# The Neuron

MMHS Advanced Biomed

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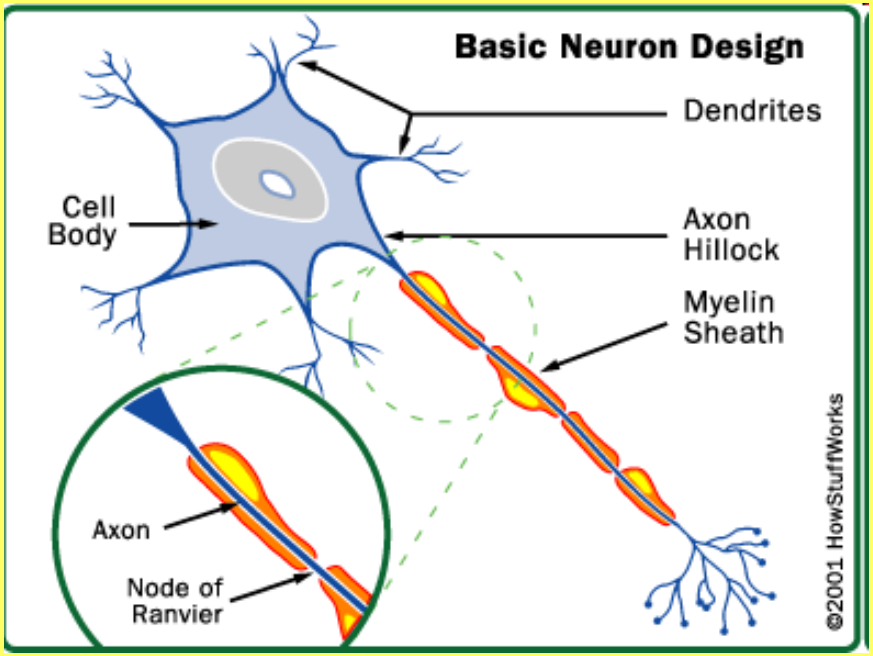
# Neuron Characteristics

- Nerves are bundles of nerve fibers (intertwined axons)
- Neurons never touch – separated by an extracellular space called a synapse.
- Contain nerve fibers that vary in length from microscopic to 4 feet!
- Amitotic because they lack centrioles which are involved in mitosis.

# A Specialized Cell

Neuron Parts:

1. Cell Body
2. Dendrites
3. Axons
4. Myelin Sheath
5. Terminal End Fibers



# Cell Body “Cyton”

- Metabolic center of the neuron.
- Contains the nucleus
- Nissl Bodies/Substance – specialized rough ER that maintain cell shape.
- Often contains branching dendrites that project from it’s surface.

# The Dendrites “Ears”

- Branched, projections that surround the cell body.
- Receive incoming stimulus (impulse) from adjacent neurons.
- Conduct impulses to the cell body.
- They contain receptor sites that the NT bind to. (AKA. Post Synaptic Terminal)

# The Axon “Electric Wire”

- Extends away from the cell body.
- Arise from the cone-like region of the cell body called the “axon hillock”.
- Only 1 per neuron
- May have side branches called “Terminal End Fibers” that lead impulses away from the axon toward the synapse.

# Myelin Sheath (Schwann Cells) "Plastic Wire Housing"

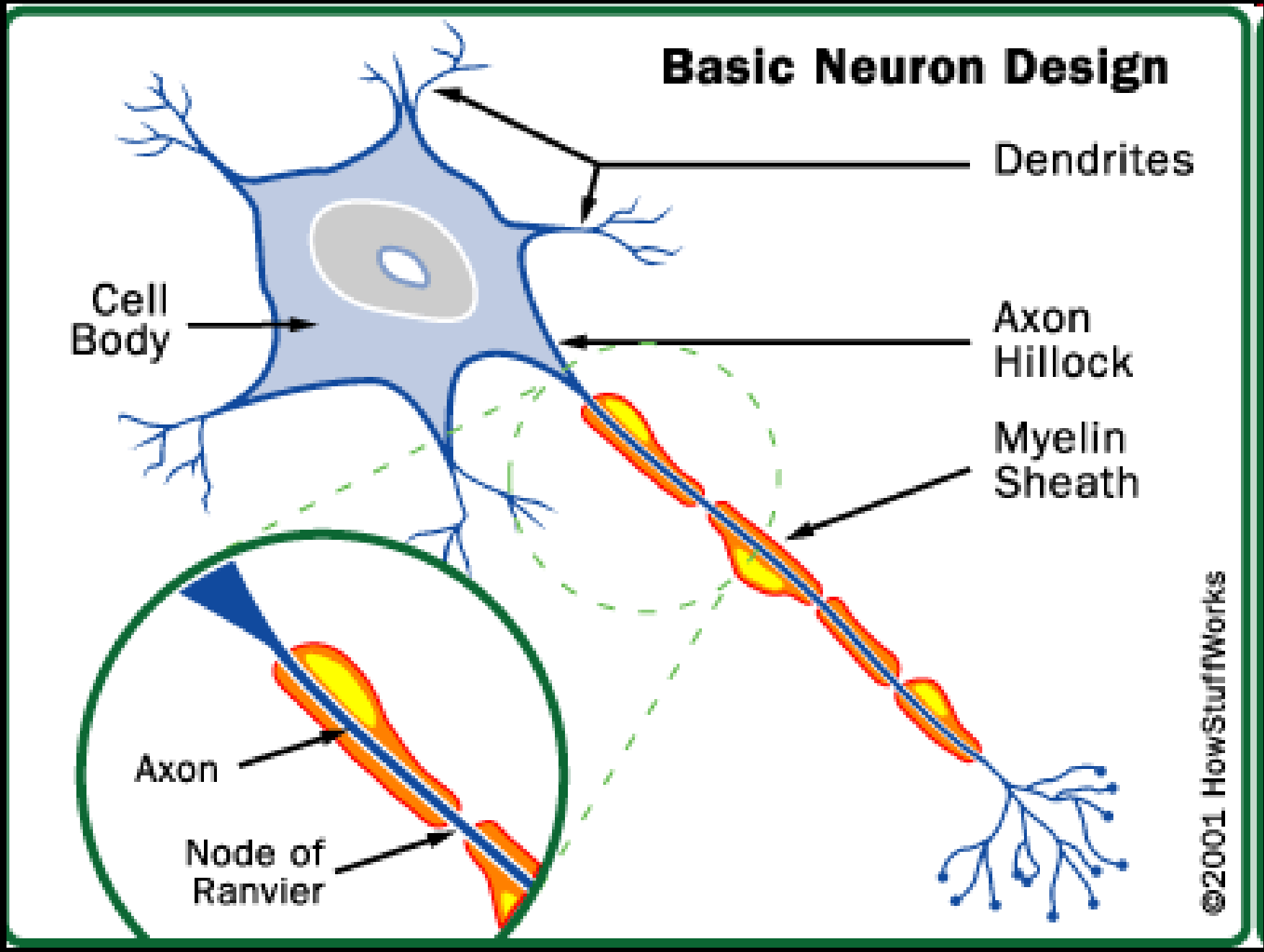
- A type of fatty connective tissue that surround the axons of large neurons.
- Also covers parts of the spinal cord, white matter of brain and most peripheral nerves.
- Nodes of Ranvier= gaps in myelin sheath.
- Acts as an insulator that speeds up nerve impulses.

**White Matter** = Myelinated

**Grey Matter** = Non-myelinated

# Terminal End Fibers (The Voice)

- Usually found at the end of the axon.
- Transmits impulse to next neuron.
- Contain hundreds of synaptic vesicles that hold neurotransmitters.
- NT’s transmit impulse chemically across the synapse by diffusion.


Basic Neuron Design
Dendrites
Cell Body
Axon Hillock
Myelin Sheath
Axon
Node of Ranvier
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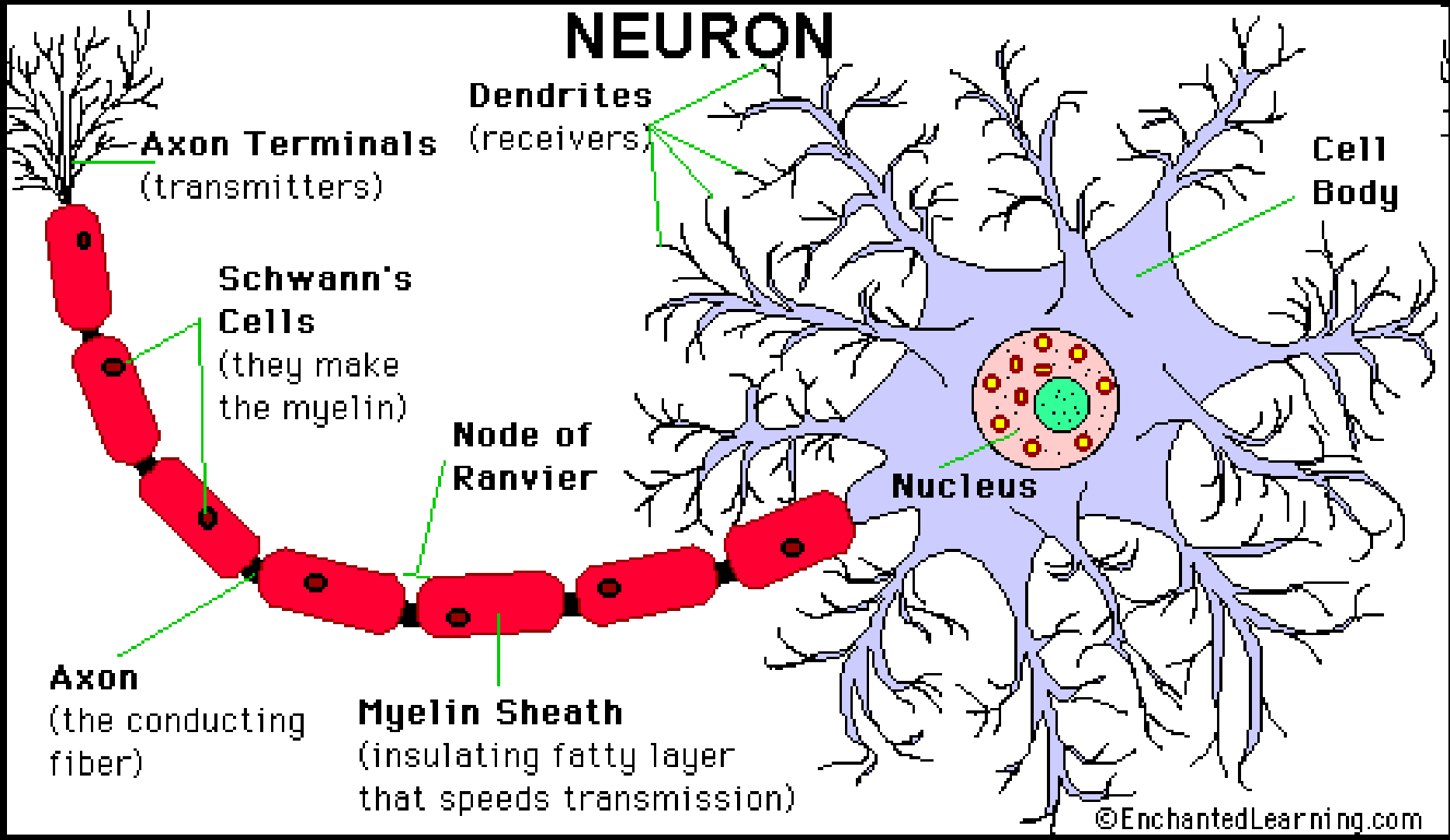
NEURON
Dendrites
(receivers)
Axon Terminals
(transmitters)
Cell
Body
Schwann's
Cells
(they make
the myelin)
Node of
Ranvier
Nucleus
Axon
(the conducting
fiber)
Myelin Sheath
(insulating fatty layer
that speeds transmission)
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# Neuronal Types

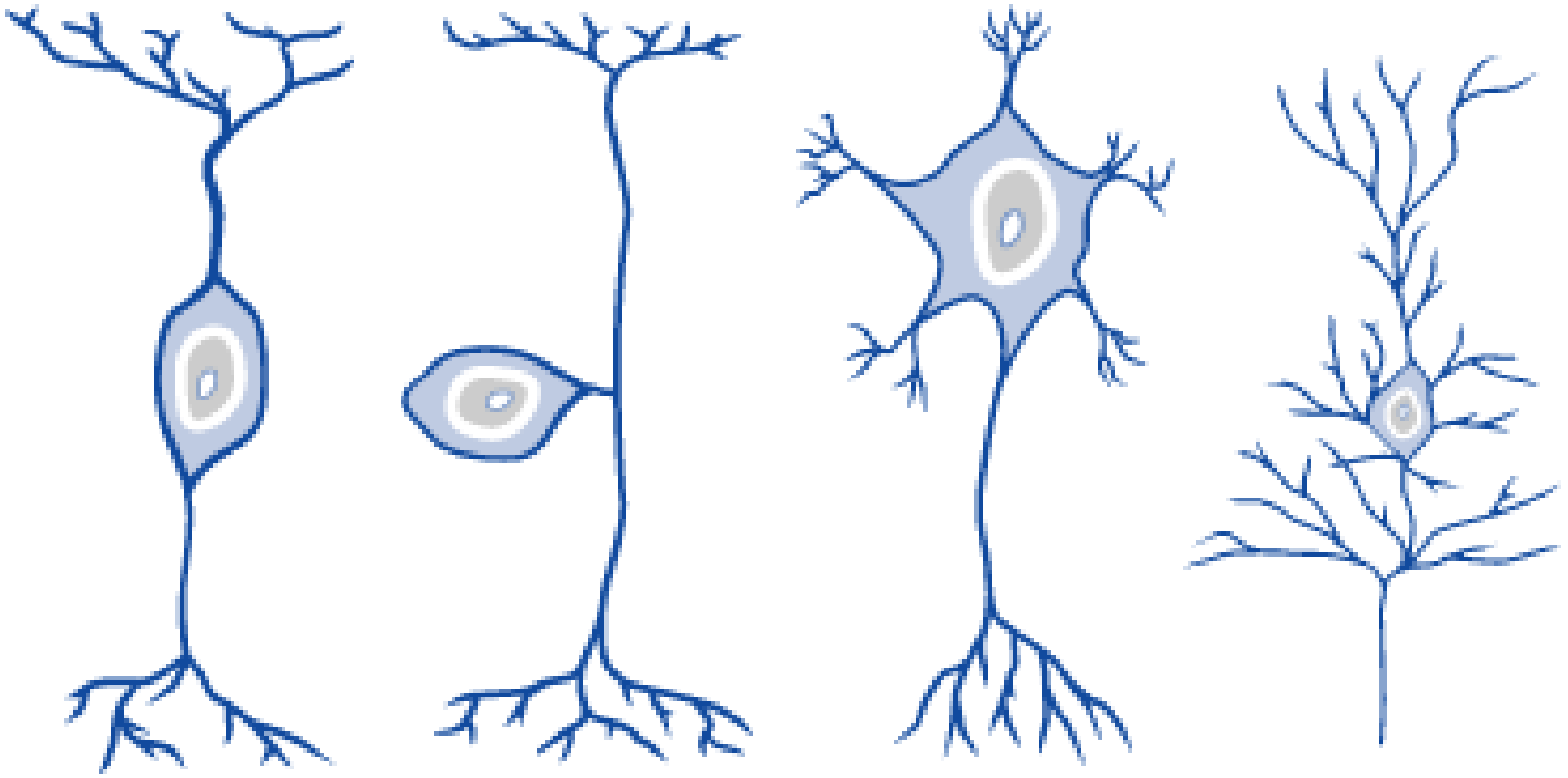
A. Differ by their structure:

1. **Bipolar** = axons and dendrites extend from opposite ends (sensory)

2. **Unipolar** = axons and dendrites originate from the same location. (ganglia in brain, spinal cord)

3. **Multipolar** = multiple projections around the cell body. (most brain, spinal)

# Basic Neuron Types



Bipolar (Interneuron)

Unipolar (Sensory Neuron)

Multipolar (Motoneuron)

Pyrimidal Cell

# Neuronal Types

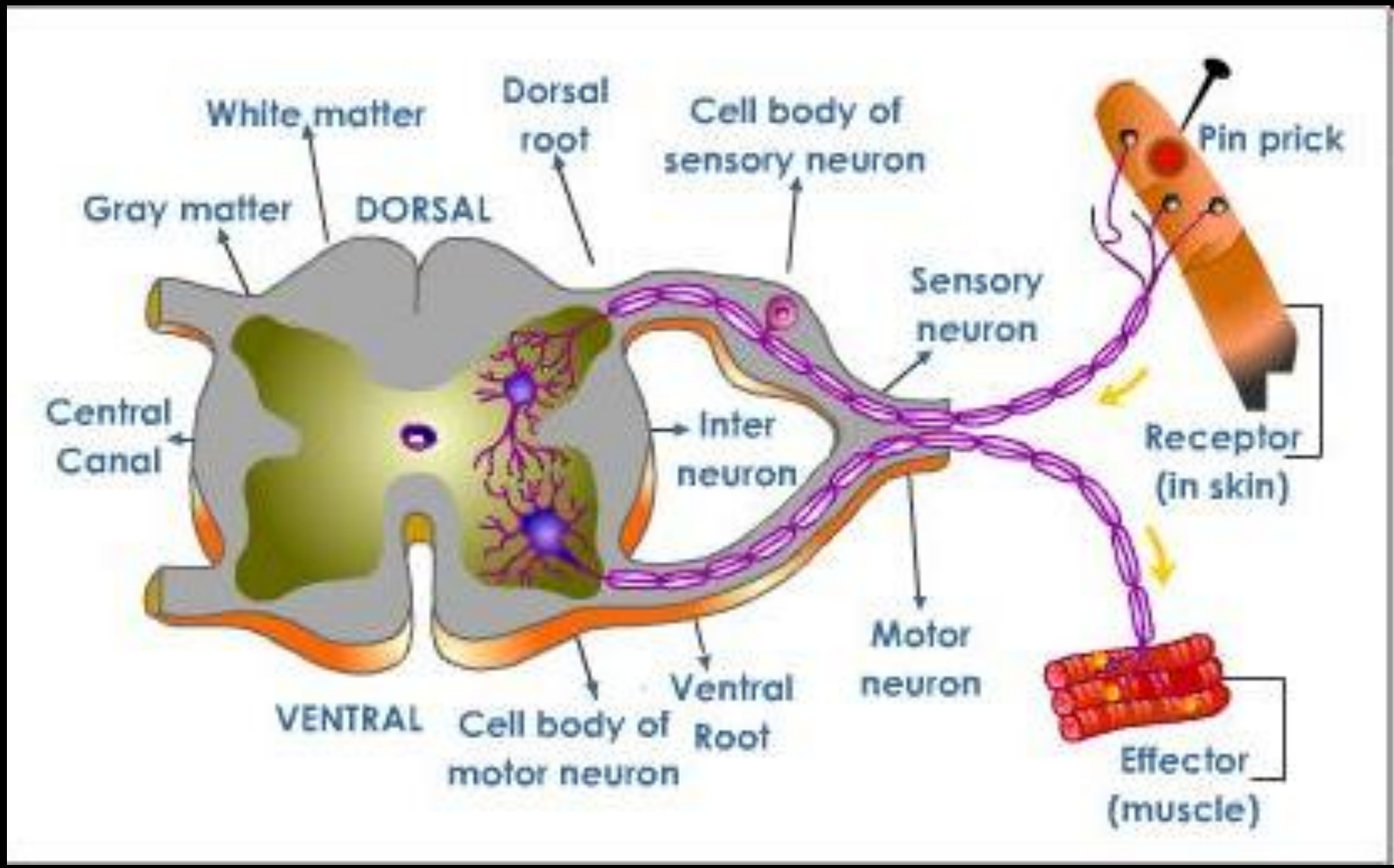
B. Differ by Function.

1. **Sensory (afferent)**: specialized receptor cells in the skin and sensory organs. (PNS)

2. **Interneurons (association):** connect sensory to motor. (CNS).

3. **Motor (Efferent)**: stimulate muscle contraction or glandular secretions. Are multipolar (PNS)

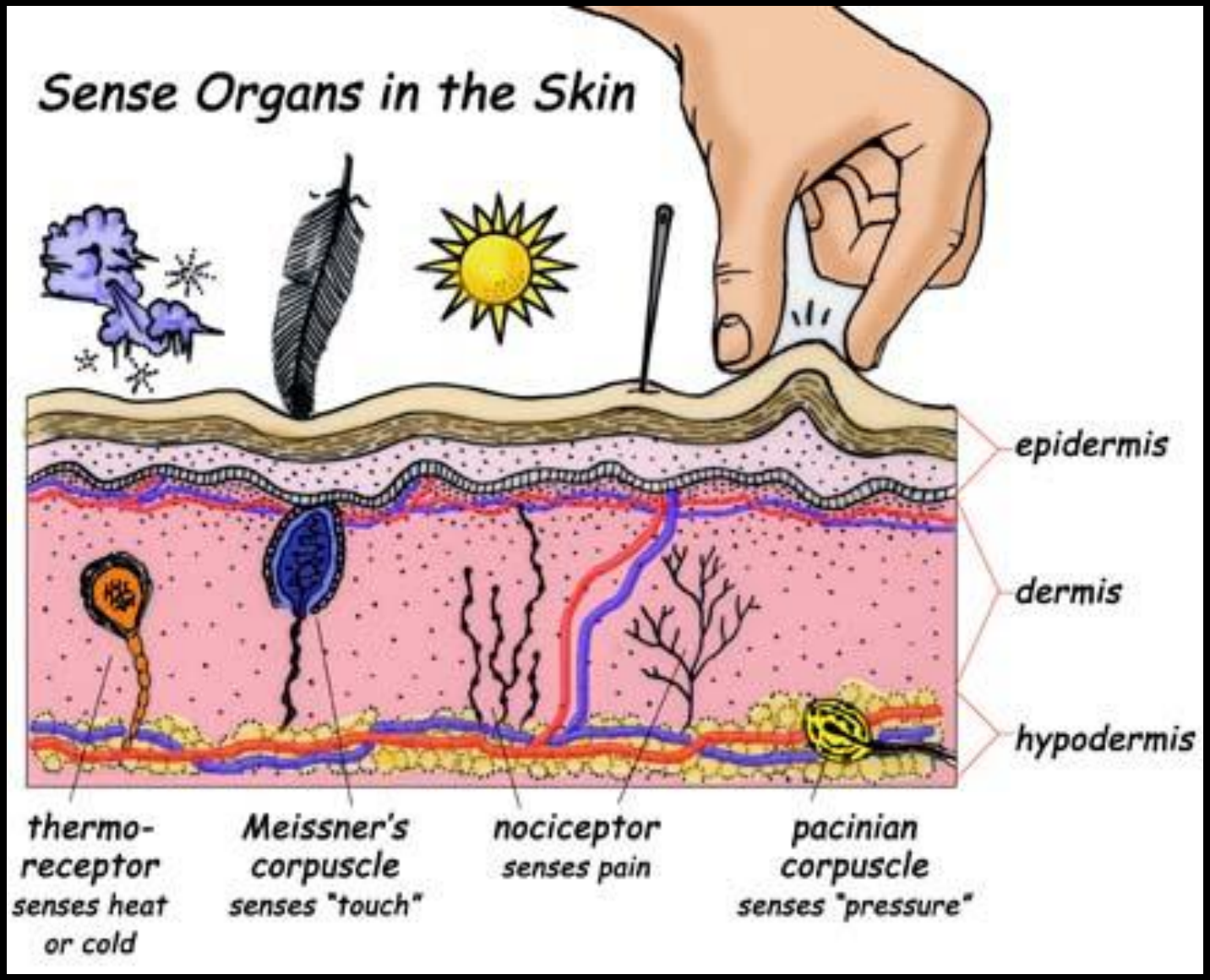
# 3 Functional Neurons



# Type of Sensory Receptors

1. Nociceptor (pain/temperature receptors)
2. Meissner's Corpuscles (touch receptor)
3. Pacinian Coruscles (deep pressure receptor)
4. Golgi Tendon Organ (proprioceptor)
5. Muscle Spindle (proprioceptor)

# Sensory Receptor Types



# The Nerve Impulse

- Can be initiated anywhere along the neuron.
- Runs from dendrites to axons ONLY!
- Chemicals called NT bridge the synaptic gap. (Acetylcholine is the main NT)
- Impulses travel up to 120 m/s or 272 mph.