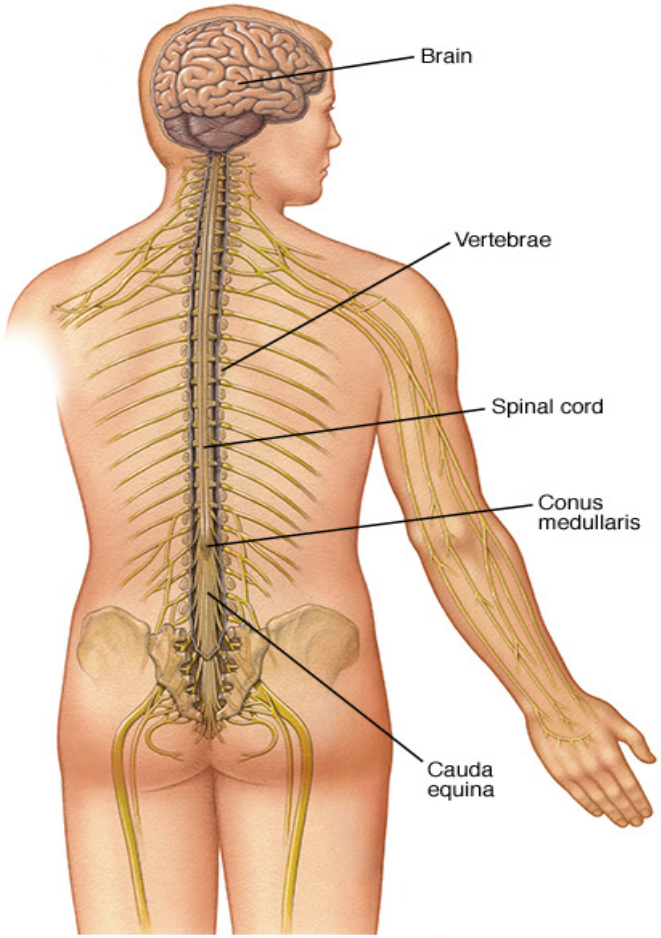
# Nervous System

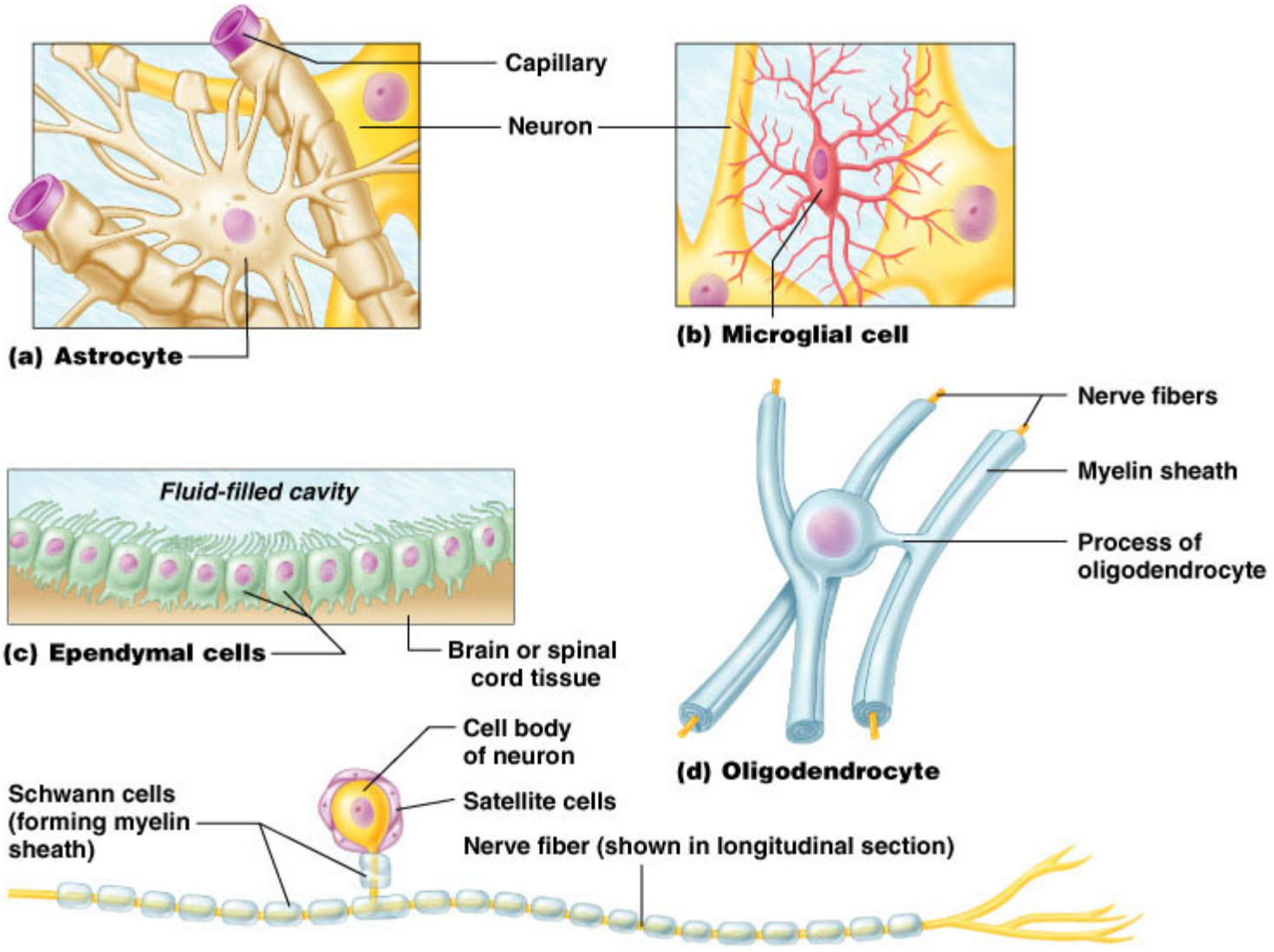
## Nervous Tissue



- Master integrating and control system of body
- Composed of 2 main parts
- Central nervous system consisting of brain and spinal cord
- Peripheral nervous system consisting of nerves, ganglia and receptors

# Basic terminology

- Neuron is term for “nerve cell”
- Supporting cells are called glial cells:  they protect the delicate neurons (see pg 254 )
  - Central Nervous System (CNS)
    - Astrocytes, oligodendrocytes, microglia and ependymal cells
  - Peripheral Nervous System (PNS)
    - Schwann cells and satellite cells



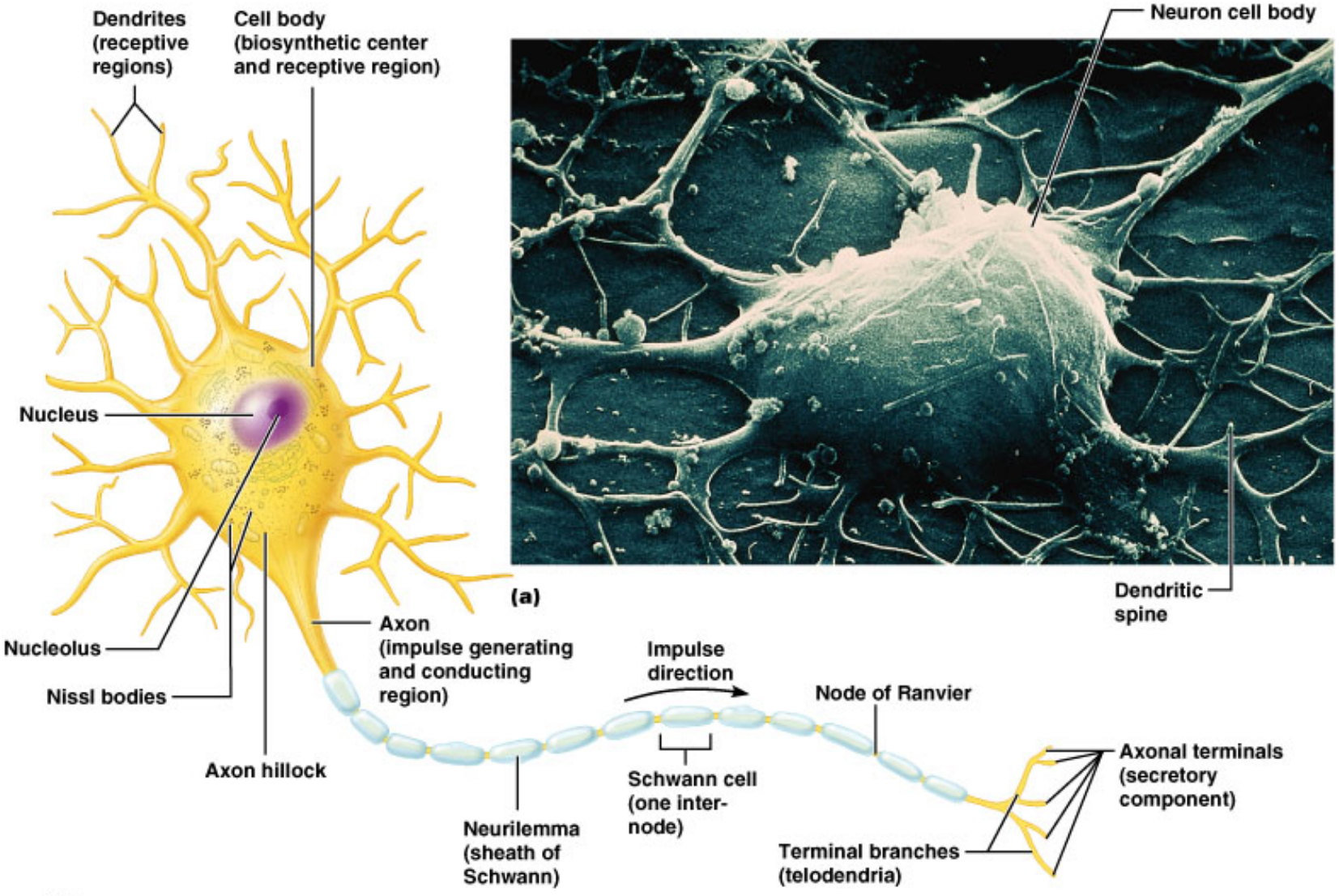
# Neuroglia of CNS

- **Astrocytes:** blood brain barrier, maintain chemical environment, metabolize neurotransmitters, regulate K+ levels, provide structural support
- **Oligodendrocytes**: myelin sheath
- **Microglia**: phagocytic cells
- **Ependymal cells** – form and circulate CSF

# Neuroglia of PNS

- **Schwann cells** – produce myelin sheath in CNS

- **Satellite cells** – structural support for neuron cell bodies in PNS, regulate exchange material between cell bodies and interstitial fluid.



# Neuron Anatomy

1. Cell body has nucleus
   - Usually found in the CNS in clusters called nuclei
   - Sometimes found outside CNS in areas called ganglia
   - has neurofibrils (bundles of intermediate filaments;part of cytoskeleton)
   - Nissl bodies (clusters of endoplasmic reticulum)
   - Lipofuschin yellowish brown cytoplasmic granules, a product of lysosomes

# Cont…

2. **Dendrites** are multiple short, branching neuronal processes that RECEIVE electrical signals
3. **Axons** is a long, usually single neuron process that GENERATE electrical signals
4. **Axon hillock** is where the axon begins on the neuron cell body
5. **Initial segment** is first part of axon
6. **Trigger zone** at junction of axon hillock and initial segment, impulses arise here
7. **Axoplasm** – cytoplasm of axon
8. **Axolemma** – plasma membrane of axon

# Cont…

**Axonal terminal** is where axon ends

- Synaptic end bulb, synaptic vesicles

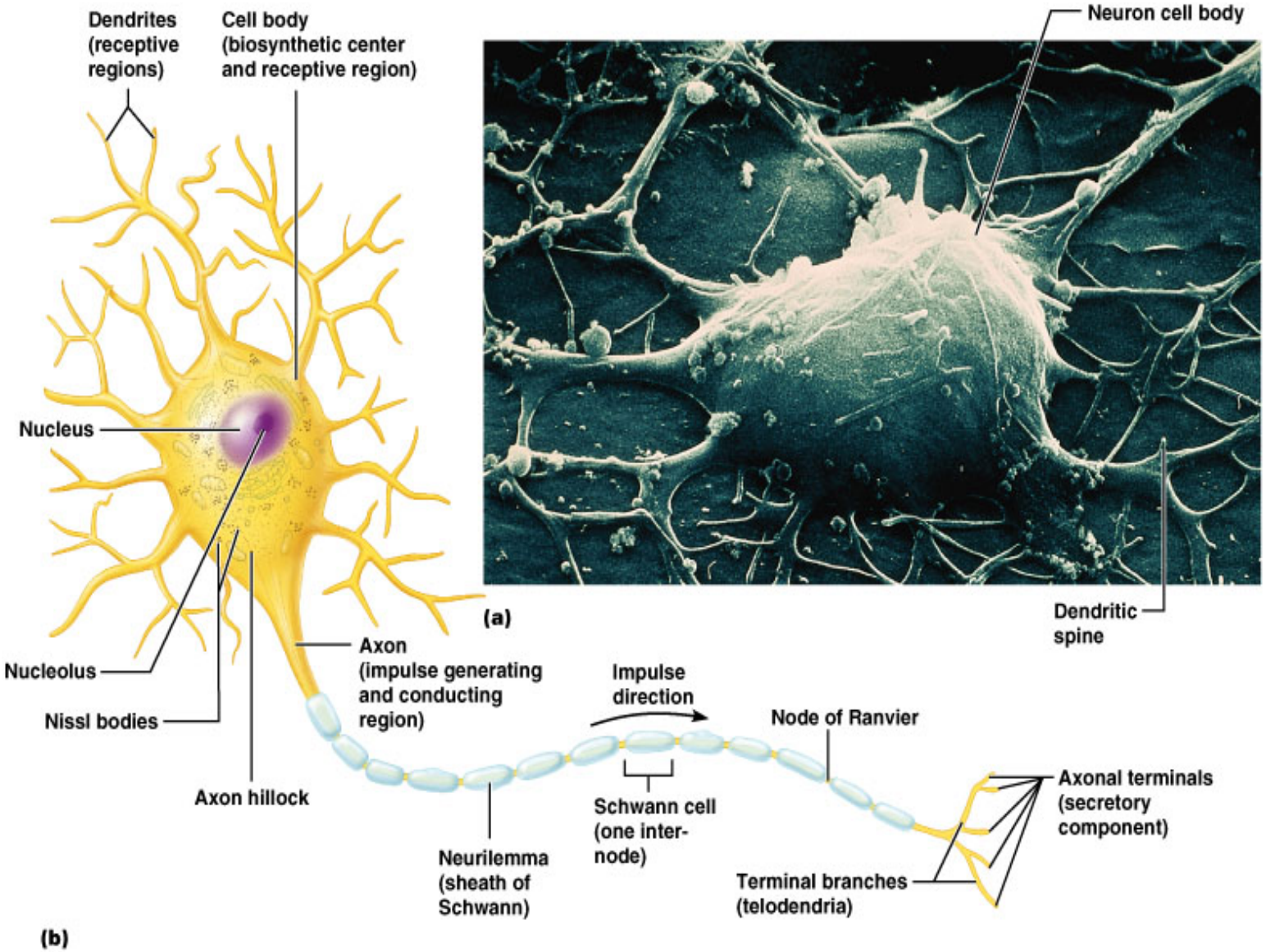
**Synaptic cleft** space between terminal and next cell

# Myelination

Myelin is an insulation around the axon to help conduct electrical pulses

- Produced by Schwann cells that wrap around axons in the PNS
- Produced by oligodendrocytes in CNS
- Myelination gives neurons a white appearance→ white matter non myelinated neuron structures appear gray → gray matter

Nodes of Ranvier are spaces on axon that have NO myelin



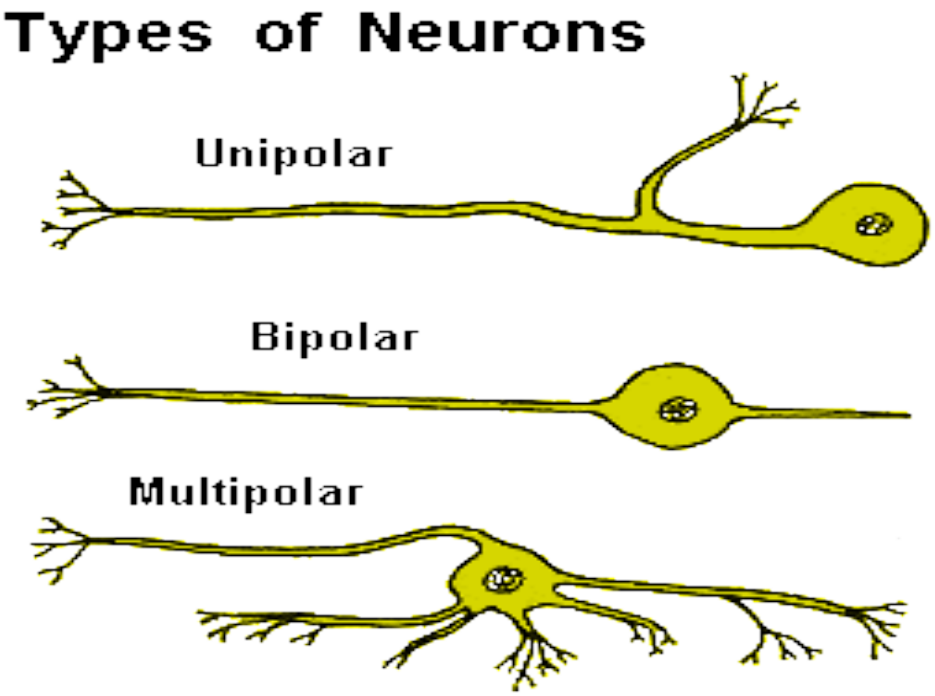
# Neuron processes

- Bundles of neuron processes in CNS form **tracts**
- Bundles of neuron processes in PNS form **nerves**

# Neuron classification

1. **Multipolar** have many dendrites, one axon; most neurons of brain and spinal cord
2. **Bipolar** have one dendrite, one axon, special senses neurons
3. **Unipolar** has one extension that acts as both a dendrite and axon, sensory neurons
4. **Purkinje cells** are neurons of cerebellum
5. **Renshaw cells** are in the spinal cord

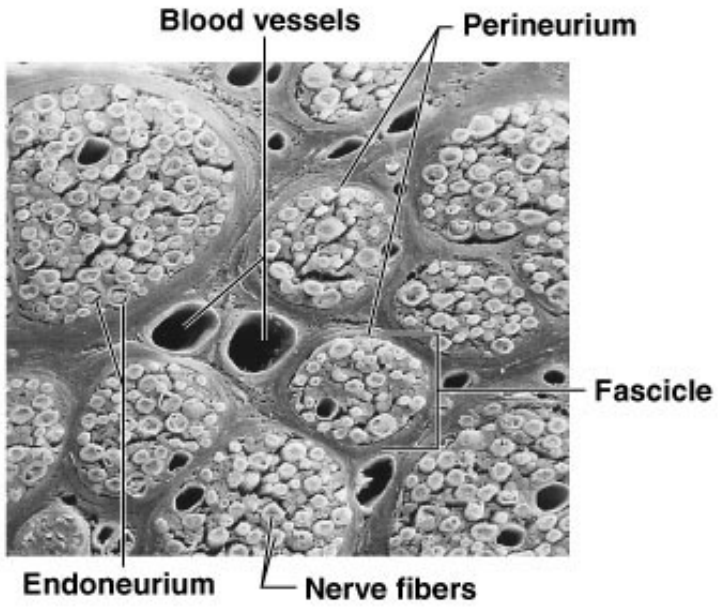
# Structural Classification of Neurons

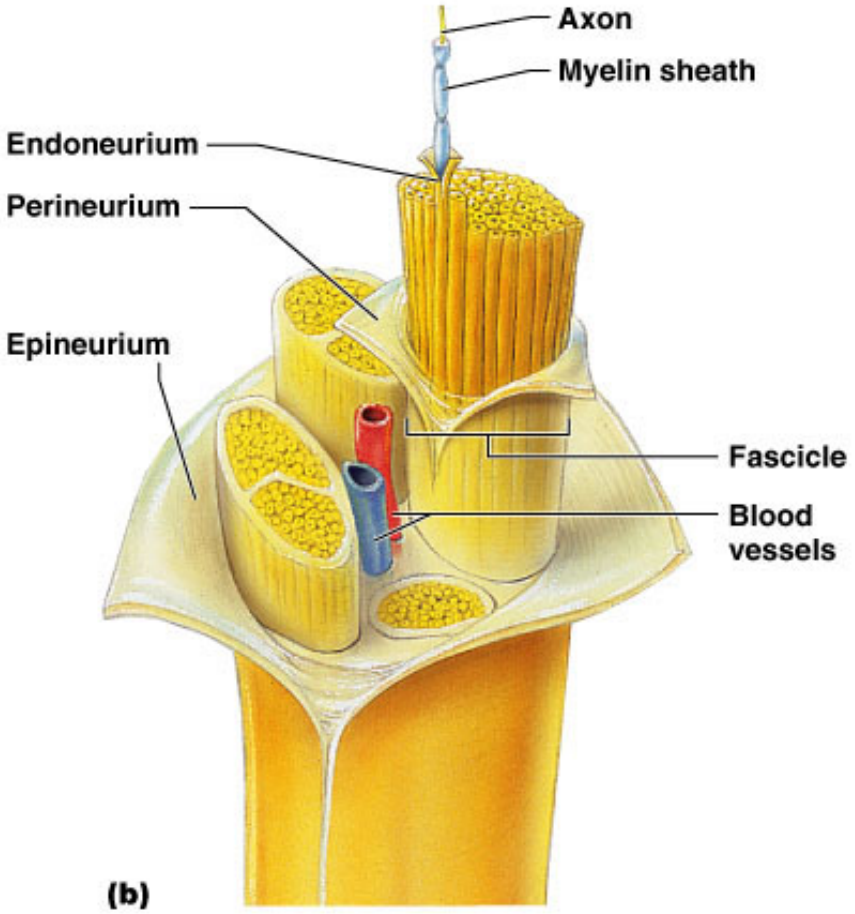


# Function classification of Neurons

1. Afferent neurons are Sensory Neurons
   - Bring information to the CNS
2. Efferent neurons are Motor Neurons
   - Take information away from CNS
3. Interneurons are completely within the CNS
   - They connect the Sensory to Motor neurons

# Structure of a Nerve



# Structure of a Nerve
## (similar to the muscle structure)

- Epineurium: Outermost layer of connective tissue
- Fascicles of axons are surrounded by perineurium
  - Blood vessels found between the fascicles
- Endoneurium surrounds each axon
- Some nerves are afferent, efferent, and others are mixed