

Spinal Cord (sp cd) and Nerves



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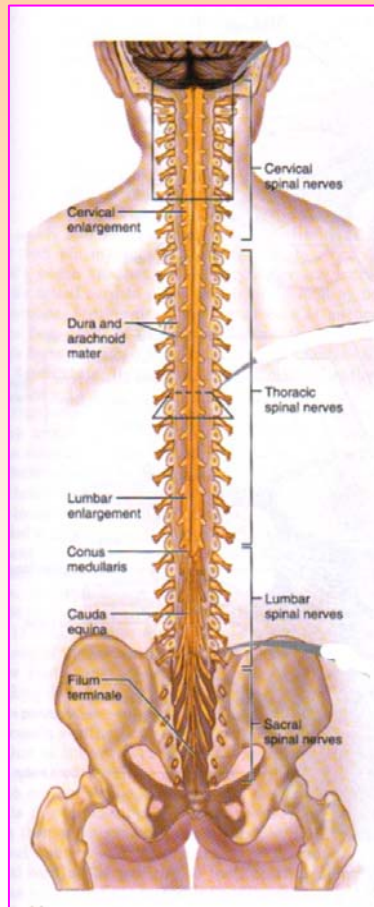
NERVOUS SYSTEM

Functions of Nervous System

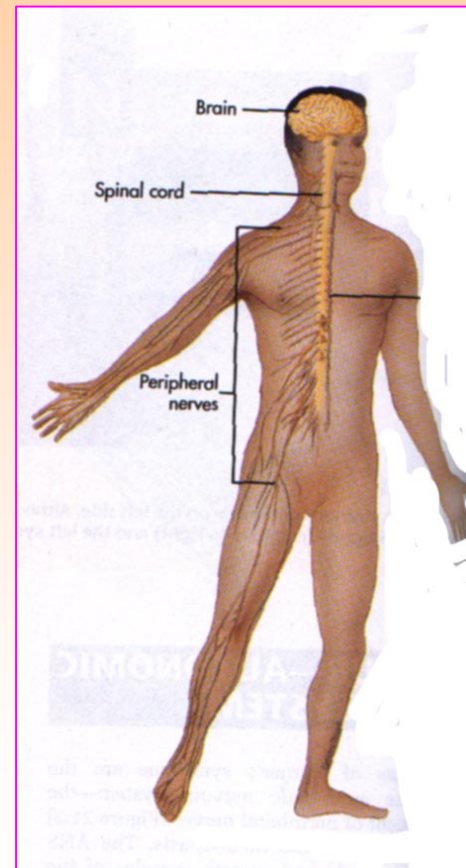
1. **Collect sensory input**
2. **Integrate sensory input**
3. **Motor output**

Organization of Nervous System

- Central Nervous System (CNS) = brain and spinal cord
- Peripheral Nervous System (PNS) = nerves

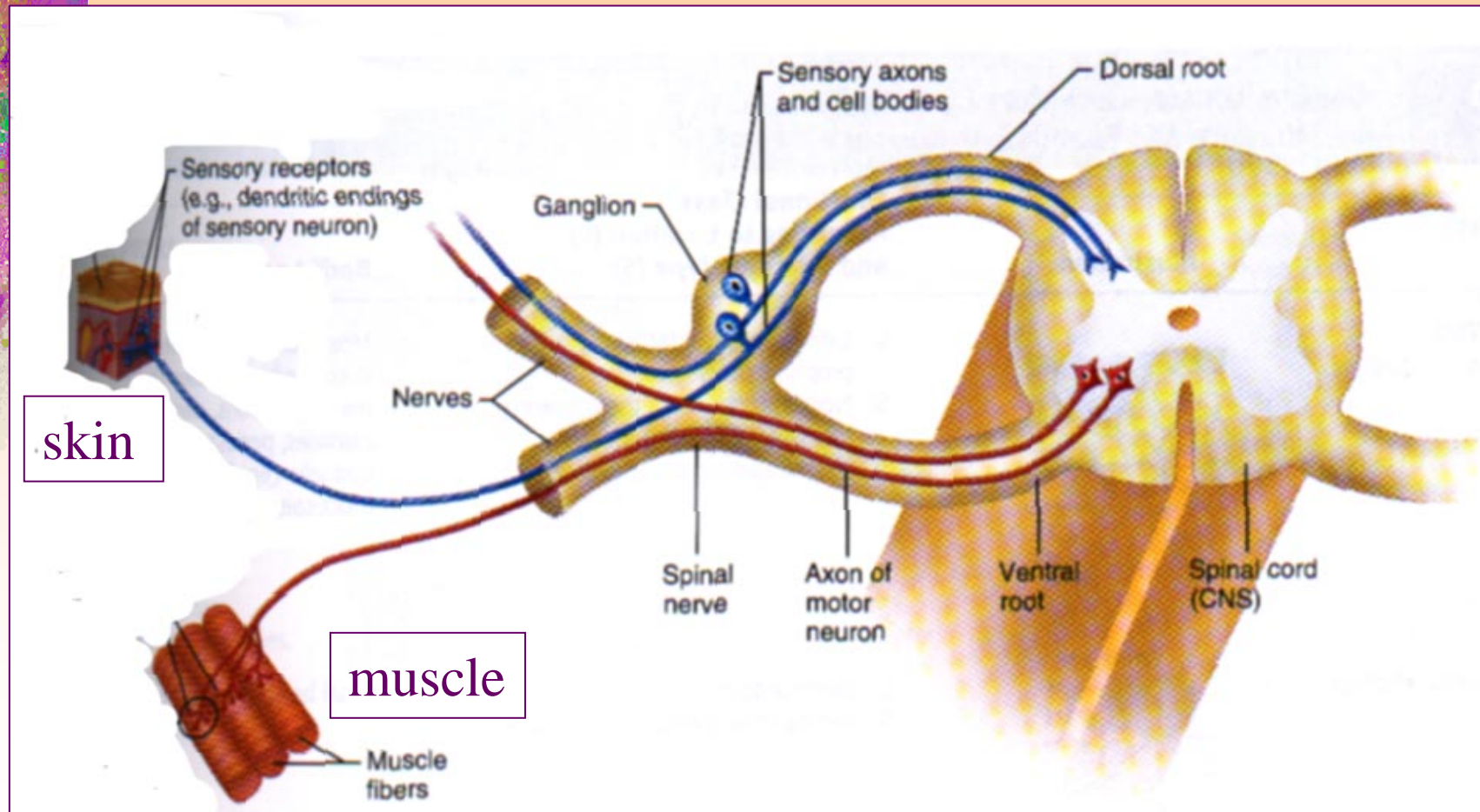


CNS



PNS

Peripheral Nervous System

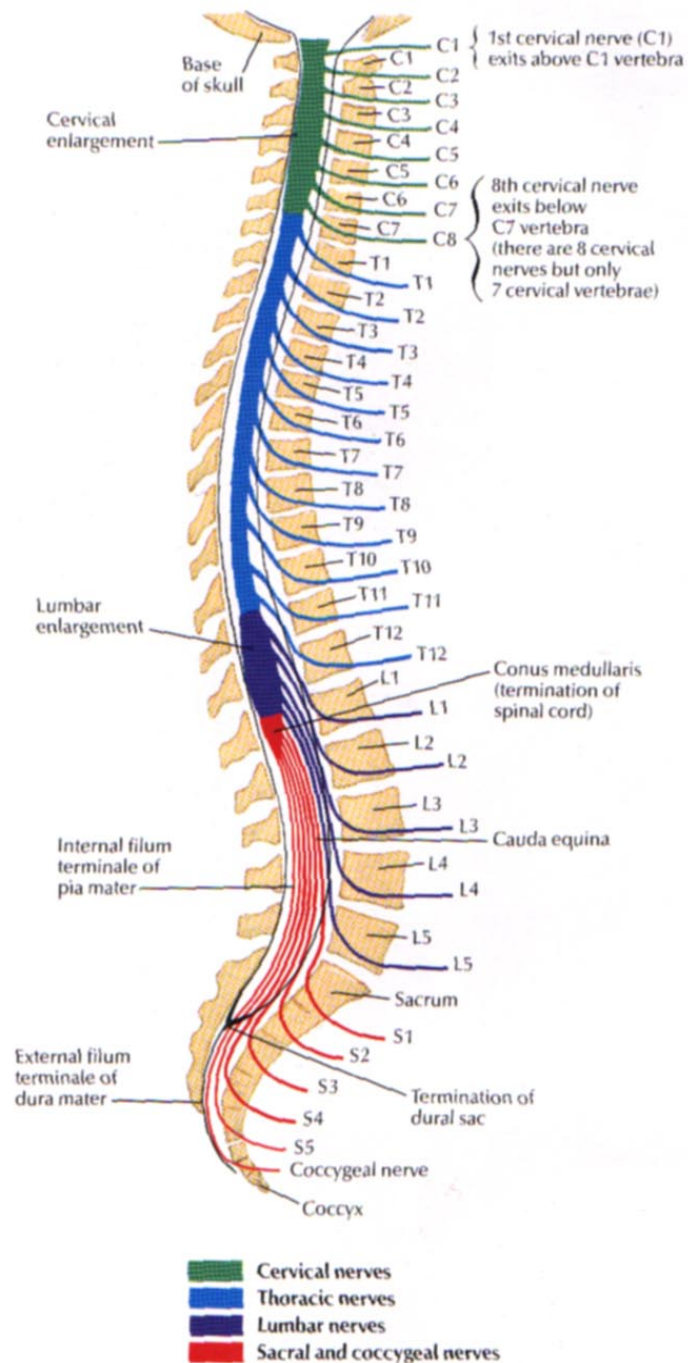




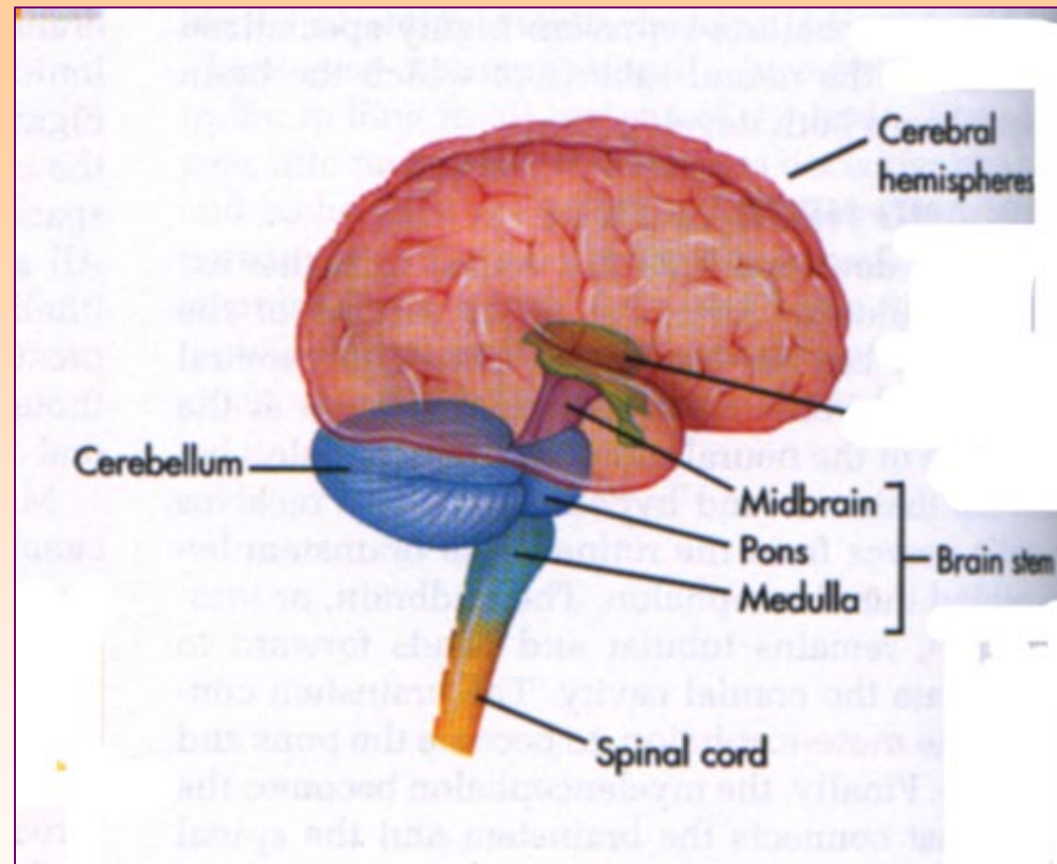
Spinal Nerves (31 pairs)

- Each pair of nerves located in particular segment (cervical, thoracic, lumbar, etc.)
- Each nerve pair is numbered for the vertebra sitting above it (i.e. nerves exit below vertebrae)
 - 8 pairs of cervical spinal nerves; *C₁-C₈
 - 12 pairs of thoracic spinal nerves; T₁-T₁₂
 - 5 pairs of lumbar spinal nerves; L₁-L₅
 - 5 pairs of sacral spinal nerves; S₁-S₅
 - 1 pair of coccygeal spinal nerves; C₀

Spinal Cord Segments



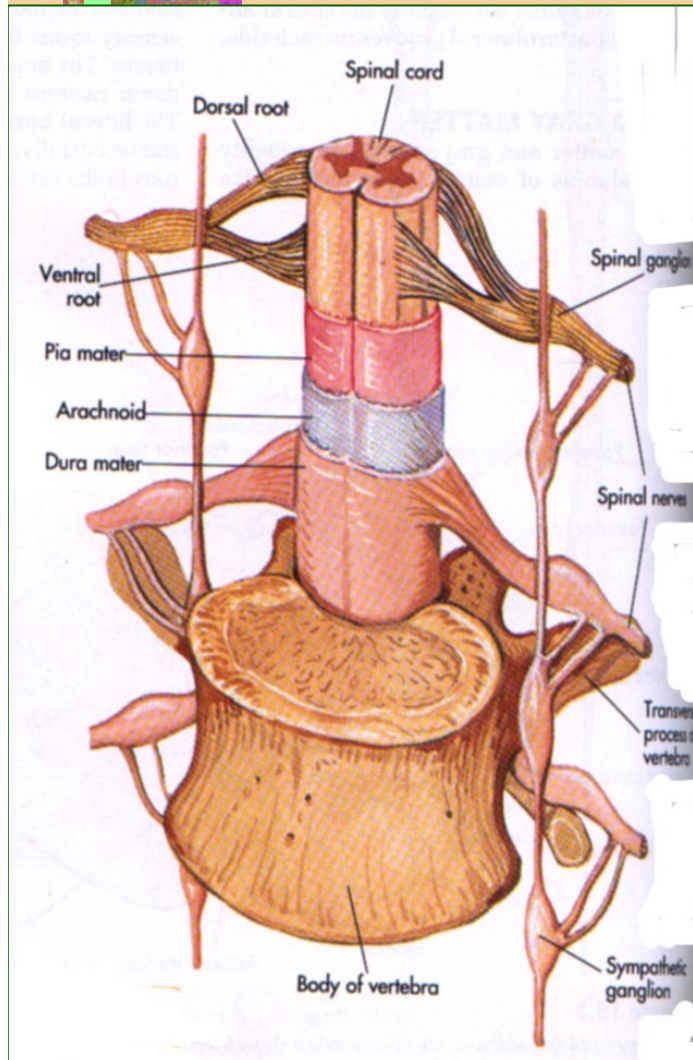
Central Nervous System



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- Brain and Spinal Cord
- Occupy Dorsal Cavity

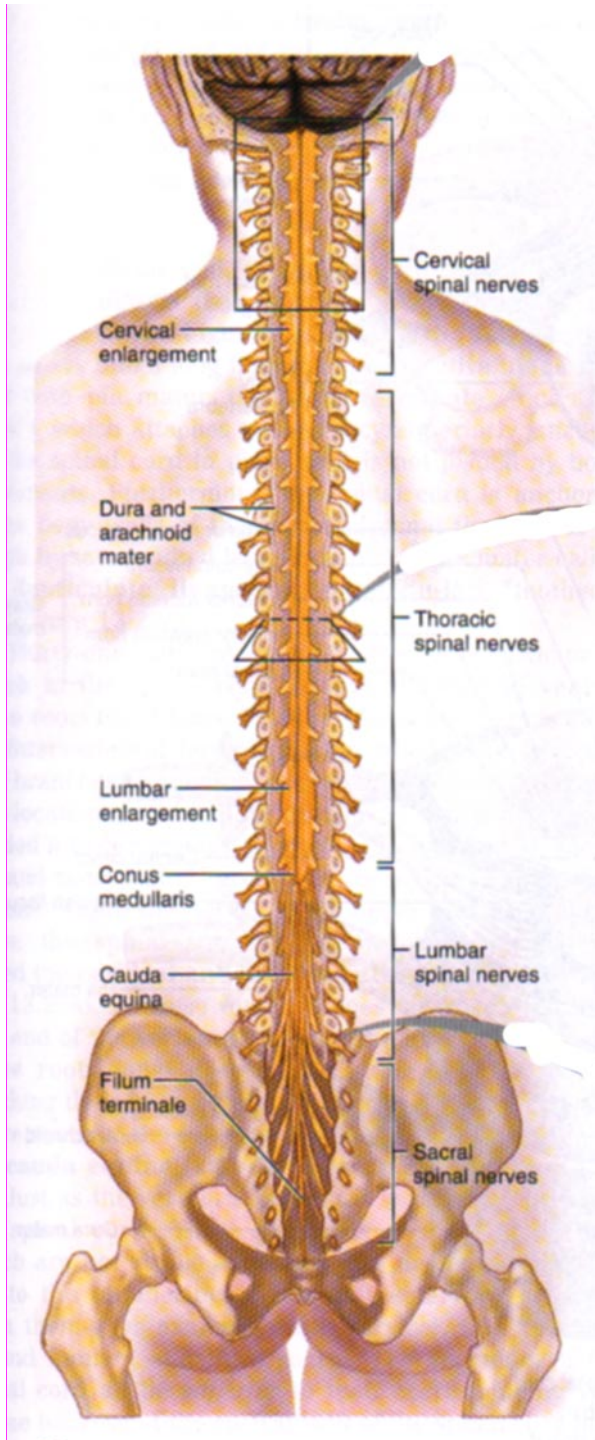
Meninges of Brain and Spinal Cord



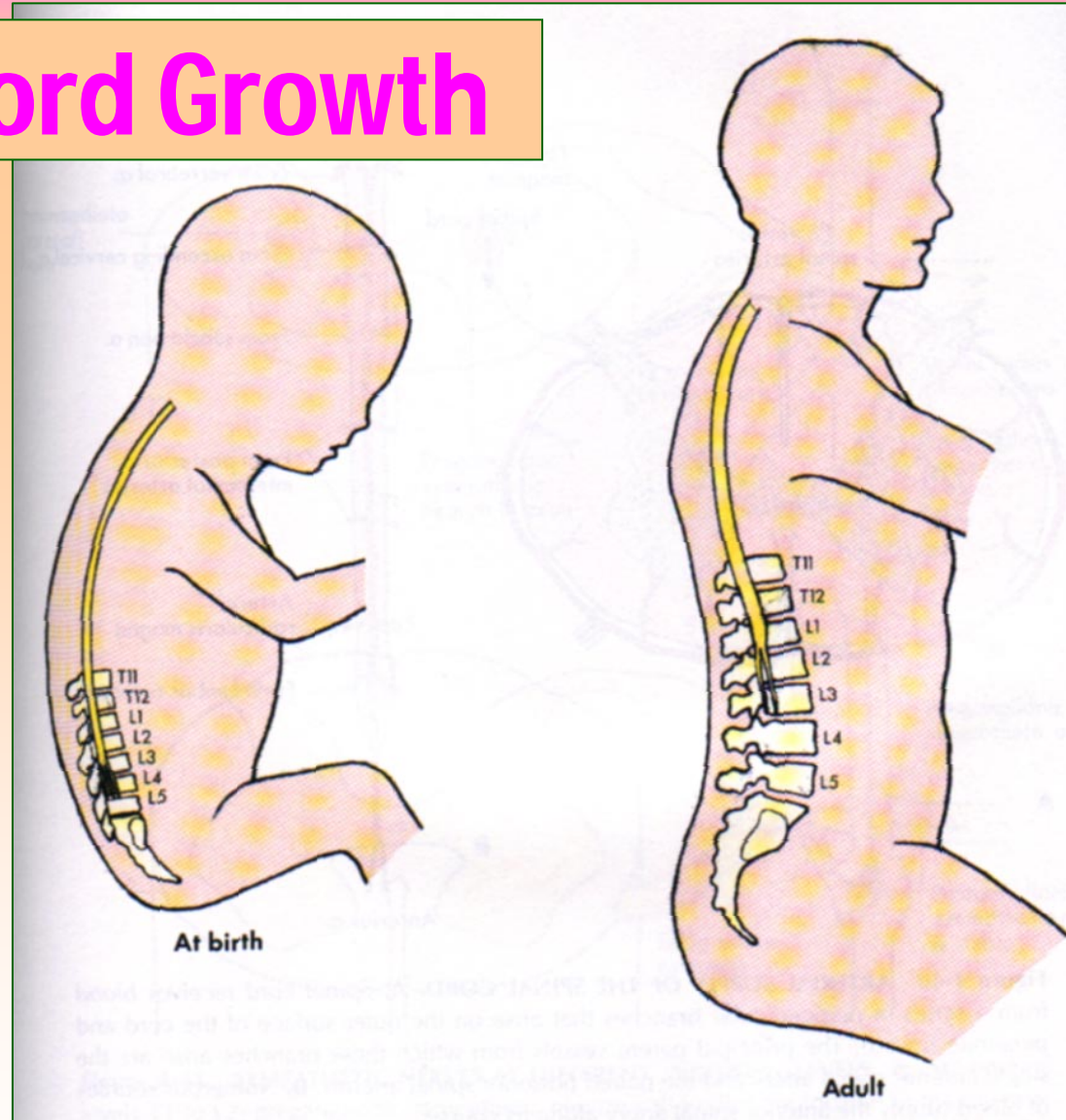
- **Pia mater (deep)**
 - delicate
 - highly vascular
 - adheres to brain/sp cd tissue
- **Arachnoid mater (middle)**
 - impermeable layer = barrier
 - raised off pia mater by rootlets
- **Spinal Dura Mater (most superficial)**
 - single dural sheath
- **Subarachnoid Space**
 - between arachnoid and pia mater
 - contains CSF
- **Epidural Space**
 - Between dura mater and vertebra
 - Contains fat and veins

Spinal Cord (sp cd)

- Passes inferiorly through **foramen magnum** into **vertebral canal**
- 31 pairs of spinal nerves branch off spinal cord through **intervertebral foramen**
- Spinal cord made of a core of **gray matter** surrounded by **white matter**



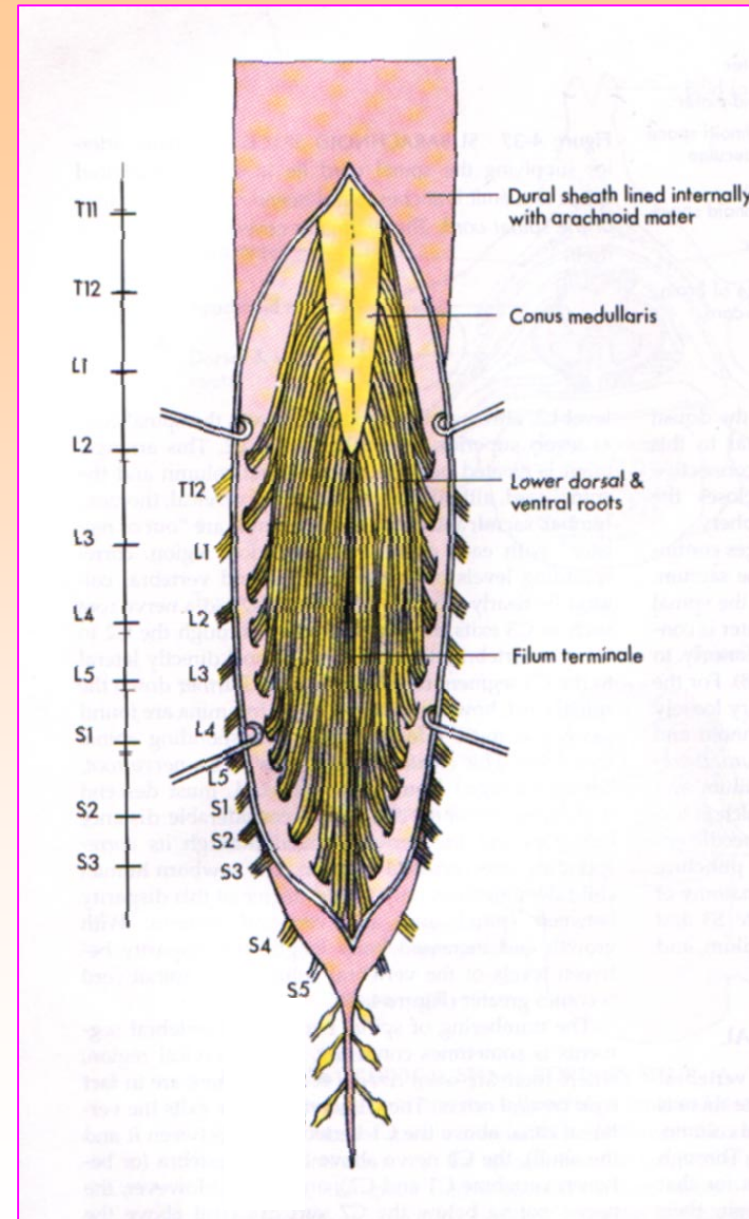
Spinal Cord Growth



- Runs from Medulla Oblongata to level of L 1 (adults)
- Runs to level of L 3-4 (infants)

Regions of Spinal Cord

- Cervical
- Thoracic
- Lumbar
- Sacral
- Coccygeal
- Cervical + Lumbar enlargements
- Cauda equina
- Conus medullaris
- Filum terminale

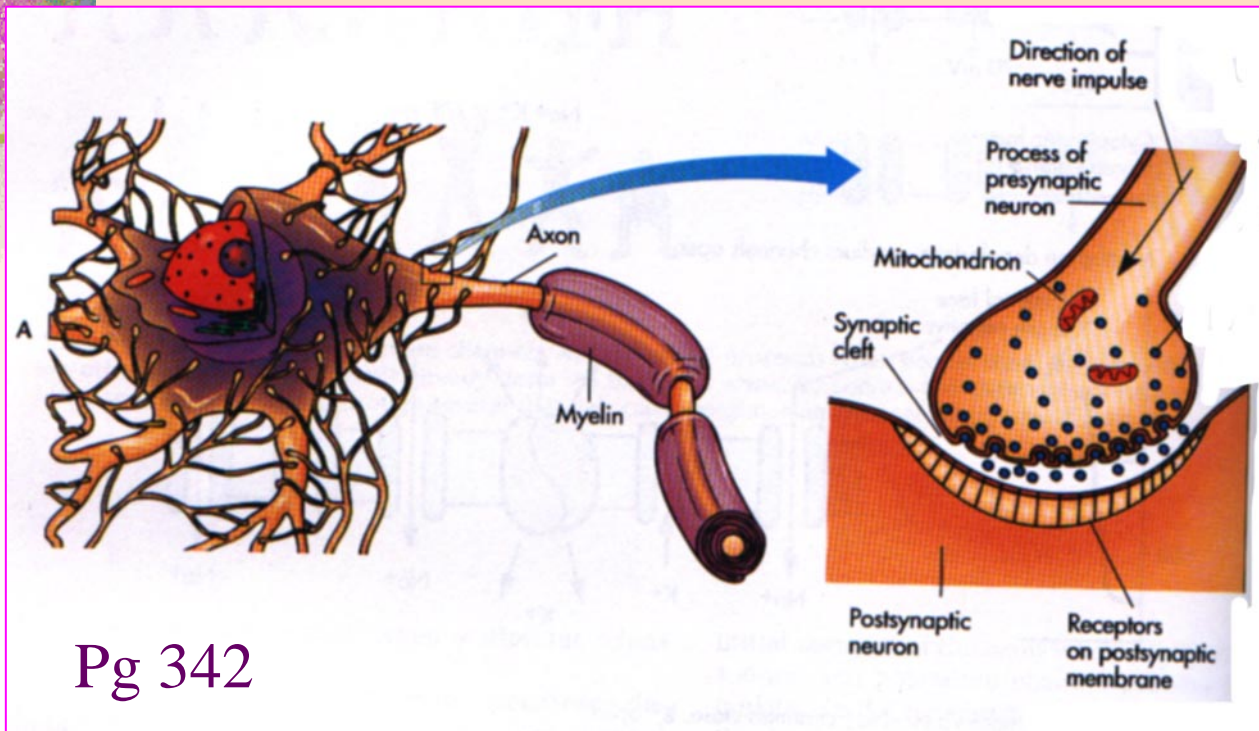


Review of Neuron Anatomy

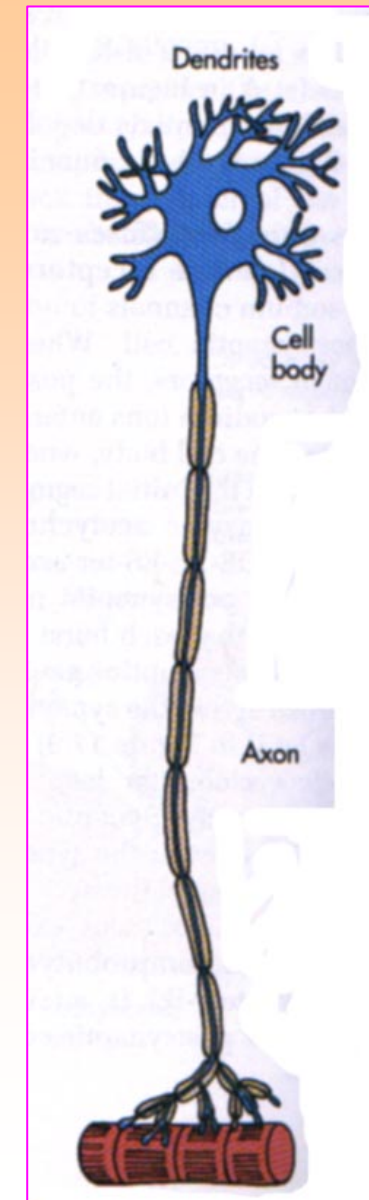
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neuron

- Cell body
- Dendrite
- Axon
- Neuroglia
- Interneuron
- Synapse



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Types of Nerve Fibers

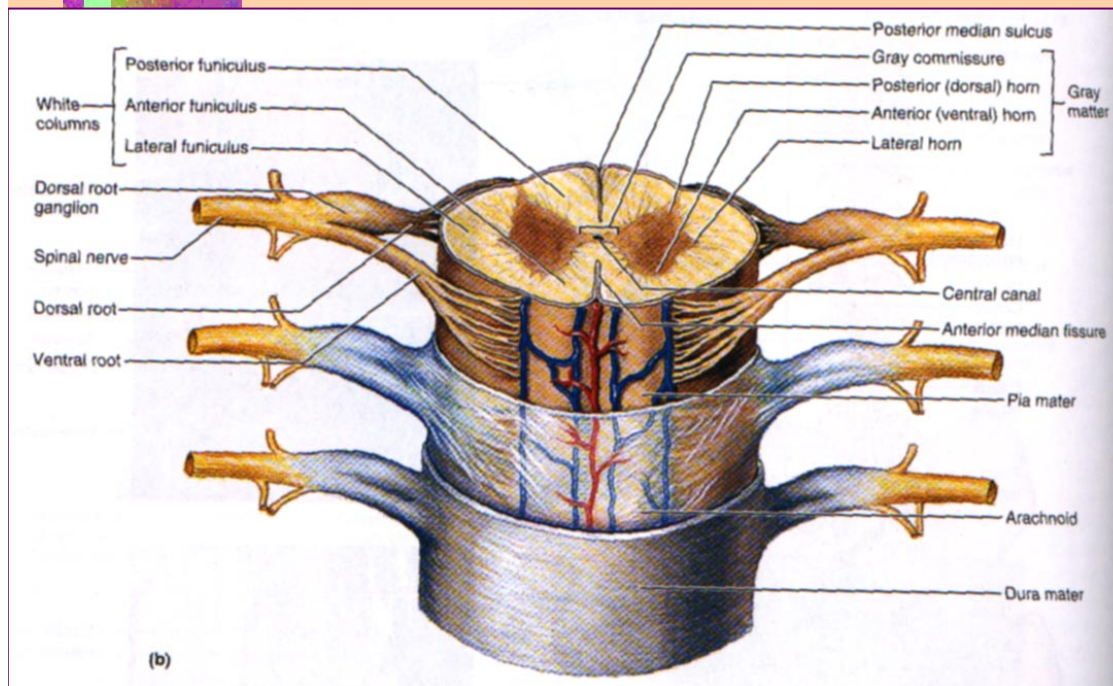
- **Sensory = Afferent Nerve fibers** = picked up by sensory receptors throughout body (PNS) and **carried TOWARDS spinal cord + brain (CNS)**
- **Motor = Efferent Nerve fibers** = carried **AWAY from CNS** by nerves of PNS to innervate body's muscles and glands
- **Remember: SAME**

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4 Kinds of Nerve Fibers

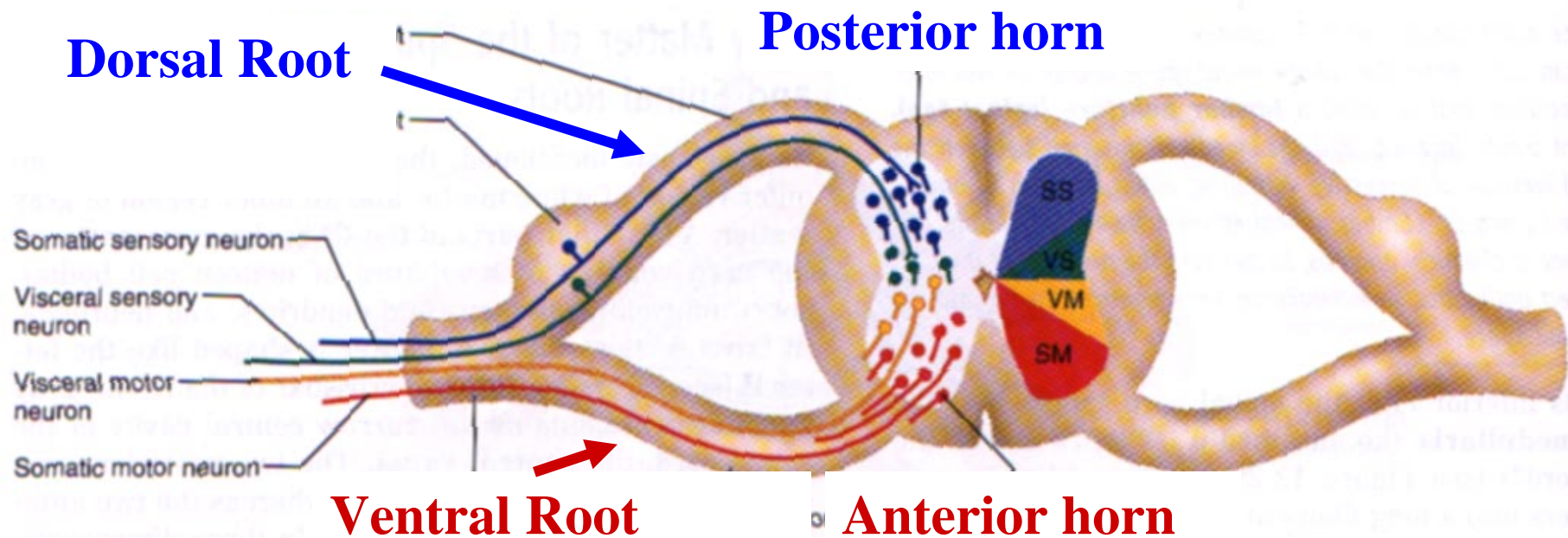
- **Somatic Sensory – “body senses”**
 - touch, pressure, temperature, vibration of body, muscles stretching, balance
- **Visceral Sensory – “organ senses”**
 - Stretch, pain, temperature in organs
 - (eg) nausea, hunger, cramps
- **Somatic Motor – “body movement”**
 - Voluntary contraction of skeletal muscles
- **Visceral Motor – “organ movement”**
 - Contraction of smooth muscle, glands
 - = Autonomic Nervous System

Cross Section of Spinal Cord



- **Gray Matter**
 - “H” shaped Inner core
 - **Gray Commissure** = crossbar of “H”
 - **Central Canal** = in gray commissure
 - Posterior/Dorsal horns
 - Anterior/Ventral horns
- **Composed of**
 - Cell bodies
 - Unmyelinated axons
 - Dendrites
 - Neuroglia

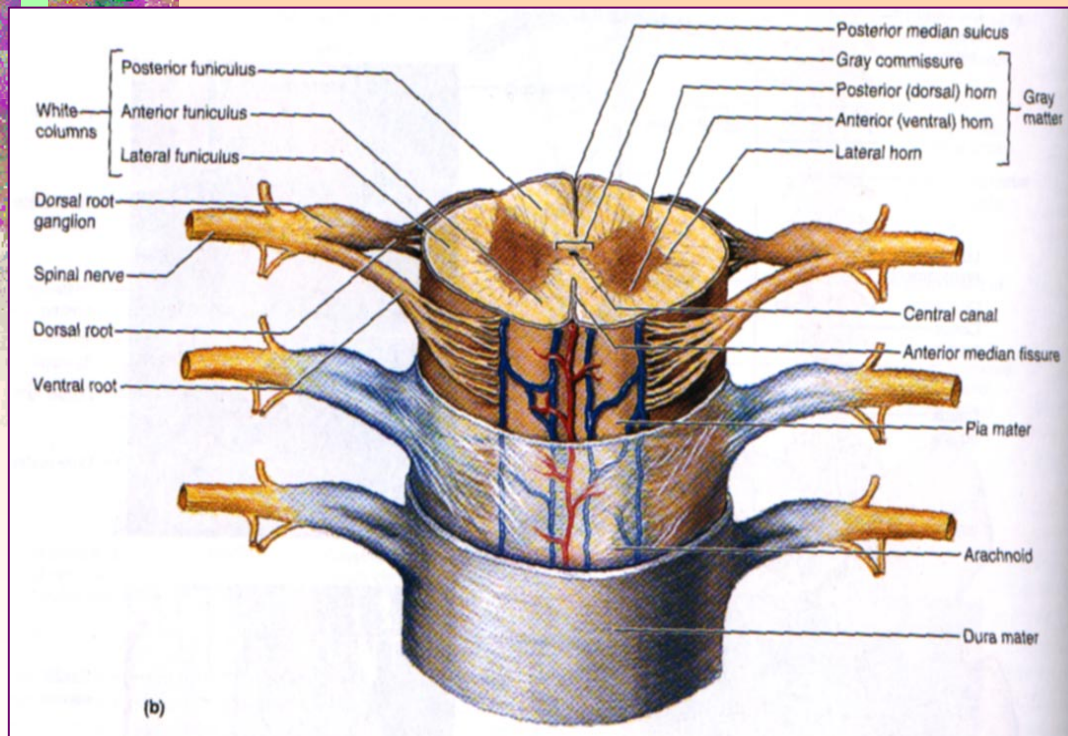
Gray Matter



Gray Matter

- **Posterior Horns** = made of interneurons transmit info from cell bodies outside of sp cd **INTO the sp cd**
 - **Dorsal Root contains Sensory Fibers**
 - Somatic Sensory (SS)
 - Visceral Sensory (VS)
 - **Dorsal Root Ganglia**-swelling in dorsal root that these interneurons pass through
- **Anterior Horns** = made of cell bodies of motor neurons that send axons **OUT of sp cd** to muscles and glands
 - **Ventral Root contains Motor Fibers**
 - Visceral Motor
 - Somatic Motor

Cross Section of Spinal Cord



- **White Matter**

- **Surrounds gray matter**

- **White columns**

- **Posterior funiculus**

- **Anterior funiculus**

- **Lateral funiculus**

- **Composed of:**

- **Myelinated axons**

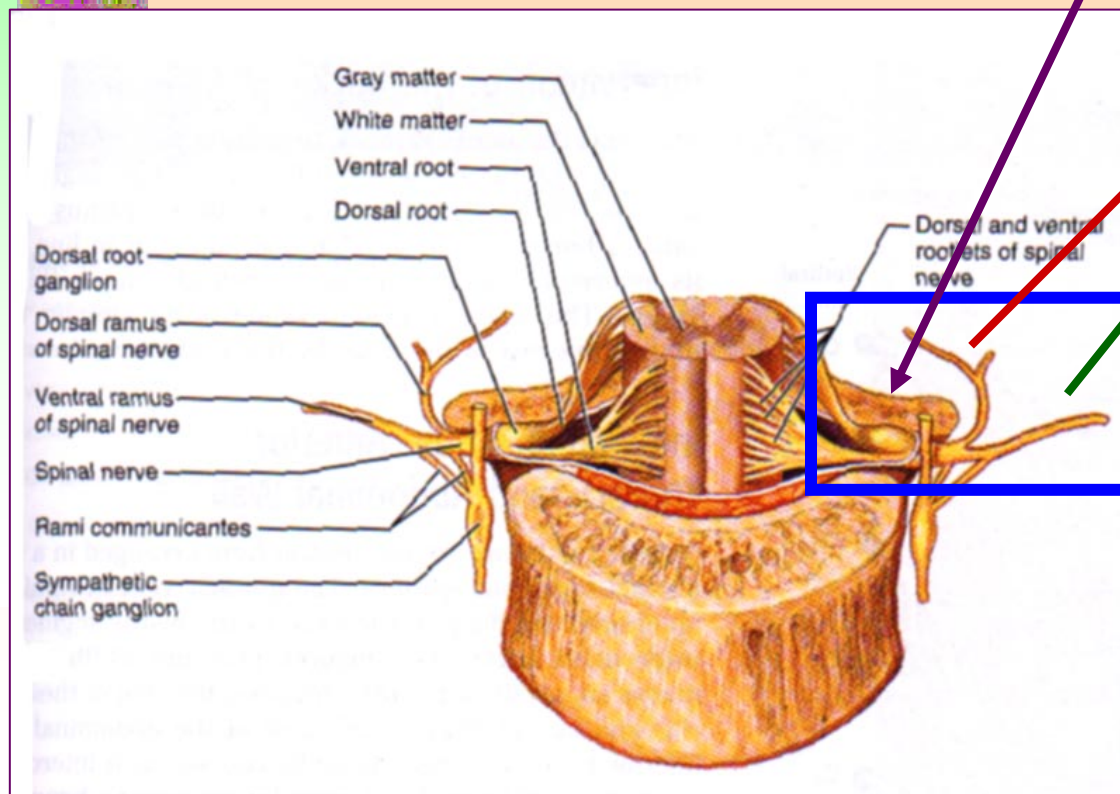
- **Unmyelinated axons**



White Matter

- **Fxn: Allows communication between parts of spinal cord, and between brain + spinal cord**
- **Two main types of nerve fibers**
 - **Ascending: carry SENSORY info from body to brain**
 - (eg) touch, pressure, pain, temperature,
 - **Descending: carry MOTOR info from brain to sp cd**
 - (eg) control precise, skilled movement = writing, maintain balance, create movement

The Big Picture



- Just lateral to intervertebral foramen, each spinal nerve then splits in 2
 - **Dorsal Rami**
 - **Ventral Rami**
- **Contain BOTH Sensory and Motor fibers!!**



Autonomic Nervous System

- **Visceral Motor Function**
- **Not easily controlled by will**
- **(eg) Get nervous and sweat**
- **Innervate smooth muscle, cardiac muscle, glands**
- **Regulate visceral function!**

Autonomic Nervous System

PARASYMPATHETIC

- **Rest + Digest**
- **When body is inactive**
- **(eg) digestion, excretion, urination**
- **Conserves energy, directs "housekeeping"**
- **Cranio-sacral spinal segments**

SYMPATHETIC

- **Fight, Flight or Fright**
- **When body is active**
- **(eg) sweats, deep breathing, increases heart rate**
- **Focuses on functions necessary to the moment**
- **Thoraco-lumbar spinal segments**



Somatic Nervous System

- Controls contraction of skeletal muscle
- Voluntary control
- (e.g.) running, moving limbs

Nervous System Overview

