



Neuroscience

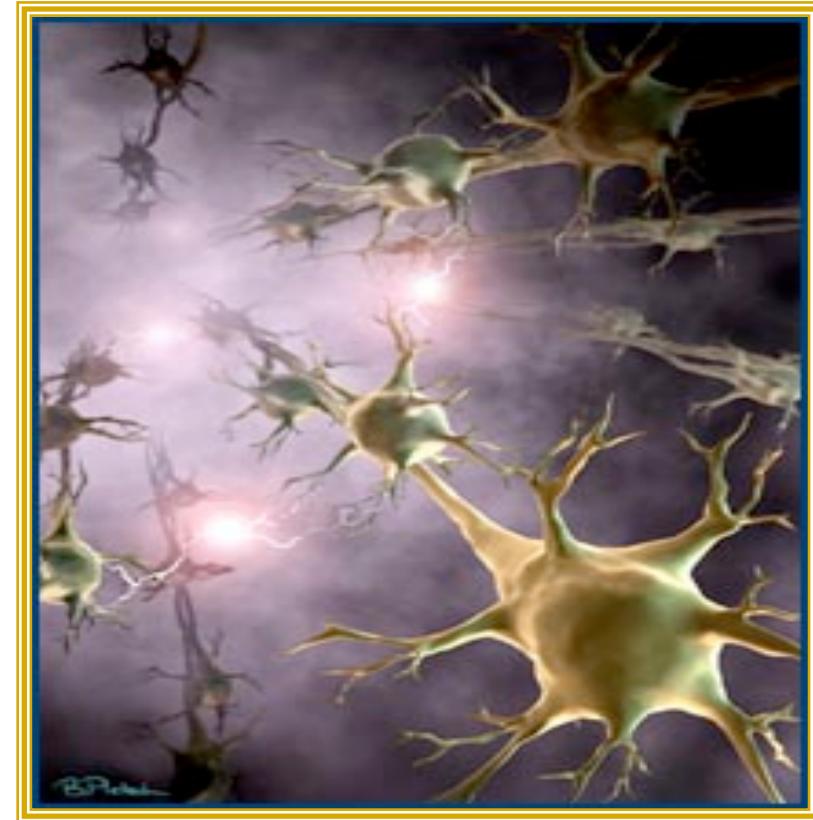
Chapter 2:

Lecture Overview

- Neural Bases of Behavior
- Nervous System Organization
- A Tour Through the Brain
- Our Genetic Inheritance

Neural Bases of Psychology

- **Neuroscience:** interdisciplinary field studying how biological processes relate to behavioral and mental processes

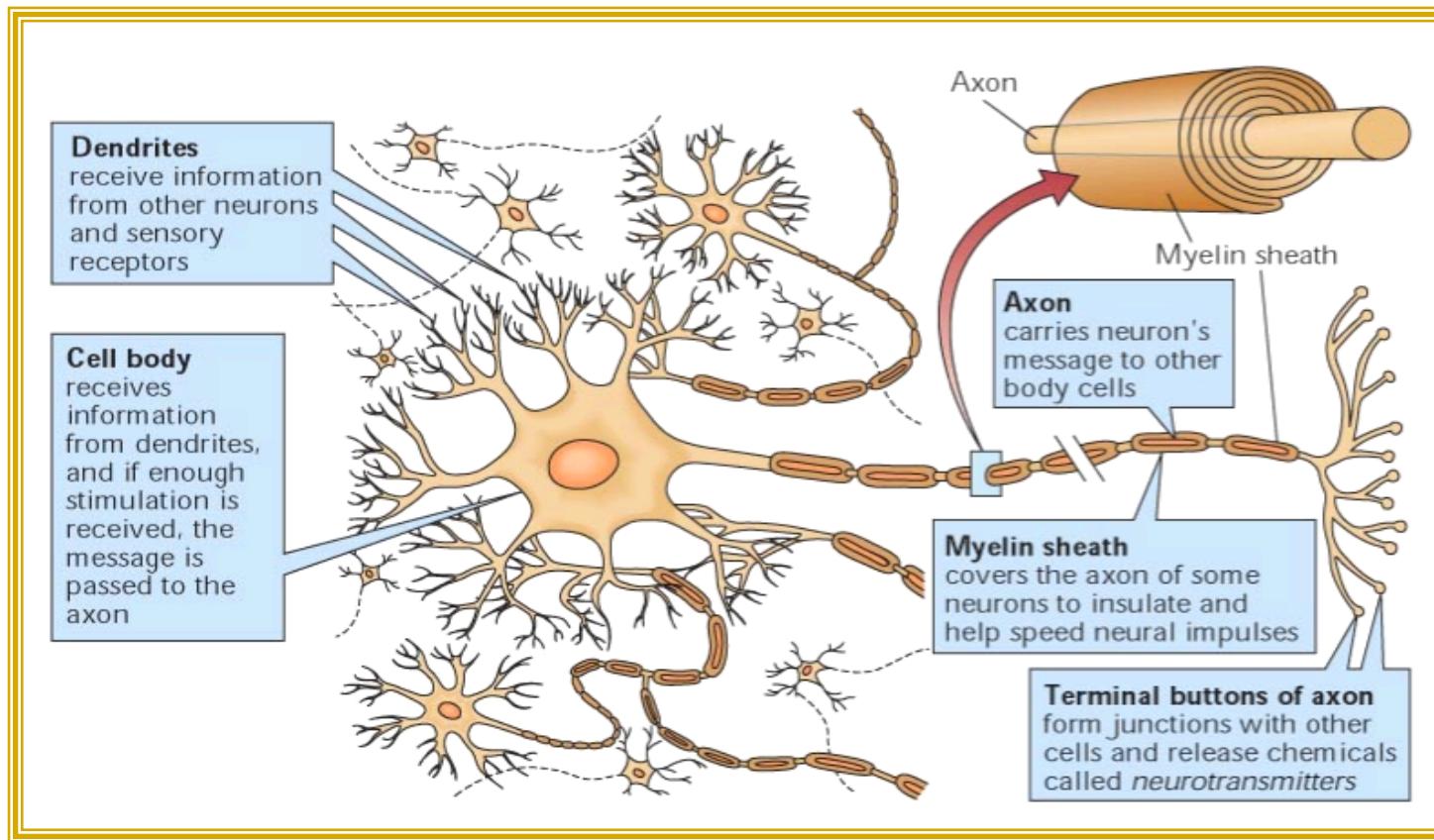


Neural Bases of Psychology



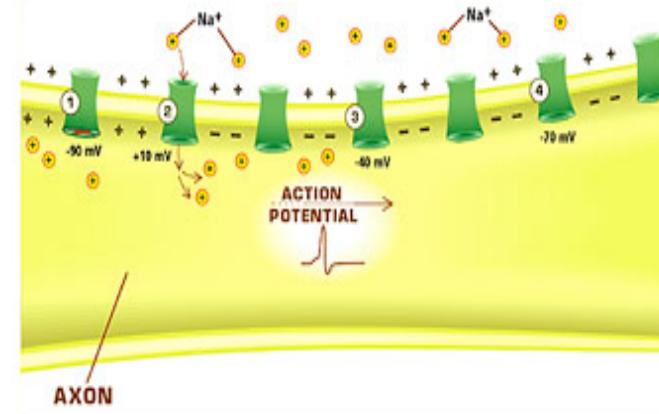
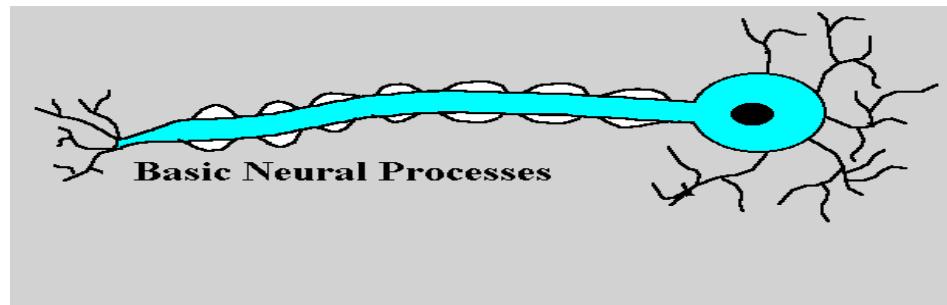
- The nervous system consists of **neurons** (cells responsible for receiving and transmitting electrochemical information).

Neural Bases of Psychology: The Structure of a Neuron



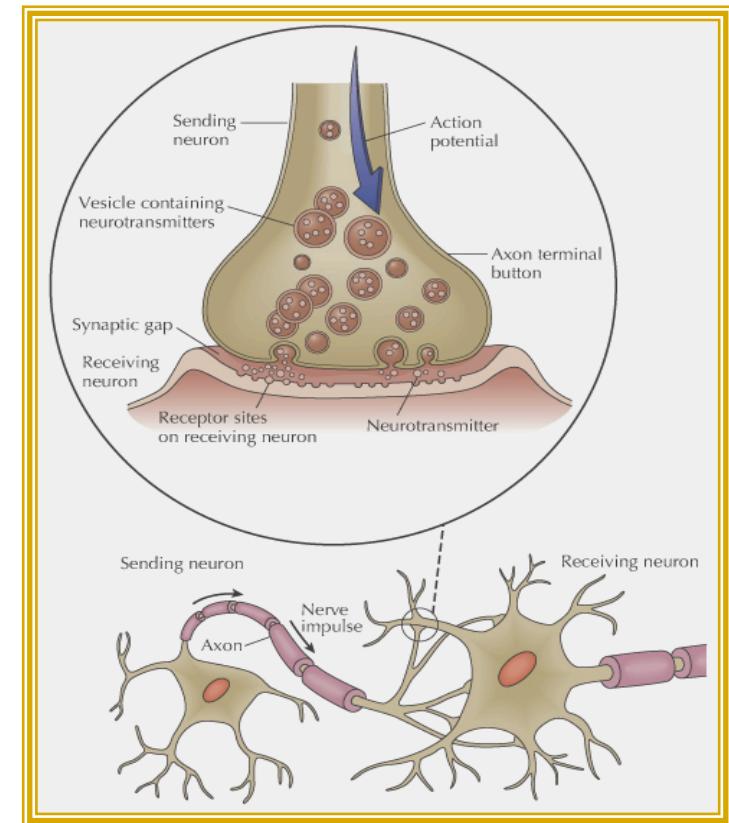
Neural Bases of Psychology: Neural Communication

- *Within* a neuron, communication occurs through an **action potential** (neural impulse that carries information along the axon of a neuron).

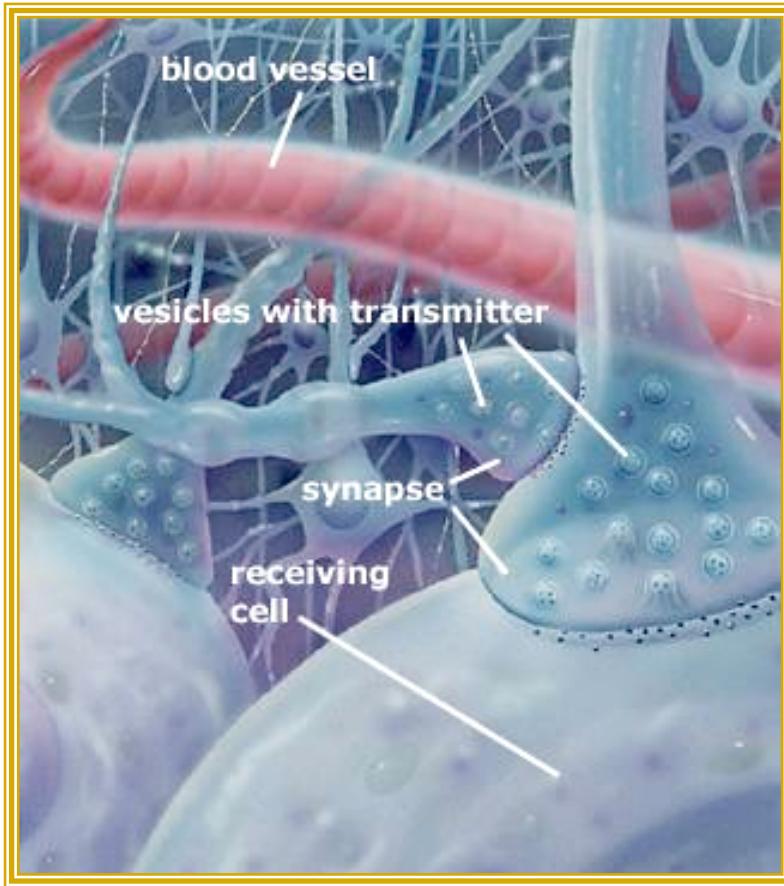


Neural Bases of Psychology: Neural Communication (Continued)

- *Between neurons, communication occurs through transmission of neural information across a **synapse** by **neurotransmitters** (chemicals released by neurons that alter activity in other neurons).*



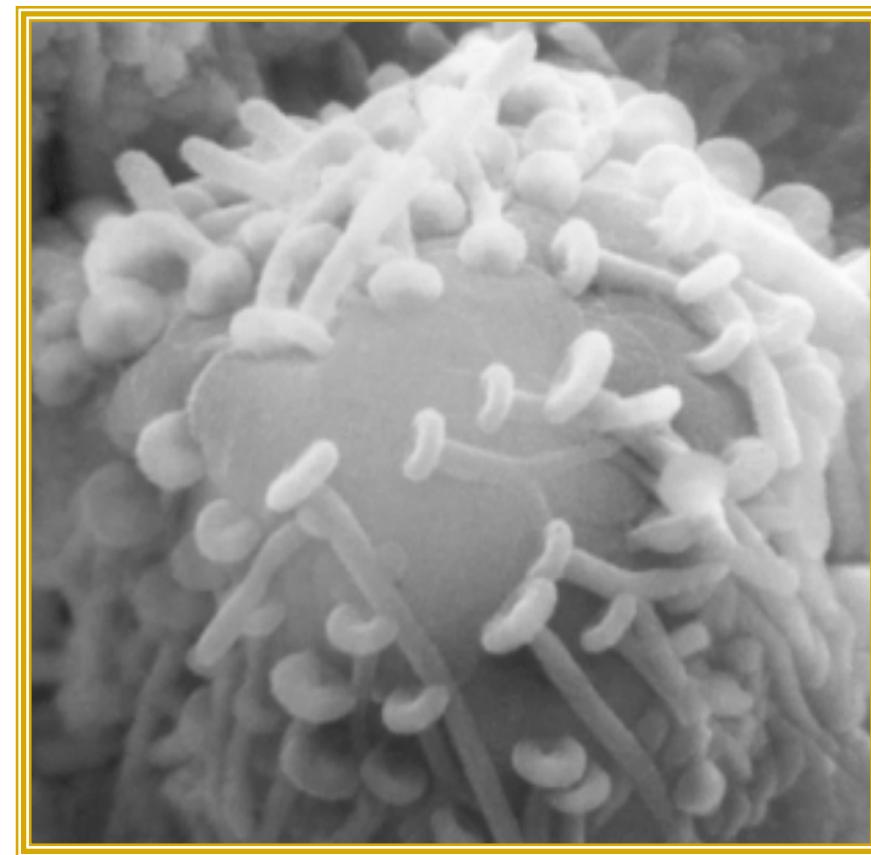
Neural Bases of Psychology: Neural Communication (Continued)



- Receiving neurons receive multiple messages from other neurons, and these messages determine if an action potential occurs or not.

Neural Bases of Psychology: Neural Communication (Continued)

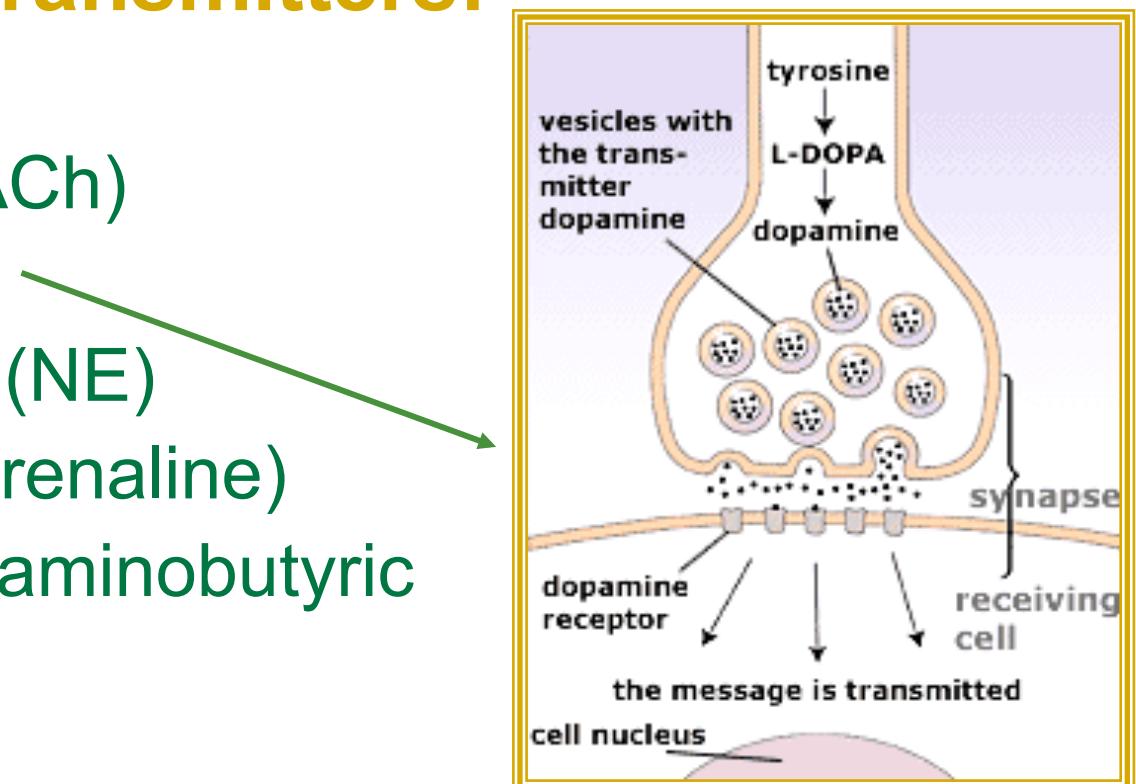
- Note how the **axon terminals** of sending neurons almost completely cover the **cell body** of the receiving neuron.



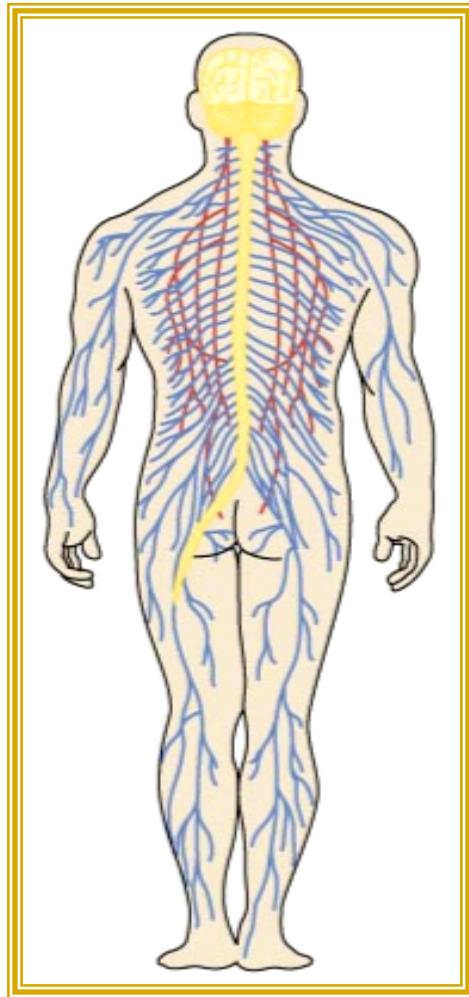
Neural Bases of Psychology: Applying Psychology to Everyday Life

■ Major Neurotransmitters:

- Serotonin
- Acetylcholine (ACh)
- Dopamine (DA)
- Norepinephrine (NE)
- Epinephrine (adrenaline)
- GABA (gamma aminobutyric acid)
- Endorphins

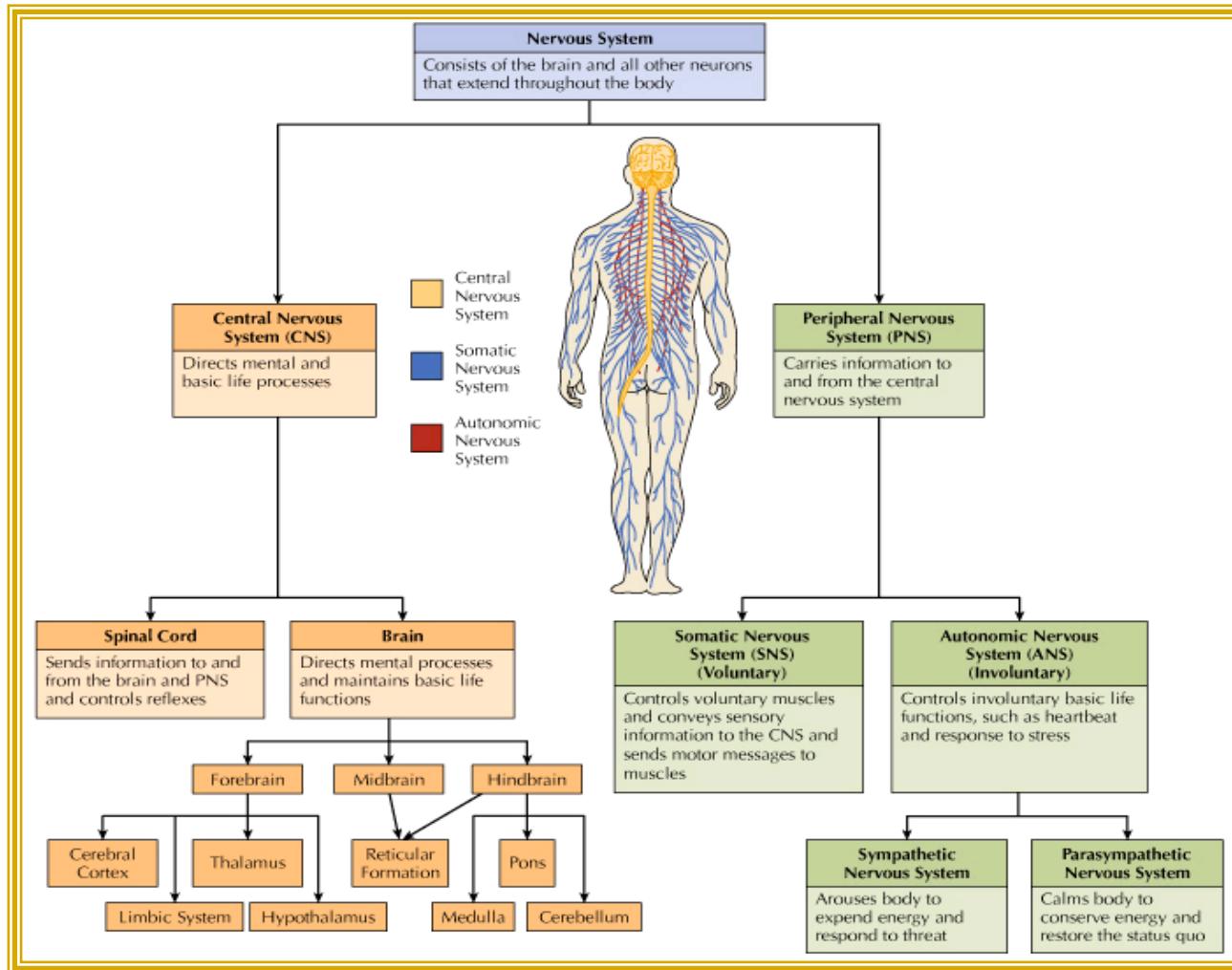


Nervous System Organization



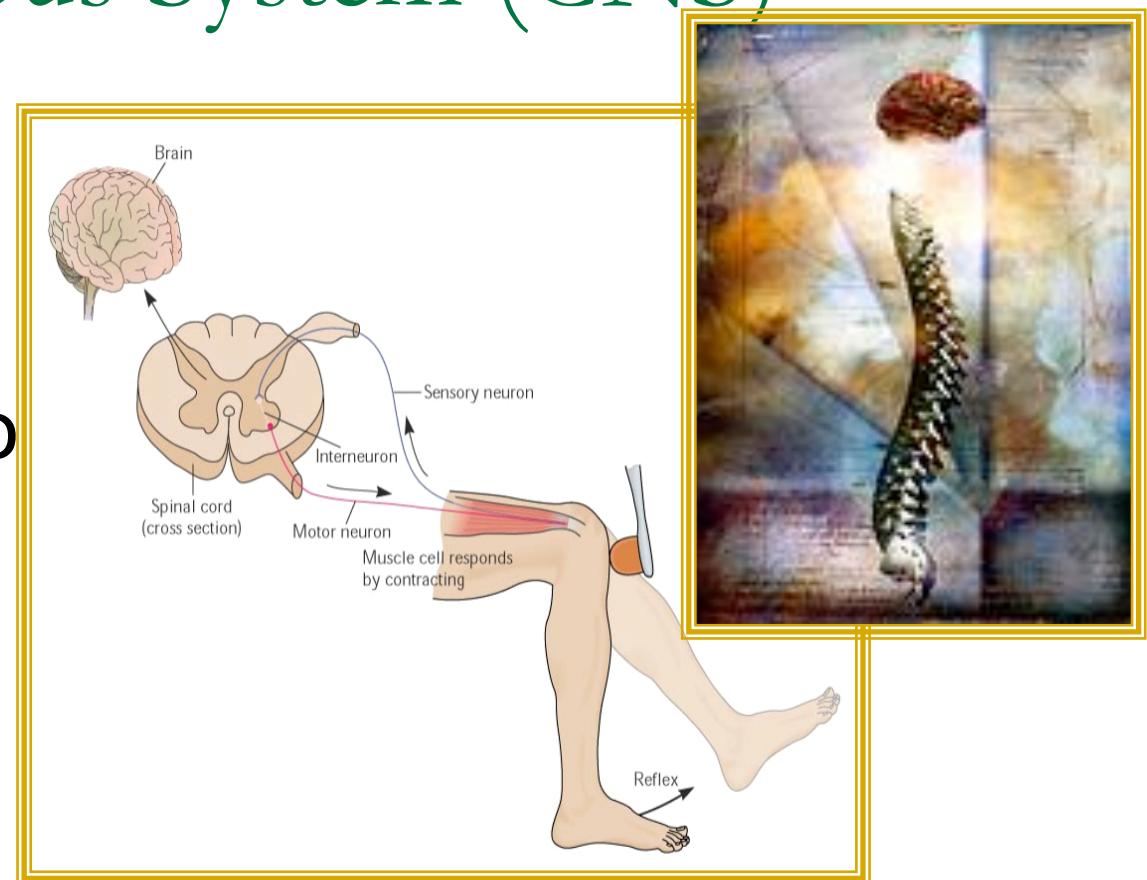
- **Central Nervous System (CNS):** includes the brain and spinal cord
- **Peripheral Nervous System (PNS):** includes all nerves and neurons connecting CNS to the rest of the body (subdivided into the **somatic** and **autonomic** nervous systems)

Nervous System Organization



Nervous System Organization: Central Nervous System (CNS)

- **Brain**
- **Spinal Cord**
(transmits
information into
and out of the
brain)

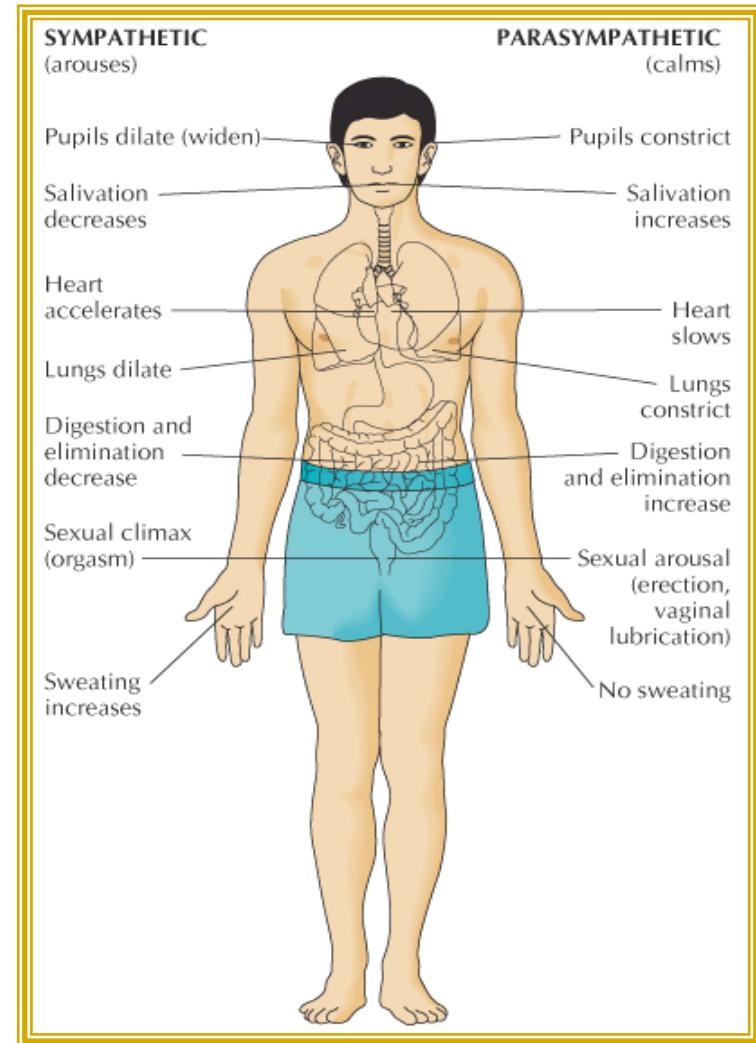


Nervous System Organization: Subdivisions of the Peripheral Nervous System

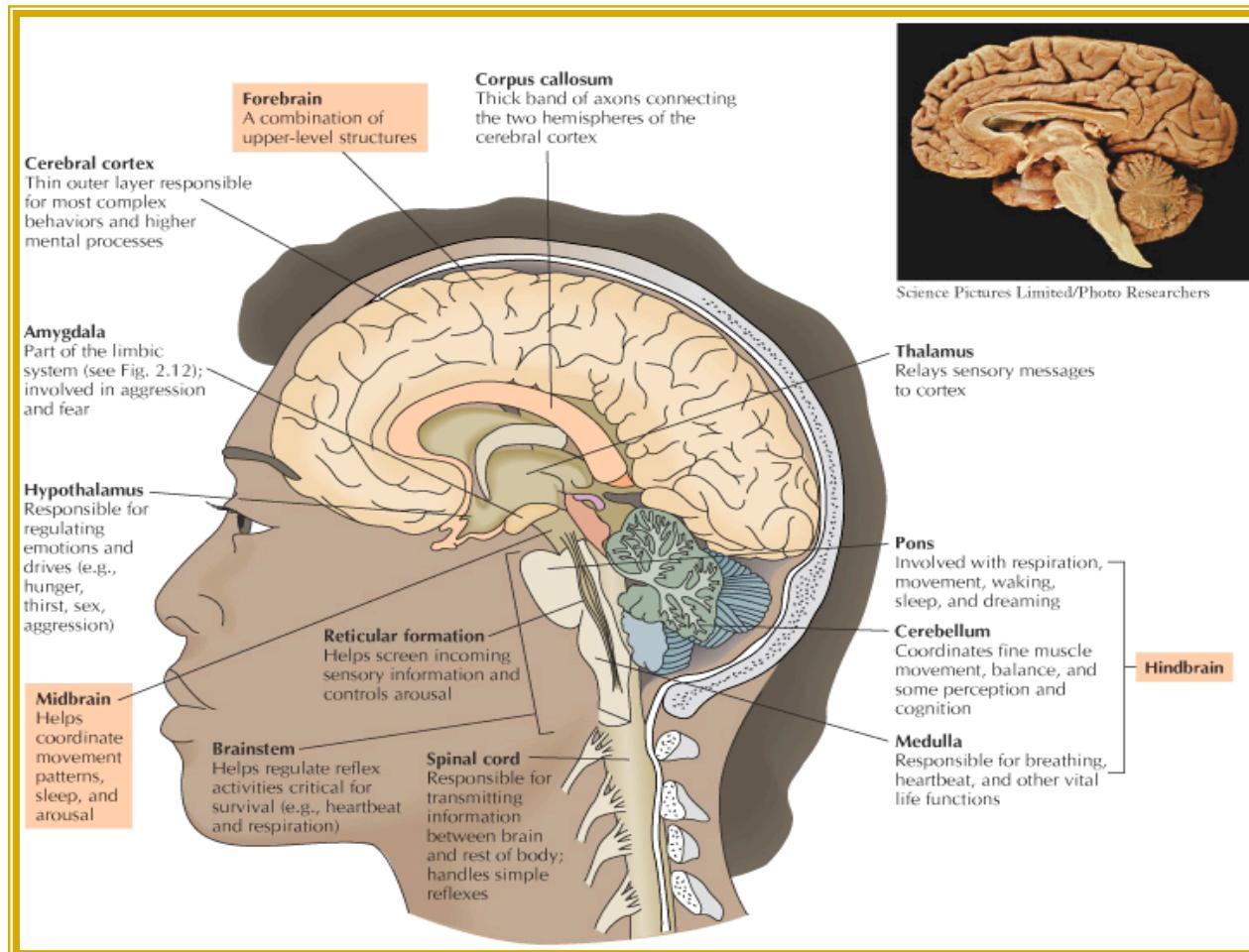
- **Somatic Nervous System (SNS):** connects to sensory receptors and controls skeletal muscles.
- **Autonomic Nervous System (ANS):** controls involuntary bodily functions
- ANS is subdivided into: **Sympathetic Nervous System** (arouses) and the **Parasympathetic Nervous System** (calms)

Nervous System Organization:

■ Parasympathetic and Sympathetic Nervous Systems



A Tour Through the Brain



A Tour Through The Brain: Hindbrain

- **Three key structures of the hindbrain:**
 - **Medulla**: life survival functions
 - **Pons**: respiration, movement, waking, sleeping, and dreaming
 - **Cerebellum**: coordination of fine muscular movements, balance, and some aspects of perception and cognition

A Tour Through The Brain (Continued)

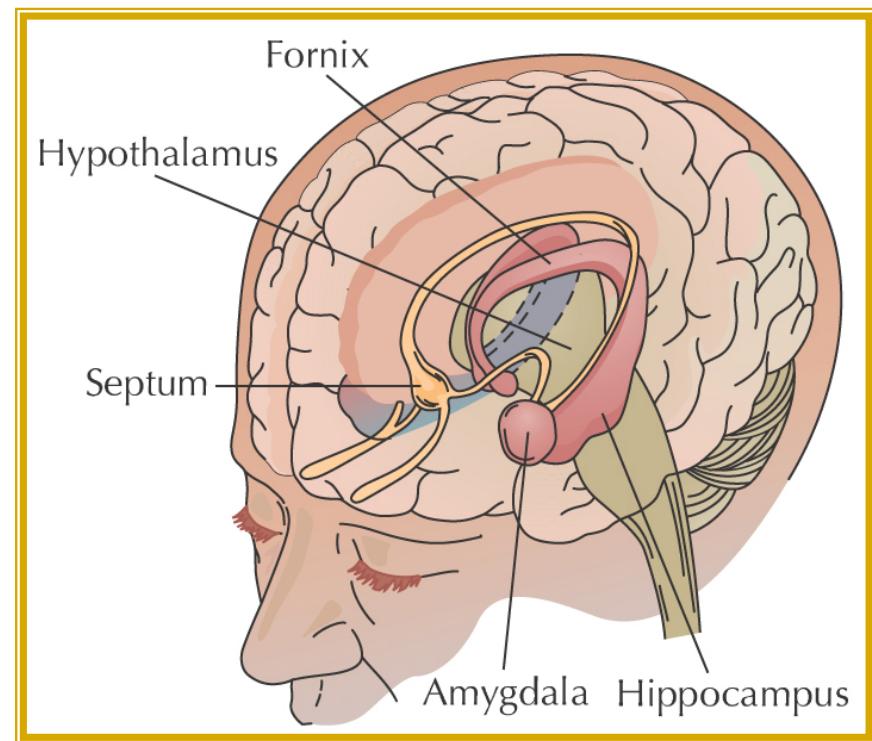
- **Midbrain**: collection of brain structures in the middle of the brain that coordinates movement patterns, sleep, and arousal
 - **Reticular formation**: runs through the hindbrain, midbrain, and brainstem and screens incoming information and controls arousal
-

A Tour Through The Brain (Continued)

- **Forebrain:** collection of upper-level brain structures, including the **thalamus**, **hypothalamus**, and **limbic system**
 - **Thalamus:** relays sensory messages to the cerebral cortex
 - **Hypothalamus:** responsible for emotions, drives, and regulating the body's internal environment

A Tour Through The Brain (Continued)

- Limbic System: interconnected group of forebrain structures involved with emotions, drives, and memory

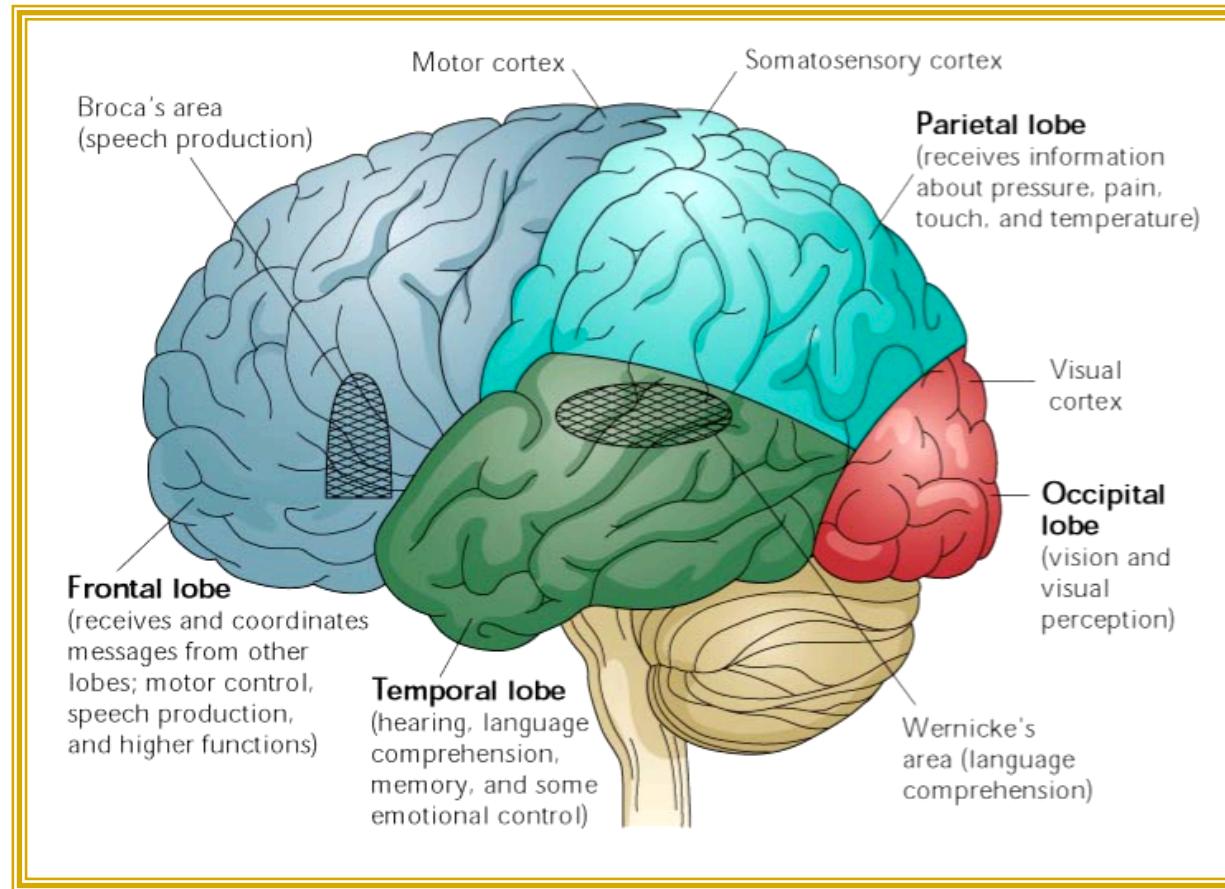


A Tour Through The Brain: Cerebral Cortex

- **Cerebral Cortex:** thin surface layer on the left and right cerebral hemispheres regulating most complex behavior, including sensations, motor control, and higher mental processes



A Tour Through The Brain: Lobes of the Cerebral Cortex (Cont.)

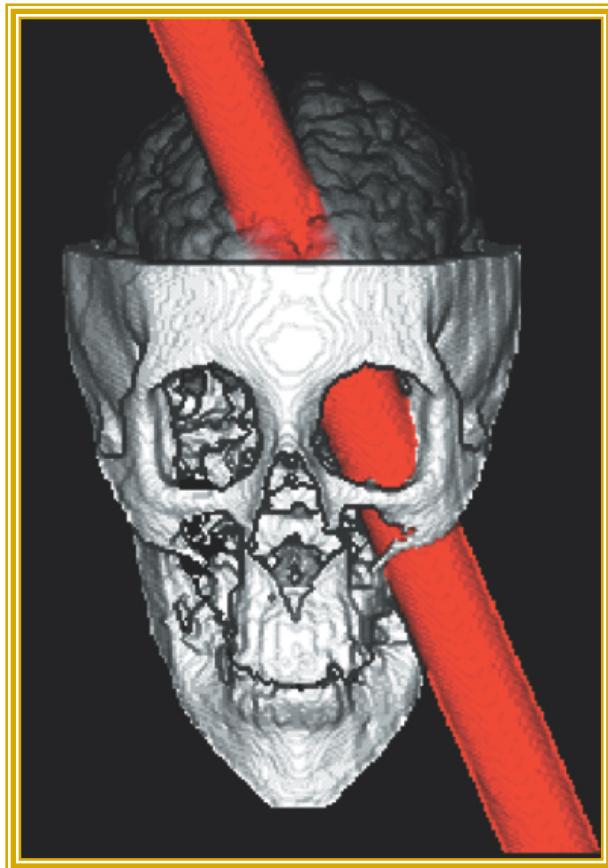


A Tour Through The Brain: Lobes of the Cerebral Cortex

- The **frontal Lobes**- receive and coordinate messages from other lobes and are responsible for motor control, speech production, and higher functions, such as thinking, personality, emotion, and memory.



A Tour Through the Brain: The Importance of the Frontal Lobes

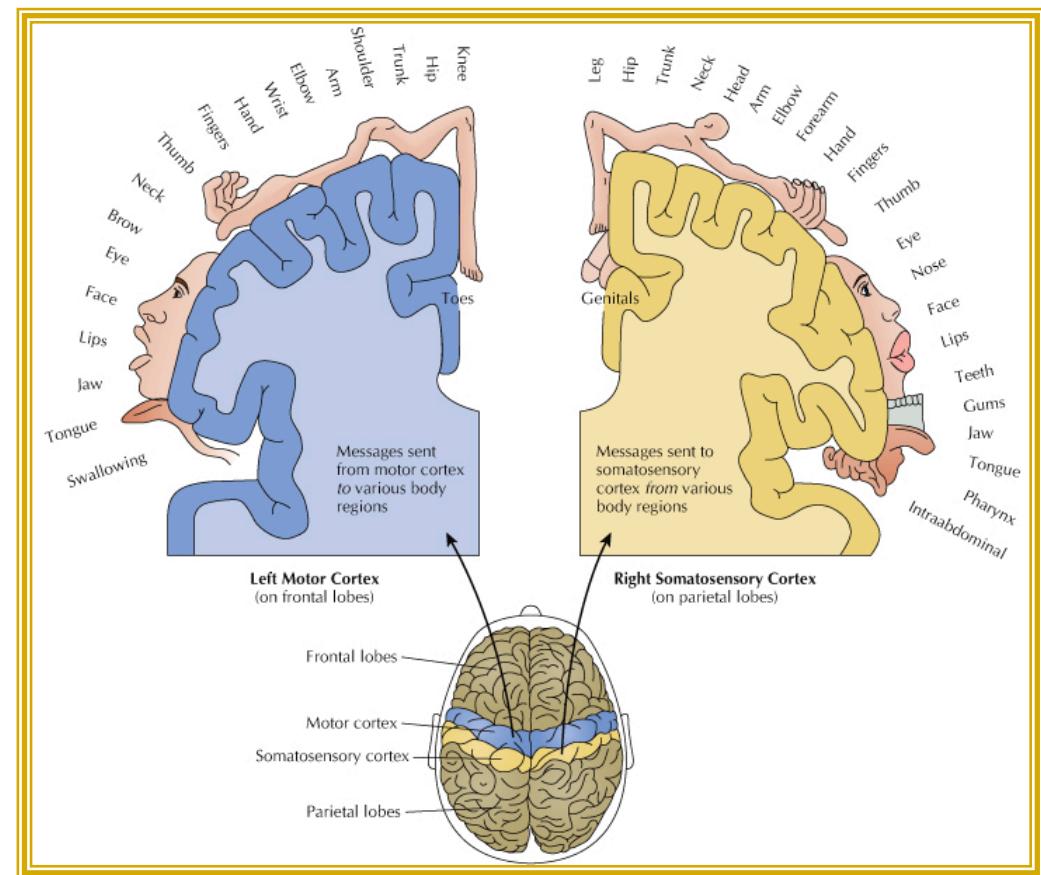


- Phineas Gage's mining accident sent a 13-pound tamping iron through his frontal lobes. How did this affect his short- and long-term behavior and mental processes?

A Tour Through The Brain: Lobes of the Cerebral Cortex (Cont.)

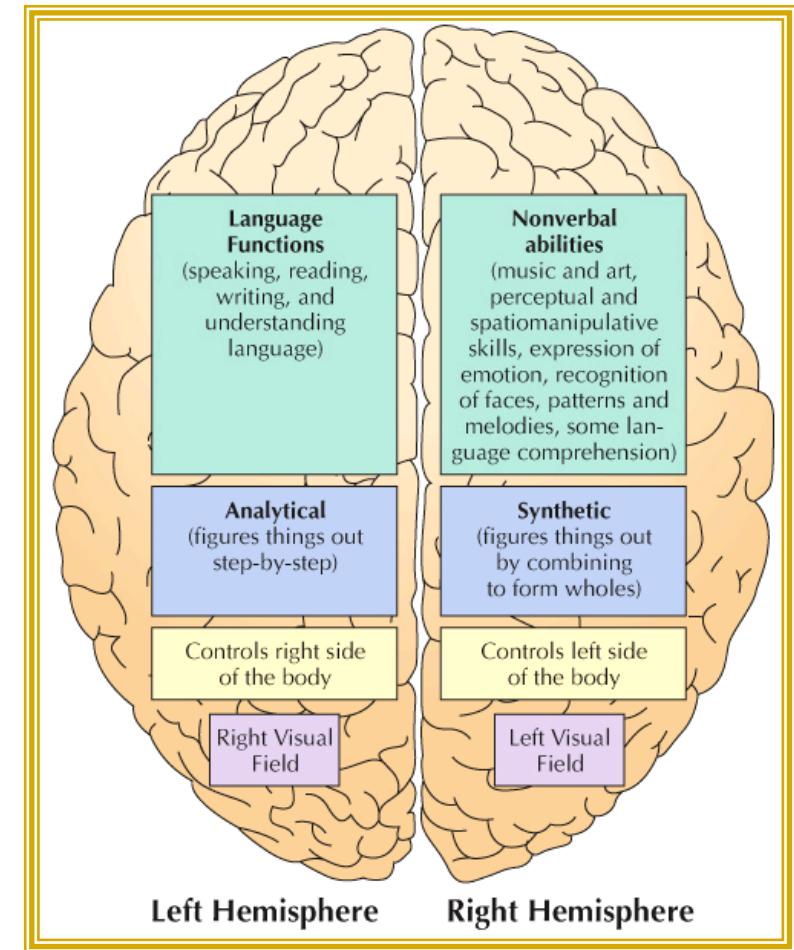
- **Parietal Lobes:** located at the top of the brain directly behind the frontal lobes and responsible for interpreting bodily sensations
- **Temporal Lobes:** located on each side of the brain above the ears and responsible for audition, language comprehension, memory, and some emotional control
- **Occipital Lobes:** located at the back of the brain responsible for vision and visual perception

A Tour Through The Brain: The Motor Cortex and Somatosensory Cortex



A Tour Through The Brain: Lateralization

- The left and right hemispheres of the brain each specialize in particular operations.



Our Genetic Inheritance

- **Evolutionary Psychology:** studies how natural selection and adaptation help explain behavior and mental processes

