Chapter 7
The Nervous System

What are the functions of the Nervous System?

Sensory input – gathering information

- To monitor changes occurring inside and outside the body
- Changes = stimuli

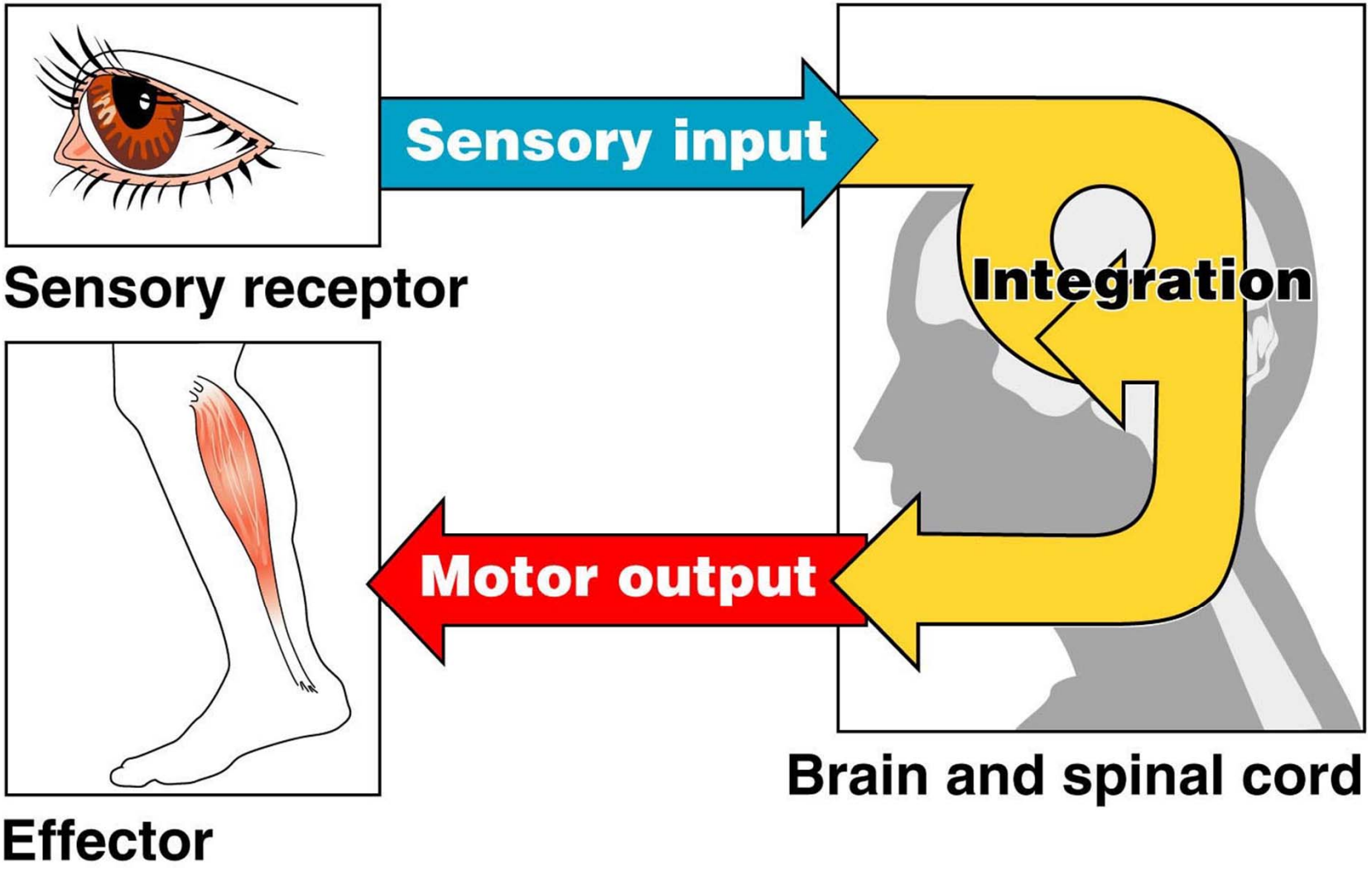
Integration

- To process and interpret sensory input and decide if action is needed

Functions continued…

Motor output

- A response to integrated stimuli
- The response activates muscles or glands



How is the Nervous System organized?

Central nervous system (CNS)

- Brain
- Spinal cord

Peripheral nervous system (PNS)

- Nerves outside the brain and spinal cord

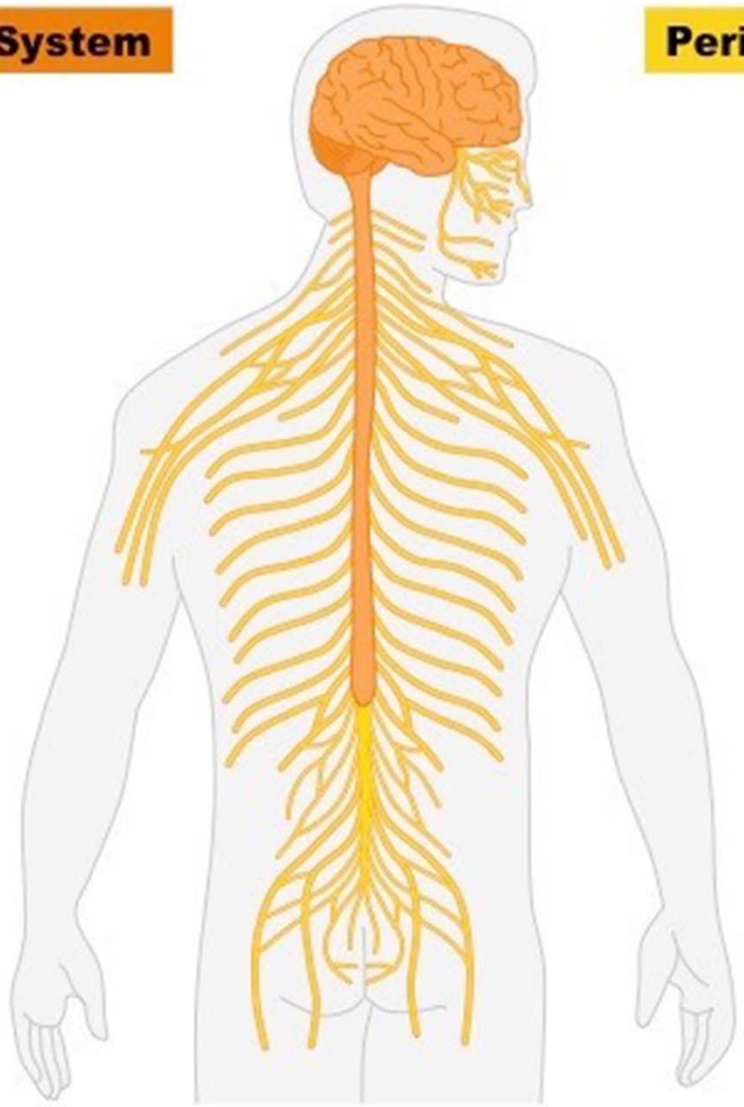
Central Nervous System

Composed of:

- Brain
- Spinal cord

Contains:

- Relay neurons (interneurons)



Peripheral Nervous System

Composed of:

- Cranial nerves
- Spinal nerves
- Peripheral nerves

Contains:

- Sensory neurons
- Motor neurons

Peripheral Nervous System

Sensory (afferent) division

- Nerve fibers that carry information TOWARDS the central nervous system

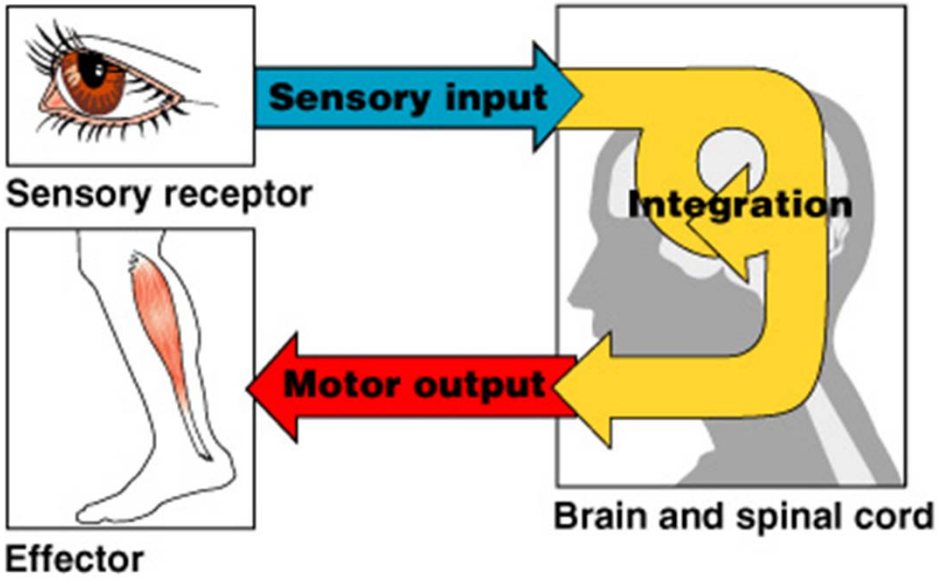


Figure 7.1

Peripheral Nervous System

Motor (efferent) division

- Nerve fibers that carry impulses **AWAY** from the central nervous system

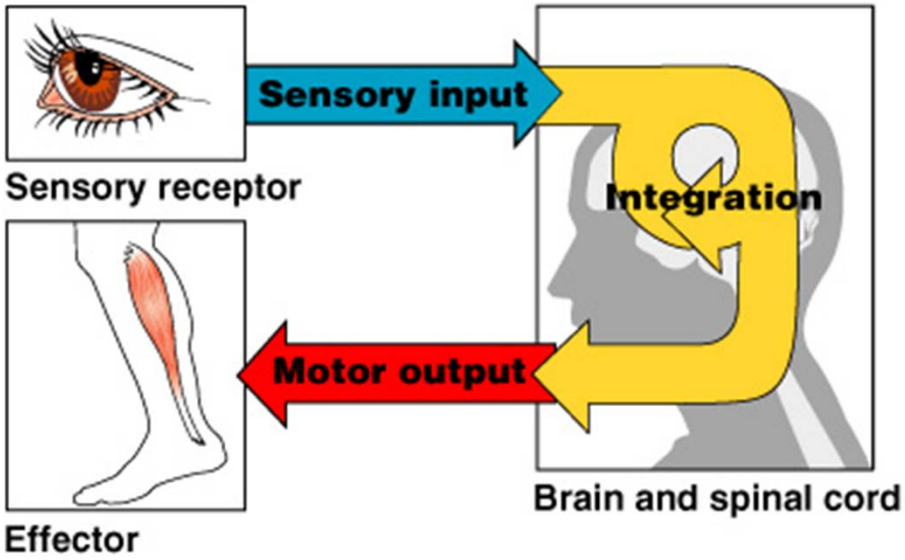


Figure 7.1

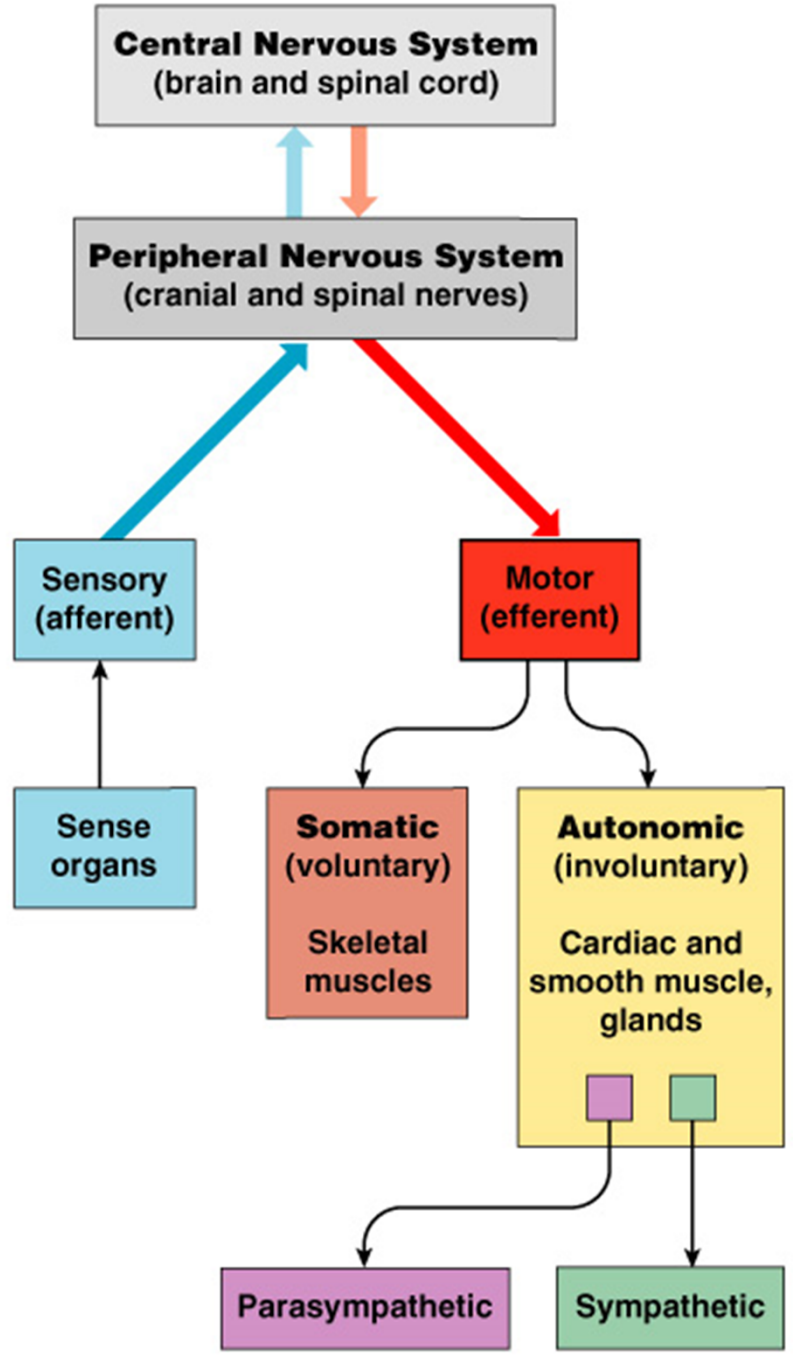
Peripheral Nervous System

Motor (efferent) division

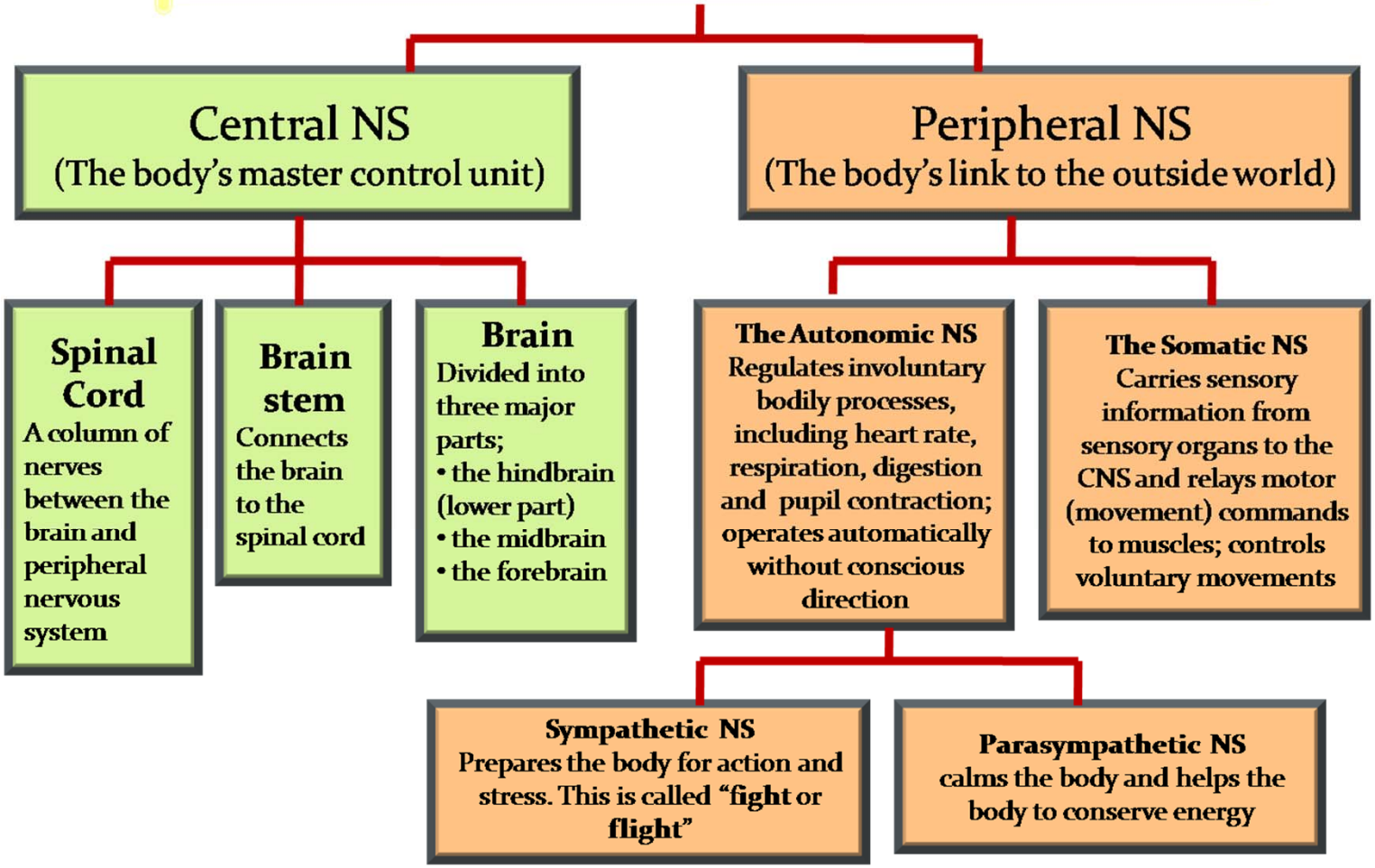
- Has two subdivisions
  1. Somatic nervous system = voluntary
  2. Autonomic nervous system = involuntary

*Think of the **autonomic** system as controlling your body **automatically.** These actions are involuntary, meaning we cannot consciously control them.*

Organization of the Nervous System



The Nervous System



Nervous Tissue: **Neurons**

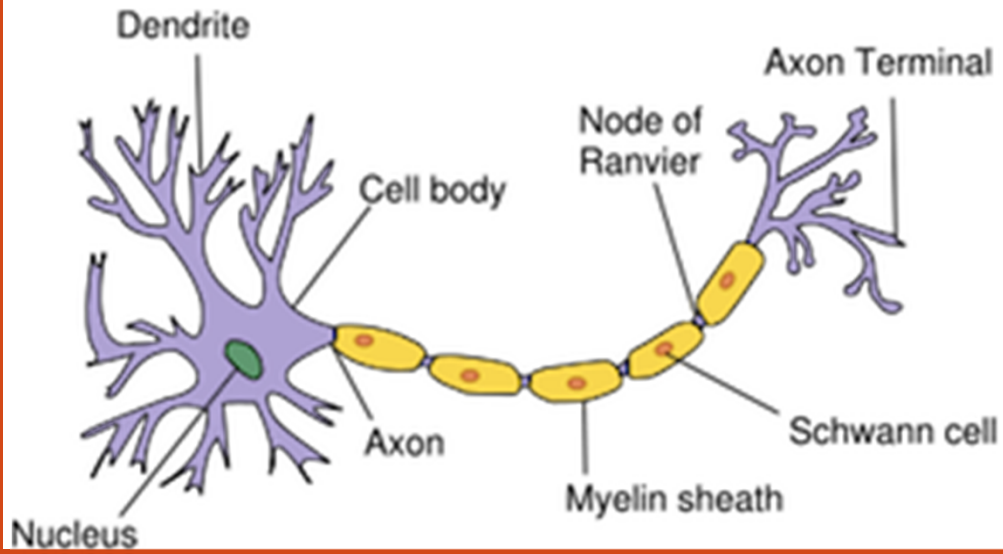
Neurons = nerve cells

- Cells specialized to transmit messages
- Major regions of neurons
  - **Cell body** – nucleus and metabolic center of the cell
  - **Processes** – fibers that extend from the cell body including the axon and dendrites.

Neuron Anatomy

Cell body

- Nucleus
- Large nucleolus



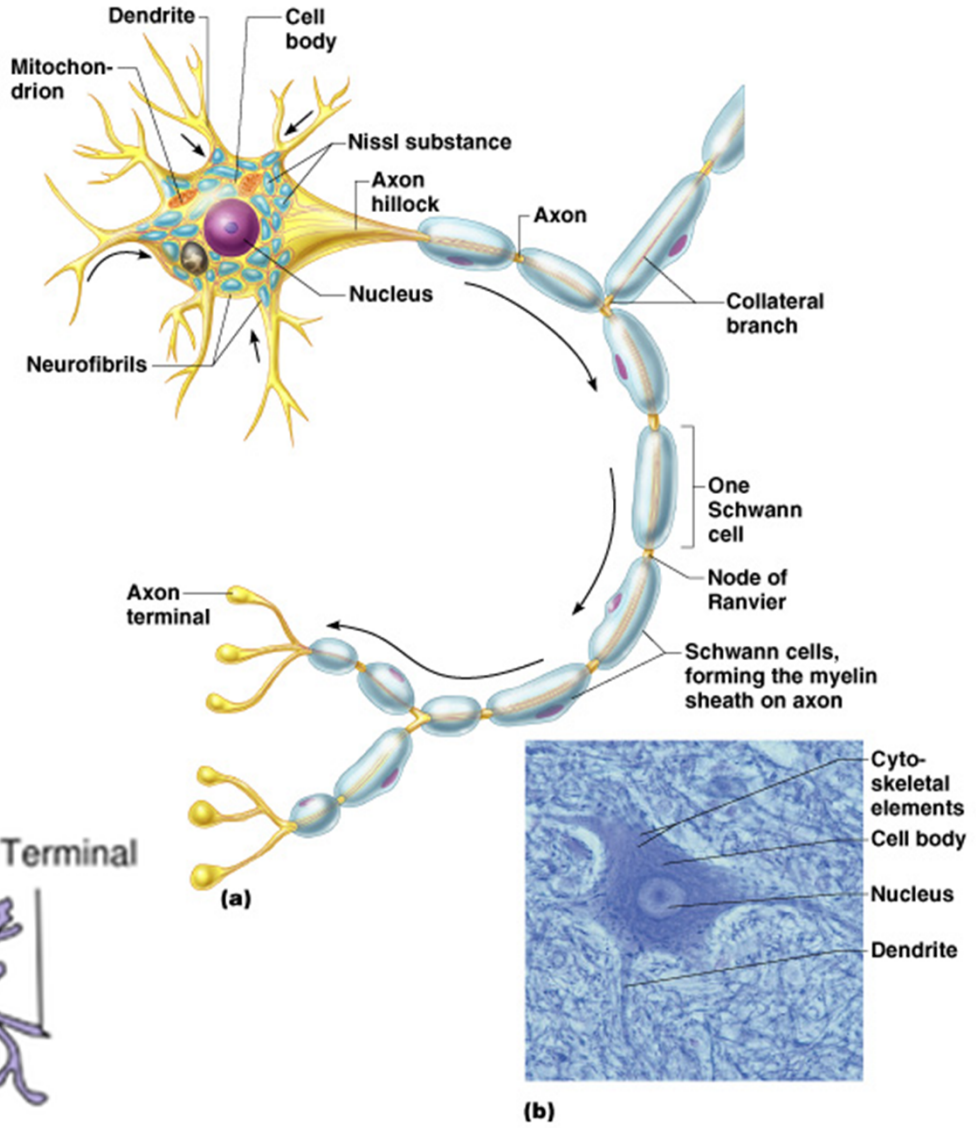


Figure 7.4a–b

Neuron Anatomy 2

Extensions outside the cell body

- **Dendrites** – conduct impulses toward the cell body
- **Axons** – conduct impulses away from the cell body

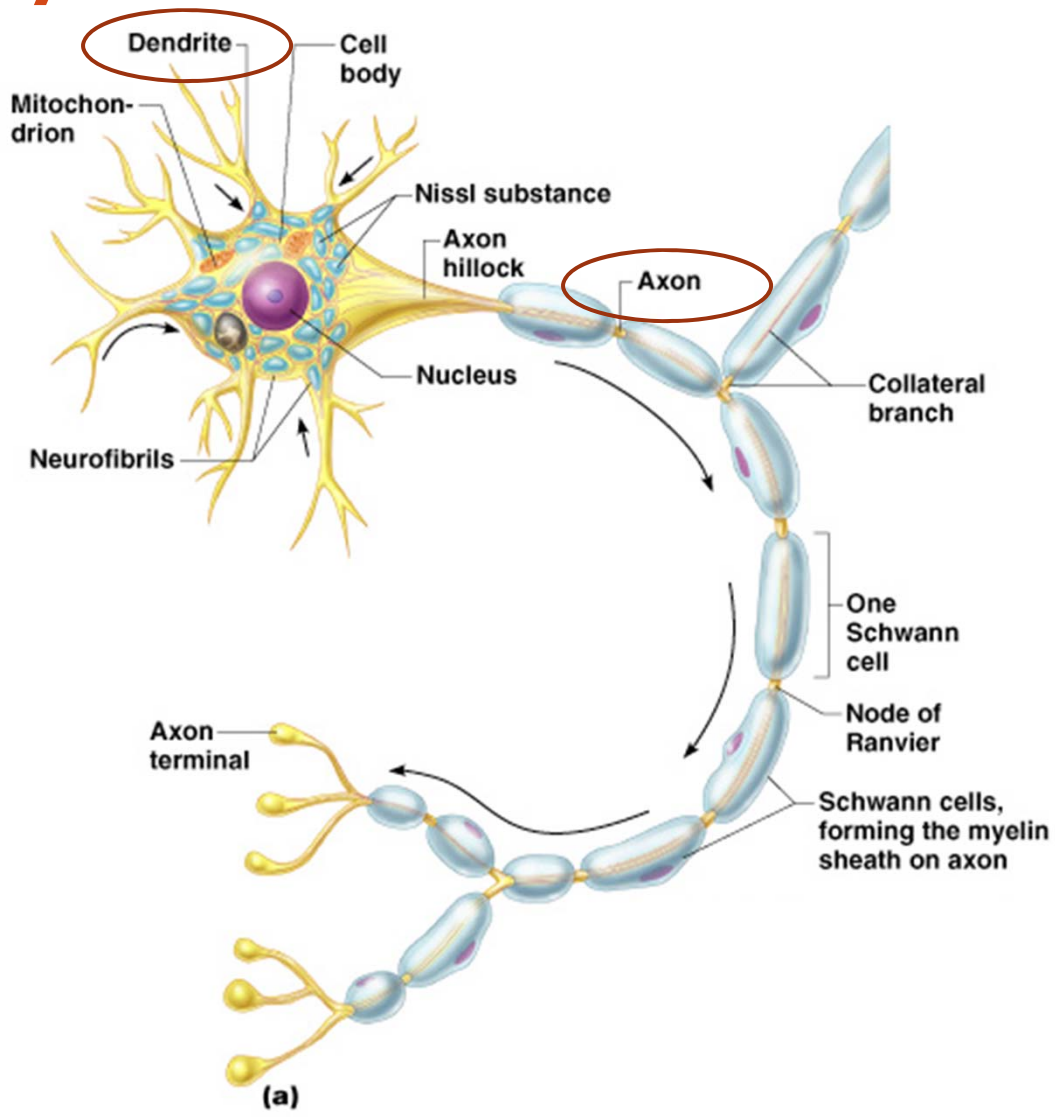


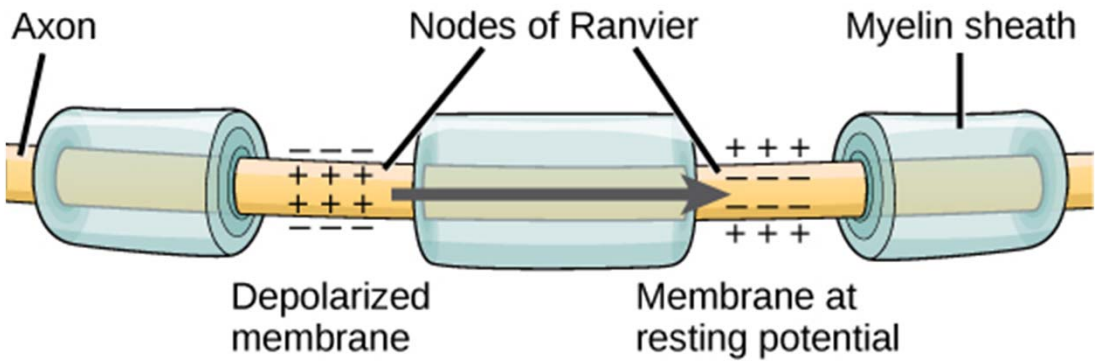
Figure 7.4a

Axons and Nerve Impulses

- Axons end in axonal terminals
- Axonal terminals contain vesicles with neurotransmitters
- Axonal terminals are separated from the next neuron by a gap
  - **Synaptic cleft** – gap between adjacent neurons
  - **Synapse** – junction between nerves

Nerve Fiber Coverings

- **Schwann cells** – produce myelin sheaths in jelly-roll like fashion
- **Nodes of Ranvier** – gaps in myelin sheath along the axon



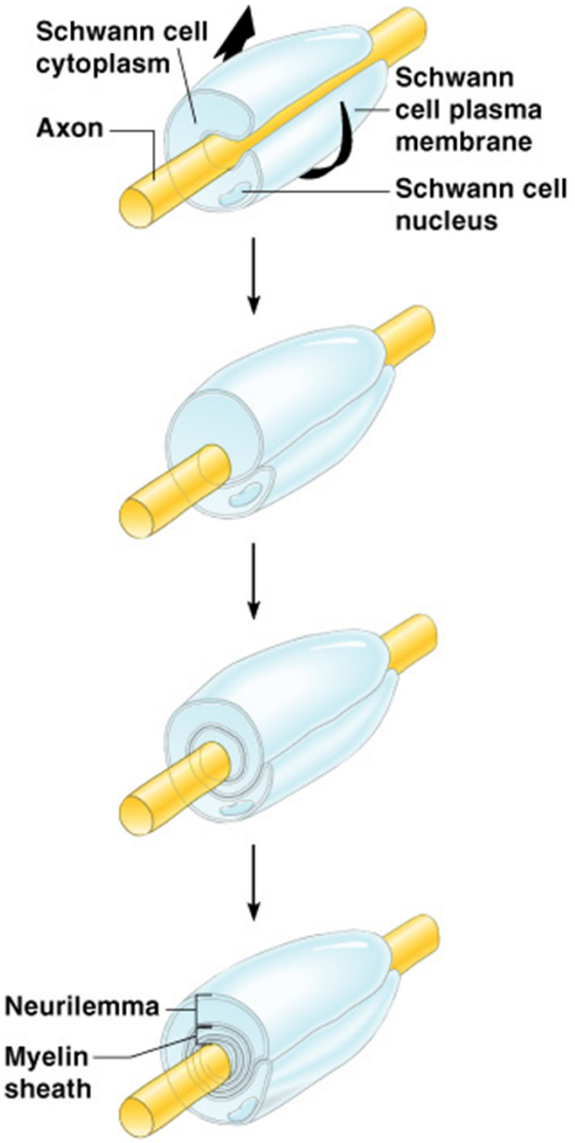


Figure 7.5

Neuron Cell Body Location

- Most are found in the central nervous system
  - **Gray matter** – cell bodies and unmyelinated fibers
  - **Nuclei** – clusters of cell bodies within the white matter of the central nervous system
- **Ganglia** – collections of cell bodies outside the central nervous system

Functional Classification of Neurons

- **Sensory** (afferent) neurons
  - Carry impulses from the sensory receptors
- **Motor** (efferent) neurons
  - Carry impulses from the central nervous system

Functional Classification of Neurons

Interneurons (association neurons)

- Found in neural pathways in the central nervous system
- Connect sensory and motor neurons

Neuron Classification

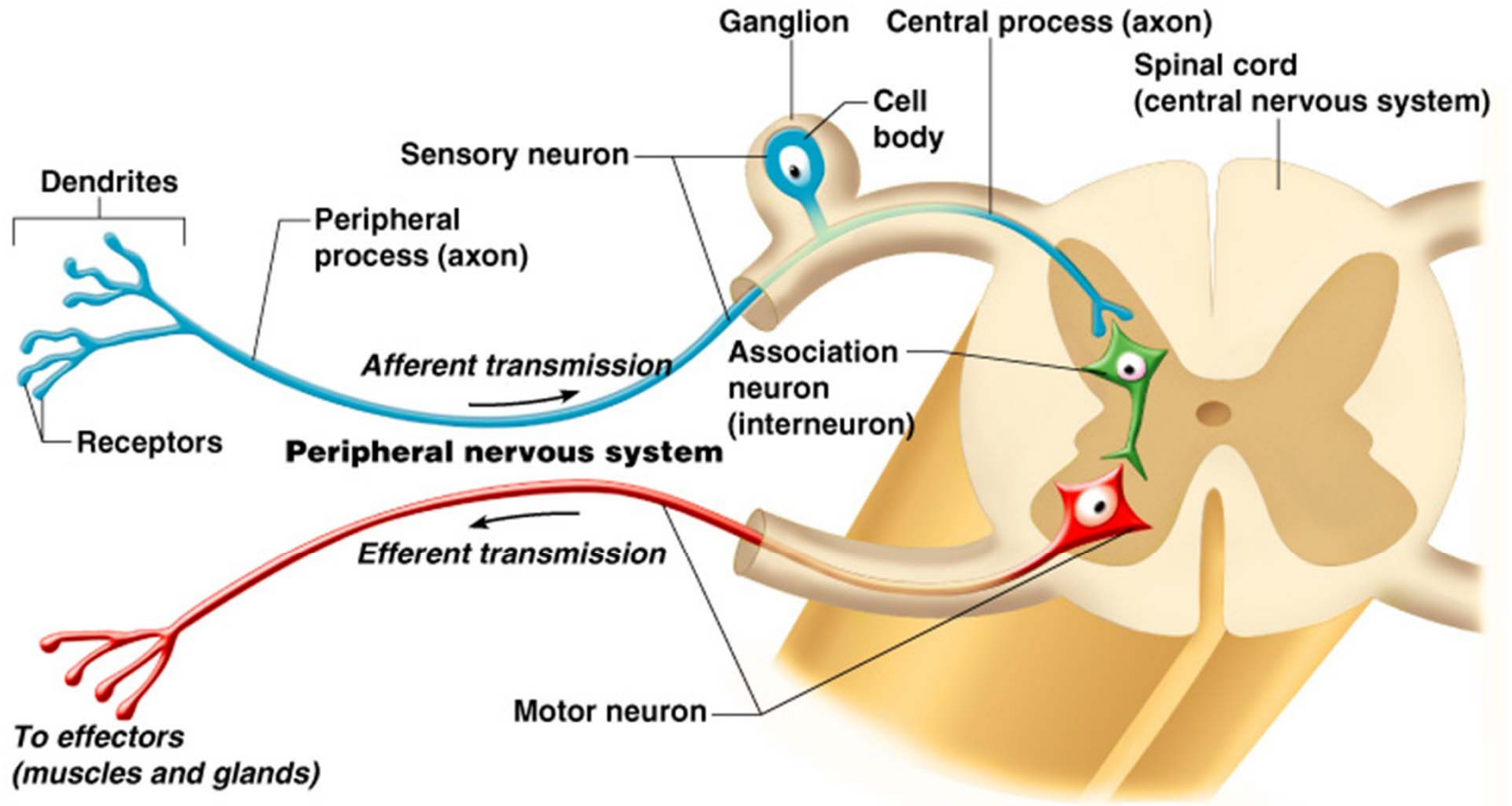


Figure 7.6

Structural Classification of Neurons

- **Multipolar** neurons – many extensions from the cell body

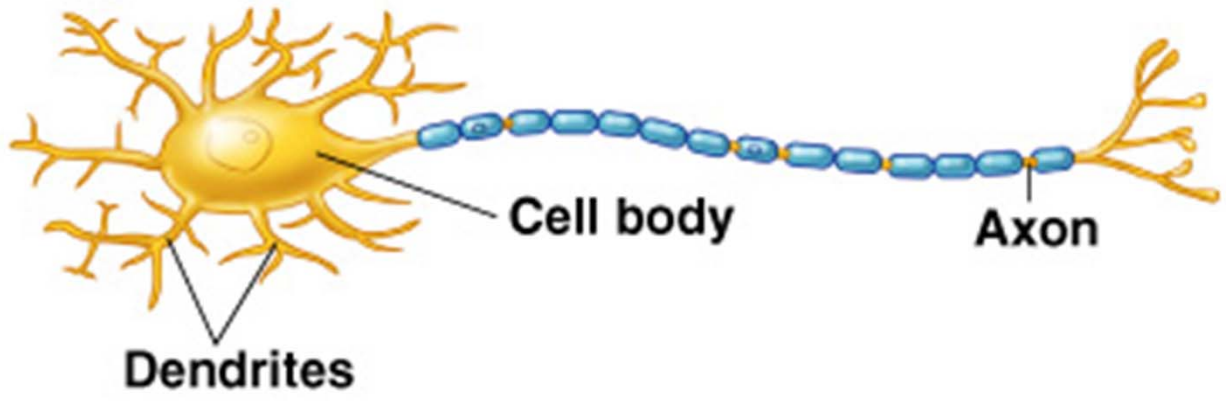


Figure 7.8a