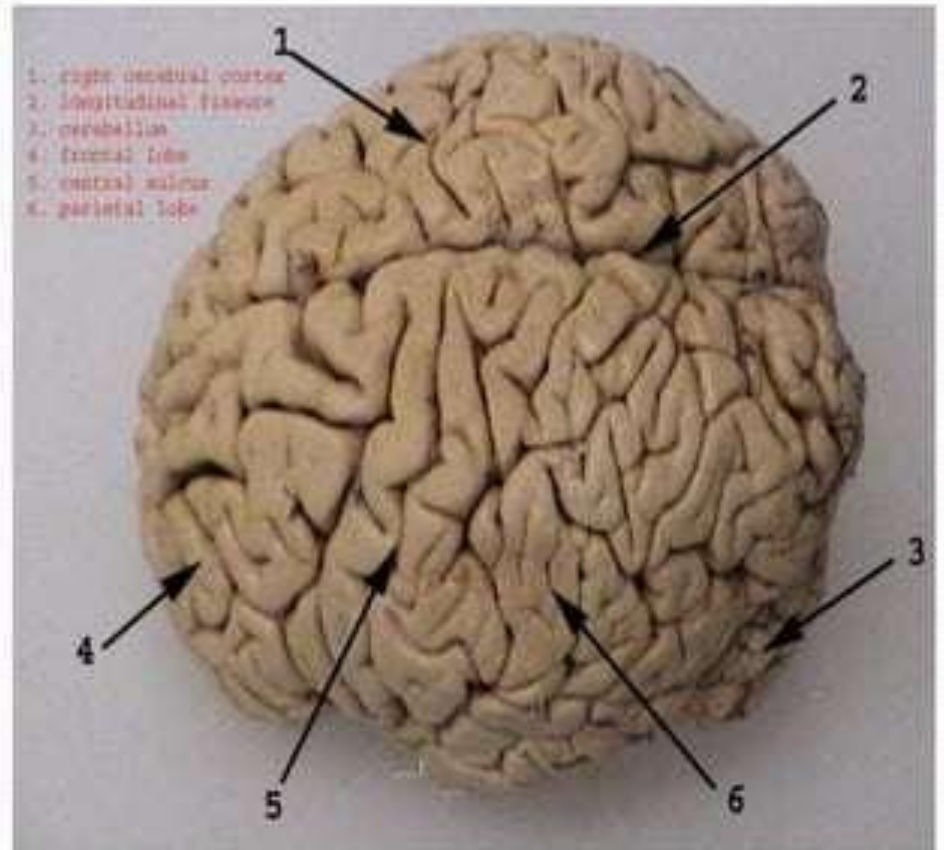
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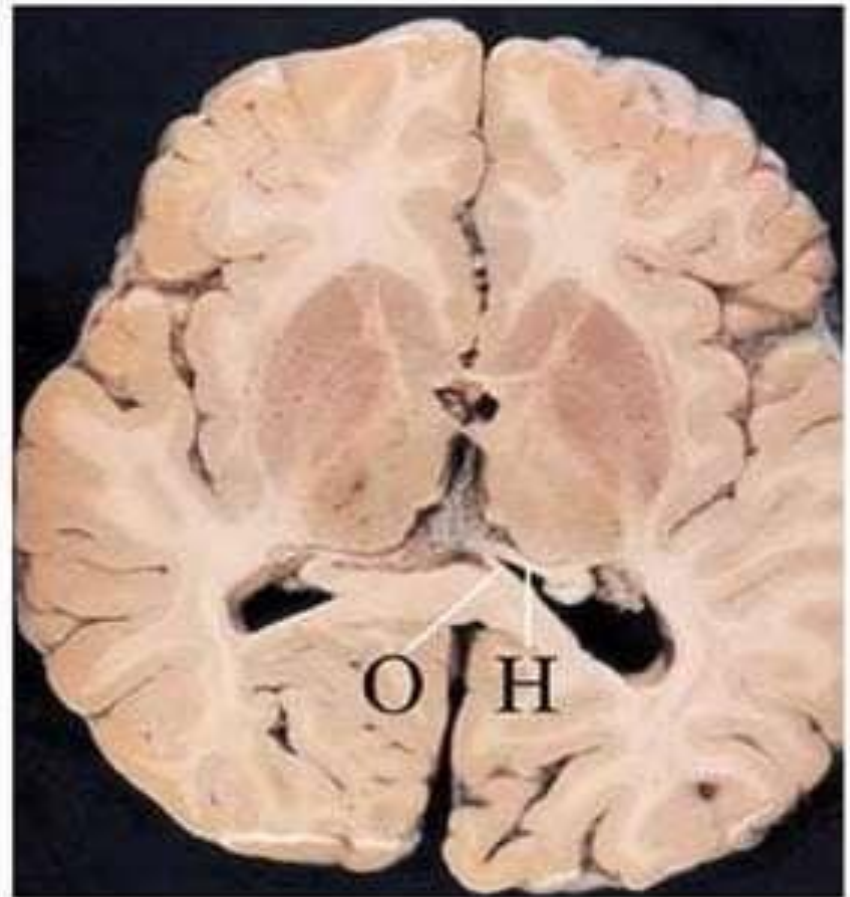
External topography

- 2 hemispheres
 - : left cerebral hemisphere
 - : right cerebral hemisphere
- separated by vertical longitudinal fissure
- Joined by corpus callosum
- Ridges(gyrus), furrows(sulci)



External topography contd...

- Pallium/cerebral mantle
 - : outer-grey matter/
cerebral cortex
 - : inner-white matter/
medullary substance
- basal ganglia
 - : corpus striatum
 - caudate
 - lenticular nuclei
 - : amygdaloid nuclei
 - : claustrum



Lobes of cerebrum

- Five lobes
 - : frontal lobe
 - : parietal lobe
 - : temporal lobe
 - : occipital lobe
 - : insula/island of reil
- Rhinencephalon though considered separate entity, not included as a lobe
- Limbic lobe is a functional lobe

Frontal lobe, boundary (lateral)

- Frontal lobe

- anteriorly

 - frontal pole

- posteriorly

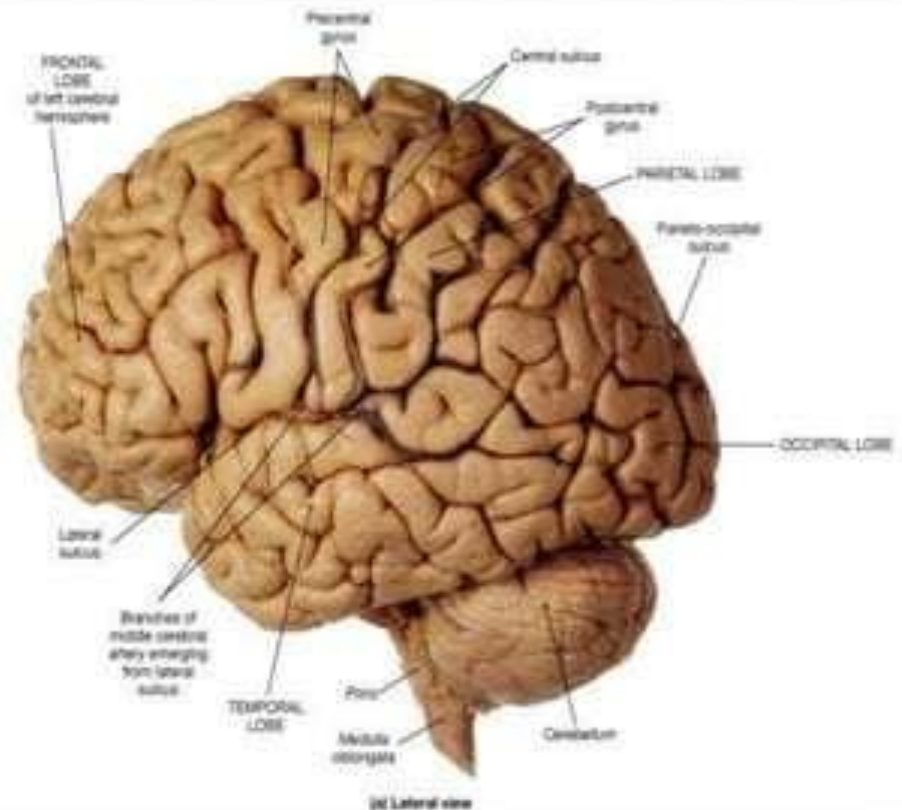
 - central sulcus of rolando

- inferiorly

 - sylvian fissure

- superiorly

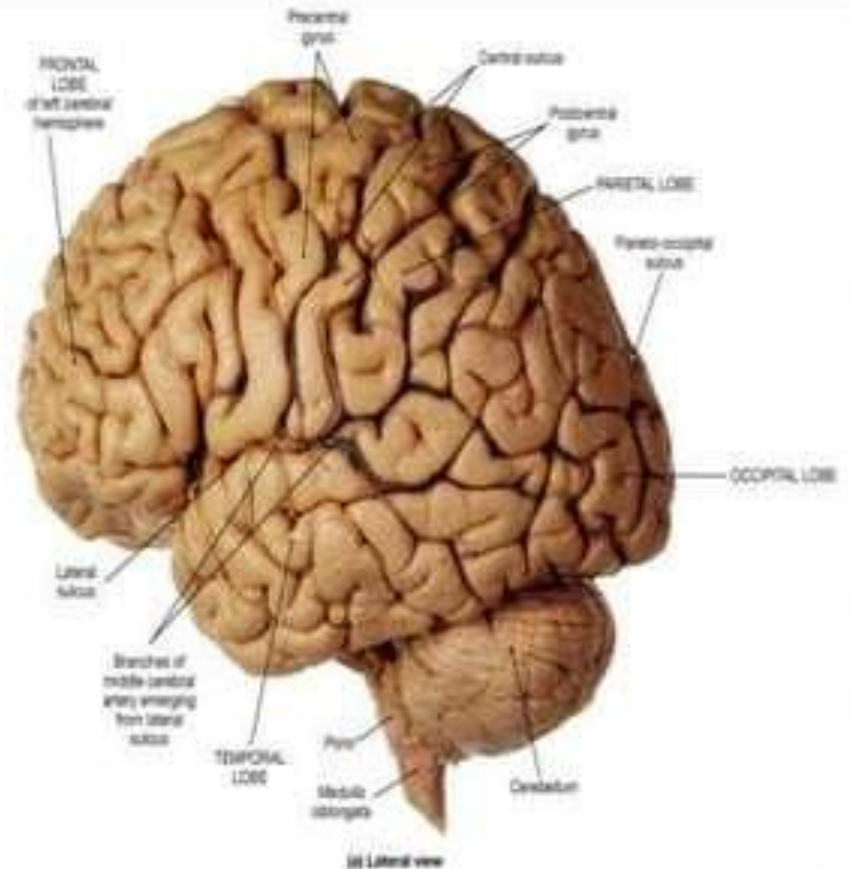
 - superior border



Frontal lobe, sulci (lateral)

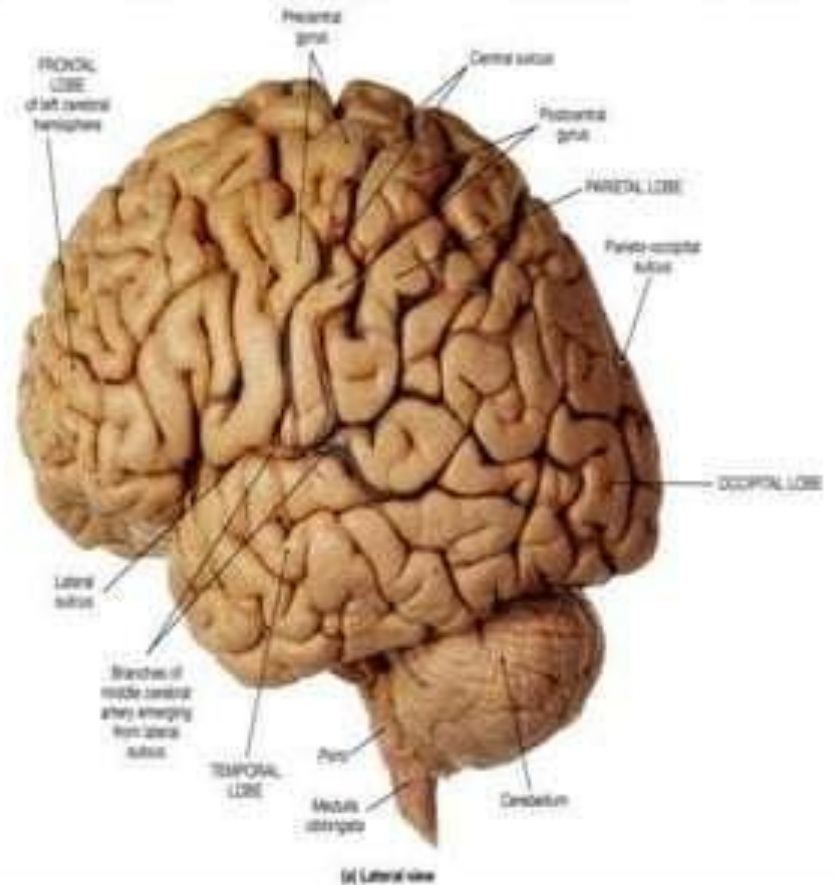
- Sulci

- : pre-central sulcus
- : superior frontal sulcus
- : middle frontal sulcus
- : inferior frontal sulcus
- : anterior horizontal branch of sylvian
- : anterior ascending branch of sylvian



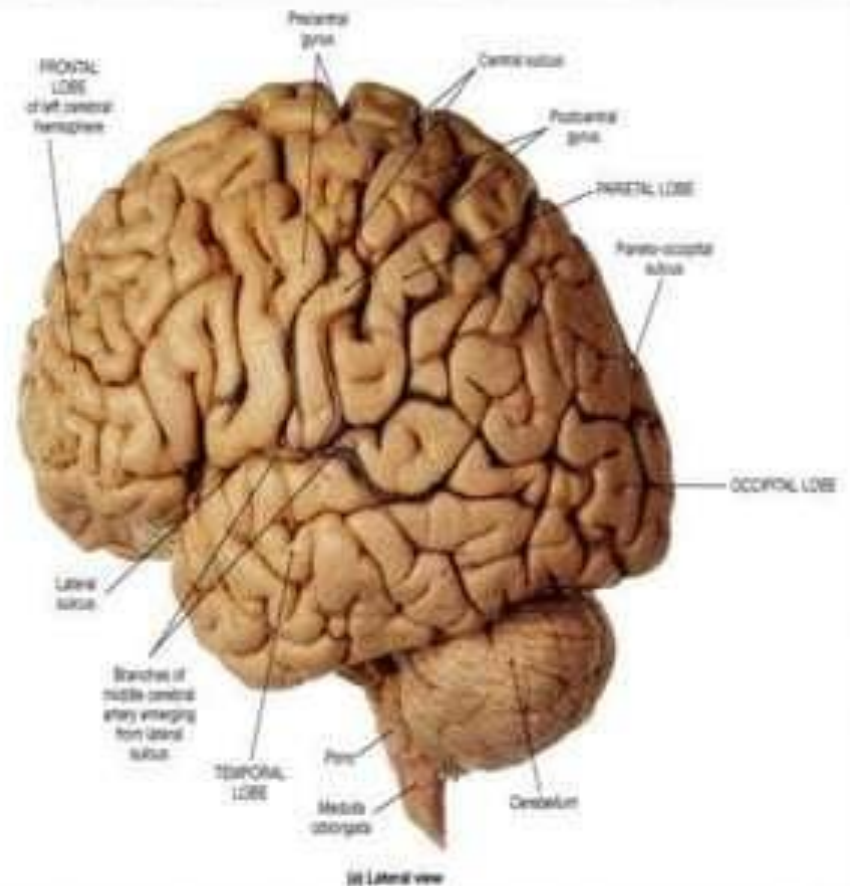
Frontal lobe, gyrus (lateral)

- Gyrus
 - : pre-central gyrus
 - : superior frontal gyrus
 - : middle frontal gyrus
 - : inferior frontal gyrus
 - pars orbitalis
 - pars triangularis
 - pars opercularis
- (pars triangularis and pars opercularis consists of Broca's area)



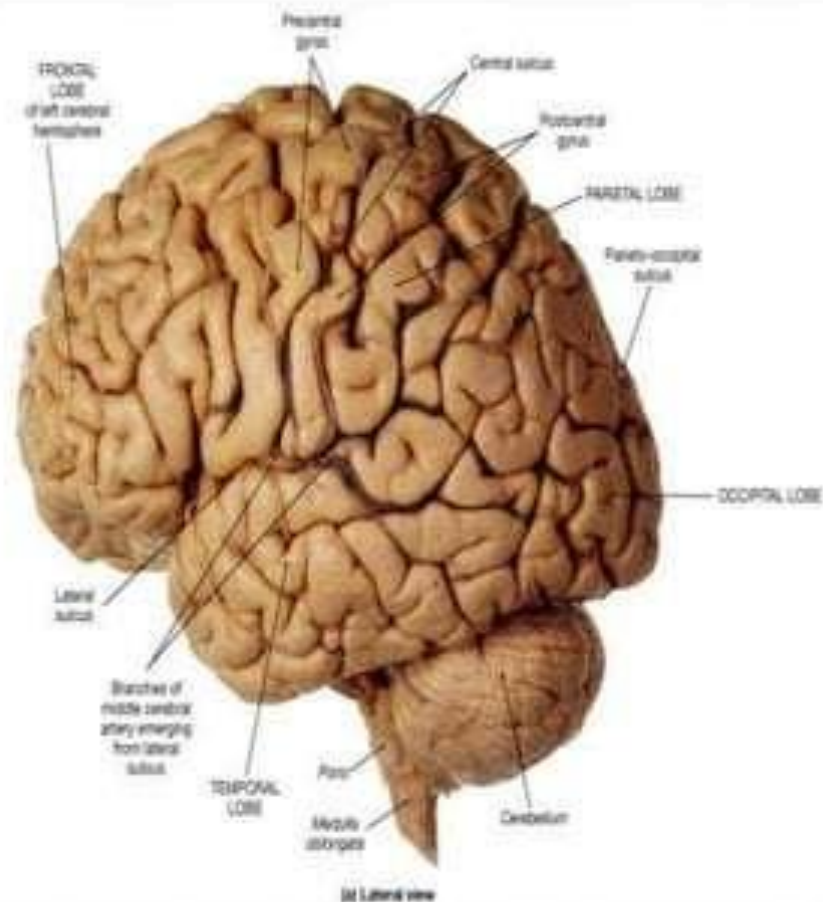
Parietal lobe, boundary (lateral)

- Parietal lobe
 - anteriorly
 - central sulcus of rolando
 - posteriorly
 - imaginary line drawn from parieto-occipital sulcus to pre-occipital notch
 - superiorly
 - Superior border
 - inferiorly
 - imaginary line drawn from posterior ramus of sylvian fissure to the middle of the imaginary line drawn from parieto-occipital sulcus to pre-occipital notch



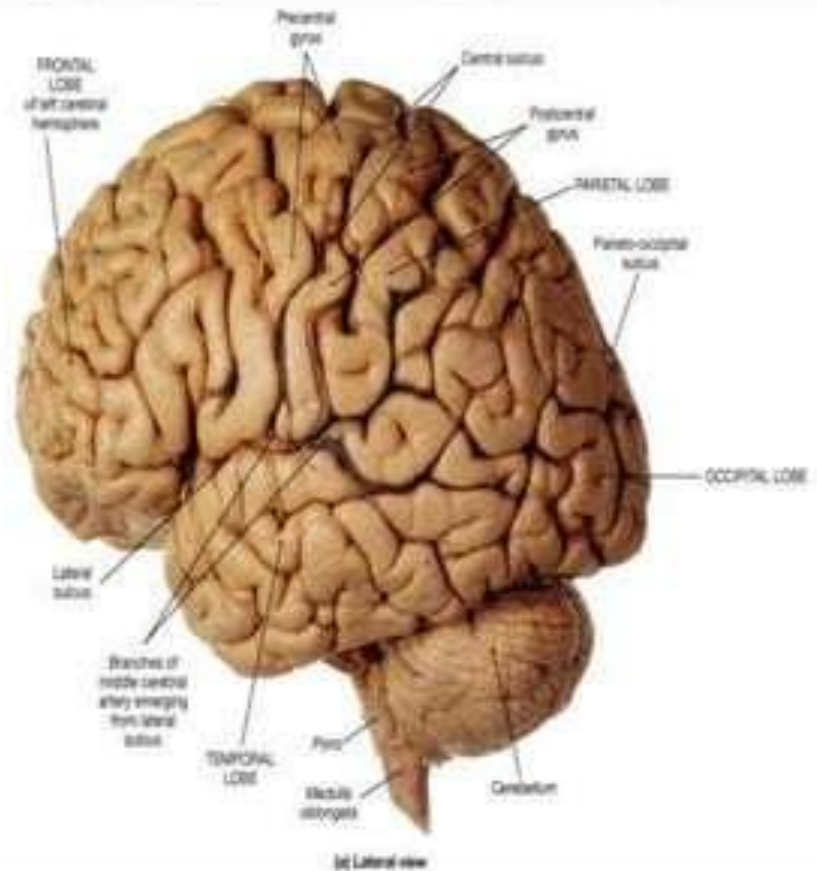
Parietal lobe, sulci (lateral)

- Sulci
 - : post central sulcus
 - : intra-parietal sulcus
 - : marginal branch of sylvian
 - : portion of superior temporal sulcus



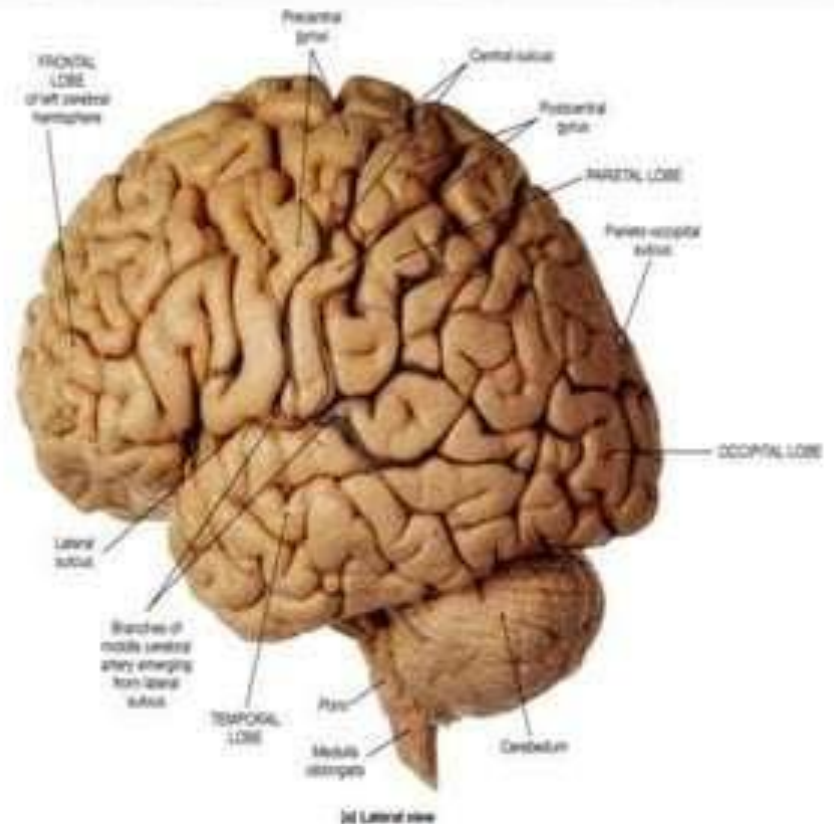
Parietal lobe, gyrus (lateral)

- Gyrus
 - : post central gyrus
 - : superior parietal lobule
 - : inferior parietal lobule
 - supramarginal gyrus
 - angular gyrus



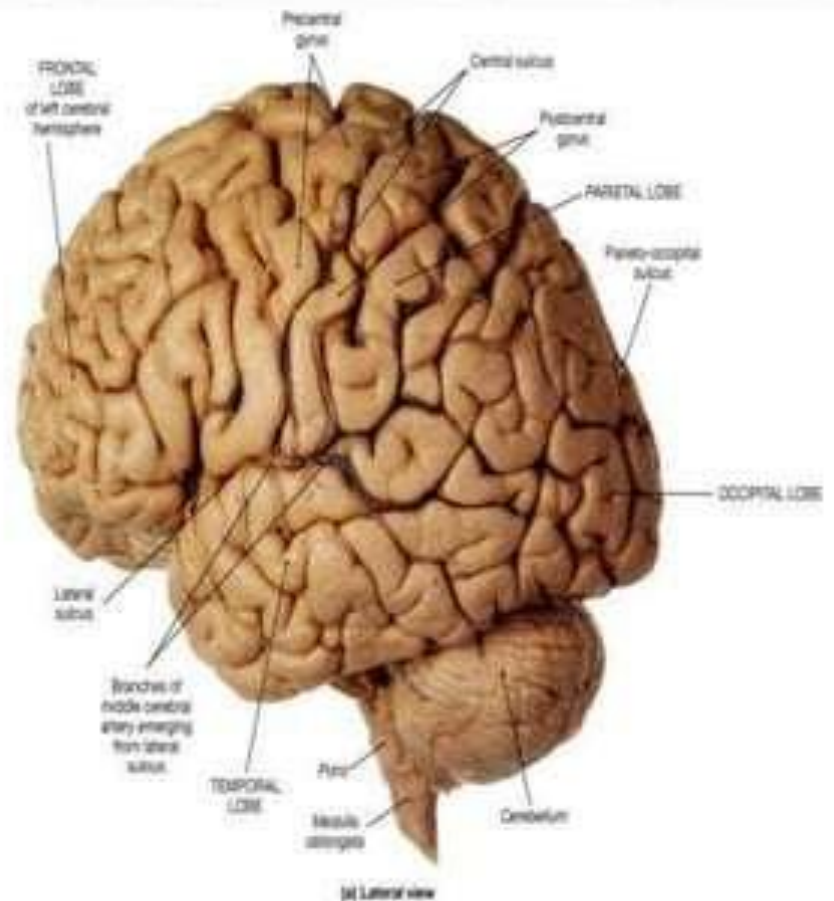
Temporal lobe, boundary (lateral)

- Temporal lobe
 - anteriorly
 - temporal pole
 - superiorly
 - Sylvian fissure
 - inferiorly
 - inferiolateral boarder
 - posteriorly
 - lower half of imaginary line drawn from parieto-occipital sulcus to pre-occipital notch



Temporal lobe, sulci and gyri (lateral)

- Sulci
 - : superior temporal sulci
 - : inferior temporal sulci
- Gyrus
 - : superior temporal gyrus
 - transverse temporal gyri of Heschl lies buried in sylvian fissure
 - : middle temporal gyrus
 - : inferior temporal gyrus



Occipital lobe, boundary(lateral)

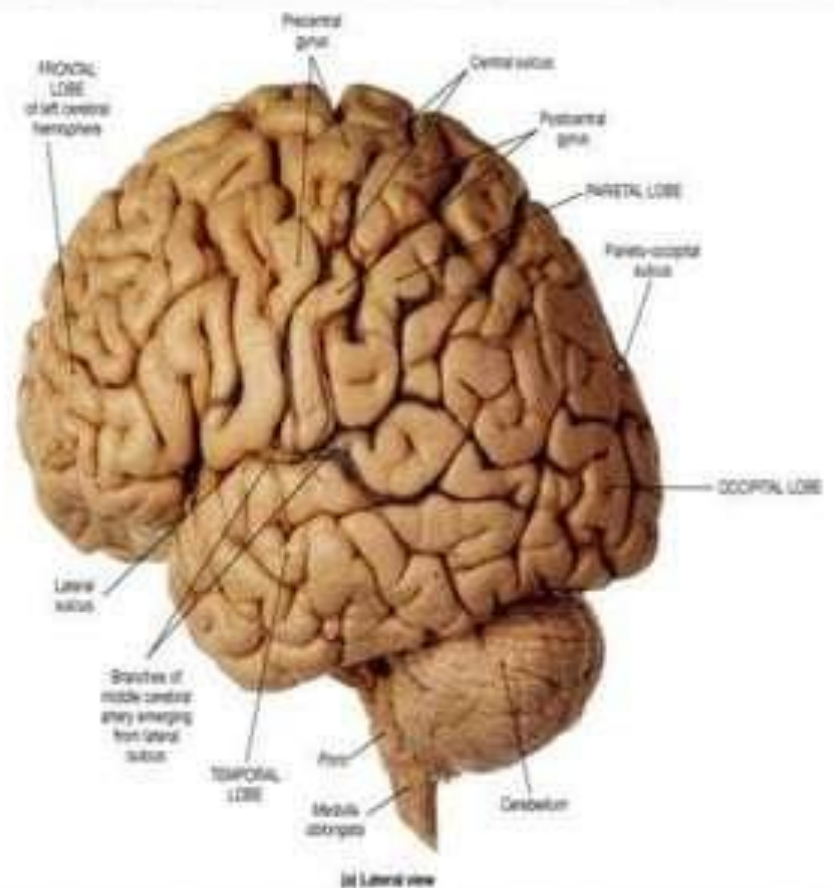
- Occipital lobe

- anteriorly

Imaginary line
drawn from
parieto-occipital
sulcus to
occipitotemporal
notch

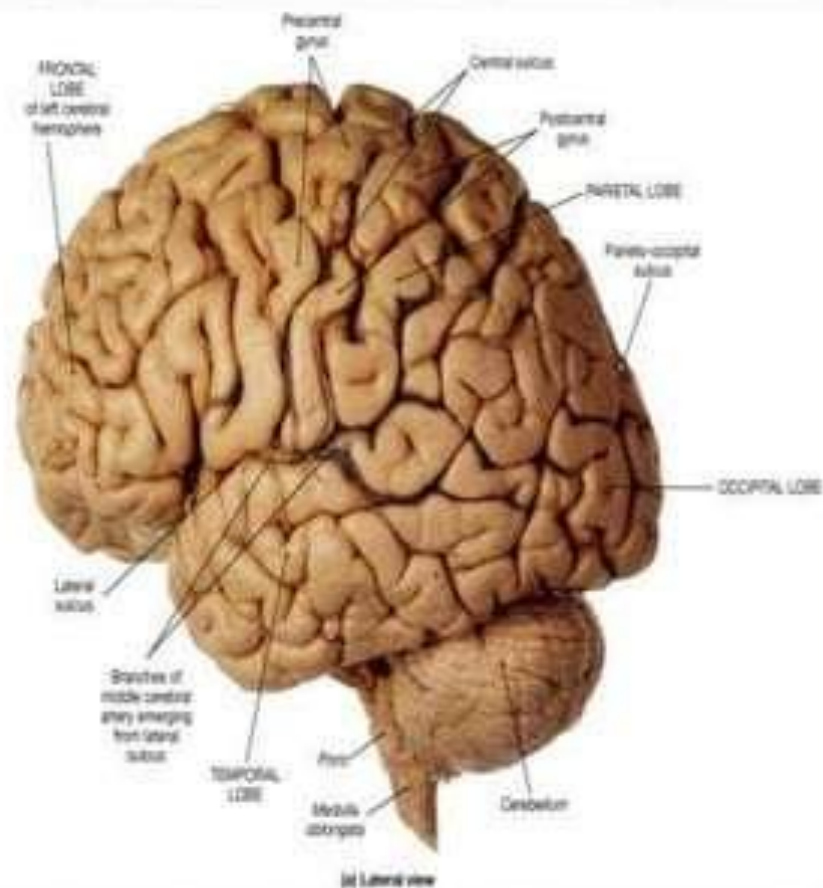
- posteriorly

occipital pole



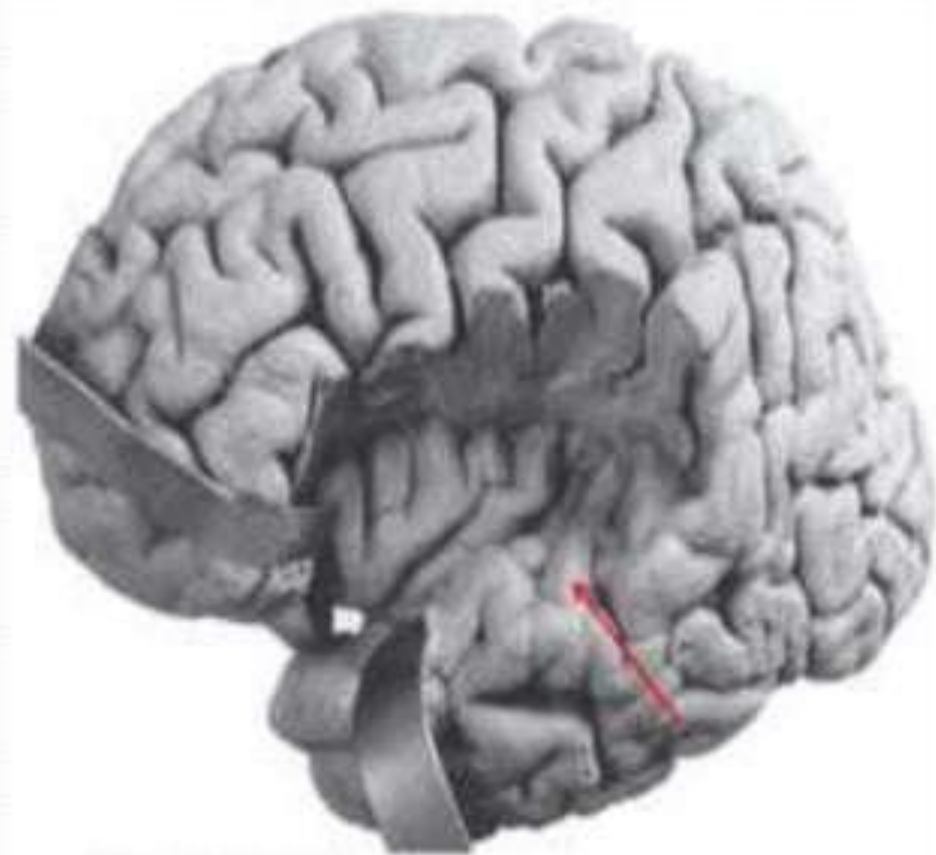
Occipital lobe, sulci and gyri

- Sulci
:lateral occipital sulci
- Gyri
:lateral occipital gyri



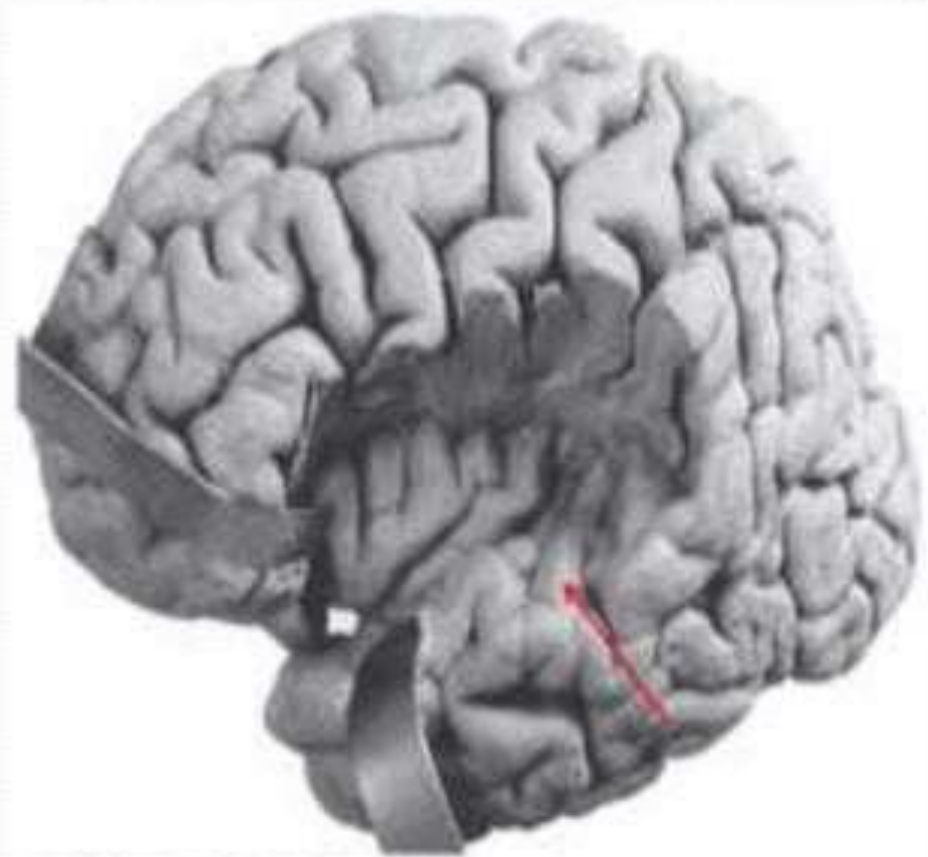
Insula/island of Reil

- Can be viewed only when sylvian fissure drawn apart or when opercular portions removed
- Triangular in shape
- Consists of apex and base
- Apex (limen insulae) directed downward and forward towards the sylvian fissure
- Base is broad and separated from frontal, parietal and temporal lobe



Insula/island of Reil, sulci and gyri

- Sulci
 - : longitudinal sulcus
 - : circular sulcus
- Gyrus
 - : gyrus longus
 - : gyrus brevis



Medial surface of cerebrum



visuals:unlimited

Medial surface, sulci

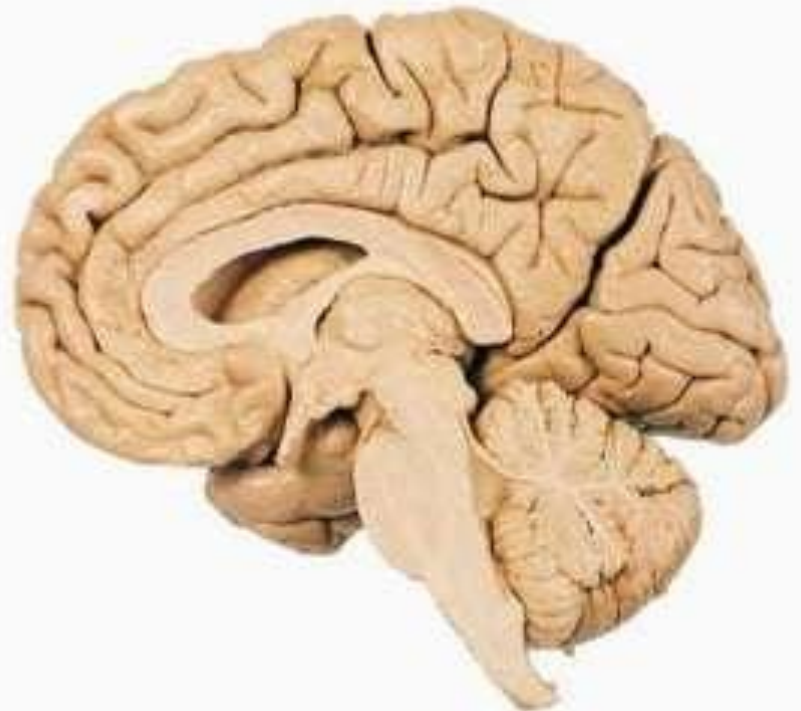
- Callosal sulcus
- Hippocampal sulcus
- Sulcus cingulli
 - : paracentral sulcus
 - : marginal sulcus
 - : sub-parietal sulcus
- Parieto-occipital sulcus
- Calcarine sulcus
- Collateral sulcus



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Medial surface, gyri

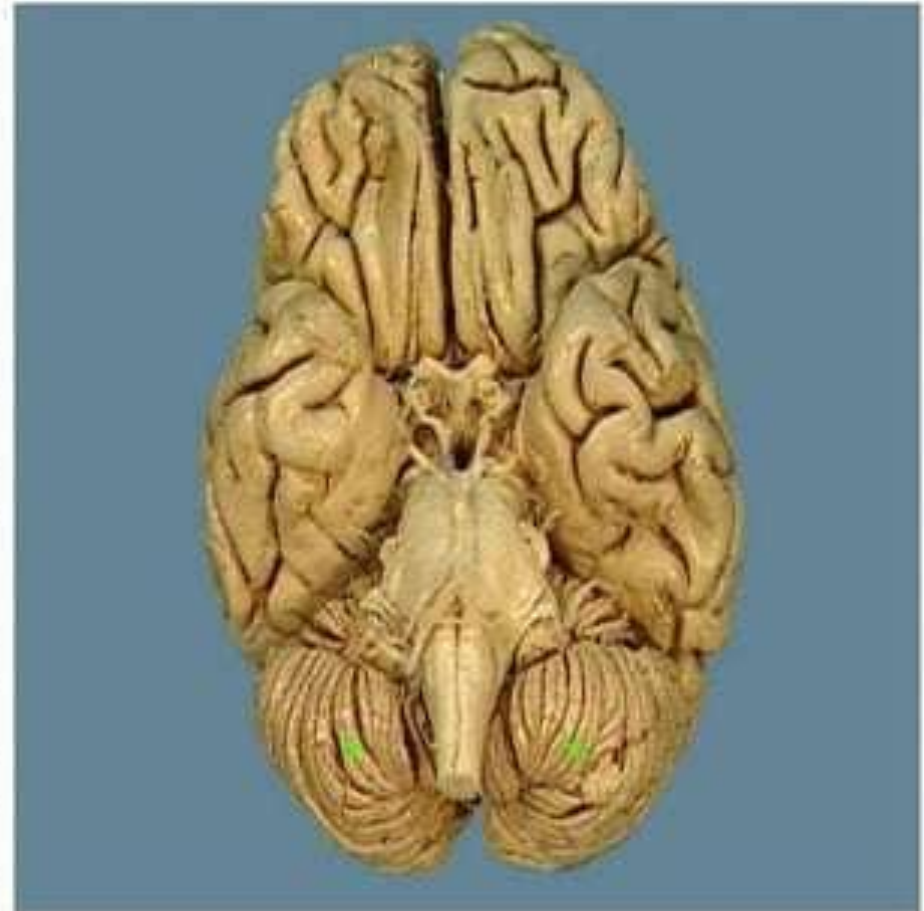
- Medial frontal gyri
:continuation of superior frontal gyrus
- Para-central lobule
:anterior to central sulcus is a continuation of pre-central gyrus
:posterior to central sulcus is a continuation of post central gyrus
- Pre-cuneus
:parietal lobe
- Cuneus
:occipital lobe
- Lingual gyrus
:occipital and temporal gyrus
- Cingulate gyrus
:limbic lobe
- Parahippocampal gyrus
- Area subcallosa
- Paraterminal gyrus



visuals:unlimited

Inferior surface of cerebrum

- Gyrus recti
- Orbital gyri
- Parahippocampal gyrus
- Occipito-temporal gyrus
- Inferior temporal gyrus



Pallium

- Outer Cerebral mantle/cerebral cortex/grey mater
- Inner cerebral mantle/Medullary substance/white mater

Outer Cerebral mantle/ cerebral cortex

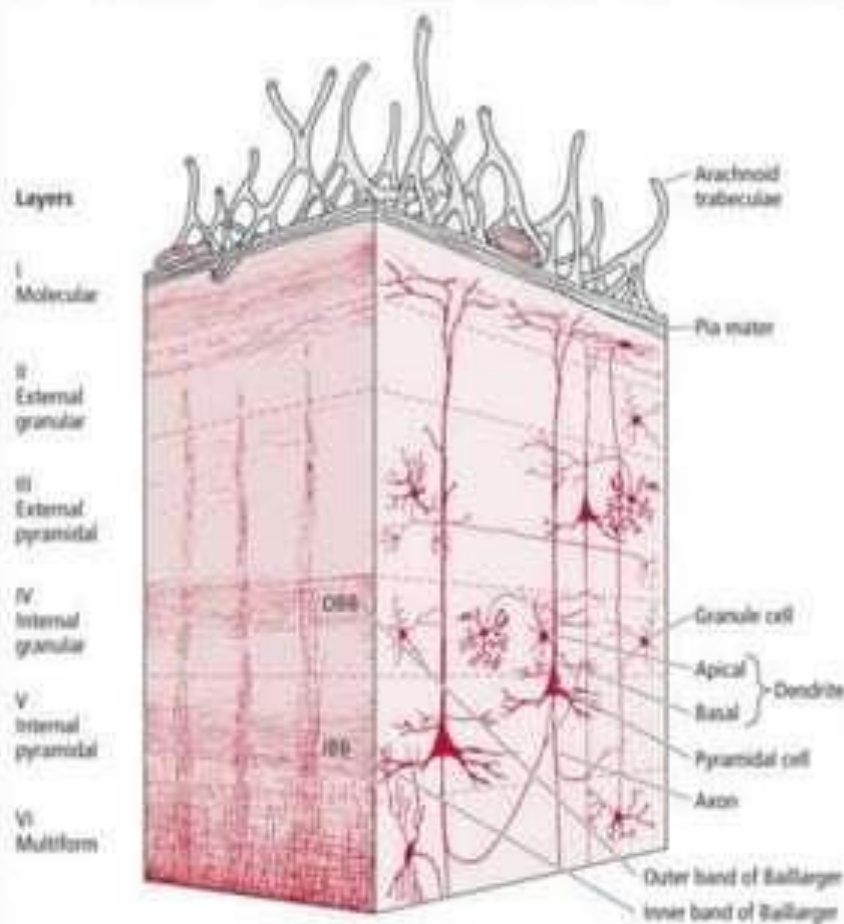
- Terminals of Afferent fibers from different parts of nervous system
- Association fibers
- Commissural fibers
- Projection fibers

Cortical cells

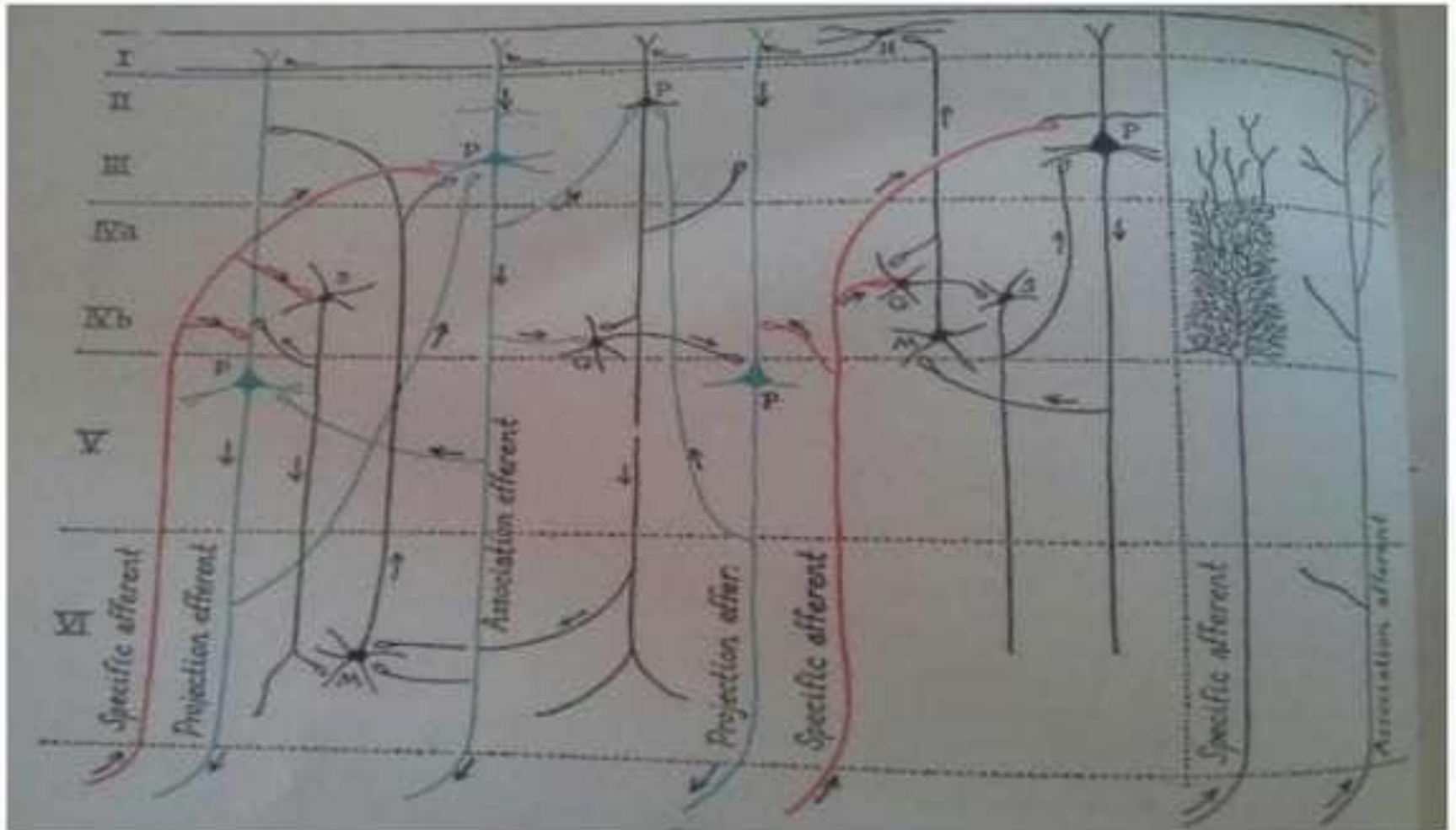
- Granule cell/stellate cell
- Pyramidal cell
- Fusiform cell/spindle cell
- Horizontal cell of cajal
- Cell of martinotti
- Basket cell
- Double bouquet cell
- Chandlier cell
- Neurogliform cell

Cortical layers

- 1 molecular layer
- 2 external granular layer
- 3 external pyramidal layer
- 4 Internal granular layer
- 5 Internal pyramidal layer
- 6 multiform layer



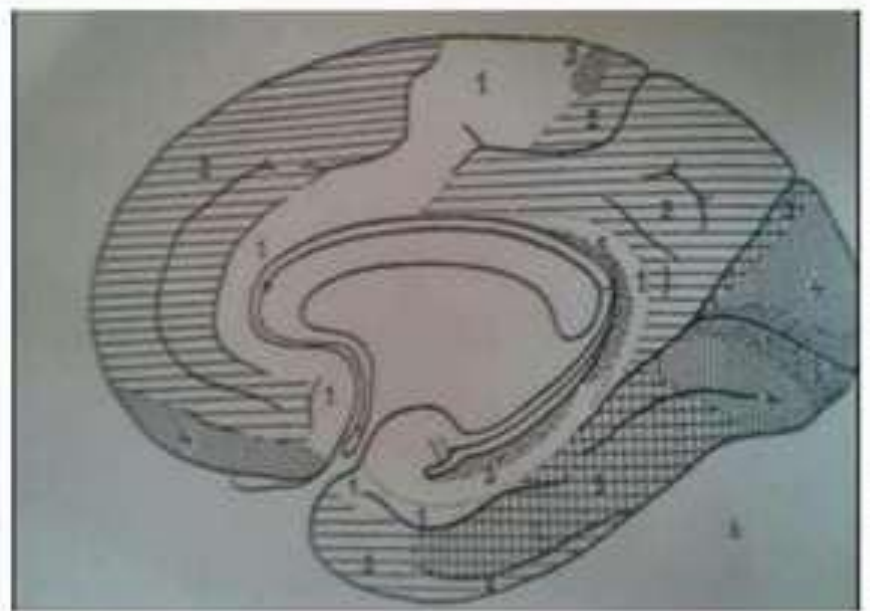
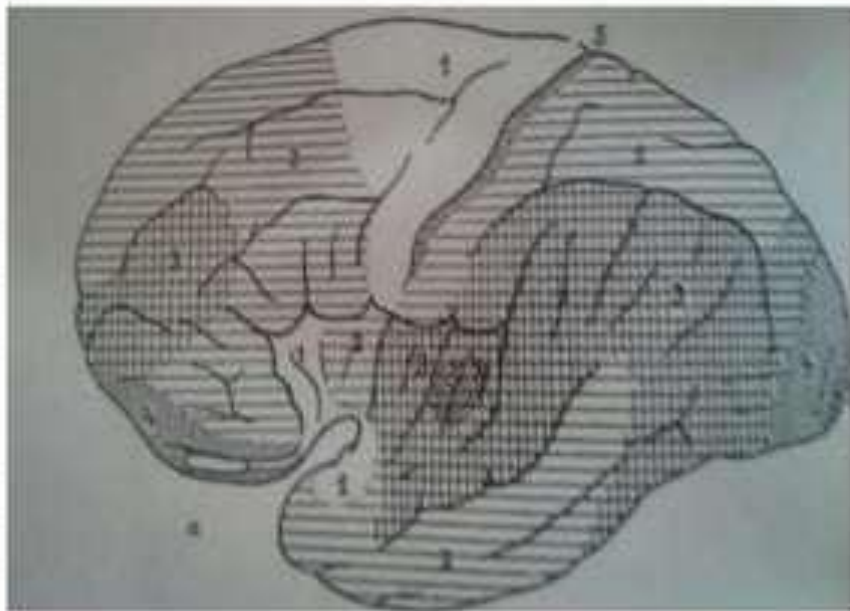
Intracortical circuit



Types of cortex

- Type 1 : agranular type cortex
- Type 2: frontal type cortex
- Type 3: parietal type cortex
- Type 4: polar type cortex
- Type 5: granulous typecortex/koniocortex

Types of cortex



Medullary substance

- Projection fibers
- Association fibers
- Commisural fibers

Projection fibers

- Afferent and efferent fibers forms corona radiata
- Converging towards the brain stem ,flanked medially by caudate and thalamus ,laterally by lentiform nucleus
- Anterior limb, genu, posterior limb, optic radiation
- Afferent fibers
 - : thalamocortical fibers
- Efferent fibers
 - : corticospinal tract
 - : corticobulbar tract
 - : frontopontine tract
 - : temporoparietopontine tract
 - : Corticothalamic fibers
 - :smaller efferent to corpus striatum, hypothalamus, substantia nigra, red nucleus, mid brain

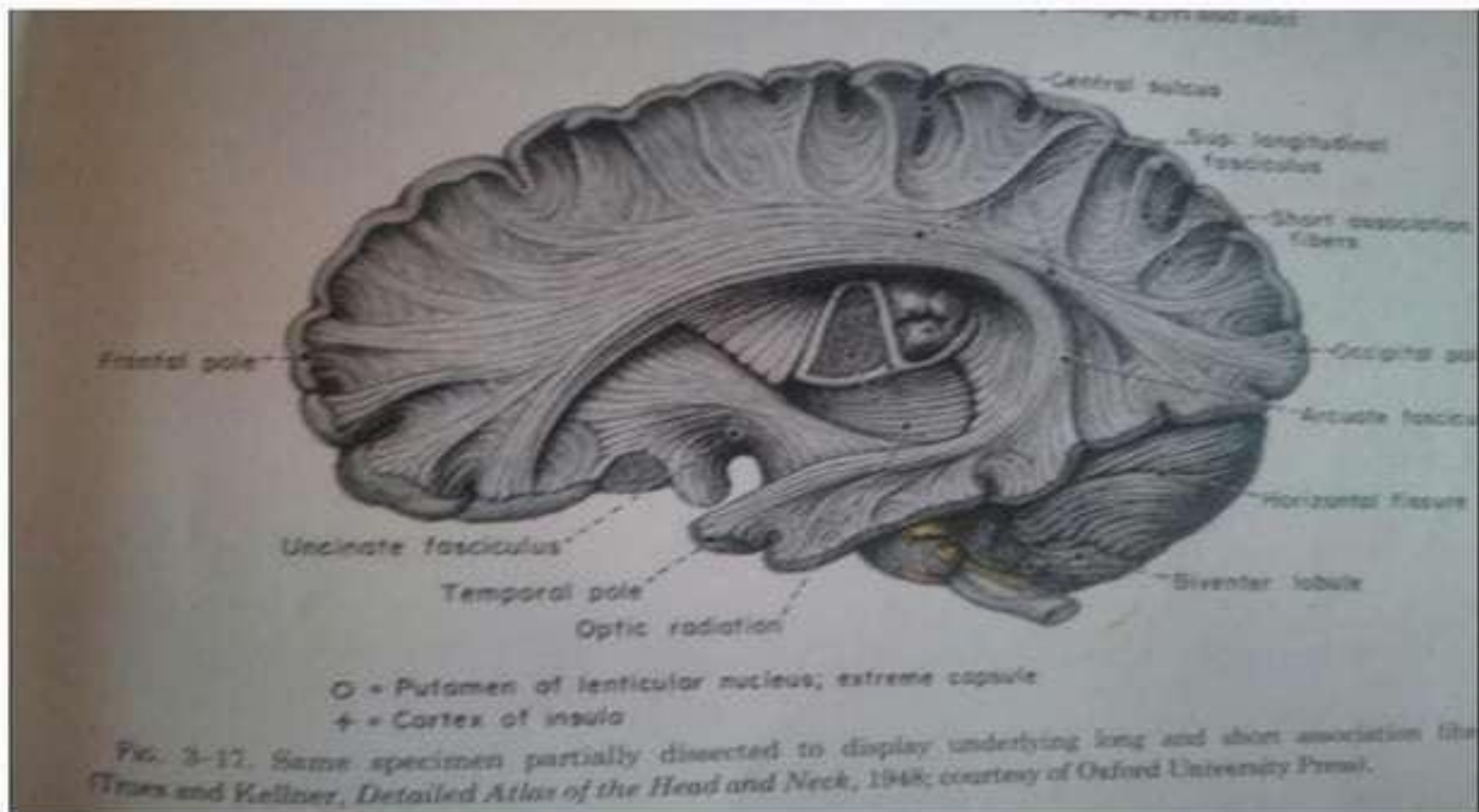
Association fibers

- Intracortical fibers
- Subcortical fibers
 - : short association fibers
 - : long association fibers

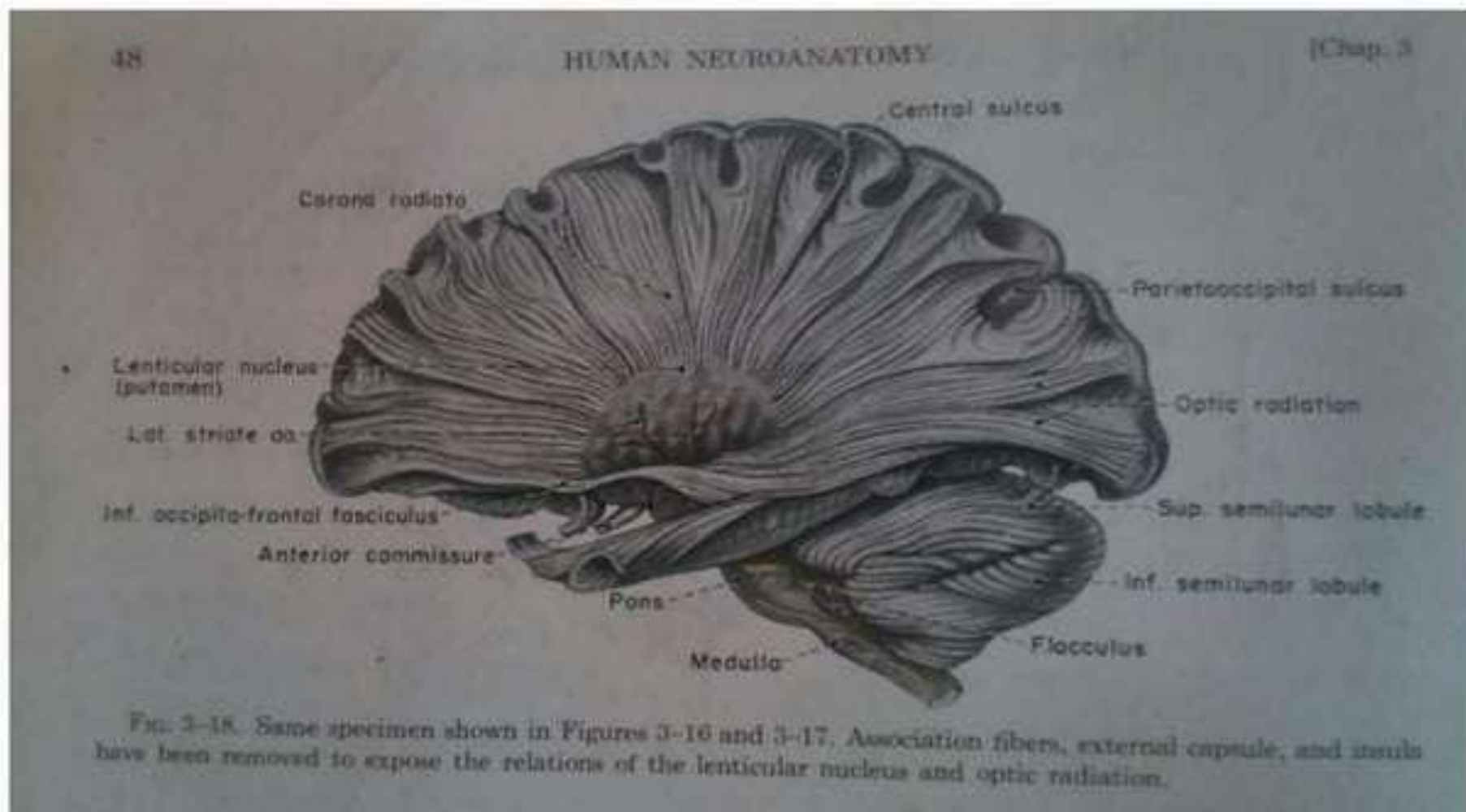
Long association fibers

- Uncinate fasciculus
- Inferior occipitofrontal fasciculus
- Arcuate fasciculus
- Superior longitudinal fasciculus
- Cingulum
- Vertical occipital fasciculus
- Inferior longitudinal fasciculus

Long association fibers



Long association fibers



Long association fibers

FIG. 3-20. Medial surface of left hemisphere showing principal gyri and sulci. The ependyma and part of the thalamic nuclei were removed to expose the relations of the anterior column of the fornix and the mammillothalamic tract.

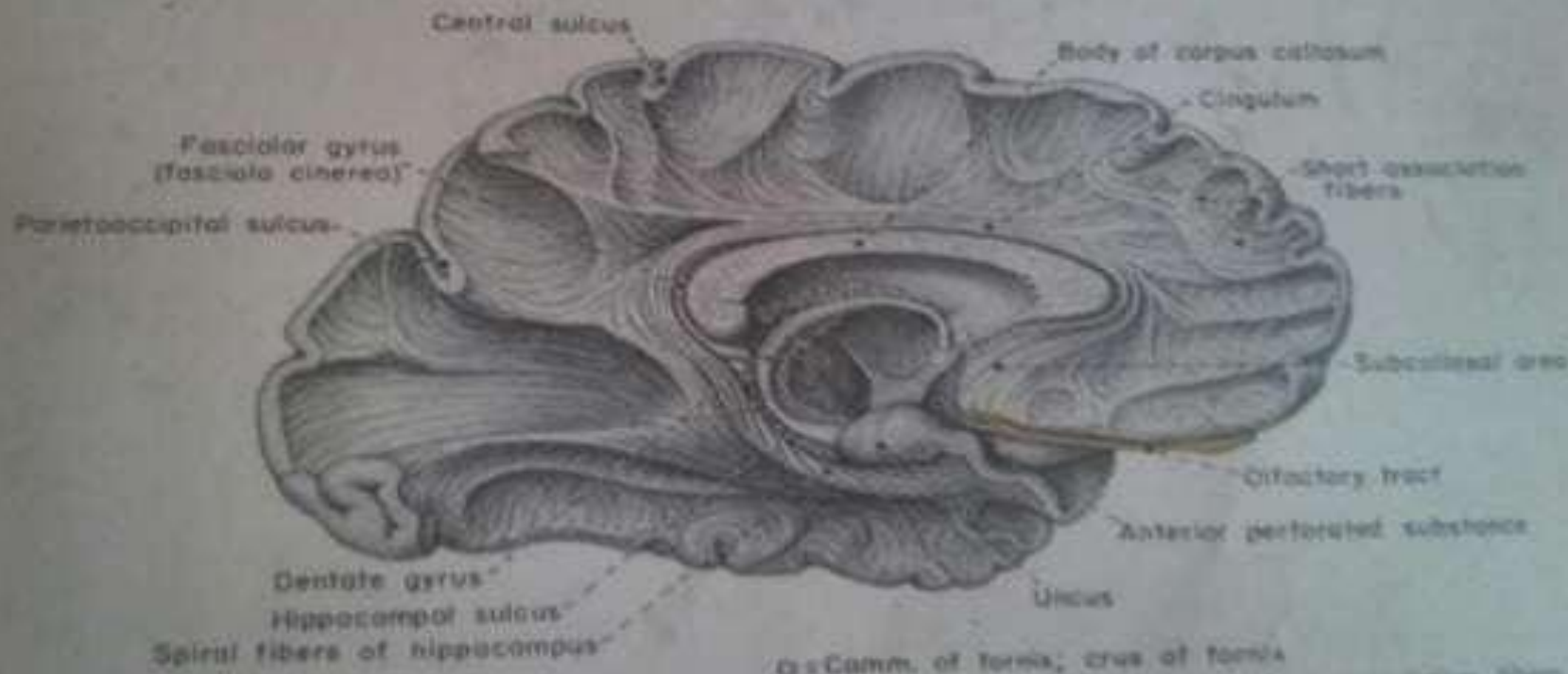


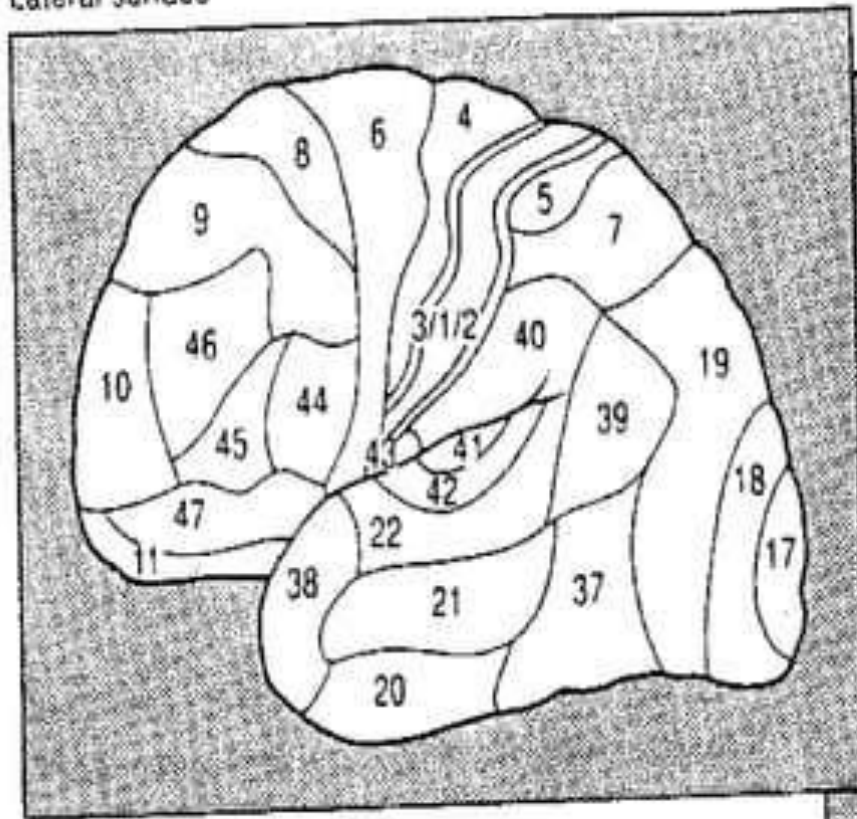
FIG. 3-21. Same specimen partially dissected to display underlying long and short association fibers. (Tenza and Keilner, *Detailed Atlas of the Head and Neck*, 1948, courtesy of Oxford University Press).

Commisural fibers

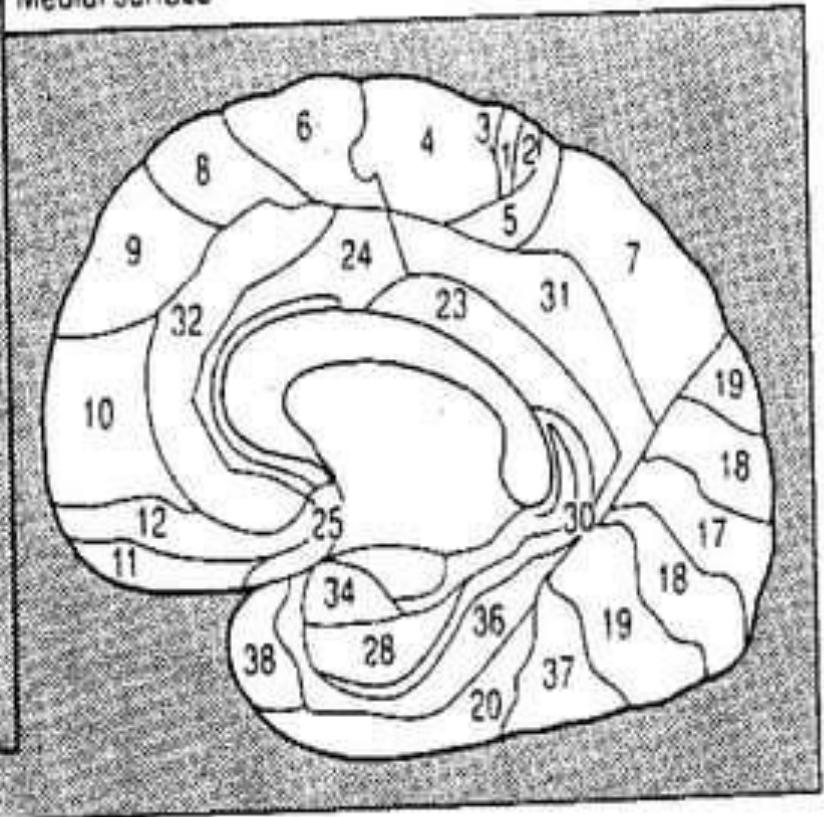
- Corpus callosum
- Anterior commissure
- Posterior commissure
- Habenular commissure
- Forniceal commissure

Broadman areas

Lateral surface



Medial surface



Cytoarchitectural areas of Brodmann.

Afferent cortical areas

- 1 primary sensory areas
- 2 secondary sensory areas

Primary sensory areas

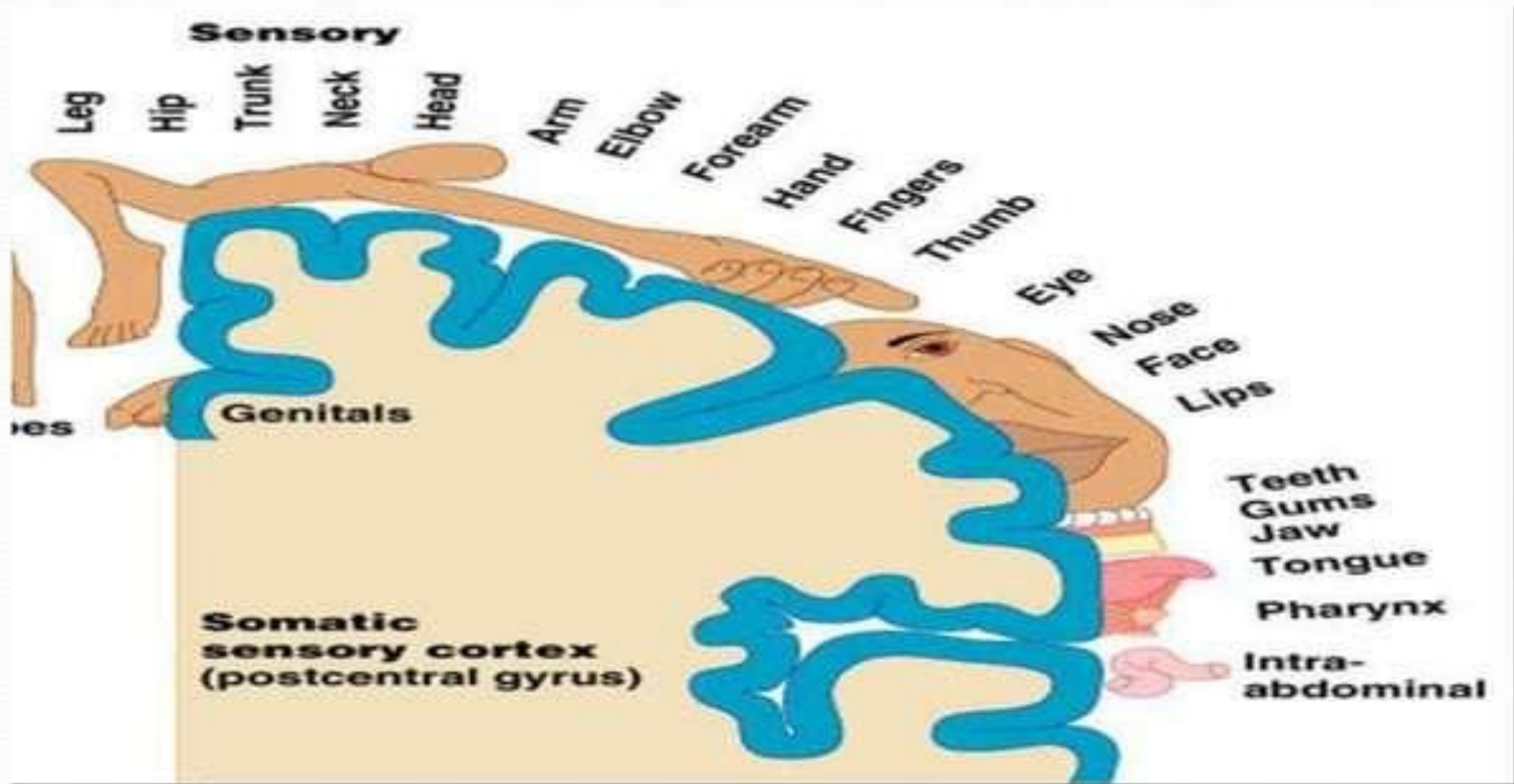
- Localised regions of cortex where impulses concerned with specific sensory modalities are projected
- All fibers reach these areas via thalamocortical fibers except olfaction

- 1 somesthetic area (area 3,1,2)
- 2 visual/striate area (area 17)
- 3 auditory area (area 41,42)
- 4 gustatory area (area 43)
- 5 olfactory area (prepyriform and periamygdaloid region)
- 6 vestibular projection (superior Temporal lobe rostral to auditory area)

Secondary sensory areas

- Cortical zones adjacent to primary sensory areas but outside but outside principle projection areas of specific sensory relay nuclei of thalamus
- 1 secondary somatic sensory area/somatic area II (ventral to primary sensory and motor area along the superior lip of sylvian fissure)
- 2 secondary auditory area/auditory area II (ventral to primary auditory area)
- 3 secondary visual area/visual area II (area 18,19)

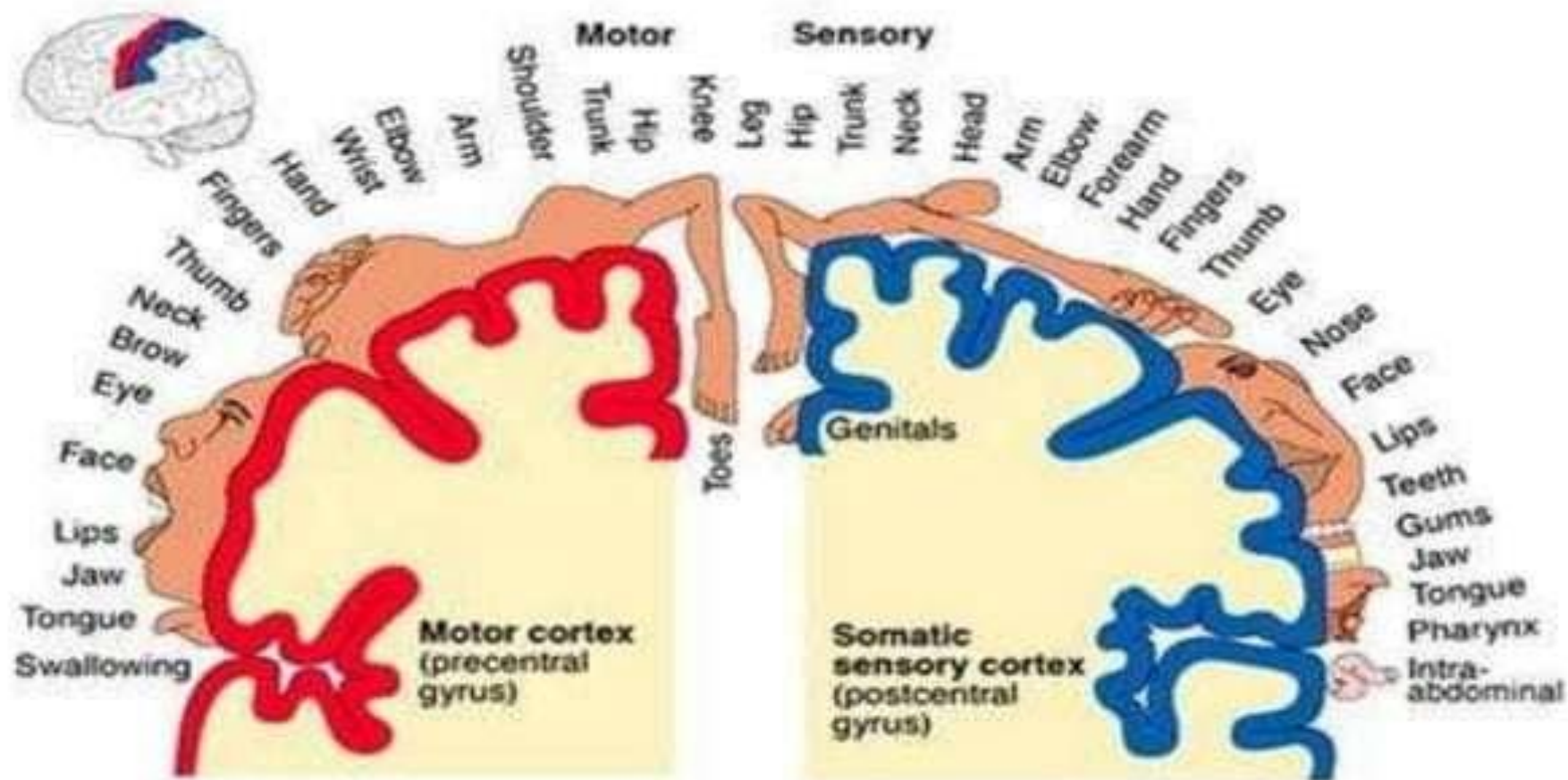
Somesthetic area



Efferent cortical areas

- Primary motor area (area 4)
- Premotor area (area 6)
- Supplimentary motor area (medial surface of superior frontal gyrus)
- Frontal eye field (area 8)

Motor homonculus



Cortical functioning

- AGNOSIA
- Failure to recognise
 - : tactile agnosia (lesion of supramarginal gyrus in left cerebral hemisphere)
 - : aesterognosis/somato sensory agnosia
 - : visual agnosia (lesion of lateral visual association area in the dominant hemisphere)
 - : alexia (interruption in pathways conveying ompulse from visual cortex to dominant side angular gyrus)
 - : auditory agnosia/word deafness (lesion of superior temporal convolution posteriorly,area 22)
 - : cerebral achromasia
 - : anosognosia
 - : right left disorientation
 - : finger agnosia

Aphasia

- Receptive and expressive disturbances in faculty of using signs and signals to communicate
- Wernicks aphasia
- Brocas aphasia
- Conductive aphasia
- Transcortical sensory aphasia
- Transcortical motor aphasia

apraxia

- Kinetic apraxia
- Ideomotor apraxia
- Ideational apraxia
- Constructional apraxia
- Gait apraxia
- Apraxia of speech

Gerstmann syndrome

- Finger agnosia
- Right-left disorientation
- Agraphia
- acalculia

References

- Human neuroanatomy, carpenter and truex
- Human neuroanatomy, albert rhoton junior
- Snells neuroanatomy
- Neurological examination made easy, geraint fuller

