LEC 1A
ANATOMY OF THE NERVOUS SYSTEM

Cogs 17  *  UCSD
Consciousness – “The Hard Problem”
Mid-Sagittal Section

- Cingulate gyrus
- Frontal lobe
- Corpus callosum
- Hypothalamus
- Pituitary gland
- Pons
- Medulla
- Spinal cord
- Cerebral cortex
- Parietal lobe
- Thalamus
- Occipital lobe
- Superior & inferior colliculi
- Tegmentum
- Cerebellum
- Central canal of spinal cord
- Mid-brain
Planer Views of the Brain

- Sagittal plane
- Horizontal plane
- Coronal plane
- Cross section
Planer Views of the Brain

Coronal

Saggital

Horizontal
Lateral & Medial
Dorsal & Ventral

In Humans,
"Dorsal" = TOP of Brain & REAR of Spinal Cord
"Ventral" = BOTTOM of Brain & FRONT of Spinal Cord
Bilateral Structure
Nervous System duplicated on right & left
**Ipsi-lateral** (same side) and **Contra-lateral** (opposite side) Connections

- **Ipsi-lateral connections**
  - Motor homunculus on primary motor cortex of left cerebral hemisphere
  - Corticobulbar tract
  - To face and tongue muscles
  - To face and tongue muscles
  - Corticospinal tract
  - Medulla
  - Ventral corticospinal tract
  - Spinal cord
  - To distal limbs
  - To trunk and leg muscles

- **Contra-lateral connections**
Support Structures: The **Meninges**
Surrounds CNS under bone

![Diagram of the meninges with labels for dura mater, arachnoid, pia mater, and subarachnoid space. The space is filled with cerebral spinal fluid, which acts as a shock absorber.](image-url)
Ventricles

Produce, and filled with, Cerebral Spinal Fluid (CSF)
Hydrocephalus

If CSF does not drain properly, can build up in Ventricles
Blood Vessels in Brain

Brain = 2% of body weight, uses 20% of blood supply!
Blood-BRAIN Barrier

Exercising tight controls over what enters brain from bloodstream
Blood-Brain Barrier

Exercising tight controls over what enters brain from bloodstream
CNS & PNS

**CNS**
Central Nervous System

= Brain & Spinal Cord

Surrounded by bone and meninges

**PNS**
Peripheral Nervous System

SOMATIC System
= Interaction w/external env.

AUTONOMIC System
= Regulates internal env.
Mid-Saggital Section
including.... HINDBRAIN

Medulla oblongada  Pons  Cerebellum
Brainstem

Figure 4.12  The human brainstem
HINDBRAIN: Medulla

Medulla oblongada - Primal reflexes

Figure 4.12 The human brainstem
HINDBRAIN: Pons

Figure 4.12 The human brainstem
Brainstem

Most Cranial Nerves also enter/exit Medulla & Pons

Figure 4.12 The human brainstem
HINDBRAIN: Cerebellum

Motor Programs
w/ realtime sensory coordination
HINDBRAIN: Cerebellum

MNEMONIC:

Sarah the ballerina has a hell of a cerebellum!
MIDBRAIN

Superior Colliculus (Visual Motion)

Inferior Colliculus (Auditory Motion)

Figure 4.12 The human brainstem
MIDBRAIN

Motor Pathways & some Cranial Nerves

Figure 4.12 The human brainstem
MIDBRAIN

**MIDBRAIN MNEMONIC:**

Tectum, up top, sensory colliculi
Tegmentum for motor down below

*Figure 4.12 The human brainstem*
Diencephalon of Forebrain: THALAMUS

Projects to/Receives from Sensory, Motor & Arousal systems
Diencephalon of Forebrain: Hypothalamus

Neuro-Endocrine (Brain+Hormone) System

Oversees 4Fs + Temp + Clock

Communicates to PITUITARY GLAND (the "master" gland)
**Telencephalon**: All other Forebrain Structures
Limbic System - Motivation

Figure 4.10 The limbic system is a set of subcortical structures that form a border (or limbus) around the brain stem
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Limbic System - Motivation

CINGULATE GYRUS
+/− Evaluator
A "Re-Entrant" System

OLFACTORY BULB
- Smell

AMYGDALA
- Emotion

HIPPOCAMPUS
- Memory

Corpus callosum
Fornix
Mamillary bodies
Hippocampus

...and MORE!
Basal Ganglion

Organizing activity into TASKS

Another RE-ENTRANT System
Parkinsons Disease:
Compromised connections from Tegmentum to Basal Ganglia
>>Motor deficits

Michael J. Fox is curing Parkinson's because it's there.
Basal Forebrain

ACh arouses Cortex

GABA de-arouses Cortex

Receives from Raphe/Reticular Arousal System in Brainstem