The Brain
Frontal section through skull showing the cranial meninges

DURA MATER:
- Periosteal layer
- Meningeal layer
- Subarachnoid space
- Arachnoid villus

FALX CEREBRI

Superior sagittal sinus

CRANIAL MENINGES:
- Parietal bone cranium
- Dura mater
- Arachnoid
- Pia mater
- Cerebral cortex

Skin

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(b) Frontal section of brain and spinal cord
Lateral ventricle's choroid plexus → Lateral ventricles
- Through interventricular foramina

Third ventricle's choroid plexus → Third ventricle
- Through cerebral aqueduct

Fourth ventricle's choroid plexus → Fourth ventricle
- Through lateral and median apertures

Subarachnoid space

Arachnoid villi of dural venous sinuses

Arterial blood
Venous blood

Heart and lungs

(c) Summary of the formation, circulation, and absorption of cerebrospinal fluid (CSF)
Medulla Oblongata

- Regulates heartbeat and respirations
- Blood vessel diameter
- Decussation
- Reflexes:
  - Swallowing
  - Vomiting
  - Coughing
  - Sneezing
  - Hiccuping
The Pons

- Relays impulses
- Pneumotaxic area
- Apneustic area
Reticular Activating System (RAS)

- Extends from the upper spinal cord up to the lower diencephalon.
- Helps maintain consciousness.
- Arouses the cerebral cortex to wake us up.
- Aids in muscle tone.
- Acts as a filter for extraneous sights and sounds.
Midbrain

- Movements of the eyeballs
- Visual reflex
- Auditory reflex
Thalamus

• Sensory relay system
• Interprets pain, temperature, light touch and pressure sensations.
• Some function in emotions and memory.
(a) Lateral view of right cerebral hemisphere
(b) Medial view of left cerebral hemisphere

(c) Superolateral view of thalamus showing locations of thalamic nuclei (reticular nucleus is shown on the left side only; all other nuclei are shown on the right side)

(d) Transverse section of right side of thalamus showing locations of thalamic nuclei
Functions of the Hypothalamus

- Controls autonomic system – smooth muscles, cardiac muscle, glands.
- Visceral sensory impulses
- Controls pituitary
- Mind over body phenomena
- Feelings of rage and aggression
- Controls body temperature
- Regulates food intake – satiety center
- Thirst center – control of kidneys
- Maintains waking state
- Biological rhythms / circadian rhythms
(b) Anterior view of frontal section
Sagittal section of brain showing hypothalamic nuclei

Intermediate mass of thalamus
Dorsomedial nucleus
Posterior hypothalamic nucleus
Ventral medial nucleus
Mammillary body

Corpus callosum
Paraventricular nucleus
Lateral preoptic nucleus
Medial preoptic nucleus
Anterior hypothalamic nucleus
Suprachiasmatic nucleus
Supraoptic nucleus
Optic nerve (cranial nerve II)
Regions of the Thalamus

• Epithalamus – consists of the pineal gland and the habenular nuclei. Pineal secretes melatonin. Nuclei have emotional responses to odors.
• Subthalamus – help to control body movements.
• Circumventricular organs – monitor chemical changes in the blood. Coordinate homeostatic activities.
Transverse section and anterior surface of medulla oblongata

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Habenular nuclei
Pineal gland
Superior colliculi
Inferior colliculi
Median eminence
Floor of fourth ventricle
Posterior median sulcus
Cuneate fasciculus
Gadicle fasciculus

Third ventricle
Thalamus
Lateral geniculate nucleus
Medial geniculate nucleus
Cranial nerve IV (trochlear)

Superior cerebellar peduncle
Middle cerebellar peduncle
Inferior cerebellar peduncle
Cranial nerve VII (facial)
Cranial nerve VIII (vestibulocochlear)
Cranial nerve IX (glossopharyngeal)
Cranial nerve X (vagus)
Cranial nerve XI (accessory)
Spinal nerve C1

(a) Posterior view of midbrain in relation to brain stem

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(b) Transverse section of midbrain
(a) Superior view

(b) Inferior view

(c) Midsagittal section of cerebellum and brain stem
Functions of the Cerebellum

• Muscle Tone
• Posture
• Equilibrium
• Smooth coordinated movements
• Predicting a future body position
(c) Midsagittal section of cerebellum and brain stem
(e) Oblique section of brain

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Lobes of the Cerebrum

- Frontal
- Parietal
- Temporal
- Occipital
- Limbic
- Insula
Medial view of tracts revealed by removing gray matter from a midsagittal section.
Lateral ventricle
Thalamus
Tail of caudate nucleus
Occipital lobe of cerebrum
Body of caudate nucleus
Frontal lobe of cerebrum
Putamen
Head of caudate nucleus
Amygdala

(a) Lateral view of right side of brain

14.13a
Basal Ganglia

- Includes globus pallidus, putamen and caudate nuclei.
- Help to regulate initiation and termination of movements.
- Control subconscious movements of skeletal movements.
- Laughing.
- Area is affected by Parkinson’s disease and may play a role in obsessive compulsive disorders, anxiety, and schizophrenia.
The Limbic System

- Anterior nucleus of thalamus
- Mammillothalamic tract
- Corpus callosum
- Cingulate gyrus (in frontal lobe)
- Anterior commissure
- Mammillary body in hypothalamus
- Septal nuclei
- Olfactory bulb
- Amygdala
- Parahippocampal gyrus (in temporal lobe)

View

Sagittal plane

POSTERIOR

Sagittal section

ANTERIOR
Functions of the Limbic System

• Short term memory
• Emotions: pleasure and pain, rage, tameness, affection, docility, anger, fear, sorrow, and sexual feelings.
• Hippocampus plays a role in depression and is the major section to move memories from short term to long term.
Brodemann’s Classification
The Insula

- A triangular brain area of the cerebrum beneath the other major lobes.
- Integrates cerebral activities
- Some function in memory
Brodemann’s sites to learn

- Primary visual area
- Visual association
- Somatosensory area
- Primary sensory area
- Primary motor area
- Wernicke’s area
- Broca’s area
More on Brodemann’s

• Gustatory area
• Primary auditory area
• Auditory association area
• Prefrontal lobe
(a) Frontal section of primary somatosensory area in right cerebral hemisphere

(b) Frontal section of primary motor area in right cerebral hemisphere
The EEG

- Alpha = relaxing
- Beta = thinking
- Theta = stress
- Delta = deep sleep
Terms

- Concussion
- Contusion
- Aphasia
- CVA (cerebrovascular accident)
- TIA (transient ischemic attack)
- Alzheimer’s disease
- Agnosia
- Apraxia
More Terms

- Delirium
- Dementia
- Senility
- Encephalitis
- Lethargy
- Stupor
- Ataxia