Gyri & Sulci – Lateral View
Gyri & Sulci – Inferior view (Frontal Lobe)
Gyri & Sulci - Insula

Central sulcus of insula
Circular sulcus of insula
Insula
  Short gyri
  Limen
  Long gyrus
Gyri Blood Supply Division

“Clinical Significant – Stroke”
Brodmann’s Areas

Brodmann’s areas

[Image of a detailed brain diagram with various regions labeled from 1 to 46]
Clinically Important Brodmann’s Areas

- area 4 → MI [precentral gyrus]
- area 6 → MP [posterior at Frontal gyrus]
- area 8 → FEF [posterior at medial Frontal gyrus]
- area 3, 1, 2 → SI [postcentral gyrus]
- area 40 → SII [superior at lateral fissure]
- area 17 → VI [around calcarine sulcus]
- 18, 19 → VII
- area 41, 42 → A1 [lateral fissure]
- 22 → AII
- area 43 → G [posterior central gyrus]
- area 51 → G [olfactory Bulb]
- area 7, 5, 38 [limbic]
- area 44, 45 → Broca’s [Interior Frontal gyrus]
- area 22, 39, 40 → Wernicke’s [Parieto-occipital region]
Brain Internal Structures

Cortex of frontal lobe
Genu of corpus callosum
Cavity of septum pellucidum
Fornix
Internal capsule
Choroid plexus of lateral ventricle
Putamen of lentiform nucleus
Cavity of third ventricle
Inferior horn of lateral ventricle
Pulvinar of thalamus
Posterior horn of lateral ventricle
Cortex of occipital lobe
Vermis of cerebellum
Fimbria of fornix
Superior colliculus
Inferior colliculus
Pineal body
Region of habenular nucleus
Thalamus
Interthalamic connection
Posterior commissure
Cortex of temporal lobe
Stria medullaris thalami
Anterior commissure
Head of caudate nucleus
Cavity of caudate nucleus
Corpus callosum
Fornix
Superior colliculus
Anterior thalamo tubercle
Frontal pole
Cerebellum
Internal Capsule & Corona Radiation

Illustrating Scheme
Internal Capsule & Corona Radiation

“After Dissecting out The Cortex”
Ventricle – Coronal Section

- Lateral ventricles
- Interventricular foramen
- Third ventricle
- Inferior tip of lateral ventricle
- Aqueduct of midbrain
- Fourth ventricle
- Central canal
- Corpus callosum
- Septum pellucidum
- Cerebellum
Ventricles – CSF Circulation

1. The choroid plexus of each ventricle produces CSF.
2. CSF flows through the ventricles and into the subarachnoid space via the median and lateral apertures.
3. CSF flows through the subarachnoid space over brain and spinal cord.
4. CSF is absorbed into the dural venous sinuses via the arachnoid villi.
Choroid Plexus & its Blood Supply
Ventricles – CT

Normal Anatomy

A. Falx Cerebri
C. Body of the Lateral Ventricle
E. Parietal Lobe
G. Superior Sagittal Sinus

B. Frontal Lobe
D. Splenium of the Corpus Callosum
F. Occipital Lobe
Ventricles – Hydrocephalus
Brain Sections – Sagittal

- Central sulcus
- Precentral gyrus
- Postcentral gyrus
- Corpus callosum
- Septum pellucidum
- Interventricular foramen
- Frontal lobe
- Anterior commissure
- Optic chiasm
- Mamillary body
- Temporal lobe
- Pons
- Mesencephalon
- Medulla oblongata
- Cerebellum
- Fourth ventricle
- Parieto-occipital sulcus
- Pineal gland
- Hypothalamus
- Superior colliculus
- Inferior colliculus
- Mesencephalic aqueduct
- Cerebellum
Brain Sections – Sagittal

- Corpus callosum
- Parietal lobe
- Septum pellucidum
- Anterior commissure
- Anterior cerebral artery
- Frontal lobe
- Optic chiasm
- Optic nerve
- Infundibulum (cut)
- Tuberal area
- Mamillary body
- Fornix
- Choroid plexus
- Right thalamus
- Pineal gland
- Hypothalamus
- Cerebellum
- Mesencephalic aqueduct
- Fourth ventricle
Brain Sections – Sagittal

- Corpus Callosum
- Frontal Lobe
- Parietal Lobe
- Occipital Lobe
- The Tentorium

120 mm
Brain Sections – Sagittal
Brain Sections – Sagittal
Brain Sections – Coronal

- Head of Caudate Nucleus
- Body of Corpus Callosum
- Anterior Limb of Internal Capsule
- Putamen
- External Capsule
- Claustrum
- Optic Nerve
- Optic Chiasm
- Column of Fornix
Brain Sections – Coronal
Brain Sections – Coronal
Brain Sections – Coronal
Brain Sections – Axial (Transverse)
Brain Sections – Axial (Transverse)
Brain Sections –
Axial
(Transverse)
Brain Sections – Axial (Transverse)
Brain Sections – Axial (Transverse)
Brain Sections – Axial (Transverse)
Brain Sections – Axial (Transverse)
Brain Hernias
Association, Commissural, Projectory Fibers:

- Short U.I. association fibers
- Cingulum
- Corona radiata
- Internal capsule
- Lateral geniculate nucleus
- Thalamus
- Hypothalamic nuclei
- N. geniculo-cortical
- Optic radiation
- Habenular commissure
- Hypothalamic commissures
- Posterior commissure
Two thalami on each side of slit like cavity of 3\textsuperscript{rd} ventricle

3 cms length x 1.5 cms breadth

Long axis 30 deg. oblique to midline

Interthalamic adhesion
Thalamus - Nuclei

Main connections of Thalamus

- Cingulate gyrus
- Prefrontal cortex
- Somesthetic sensory area (2, 1, 2)
- Parietal cortex
- Inferior parietal lobule
- Sup. Cereb. Peduncle
- Dentate Nucleus
- Sup. Sens. N. of Trigeminal
- N. of spinal tract of Trig. nerve
- Dorsal nerve root

Nuclei

- Thalamic nuclei
  - Ventral anterior nucleus
  - Ventral posterior nucleus
  - Ventro-lateral nucleus
  - Pulvinar nucleus
  - Medial geniculate nucleus
  - Lateral geniculate nucleus
  - Arcuate nucleus
  - Medial nucleus
  - Massa intermedia
  - Internal lamina
  - Lateral posterior nucleus
  - Lateral dorsal nucleus
  - Anterior nucleus

Connections

- Spinal lemniscus (Spinothalamic tract)
- Trigeminal lemniscus
- Medial lemniscus
- VPL
- VPM
- RN
- MB

Other structures

- Hypothalamic Nuclei
- Amygdaloid body
2. Neuronal Thalamus:

- Function: Processing & Distribution Center - Cortex 
- Involved in: Consciousness, sleep, memory, sensorimotor activity

<table>
<thead>
<tr>
<th>Input</th>
<th>Thalamic Nuclei</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammillothalamic tract</td>
<td>A - Anterior</td>
<td>Cingulate gyrus</td>
</tr>
<tr>
<td>Hippocampus</td>
<td>LD - Laterodorsal</td>
<td>Motor areas</td>
</tr>
<tr>
<td>Basal Ganglia</td>
<td>NA - Ventromedial</td>
<td>Somatosensory cortex</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>VL - Ventrolateral</td>
<td>Insula</td>
</tr>
<tr>
<td>Medial lemniscus</td>
<td>VPL - Ventral Posterior Lateral</td>
<td>Auditory Cortex</td>
</tr>
<tr>
<td>Spinothalamic tract</td>
<td>VPM - Ventral Posterior Medial</td>
<td>Visual Cortex</td>
</tr>
<tr>
<td>Central tegmental tract</td>
<td>GM - Medial Geniculate</td>
<td>Auditory Cortex</td>
</tr>
<tr>
<td>Lateral geniculate</td>
<td>GL - Lateral Geniculate</td>
<td>Visual Cortex</td>
</tr>
</tbody>
</table>

II. Association Type

- Frontal Cortex | DM - Dorsomedial | Prefrontal Cortex |
- Amygdala/Limbic | LP - Lateral Posterior | Parietal lobe |
- Parietal lobe | PULV - Pulvinar | Occipital lobe |
- Occipital lobe | | Temporal lobe |
- Temporal lobe | | Motor Cortex |
- Basal Ganglia | CM - Centromedial | Sensation |
3. Nuclei of Hypothalamus:

- Tuberal Region
  - Mammillary Region
  - Chiasmatic Region
  - Suprachiasmatic (Master Clock) Circadian Cycle

- Neurohypophysis
  - Anterior Pituitary
  - Posterior Pituitary

- Hypothalamic Areas:
  - Paraventricular
  - supraoptic
  - mammillary

- Suprachiasmatic
  - Ventromedial
  - Paraventricular
  - supraoptic

- Functions:
  1. Lateral Zones
     - Regulate water & food intake
  2. Chiasmatic Region
     - Cardiovascular Function, Circadian Rhythm, Body Temp.
  3. Tuberal Region
     - Satiation Center, Deliver peptides to portal vessels
  4. Mammillary Region
     - Memory Formation, BP/pupillary dilation/conservation of heat
Circuits at Basal Ganglia:

- Main Circuit
  - Sensorimotor Circuits
    - Supplementary Circuits
      - Subthalamic Circuit
      - Striato-nigral Circuit
      - Striato-pallido-subthalamic
      - Pallido-thalamic
      - Thalamo-thalamic

- D1: Direct pathway → Facilitates movement
- D2: Indirect pathway → Inhibits movement

Function: Coordination of movement

Disorders → Parkinson's
Hereditary
Hypokinesia & Hyperkinesia
Dystonia
5) Limbic Circuit of Papez:

- Cingulate Gyrus
- Dorsal raphe
- Hypothalamus
- Hippocampus
- Subicular

Function: Motivation & Feeling, Learning & Memory

- Nocortex - Hippocampal Formation
  - Primary Sensory areas [SI, AI, VI]
  - Associated Cortical areas [SII, AII, VII]
  - Gyrius Cinguli & gyrus parahippocampalis [28, 35, 36]
  - Hippocampus [Hippocampal Formation]
Chemical System of Brain:

I. Cholinergic System:
- ACh → cortical neurons stimulation
- improves circulation
- supports memory
- supplied by:
  - Hippocampus
  - Amygdala
  - Neocortex
  - Thalamus

II. Monoaminergic System:
- Noradrenergic:
  - Function: Regulation of transmission of sensory signals, regulation of expectation
  - Essential for categorizing
  - Supplies: spinal cord, brainstem, sensory cranial N, cerebellum, pontine nuclei, thalamus (VPL, VPM, geniculate body), hippocampus, fornix
- Dopaminergic:
  - Function: Motivation, reward system
  - Supplies: substantia nigra, compact part of striatum, globus pallidus, neocortex
- Serotoninergic:
  - Function: Analgesia in descending system, treatment of TBS, t.HR, constipation, unconsciousness
  - Supplies: raphe, medianeminence, mesencephalon

III. Glutamatergic System:
- Excitatory
- Mediates neural pathways
- Commissoned pathways
- Ascending and descending pathways
- Associated with memory, learning, and cerebellar pathways

IV. GABAergic System:
- Inhibitory neurotransmitter
- Local neurotransmitters at neopallium, hippocampus, thalamus, cerebellum
- Local neurotransmitters at globus pallidus, striatum, pontine nuclei

VI. Note Guide:
- Catecholamine neurotransmitter
- Local interactions
- Neurotransmitter release
- Vasodilation
- Neurodegenerative disorders
[Longitudinal Systems of Reticular Formation]