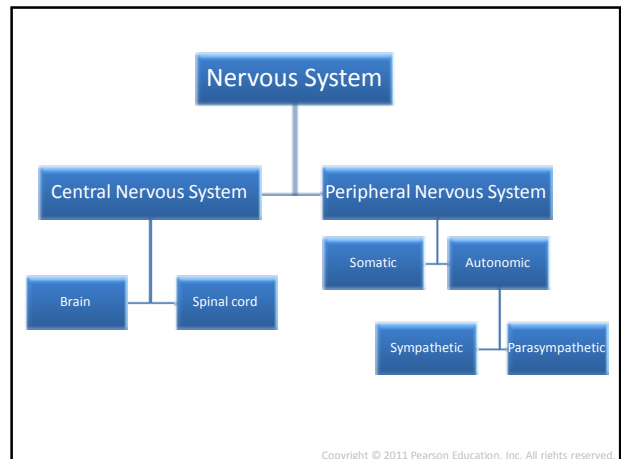


Brain-Behavior Network

- Sensory information comes into—and decisions come out of—the **central nervous system (CNS)**
- The nerves outside the CNS are called the **peripheral nervous system (PNS)**

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Central Nervous System

- The CNS, particularly the brain, is divided into systems based on location and function



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Cerebral Cortex

- The **forebrain** is the most developed area of the human brain, giving us our advanced intellectual abilities

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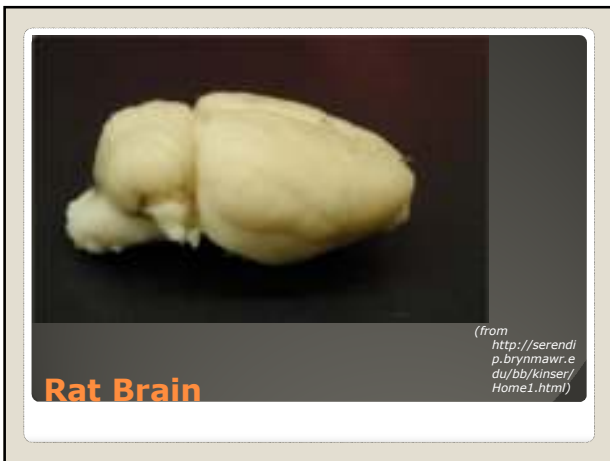
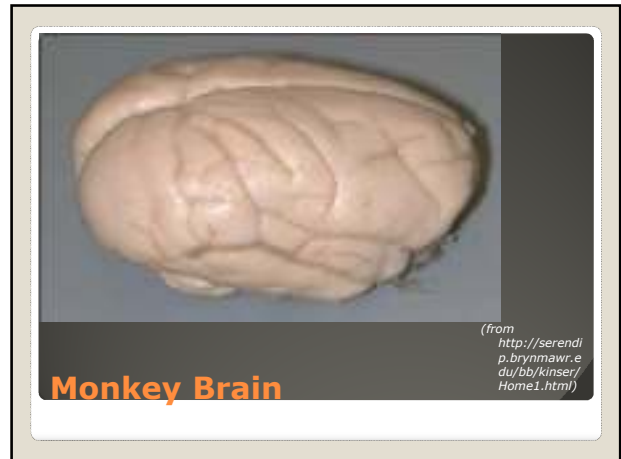
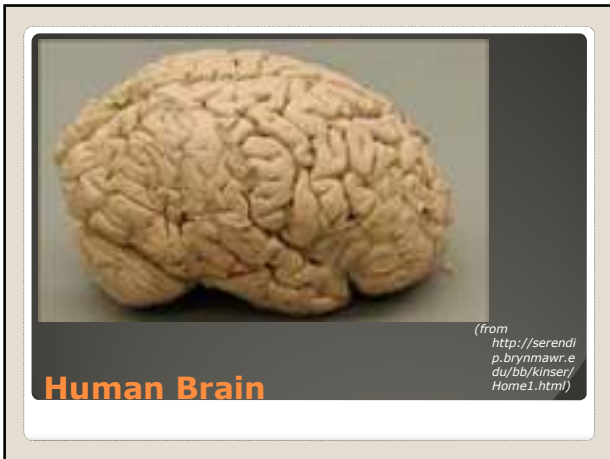
- Gray matter

(From http://commons.wikimedia.org/wiki/File:Human_brain_coronal%28_sect ion.JPG)

Cerebral Cortex (Coronal Section)

- As the cortex increases during evolution folds and wrinkles appeared
 - To fit the cortical tissue into skull
- Ridges are called **Gyri**
- Clefts are called **Fissures** or **Sulci** (shallow ones)

Gyrus and Sulcus

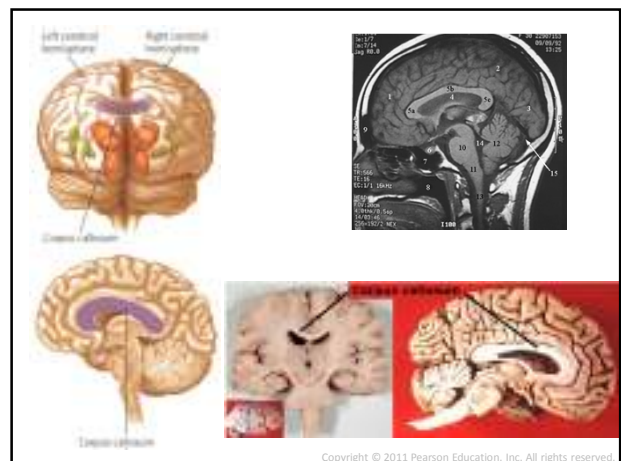


- Anatomy of the human brain is similar to the brain of rat or monkey
 - There are no neurons that are unique to humans
 - The relative size of the human brain is the biggest in all mammals
 - The relative surface area of cerebral cortex of human brain far exceeds that of other mammals
 - Human brain continues to develop after birth
 - The rate of growth after birth is higher humans compared to monkeys
- Human vs. Animal Brains**

Cerebral Cortex

- Consists of two **cerebral hemispheres** connected by the **corpus callosum** which allows communication between them

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- Majority of the forebrain is composed of the cerebral cortex
- Can be divided into four lobes, each associated with a different function



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Frontal Lobes

- Assist in motor function, language, memory
- Oversee and organize most other brain functions (*executive functioning*)
- The **prefrontal cortex** is responsible for thinking, planning, and language
- The body is mapped onto the **motor cortex**

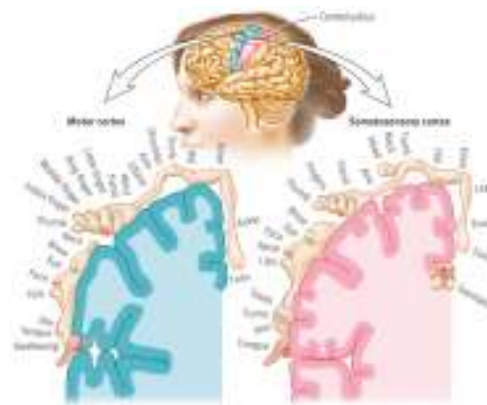
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Figure 3.13 Selected Areas of the Cerebral Cortex. The prefrontal cortex controls various aspects of behavior and personality. Broca's area is vital for the formation of speech, and Wernicke's area interprets spoken and written language. Other cortical areas include the motor cortex, primary sensory areas, and association areas.



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Parietal Lobe

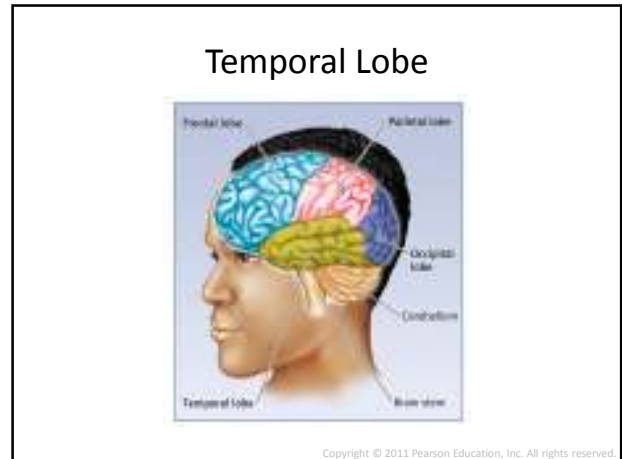
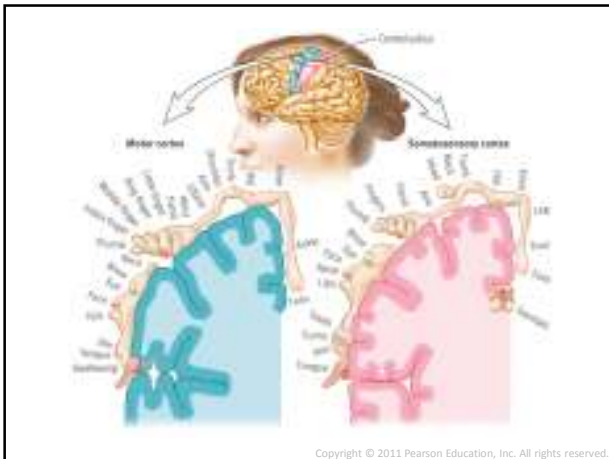


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Parietal Lobe

- Specialized for touch and perception
- Contains the somatosensory **cortex**, which is sensitive to pressure, pain, and temperature
- Communicates information to the motor cortex every time we reach, grasp, or move our eyes

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Temporal Lobe

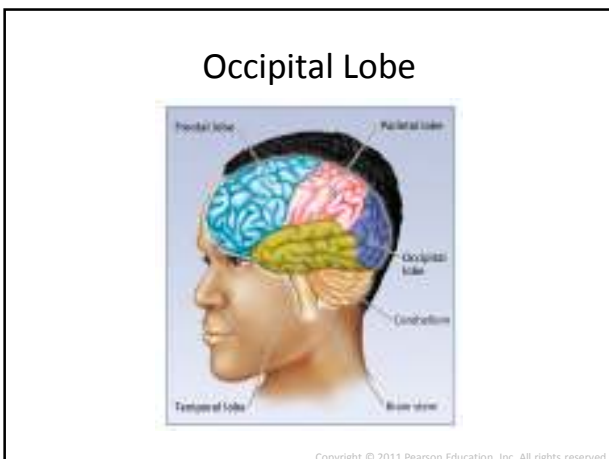
- It plays a role in hearing, understanding language, and storing autobiographical memories
- Contains the *auditory cortex* and **Wernicke's area**, responsible for speech comprehension

Figure 3.13 Selected Areas of the Cerebral Cortex. The prefrontal cortex controls various aspects of behavior and personality. Broca's area is vital for the formation of speech, and Wernicke's area interprets spoken and written language. Other cortical areas include the motor cortex, primary sensory areas, and association areas.

A diagram of the human brain from a lateral view with labels for various cortical areas:

- Prefrontal cortex:** Controls various aspects of behavior and personality.
- Broca's area:** Vital for the formation of speech.
- Wernicke's area:** Interprets spoken and written language.
- Primary somatosensory cortex:** Receives tactile, pain, temperature, and pressure information.
- Primary visual cortex:** Analyzes visual data from the eyes.
- Primary auditory cortex:** Analyzes data about sounds.
- Association cortex:** Analyzes data about sounds, sight, and other information.
- Motor cortex:** Controls voluntary movements.
- Frontal lobe:** Controls voluntary movements.
- Parietal lobe:** Receives tactile, pain, temperature, and pressure information.
- Occipital lobe:** Analyzes visual data from the eyes.
- Cerebellum:** Analyzes data about sounds, sight, and other information.
- Brain stem:** Controls voluntary movements.

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Video

- MultiMedia Library
- Explore
 - Visual Cortex
- <http://www.mathxl.com/info/mmlib.aspx?bookcode=Lilienfeld2e>

Cortical Hierarchies

- When sensory information enters the brain, it first goes to that sense's **primary sensory cortex**, then to the **association cortex**

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Figure 3.13 Selected Areas of the Cerebral Cortex. The prefrontal cortex controls various aspects of behavior and personality. Broca's area is vital for the formation of speech, and Wernicke's area interprets spoken and written language. Other cortical areas include the motor cortex, primary sensory areas, and association areas.

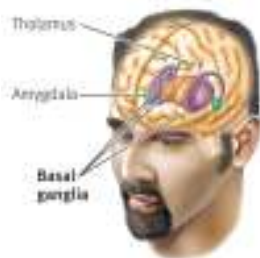


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Basal Ganglia

- Forebrain structure that helps control movement
- Allows us to perform movements to obtain rewards and reinforcement
- Damage can contribute to Parkinson's disease

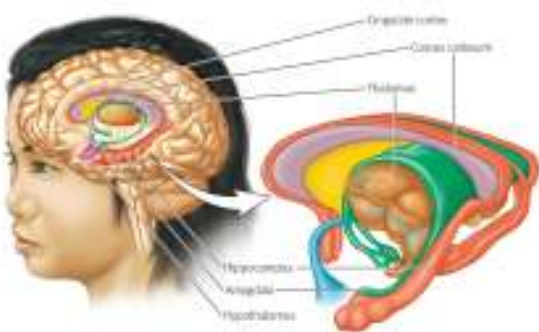


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Limbic System

- The emotional center of the brain that also has a role in smell, motivation, and memory
- **Thalamus**
- **Hypothalamus**
- **Amygdala**
- **Hippocampus**

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Spinal Cord

- The thick bundle of nerves that conveys signals between the brain and the body
- *Sensory nerves* carry information from body to the brain, *motor nerves* carry information from brain to the rest of the body
- Also contains **interneurons**, which allow **reflexes** to happen

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Figure 3.16 The Spinal Reflex. We detect even small amounts of muscle stretch and compensate by contraction. In this way we can maintain balance or keep from losing our grip.



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Video

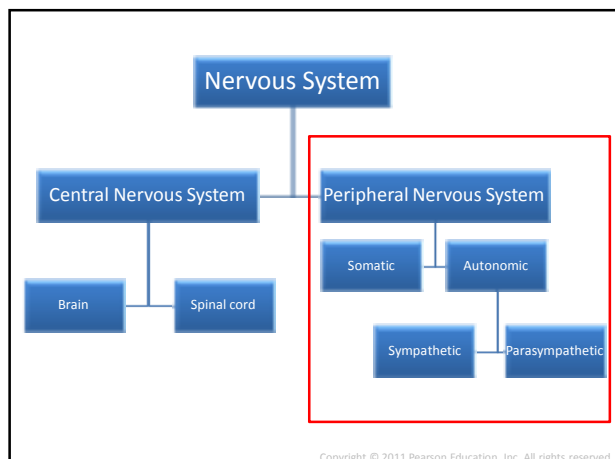
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Video

- Episode 3 Biological Psychology
- Basics : How the Brain Works, Part 2
- http://visual.pearsoncmg.com/mypsychlab/episode03/web_index.html?clip=7&tab=tab0

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Peripheral Nervous System

- **Somatic nervous system** conveys information between the CNS and the body, controlling and coordinating voluntary movement
- **Autonomic nervous system** controls the involuntary actions of our internal organs and glands; has two divisions

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Peripheral Nervous System

- **Sympathetic division** is engaged during a crisis or after actions requiring *fight or flight*
- **Parasympathetic division** controls rest and digestion

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If this rhinoceros suddenly charged at the three people on this African safari, which branch of their autonomic nervous systems would (we hope!) become activated?



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Answer: Sympathetic.



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