

- Location terminology (rostral, caudal, anterior, posterior, lateral, medial, ventral, dorsal)
- Section definitions (midsagittal, parasagittal, coronal, horizontal)
- Lobes (frontal, temporal, parietal, occipital, limbic), regions in each, and dividing sulci (longitudinal fissure, lateral (Sylvian) fissure, calcarine sulcus, central sulcus, parietooccipital sulcus)
- Major divisions of CNS: myelencephalon through telencephalon
- The meningeal layers and CSF – see lecture materials
- Location of four main ventricles, choroid plexus – see lecture materials
- **Must know location** (what major division of the brain they're in AND be able to locate on drawing of brain) **and function of the following: medulla, pons, cerebellum, inf. and sup. colliculi, hippocampus, thalamus, hypothalamus, amygdala, corpus callosum, limbic cortex, basal ganglia, M1, S1, V1, A1, IT, Broca's area, Wernicke's area.**

The meninges “PAD” the brain. Pia Mater, Arachnoid, Dura Mater

The meninges were discussed in lecture. Make sure you know the information which you were given.

Brain stem: The brainstem is located at the juncture of the cerebrum and the spinal column. It consists of the midbrain, medulla oblongata, and the pons.

Limbic cortex, Components of limbic system - – see lecture materials

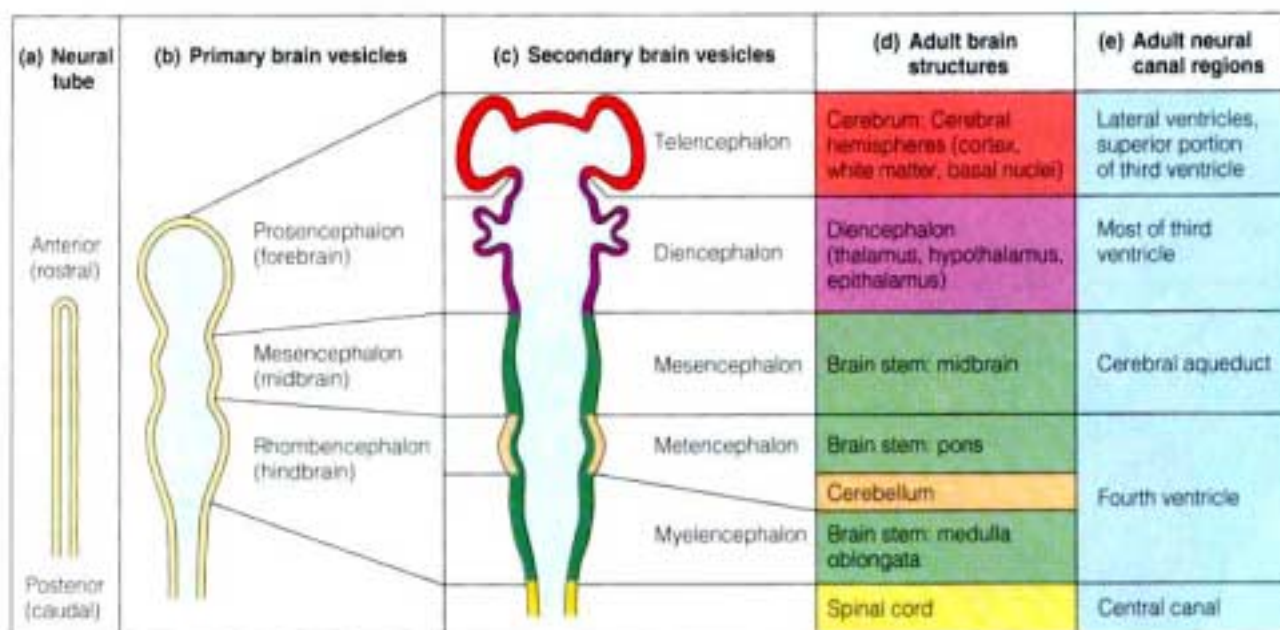


Figure 19.1 Embryonic development of the human brain. (a) The neural tube becomes subdivided into (b) the primary brain vesicles, which subsequently form (c) the secondary brain vesicles, which differentiate into (d) the adult brain structures. (e) The adult structures derived from the neural canal.

The information below is a little more detailed than you need to know. But, make sure you know the structures which make up each brain division, the location of each, and a short summary of the function of each structure which is included in the list above (plus its location).

Prosencephalon = FOREBRAIN (Includes Telencephalon & Diencephalon)

Location: The prosencephalon is the most anterior portion of the brain.

Structures:

- The prosencephalon consists of the telencephalon (cerebral cortex, basal ganglia), diencephalon (thalamus, hypothalamus, epithalamus, the optic tracts, optic chiasma, infundibulum, Ventricle III, mammillary bodies, posterior pituitary gland), lateral ventricle and third ventricle.

Epithalamus: The **epithalamus** is a dorsal posterior segment of the diencephalon (a segment in the middle of the brain also containing the hypothalamus and the thalamus) which includes the habenula, the stria medullaris and the pineal body. Its function is the connection between the limbic system to other parts of the brain. Some functions of its components include the secretion of melatonin by the pineal gland, and the regulation of hunger and thirst by the habenula.

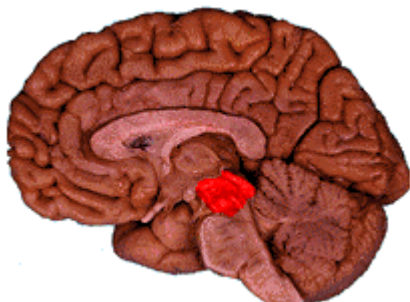
Mesencephalon = MIDBRAIN

Function:

- Controls Responses to Sight
- Eye Movement
- Pupil Dilation
- Body Movement
- Hearing

Location: The mesencephalon is the most rostral portion of the brainstem. It is located between the forebrain and brainstem.

Structures: The mesencephalon consists of the tectum (superior (visual) and inferior (auditory) colliculi) and tegmentum (cerebral aqueduct, periaqueductal gray, reticular formation, substantia nigra and the red nucleus).



←midbrain

Rhombencephalon (hindbrain = medulla, pons)

Function:

- Attention and Sleep
- Autonomic Functions
- Complex Muscle Movement
- Conduction Pathway for Nerve Tracts
- Reflex Movement
- Simple Learning

Location: The rhombencephalon is the inferior portion of the brainstem.

Structures: The rhombencephalon is comprised of the metencephalon, the myelencephalon, and the reticular formation.

Metencephalon (Pons)

Function:

- Arousal
- Assists in Controlling Autonomic Functions
- Relays Sensory Information between the Cerebrum and Cerebellum
- Sleep

Location: The pons is the portion of the brainstem that is superior to the medulla oblongata. The metencephalon is located below the posterior portion of the cerebrum and above the medulla oblongata.

Structures: The metencephalon is the division of the hindbrain that consists of the pons.



← pons

Myelencephalon; Medulla oblongata (medulla)

Function: Controls autonomic functions

- Relays nerve signals between the brain and spinal cord

Location: The medulla oblongata is the lower portion of the brainstem. It is inferior to the pons and anterior to the cerebellum.

Structures: The myelencephalon is composed of the medulla oblongata.



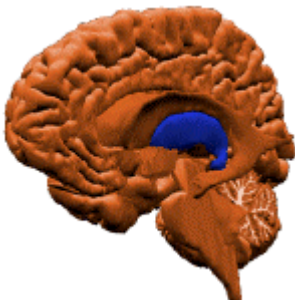
← medulla

Thalamus

Function: Motor Control

- Receives Auditory, Somatosensory and Visual Sensory Signals
- Relays Sensory Signals to the Cerebral Cortex

Location: The thalamus is a large, dual lobed mass of grey matter cells located at the top of the brainstem, superior to the hypothalamus.



The blue structure is the thalamus

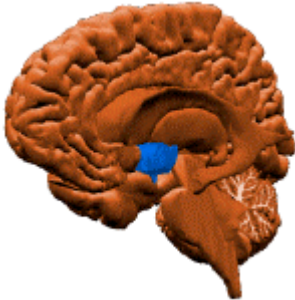
Hypothalamus

Function:

- Controls Autonomic Functions
- Emotions
- Endocrine Functions
- Homeostasis
- Motor Functions
- Regulates Food and Water Intake
- Regulates Sleep Wake Cycle

Location:

- The hypothalamus is located below the thalamus and posterior to the optic chiasma.



The blue structure is the hypothalamus

Superior colliculus

Involved in visual reflexes, and they receive input from: the eyes; the inferior colliculi; the skin; and the cerebrum. The Superior Colliculi regulate the reflexive movement of the eyes and head, in response to a number of different stimuli.

Fibers from the Superior Colliculi project to cranial nerve nuclei and to the superior cervical portion of the spinal cord where they stimulate motor neurons involved in turning the eyes (Oculomotor, Trochlear, and Abducens Cranial Nerves) and the head (the accessory cranial nerve and superior cervical cord levels). Impulses reaching the Superior Colliculi from the Cerebrum are involved in the visual tracking of moving objects.

Inferior colliculus

Involved in hearing and are an integral portion of the auditory pathways in the CNS. Neurons conducting impulses from the structures of the inner ear to the brain, all synapse in the Inferior Colliculi.

Cerebellum

Function: translates plans from M1 into specific instructions, timing, helps control saccades, compares current motor plan to new plans sent from other brain areas. (straight from Cogs 107A lecture – know this!)

Location: Located just above the brainstem, beneath the occipital lobes at the base of the skull.



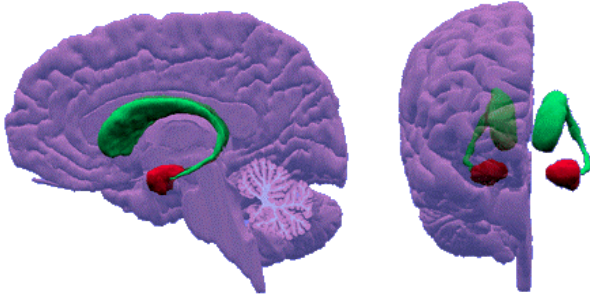
←cerebellum

Amygdala

Function:

- Arousal
- Controls Autonomic Responses Associated with Fear
- Emotional Responses
- Hormonal Secretions

Location: The amygdala is an almond shaped mass of nuclei located deep within the temporal lobes, medial to the hypothalamus and adjacent to the hippocampus.



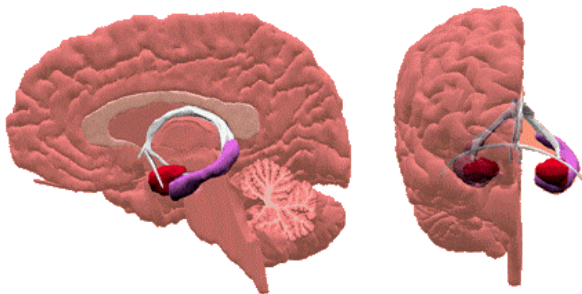
The round red object is the amygdala

Hippocampus

Function:

- Consolidation of New Memories
- Emotions
- Navigation
- Spatial Orientation

Location: The hippocampus is a horseshoe shaped sheet of neurons located within the temporal lobes and adjacent to the amygdala. Note: the “hippocampal formation” includes the hippocampus and some other structures.



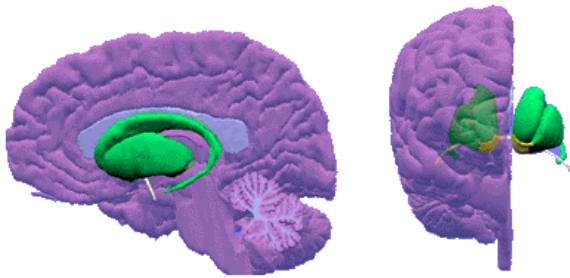
The purple structure is the hippocampus (the red structure is the amygdala)

Basal ganglia

- **Includes caudate, putamen, globus pallidus, substantia nigra, subthalamic nucleus**
- perform many functions like skilled movements (learned motor sequences), posture, may coordinate different regions of the brain, control muscle force and movement intensity, and regulation of emotion and reward via dopamine (straight from Cogs 107A lecture – know this!)
- Other groupings you may hear are the striatum (caudate + putamen), the corpus striatum (striatum + globus pallidus), or the lenticular nucleus (putamen + globus pallidus)

Location:

- The basal ganglia is located deep within the cerebral hemispheres in the telencephalon region of the brain.



Broca's area

Function:

- Controls Facial Neurons
- Involved in speech production and processing language

Location: Broca's area is located in the left frontal lobe, around the opercular and triangular sections of the inferior frontal gyrus.

Wernicke's area

Function: Language Comprehension (note: this is a very very simplified summary of function!)

Location: Wernicke's area is located in the left temporal lobe, posterior to the primary auditory complex.

Corpus callosum

Function: Connects the left and right Hemispheres

Location: The corpus callosum is a thick band of fibers located between the cerebral hemispheres.

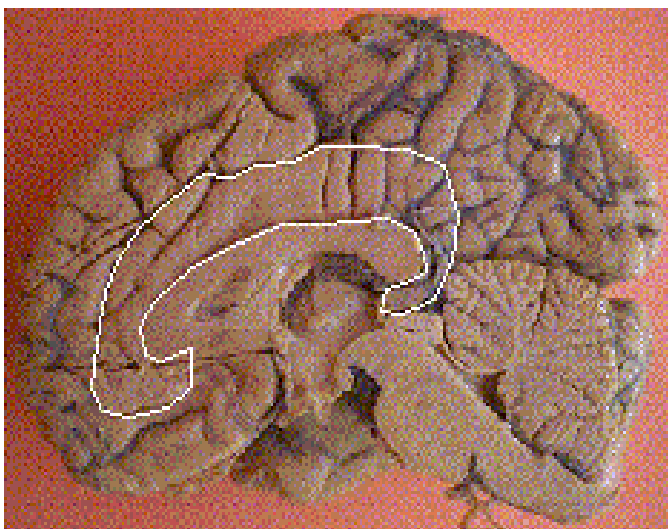
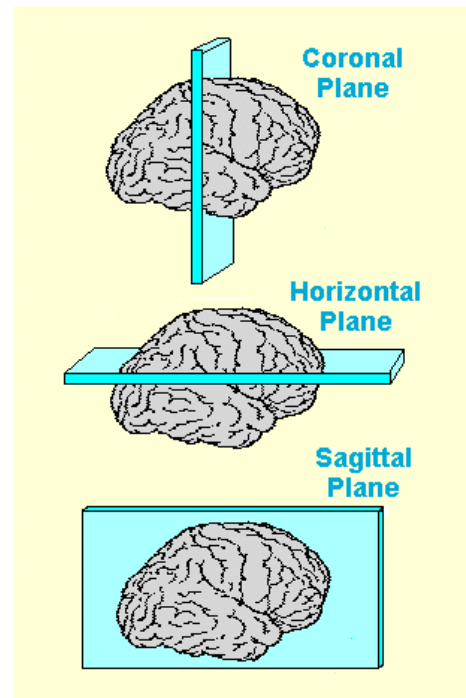
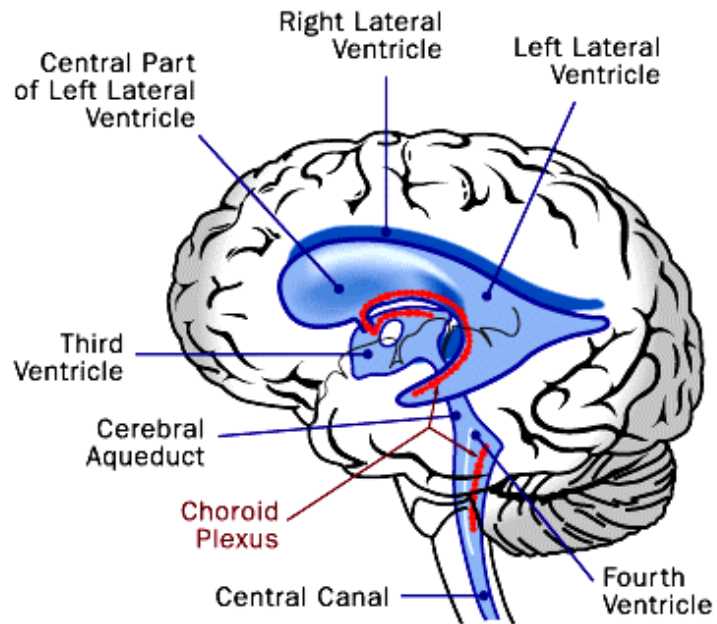


The pink structure is the corpus callosum (medial view)

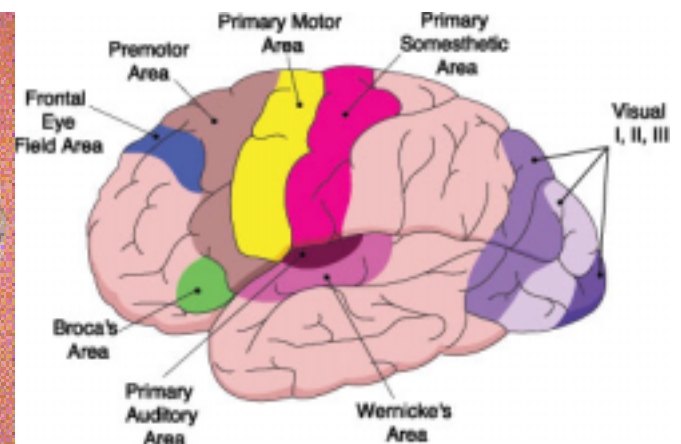
Very BRIEF summary of functions of some of the areas mentioned above

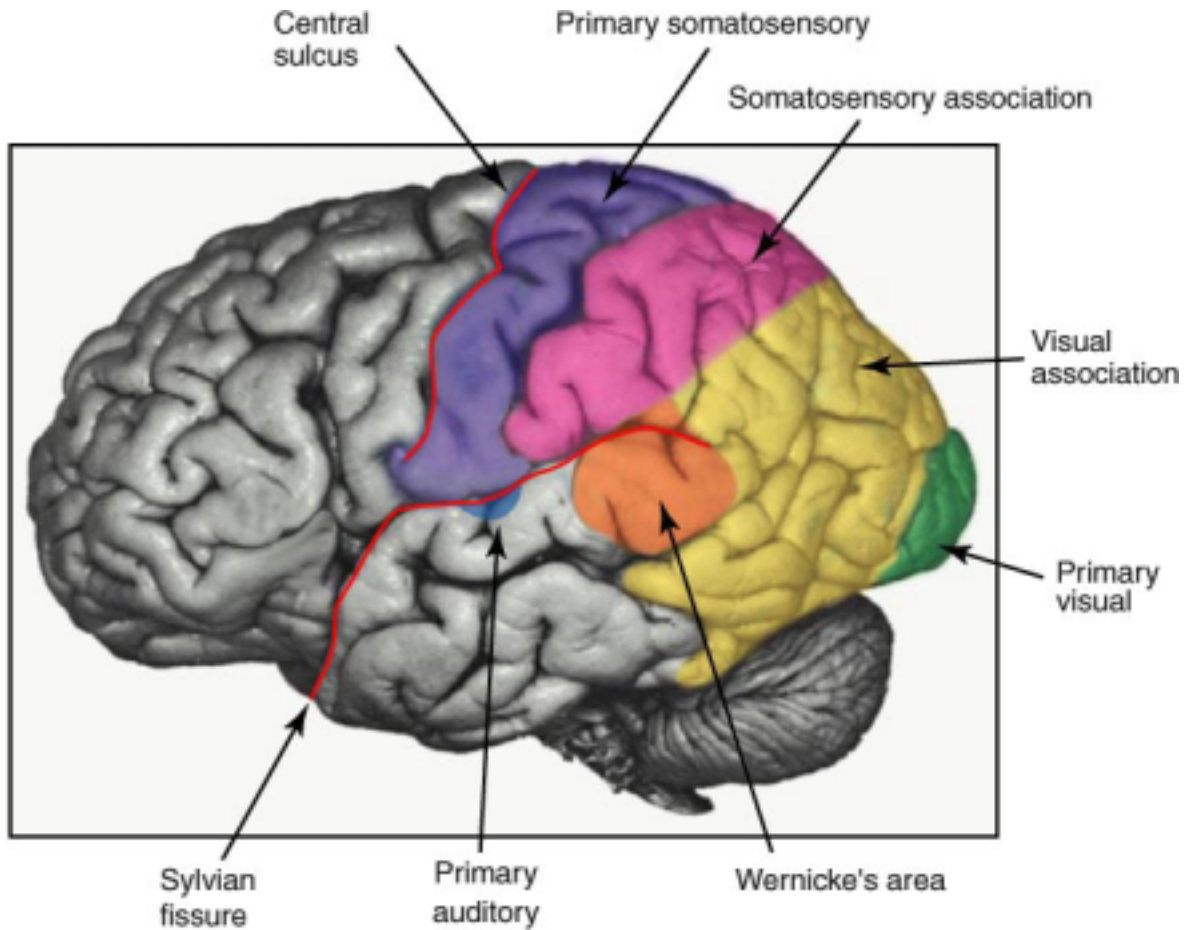
Section	Function
Spinal Cord	Input-output of sensory and motor information to and from the CNS-PNS
Medulla	Autonomic function (breathing, heart rate, etc.)
Pons	Auditory and vestibular (balance), sensory and motor
Cerebellum	Motor coordination and motor learning
Midbrain	Visuomotor functions, visual reflexes, auditory relays, motor coordination
Thalamus	Part of the diencephalon within the forebrain. Projects information to specific areas of the cerebrum, and controls which information is sent to the cerebral cortex
Hypothalamus	Regulates homeostasis in conjunction with the autonomic nervous system
Basal Ganglia	Centers for motor coordination
Hippocampus	Memory formation
Amygdala	Emotion processing
Corpus Collosum	Bundle of axons which connects the two hemispheres

The Ventricular System of the Human Brain



Limbic Lobe (outlined in white)

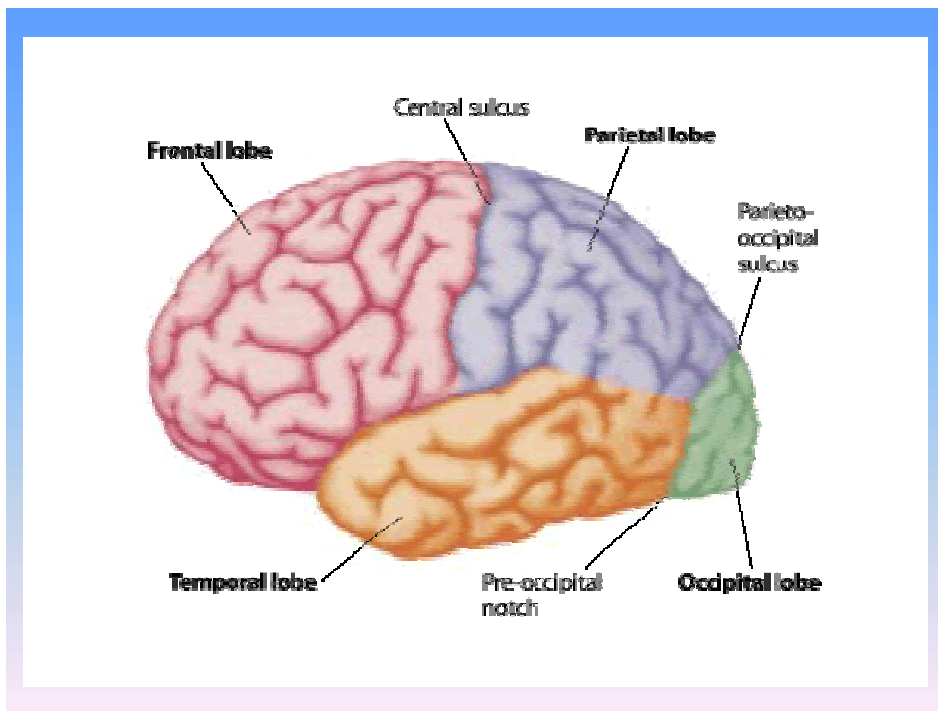


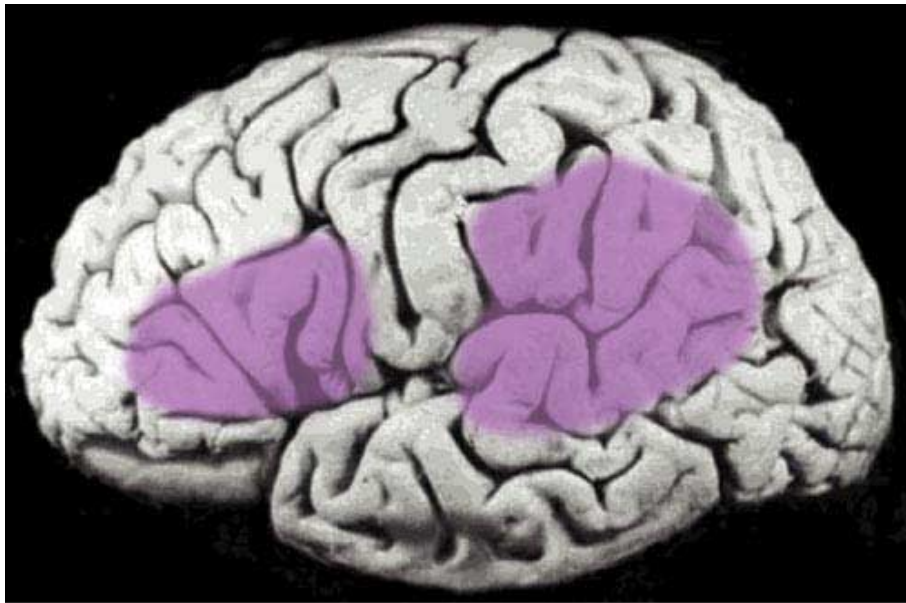


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FIGURE 6 The location of primary sensory and association areas of the human cerebral cortex. The primary auditory cortex is mostly hidden from view within the Sylvian fissure. From Guyton (1987).

Note: primary motor cortex is in the gyrus just anterior to the central sulcus.





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FIGURE 8 A depiction of the left hemisphere of the brain showing the main language areas. The area in the inferior frontal lobe is known as Broca's area, and the area in the superior temporal lobe is known as Wernicke's area, named after the 19th century physicians who first described their roles in language. Broca's area is adjacent to the motor cortex and is involved in planning speech gestures.

