



The Human Body  
in Health and Illness

*Barbara Herlihy*

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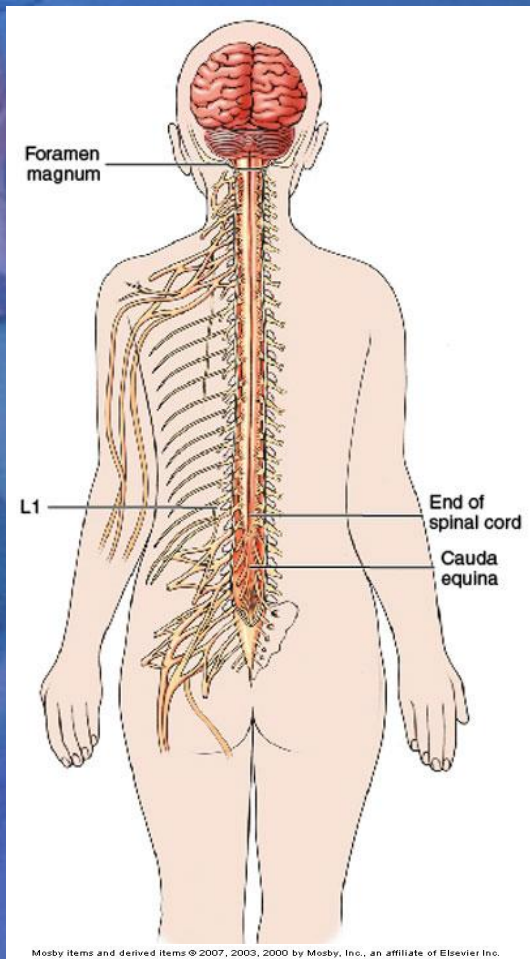
**Chapter 11:**  
**Nervous System: Spinal Cord  
and Peripheral Nerves**

# Lesson 11.1 Objectives

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- Describe the anatomy of the spinal cord and list its three functions.
- List four components of the reflex arc.

# Spinal Cord Structure



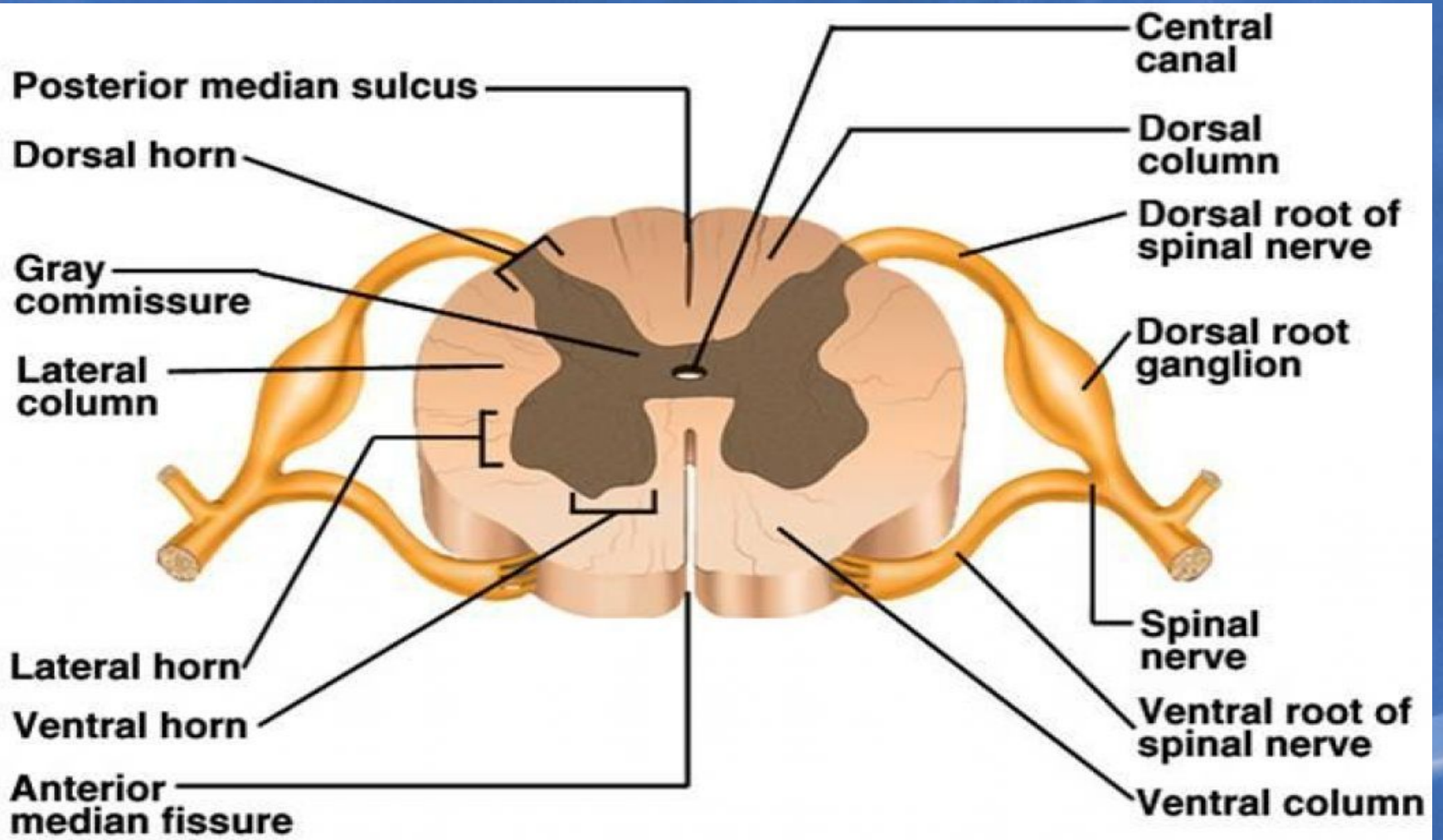
- Spinal cord: continuation of the brain stem
- Structure:
  - Tubelike structure located in the spinal cavity
  - 17 inches long
  - Diameter similar to the thickness of the thumb



# Spinal Cord Structure (cont'd.)

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- Gray matter: cell bodies and interneurons located in the center of the spinal cord and shaped like a butterfly
- Two projections: dorsal horn and ventral horn
- Central canal: opening extending the entire length of the spinal cord



# Spinal Cord Structure (cont'd.)

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- White matter: myelinated axons grouped together into nerve tracts
  - Sensory tracts: ascending tracts
  - Motor tracts: descending tracts



# Major Spinal Cord Tracts

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## Tracts

## Functions

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### Ascending

Spinothalamic

Temperature; pressure; pain; light touch

Dorsal column

Proprioception; deep pressure; vibration

Spinocerebellar

Proprioception

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# Major Spinal Cord Tracts (cont'd.)

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## Tracts

## Functions

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### Descending

Pyramidal

Skeletal muscle tone; voluntary muscle movement

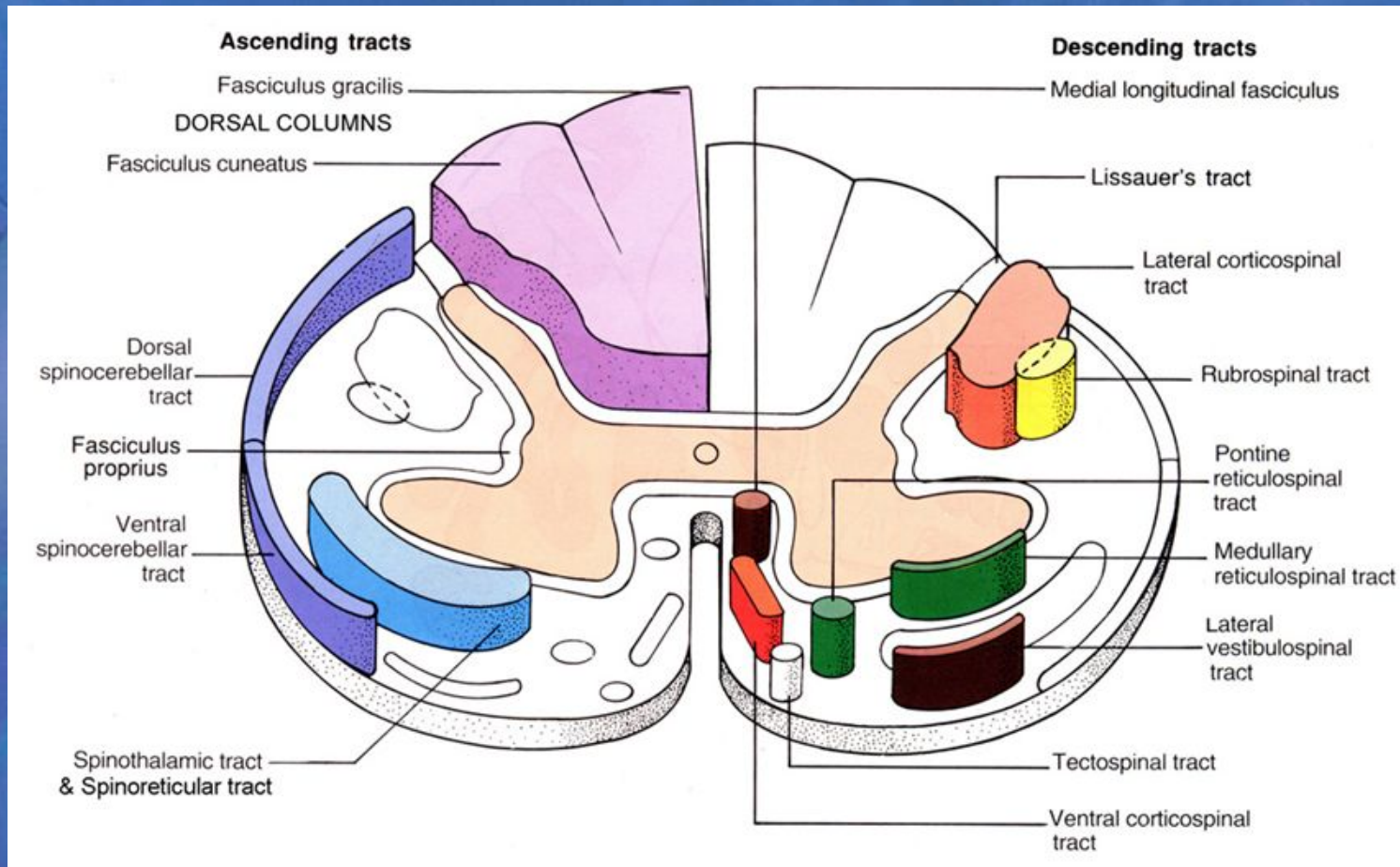
Extrapyramidal

Skeletal muscle activity (balance and posture)

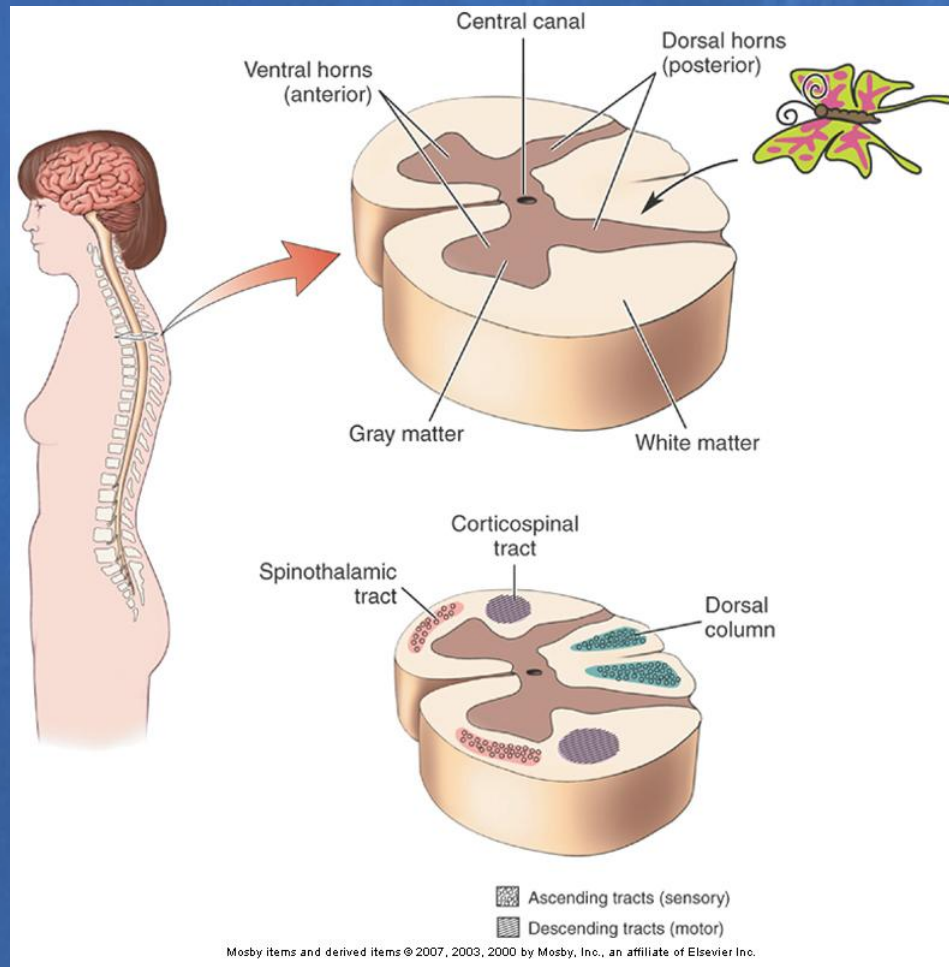
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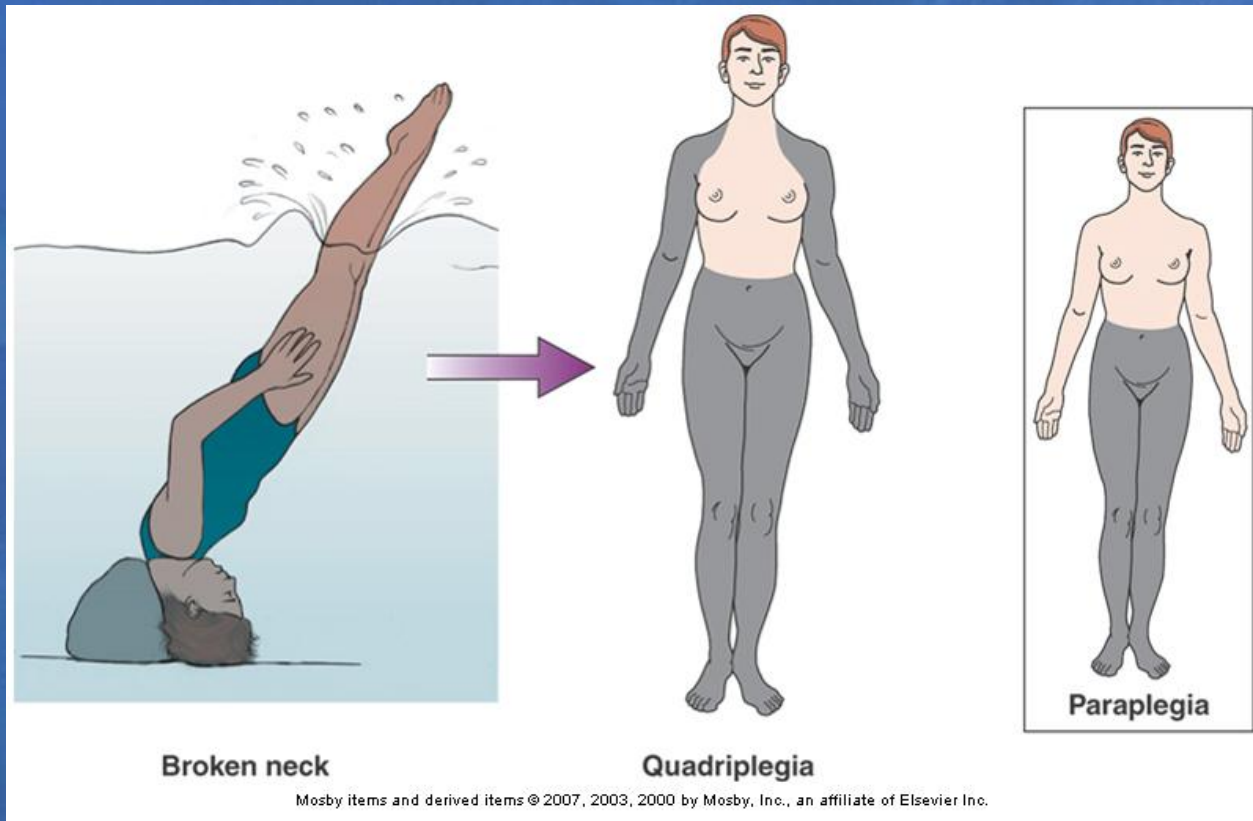
# Ascending and Descending Tracts



# Spinal Cord Structure



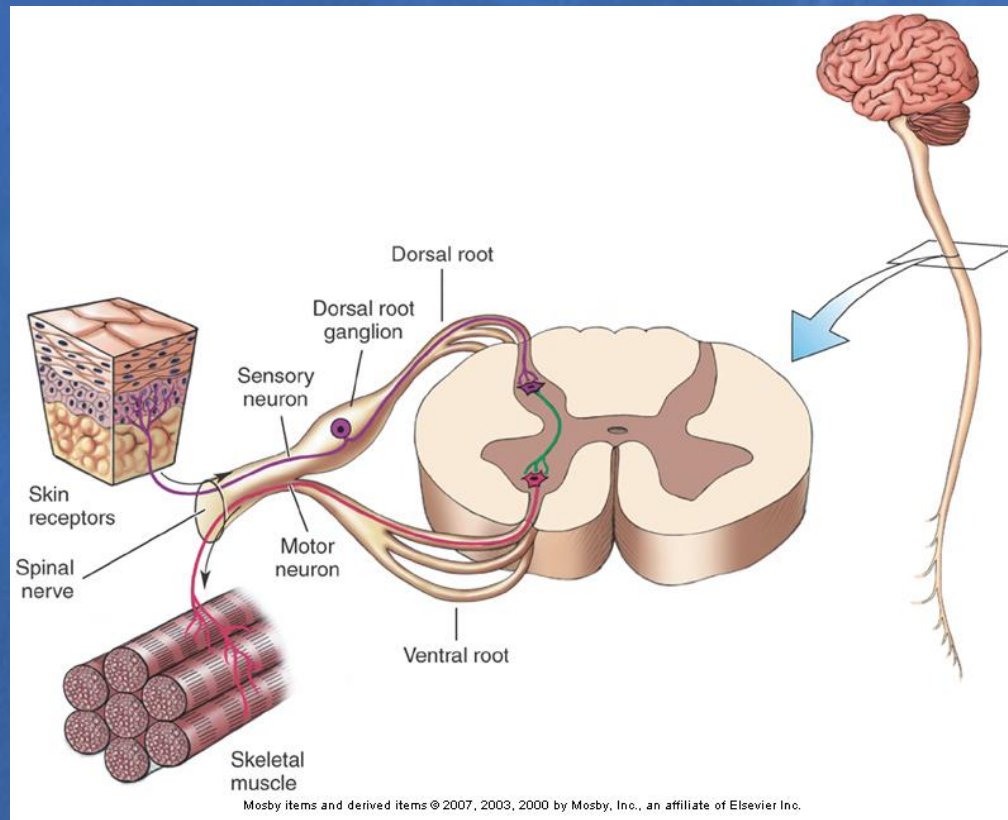
# Spinal Cord Structure (cont'd.)



Spinal cord injuries.



# Spinal Cord Structure (cont'd.)



Attachment of the spinal nerves to the spinal cord.



# Spinal Cord Function

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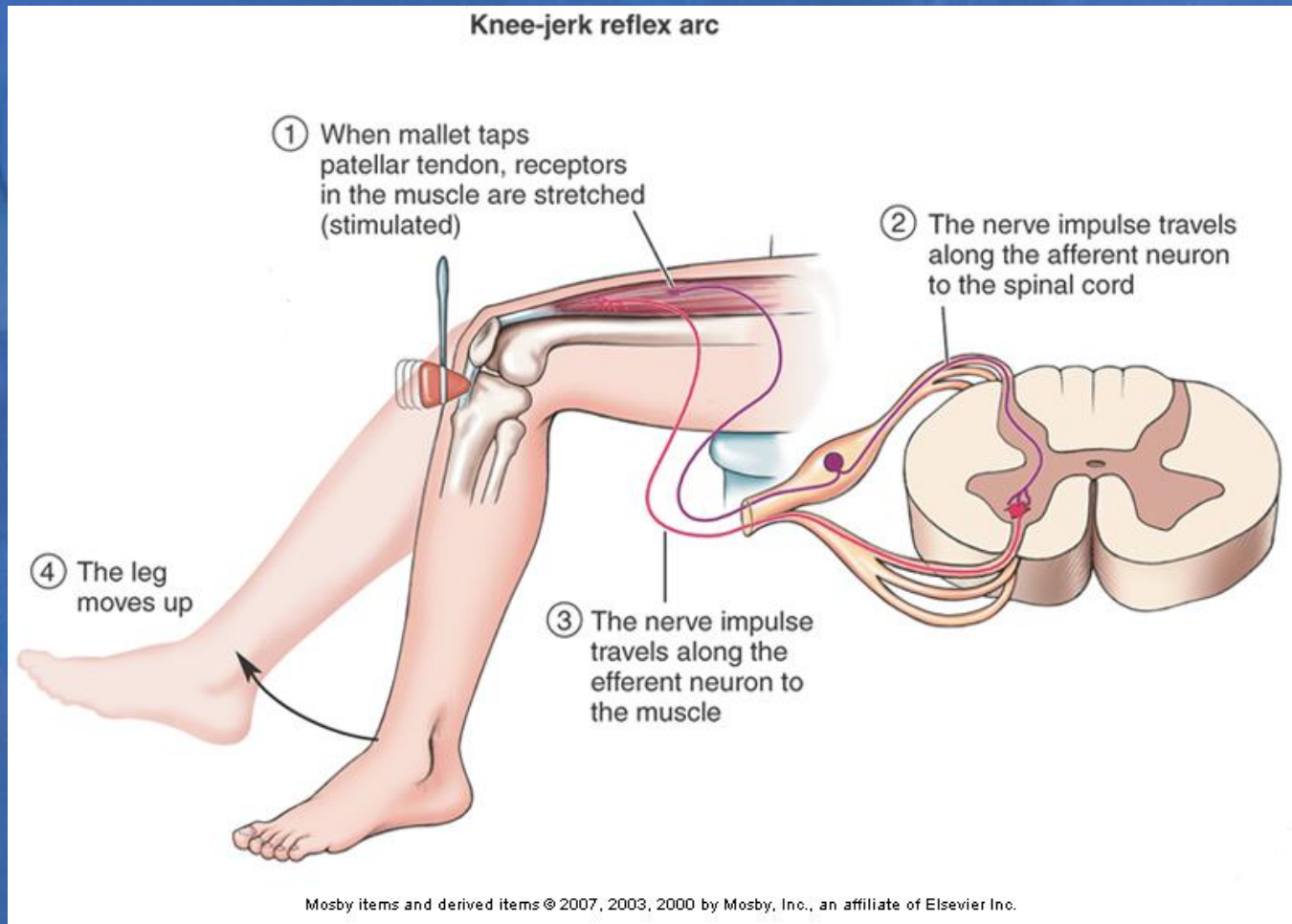
- Three major functions:
  - Sensory pathway
    - Provides pathways for sensory information from periphery to the brain
  - Motor pathway
    - Pathway to send motor information from the brain to the periphery
  - Reflex center
    - Acts as a major reflex centre

# Spinal Cord Function (cont'd.)

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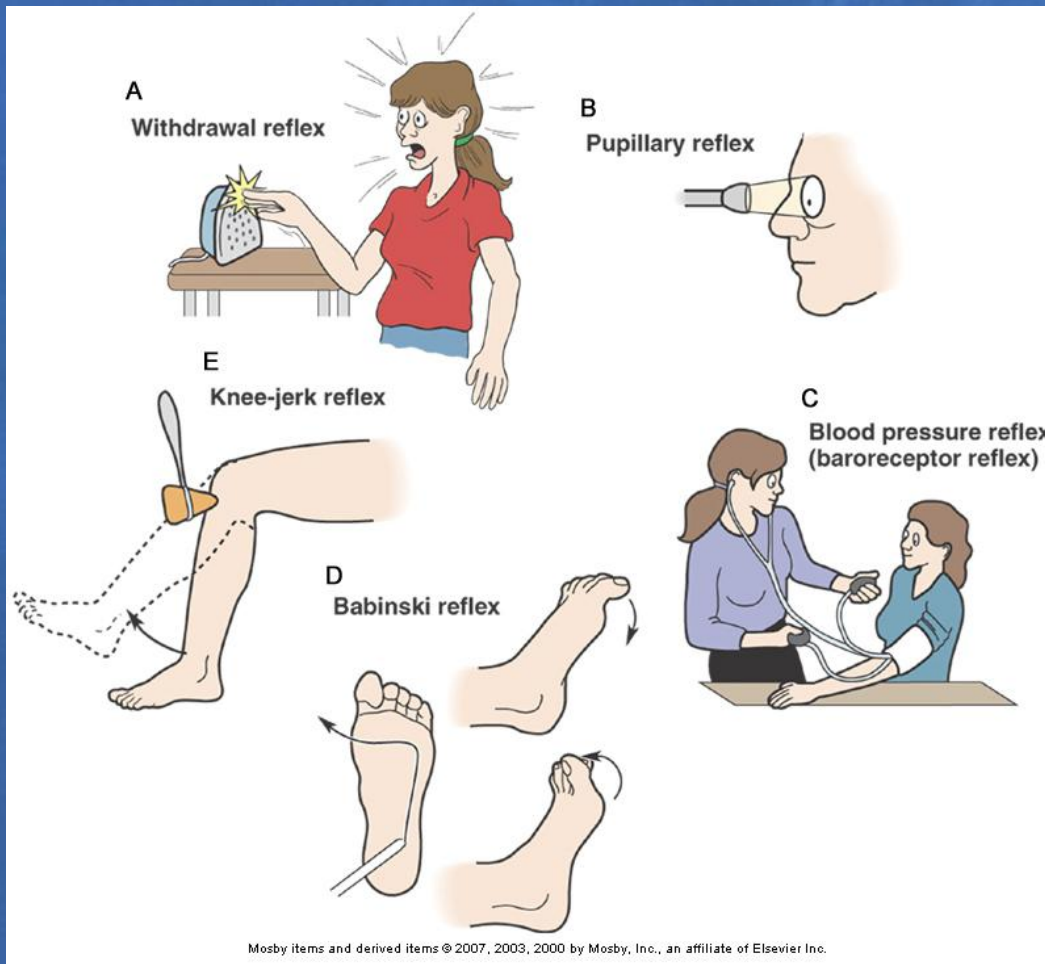
- Reflex: involuntary response to a stimulus
- Reflex arc: nerve pathway involved in a reflex
  - Receptor
  - Afferent neuron
  - Efferent neuron
  - Effector organ

# Spinal Cord Function (cont'd.)





# Spinal Cord Function (cont'd.)





# Lesson 11.2 Objectives

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- List and describe the functions of the 12 pairs of cranial nerves.
- Identify the classification of spinal nerves.
- List the functions of the three major plexuses.

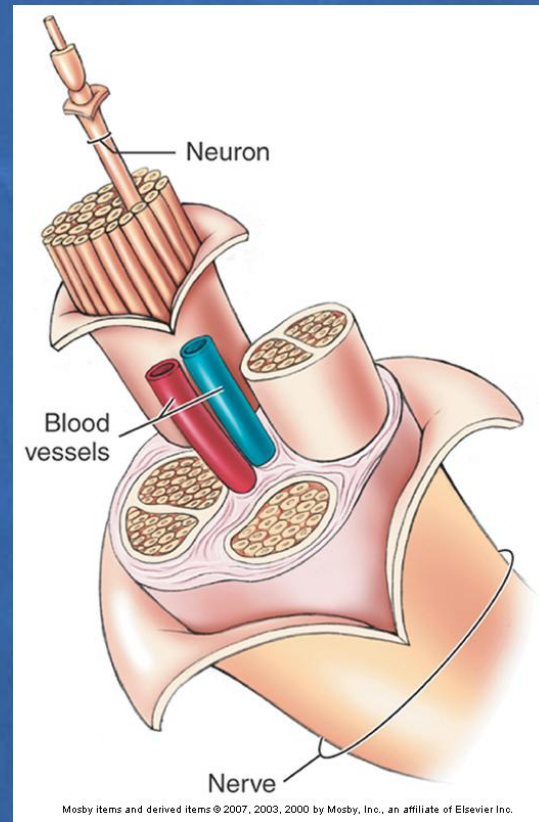
# Nerves

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- Neuron is a single nerve cell
- A nerve is made of many neurons bundled together, with blood vessels and wrapped in connective tissue
- 3 types of nerves
  - Sensory
  - Motor
  - Mixed

# Peripheral Nervous System

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Difference between a neuron and nerve.



# Peripheral Nervous System (cont'd.)

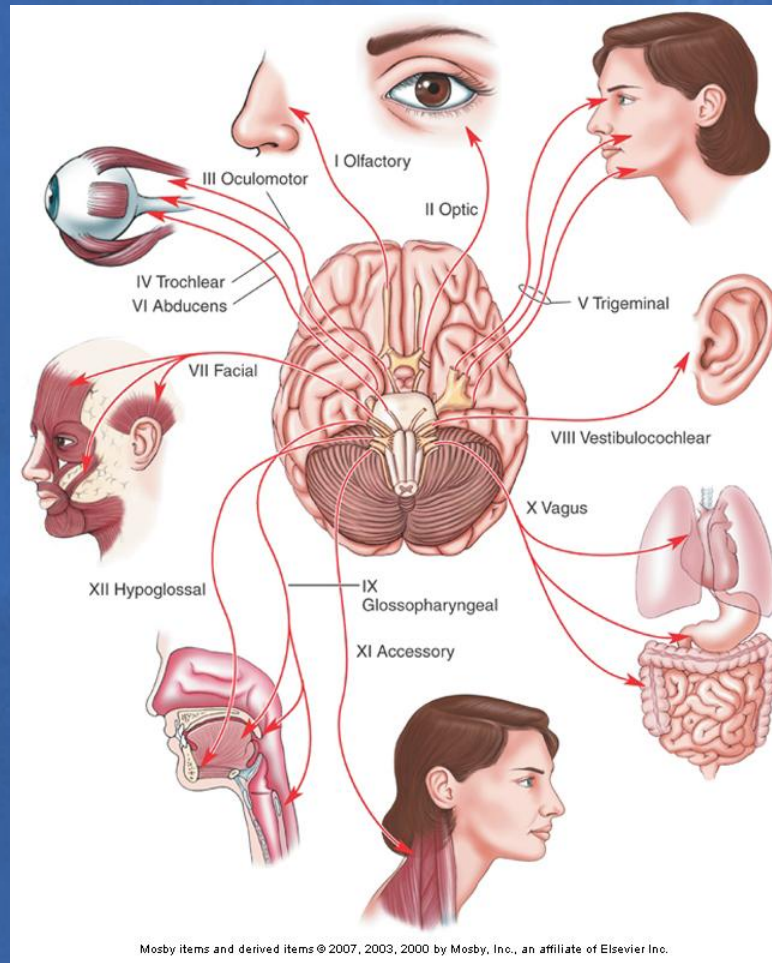
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- Classifications of peripheral nervous system:
  - Structural classification: based on origin of the fiber
    - Cranial nerves
    - Spinal nerves
  - Functional classification: based on where nerves go and what they do
    - Somatic afferent nerves
    - Somatic efferent nerves
    - Autonomic nervous system (ANS)



# Peripheral Nervous System (cont'd.)

## Cranial nerves



# Peripheral Nervous System (cont'd.)

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- Functions of cranial nerves:
  - Sensory information for the special senses: smell, taste, vision, hearing, and balance
  - Sensory information for the general senses: touch, pressure, pain, temperature, and vibration
  - Motor information that results in contraction of skeletal muscles
  - Motor information that results in the secretion of glands and the contraction of cardiac and smooth muscle

# Peripheral Nervous System (cont'd.)

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- CN I
  - Olfactory nerve
  - Sensory
  - Sense of smell
- CN II
  - Optic nerve
  - Sensory
  - Sense of sight



# Peripheral Nervous System (cont'd.)

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- CN III
  - Oculomotor
  - Motor nerve
  - Movement of eyeball, raising of eyelid; change in pupil size
- CN IV
  - Trochlear
  - Motor nerve
  - Movement of eyeball



# Peripheral Nervous System (cont'd.)

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- CN V
  - Trigeminal
  - Mixed nerve
  - Chewing of food; sensations in face, scalp, cornea, and teeth
- CN VI
  - Abducens
  - Mixed nerve (mostly motor)
  - Movement of eyeball

# Peripheral Nervous System (cont'd.)

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- CN VII
  - Facial
  - Mixed nerve
  - Facial expressions; secretion of saliva and tears; taste; blinking
- CN VIII
  - Vestibulocochlear
  - Sensory
  - Sense of hearing and balance

# Peripheral Nervous System (cont'd.)

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- CN IX
  - Glossopharyngeal
  - Mixed nerve
  - Swallowing, secretion of saliva; taste; sensory for reflex regulation of blood pressure; gag reflex
- CN X
  - Vagus
  - Mixed nerve
  - Visceral muscle movement and sensations; sensory for reflex regulation of blood pressure



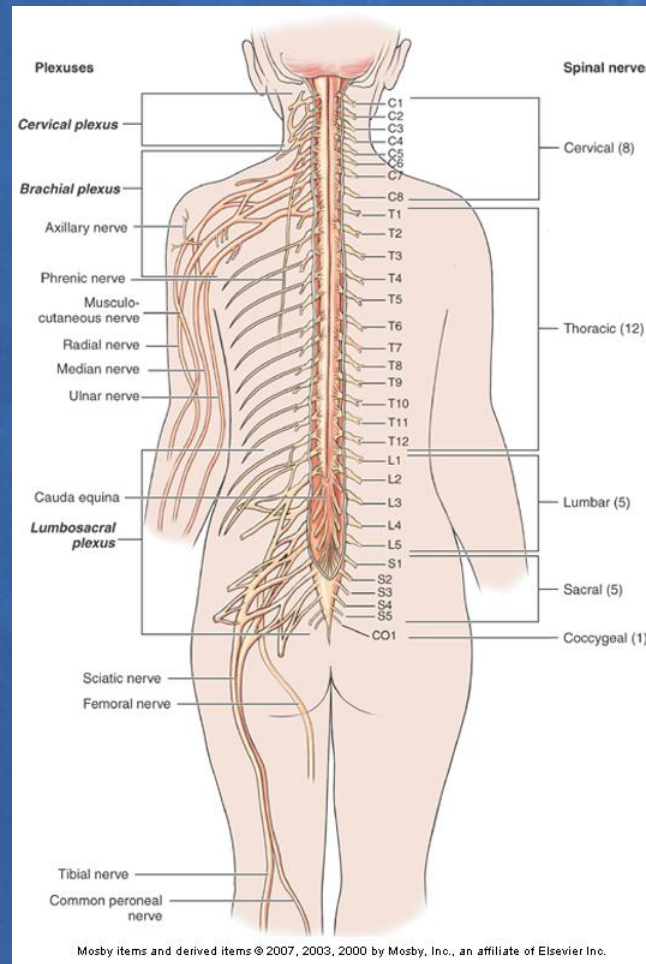
# Peripheral Nervous System (cont'd.)

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- CN XI
  - Accessory
  - Mixed nerve (mostly motor)
  - Swallowing; head and shoulder movement; speaking
- CN XII
  - Hypoglossal
  - Mixed nerve (mostly motor)
  - Speech and swallowing

# Peripheral Nervous System (cont'd.)

## Spinal nerves



# Peripheral Nervous System (cont'd.)

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- Spinal nerves:
  - Cervical nerves: 8 pairs
  - Thoracic nerves: 12 pairs
  - Lumbar nerves: 5 pairs
  - Sacral nerves: 5 pairs
  - Coccygeal nerves: 1 pair



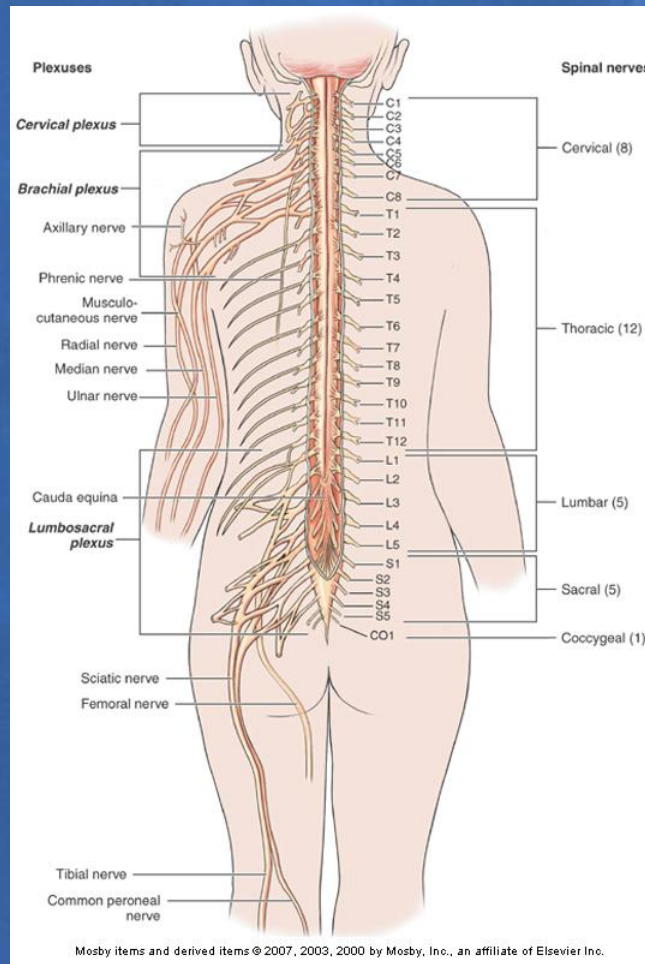
# Peripheral Nervous System (cont'd.)

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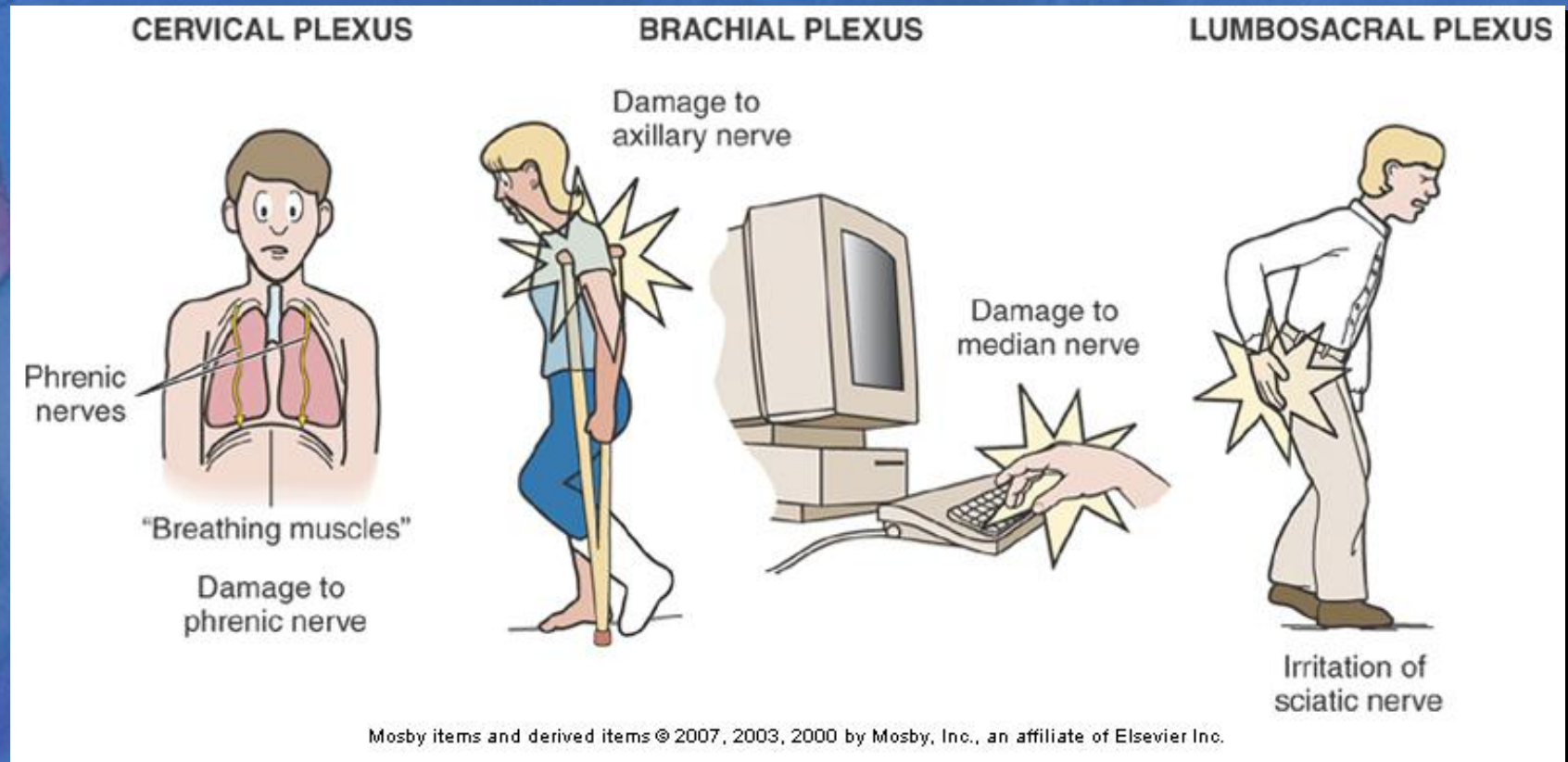
- Spinal nerve plexuses:
  - Cervical plexus (C1 to C4)
  - Brachial plexus (C5 to C8, T1)
  - Lumbosacral plexus (T12, L1 to L5, S1 to S4)

# Peripheral Nervous System (cont'd.)

## Spinal nerve plexuses



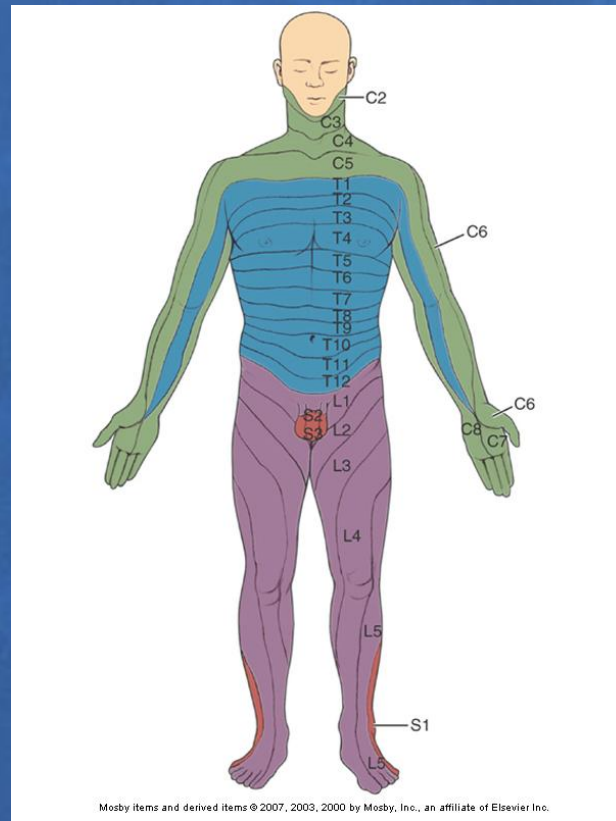
# Peripheral Nervous System (cont'd.)



Examples of nerve damage.



# Peripheral Nervous System (cont'd.)



**Dermatome.**