

Vocabulary & General Concepts of Brain Organization

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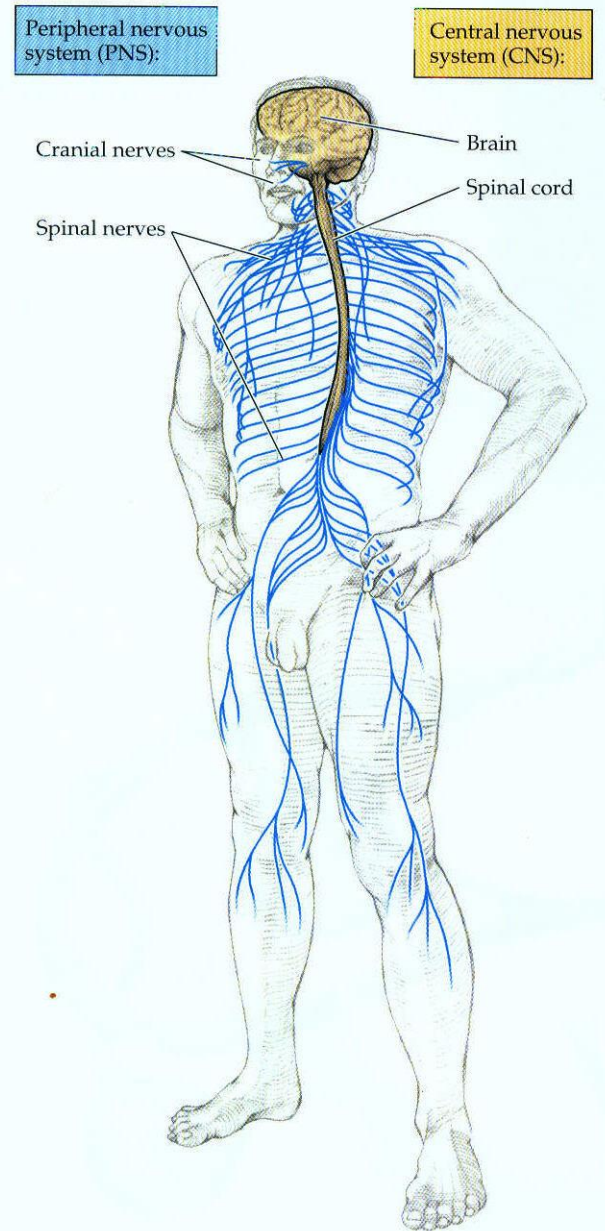
Course Outline

- ***Lecture 1: Vocabulary & General Concepts of Brain Organization***
- ***Lecture 2: Cellular & Molecular Organization of the Brain***
- ***Lecture 3: Brain Areas involved in Different Types of Memory***
- ***Lecture 4: What Modern Neuroscience Reveals about what Memory is and isn't***
- ***Lecture 5: Disorders that affect Memory***
- ***Lecture 6: How to keep your Memory – and Brain – Healthy and Happy!***

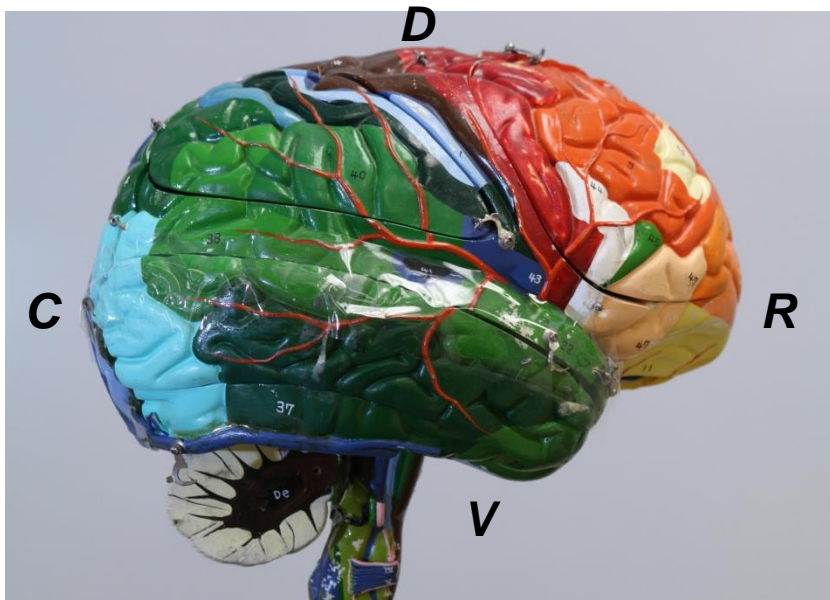
CNS: Brain & spinal cord

PNS: Any nervous elements outside of the brain & spinal cord

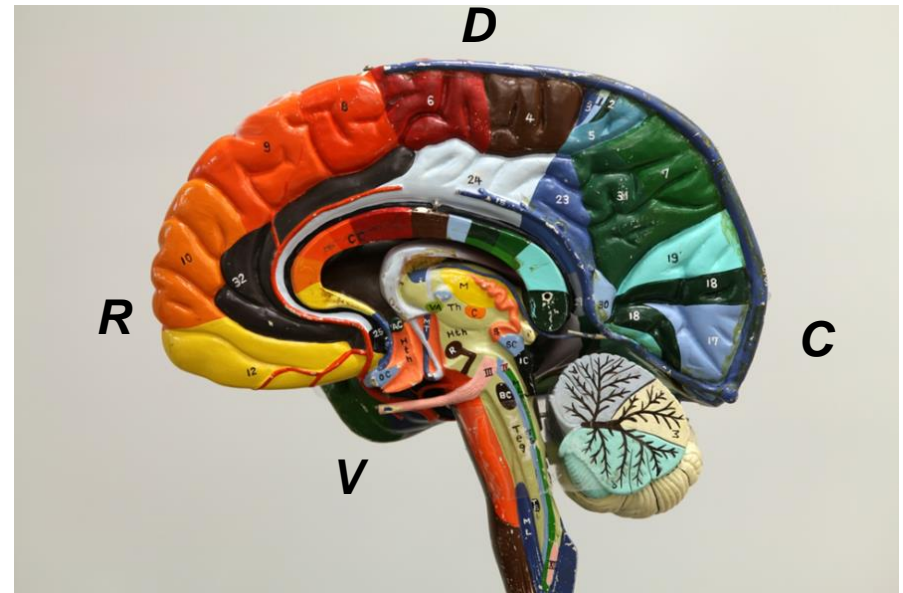
Both the CNS and PNS are made up of individual cells called “neurons”; the brain alone has 100 billion neurons or nerve cells



- A number of directional terms are used to refer to the nervous system:
 - **ROSTRAL:** towards the “head” end
 - **CAUDAL:** towards the “tail” end
 - **DORSAL:** back or upper surface
 - **VENTRAL:** belly or under surface
 - **MEDIAL:** towards the midline
 - **LATERAL:** towards the side

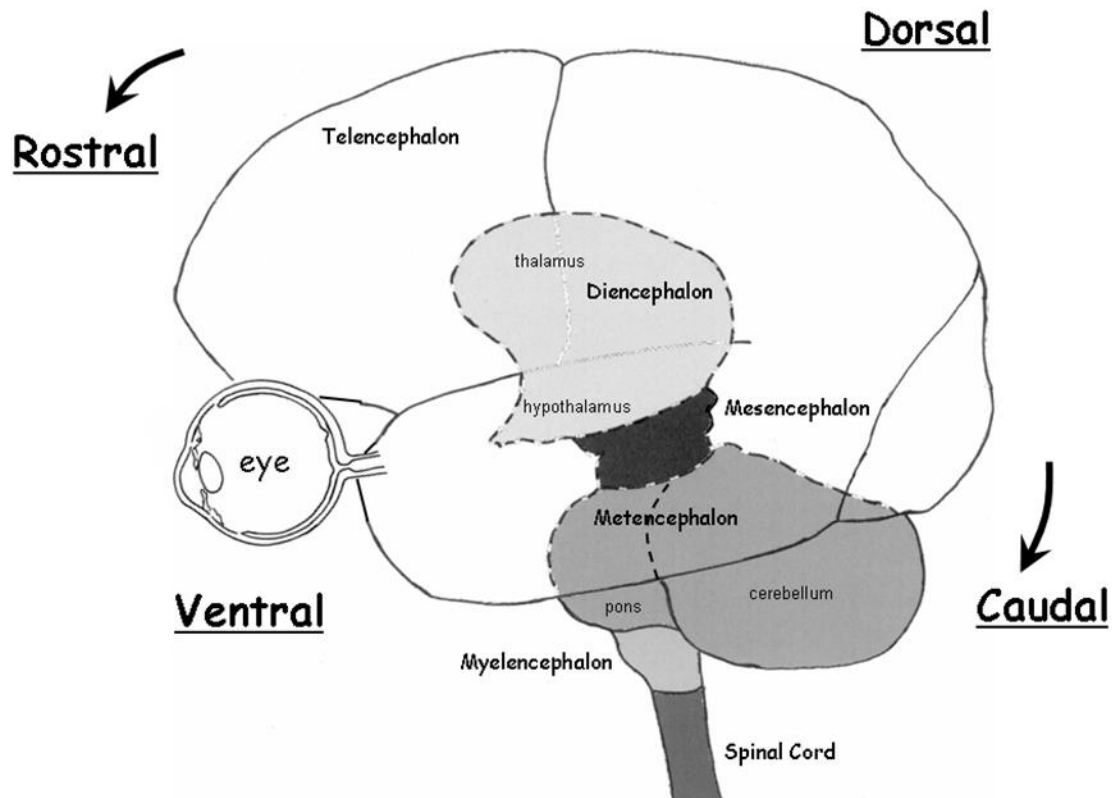


Lateral view



Medial view

- The brain or “encephalon” is subdivided into 5 divisions (beginning rostrally or “towards” the head end): *telencephalon*, *diencephalon*, *mesencephalon*, *metencephalon* and *myelencephalon*



- ***Nuclei or areas*** are groups of neurons forming structures with specific functions
 - ***For example, each of the different colors on our brain model represents an individual nucleus or area – each with its own internal structure and function***



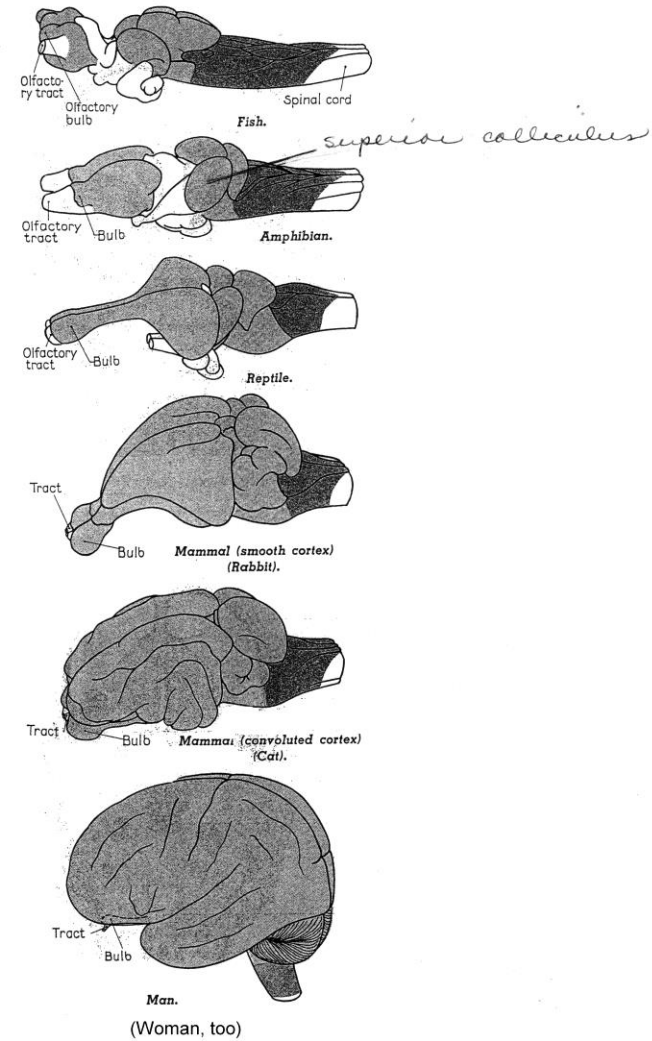
- Each of the 5 brain subdivisions contains specific nuclei or areas which have important functions
 - ***Telencephalon:*** consists of two cerebral hemispheres; the outer covering of the hemispheres is called the “cortex” (“rind” or “bark”); the cortex is responsible for voluntary action or thought and for subjective experience
 - ***Diencephalon:*** includes the thalamus (or “anteroom” – the structure that “decides” what will be transmitted up to the cortex) and the hypothalamus (the structure that maintains homeostasis in the body)

- ***Mesencephalon (or midbrain):*** contains many small nuclei that are important in reflexes, such as reflex turning of the eyes towards the source of an object or sound
- ***Metencephalon:*** pons (“bridge” – a structure that connects the cerebellum [“little cerebrum”] with the rest of the brain and the cerebellum (involved in learned skilled motor movement)
- ***Myelencephalon:*** medulla – area of the brain that controls vital functions

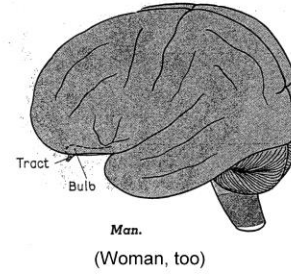
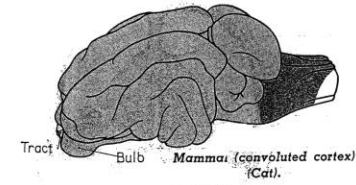
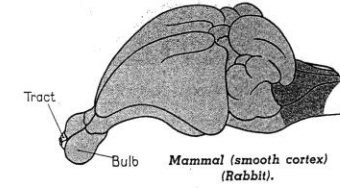
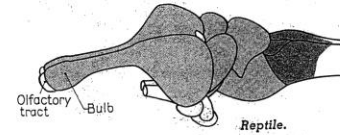
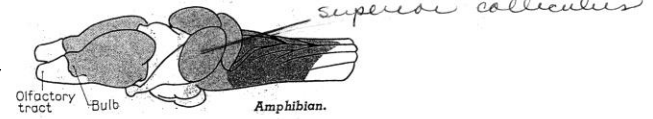
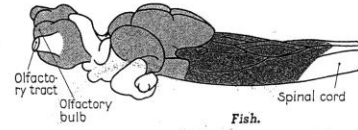
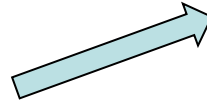
The midbrain, pons and medulla are also called the “brainstem”

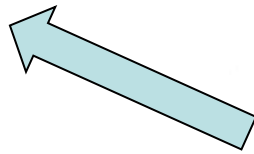
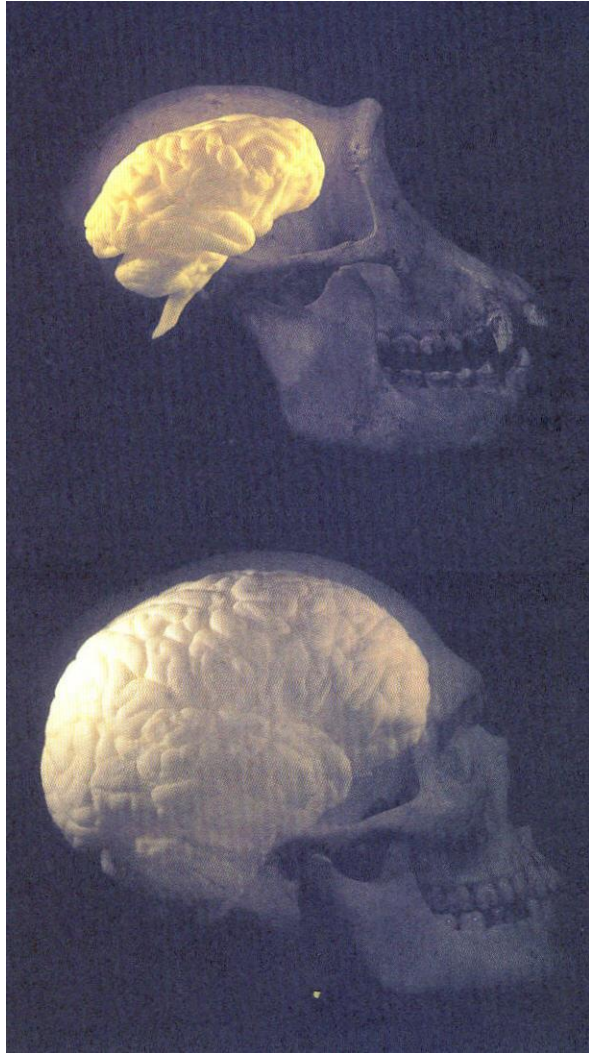
Looking across different groups of animals, the brainstem is remarkably similar in structure and function; it is the telencephalon that undergoes the greatest change

Phylogenetic Development of the Telencephalon

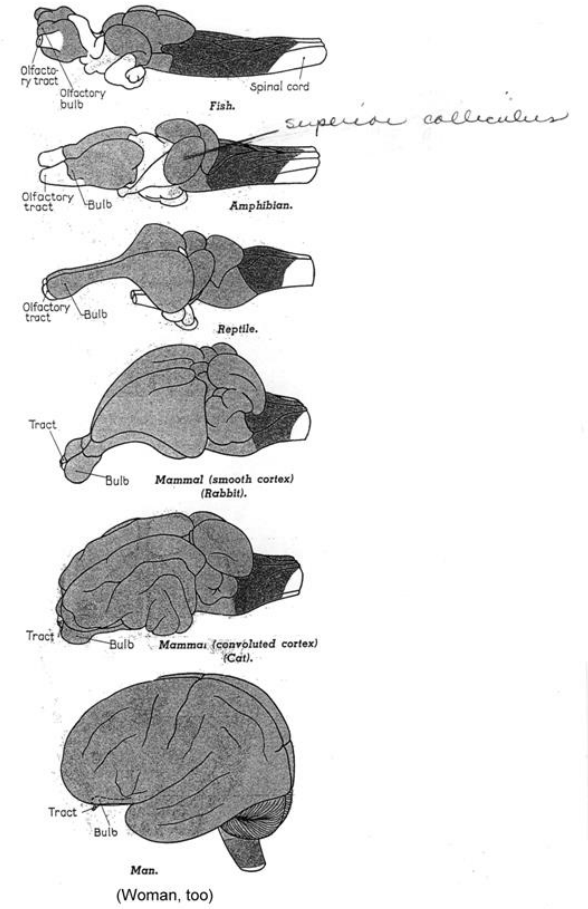


Phylogenetic Development of the Telencephalon





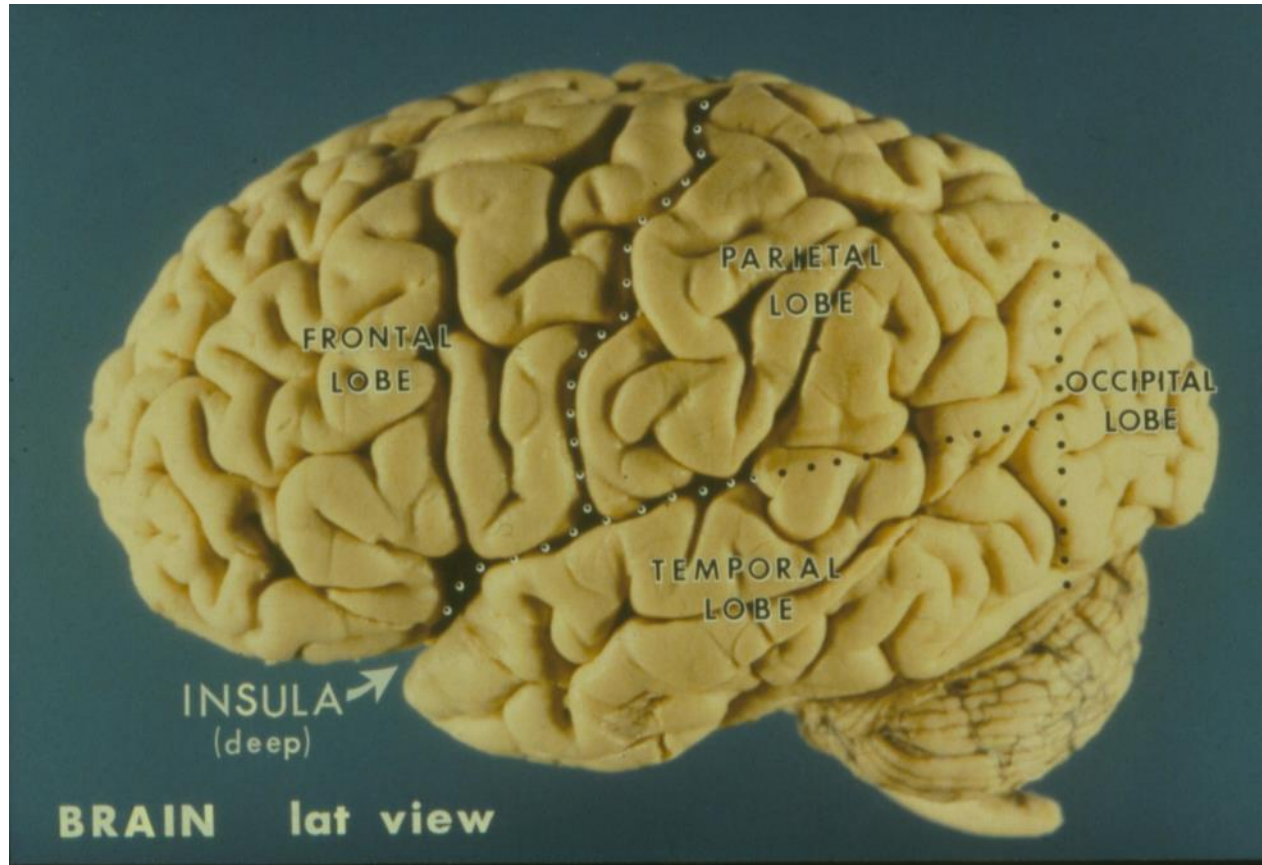
Phylogenetic Development of the Telencephalon



CORTEX

- The CORTEX represents the outer covering of the cerebral hemispheres; it consists of layers of nerve cells (from 3 to 6 layers) and varies in thickness from ~1-4 mm
- The CORTEX is divided into 5 “lobes” (4 are named after the cranial bones which overlie them)
 - **FRONTAL LOBE**
 - **PARIETAL LOBE**
 - **OCCIPITAL LOBE**
 - **TEMPORAL LOBE**
 - **“LIMBIC LOBE”** – *Medially located structures involved in learning, memory and emotion*

CORTEX

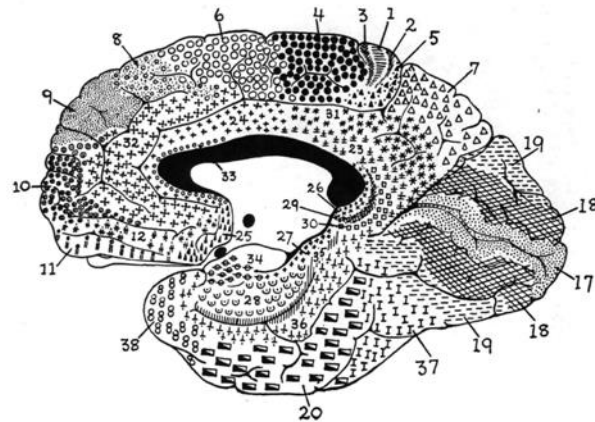
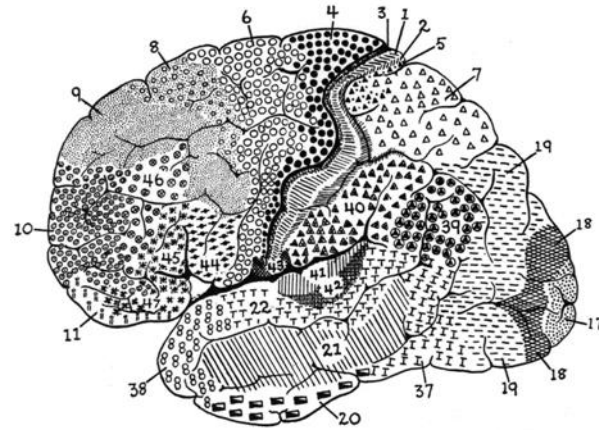


Limbic Lobe

Learning, Memory & Emotion



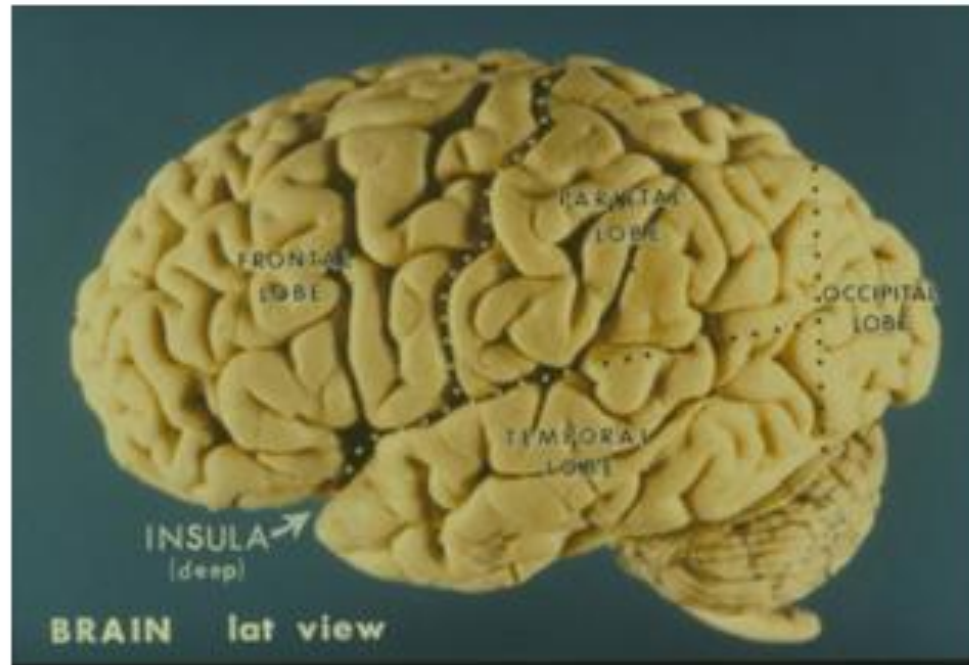
Brodmann's System for dividing the Cortex into Functional Areas



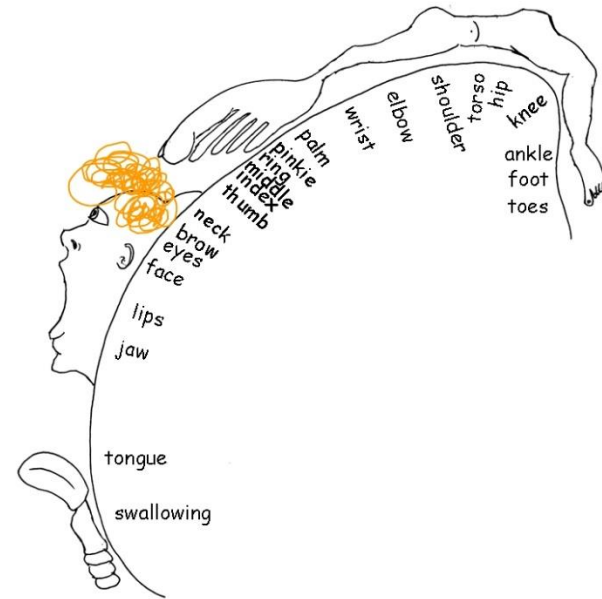
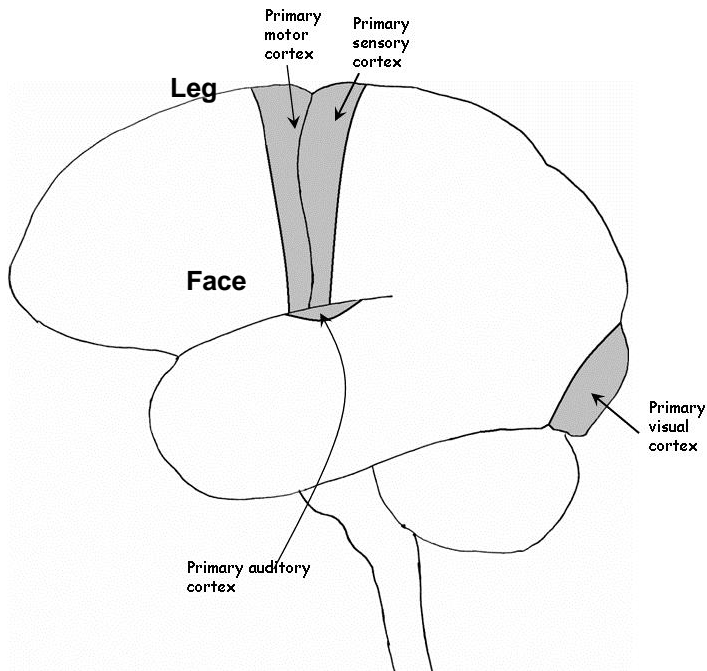
The Brain is also Organized into “Systems”

- **As time allows, we will look at various lobes of the cortex and discuss how the different lobes play a role in various brain functions, including the ability to make a voluntary movement, the ability to identify an object by sight, and the ability to speak & understand language (we will save the specific discussion of areas involved in memory until later in our course)**
- **As we discuss various functions, we will also mention how a patient might present if they were to have damage to the area – regardless of whether the damage is caused by a stroke or by a tumor or an other brain disorder**

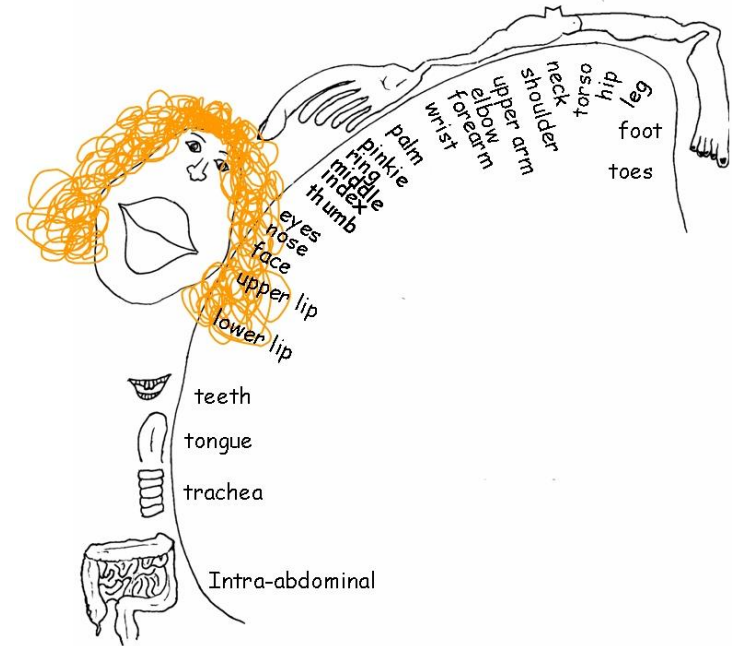
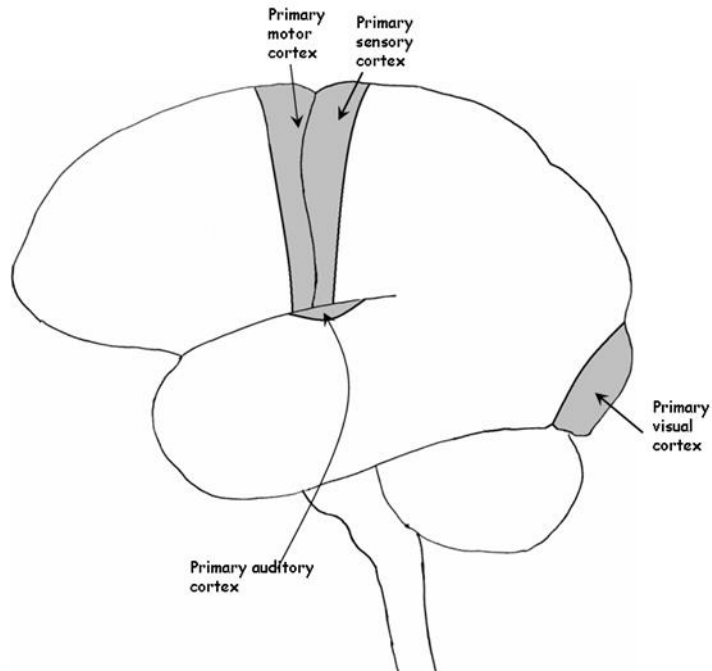
CORTEX



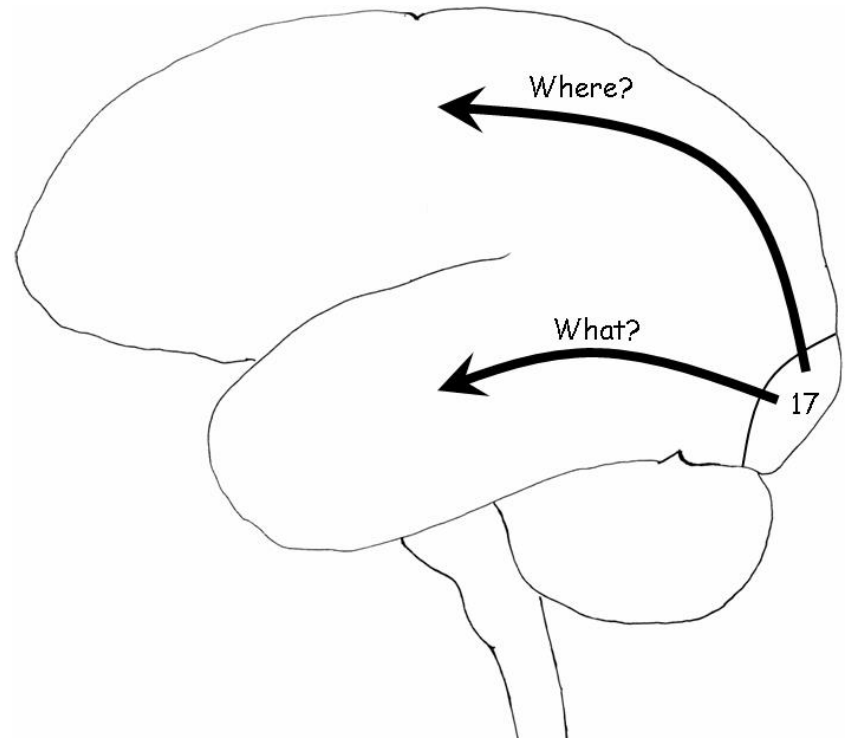
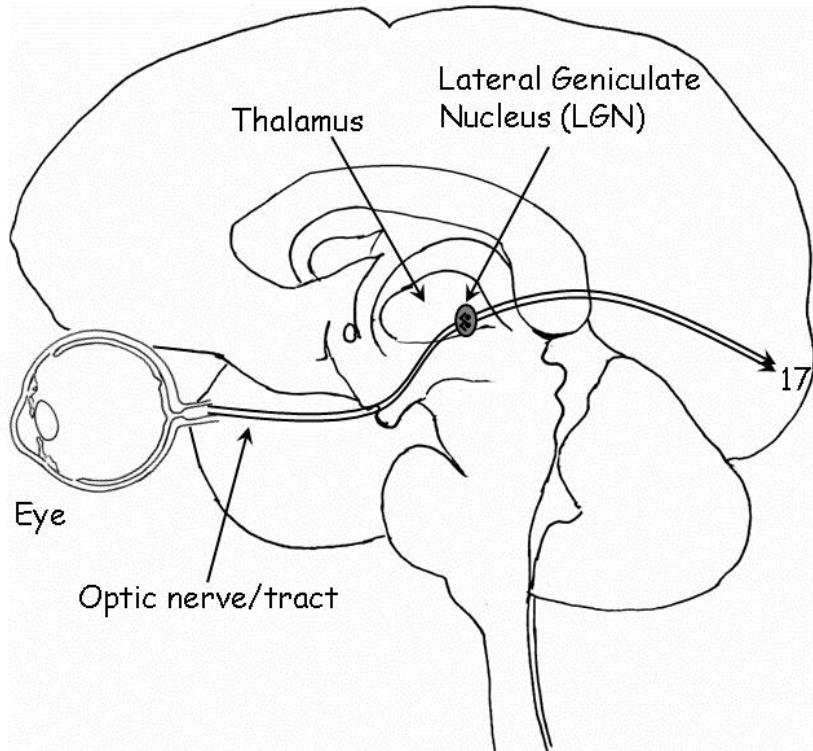
Motor System (Frontal lobe)



SOMATOSENSORY SYSTEM (Parietal Lobe)



Visual System (Occipital Lobe)



HEARING & LANGUAGE (Temporal Lobe)

