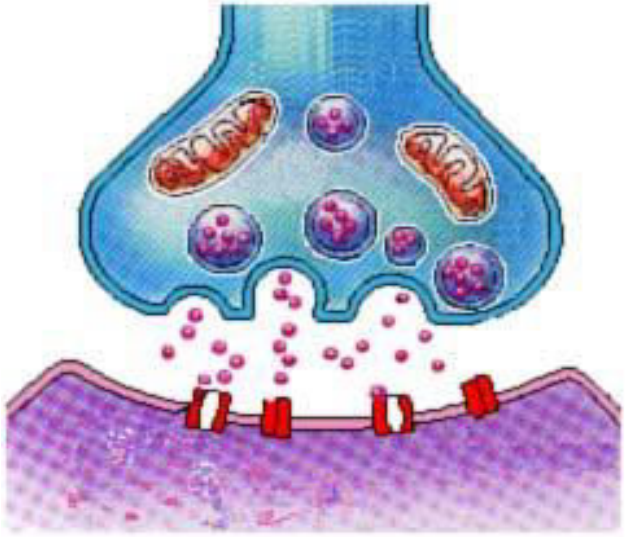

The Nerve Cell

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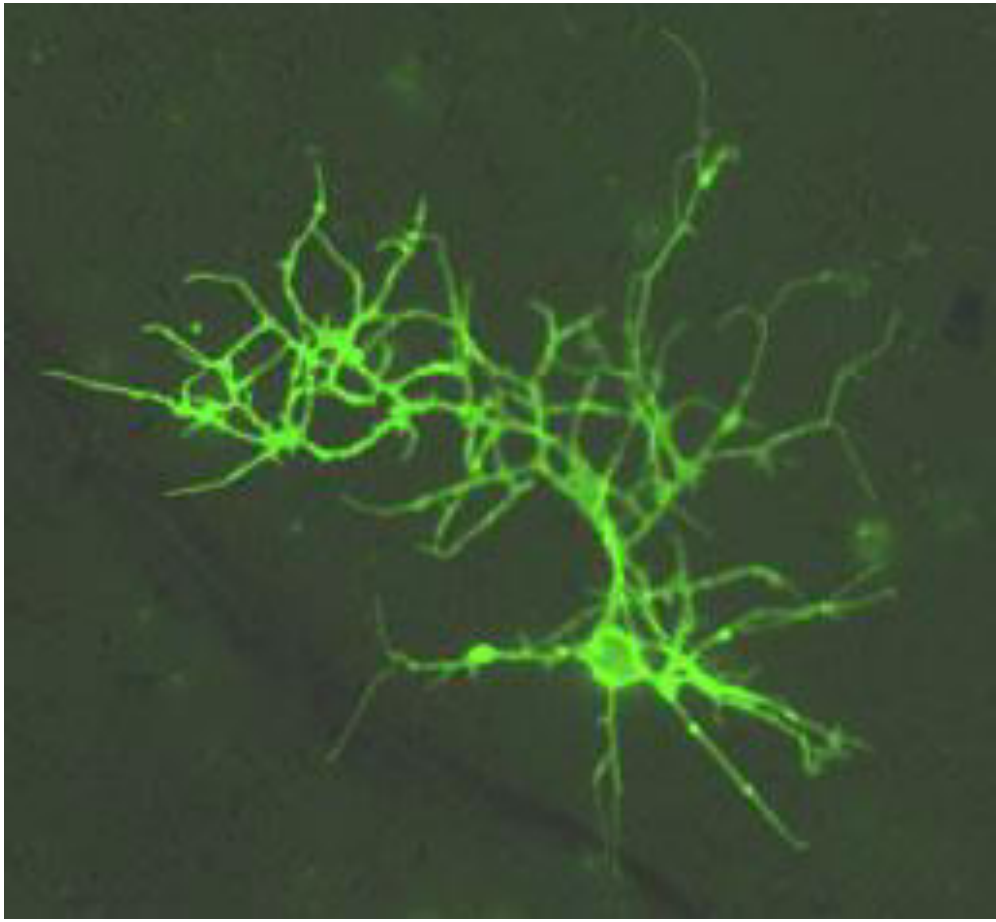
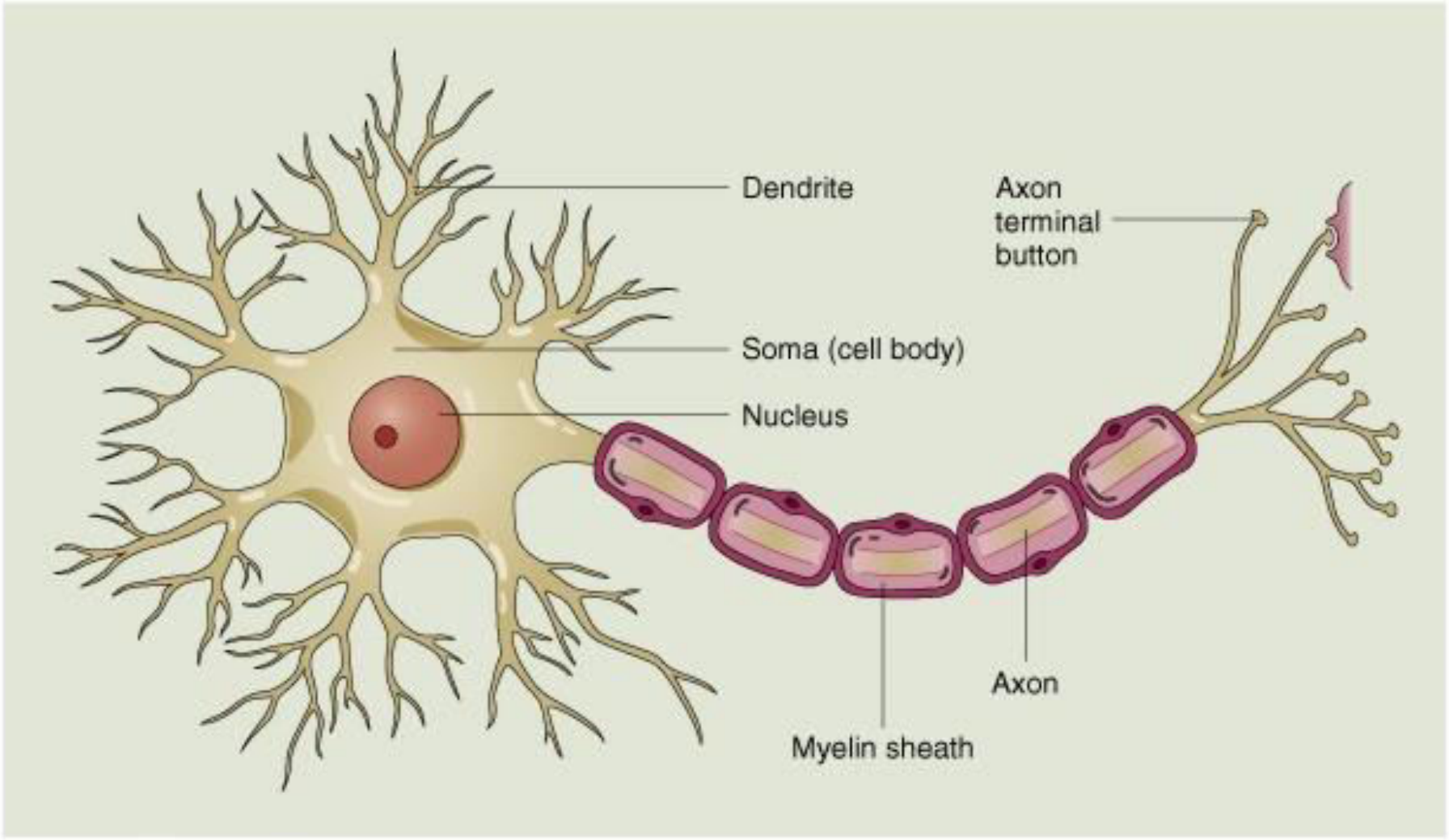
The Neuron

- The basic functional unit of the nervous system.
- Function: Send impulses to and from the CNS and PNS and the effectors (muscles/glands)

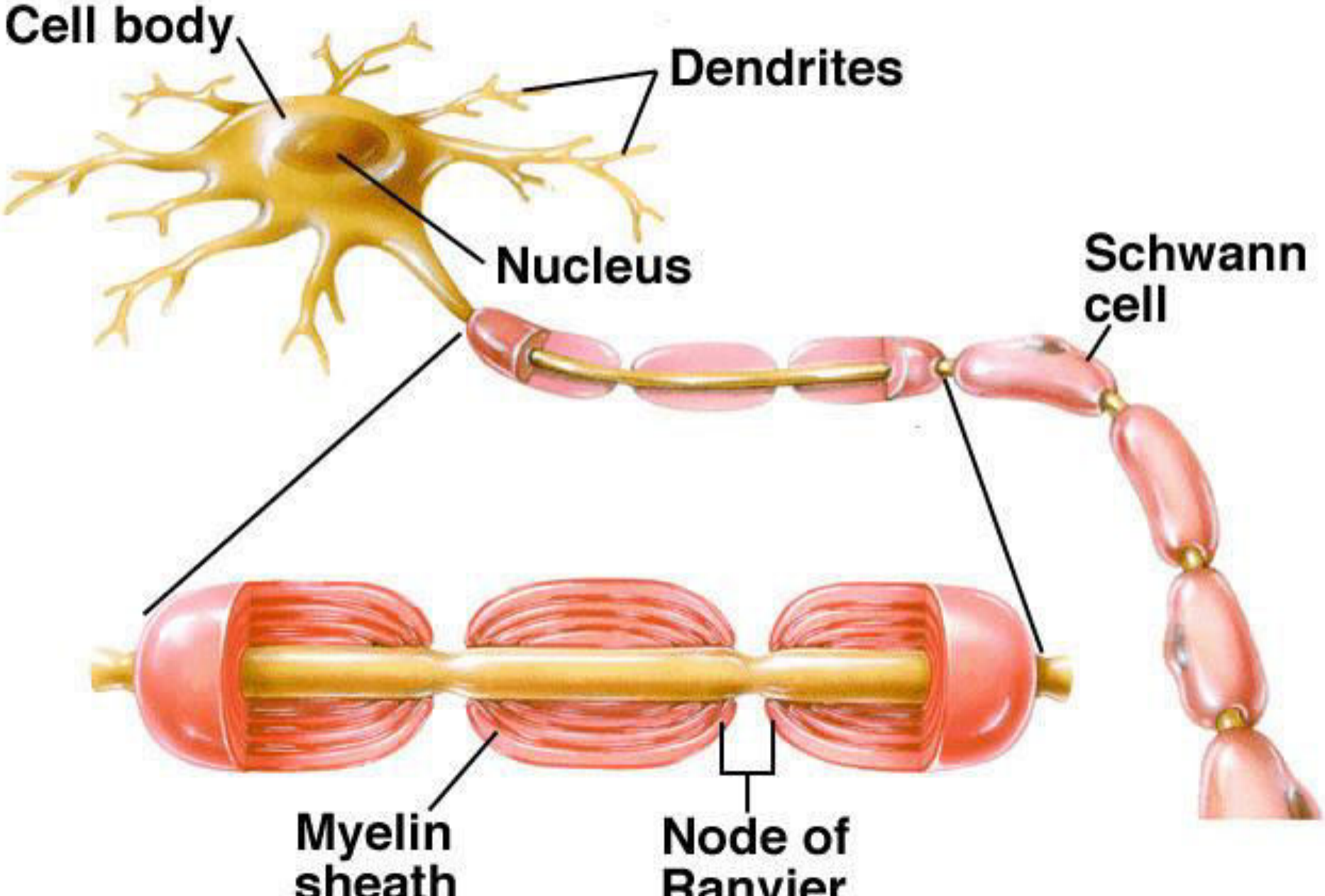


Neuron Structure



- Dendrite → Fine hair-like extensions on the end of a neuron.
  - *Function*: receive incoming stimuli.
- Cell Body or Soma → The control center of the neuron.
  - *Function: Directs impulses from the dendrites to the axon.*
- Nucleus → Control center of the Soma.
  - Function: Tells the soma what to do.
- Axon→ Pathway for the nerve impulse (electrical message) from the soma to the opposite end of the neuron.
- Myelin Sheath → An insulating layer around an axon. Made up of Schwann cells.
- Nodes of Ranvier → Gaps between schwann cells.
  - Function: Saltatory Conduction (Situation where speed of an impulse is greatly increased by the message 'jumping' the gaps in an axon).

Neuron Structure

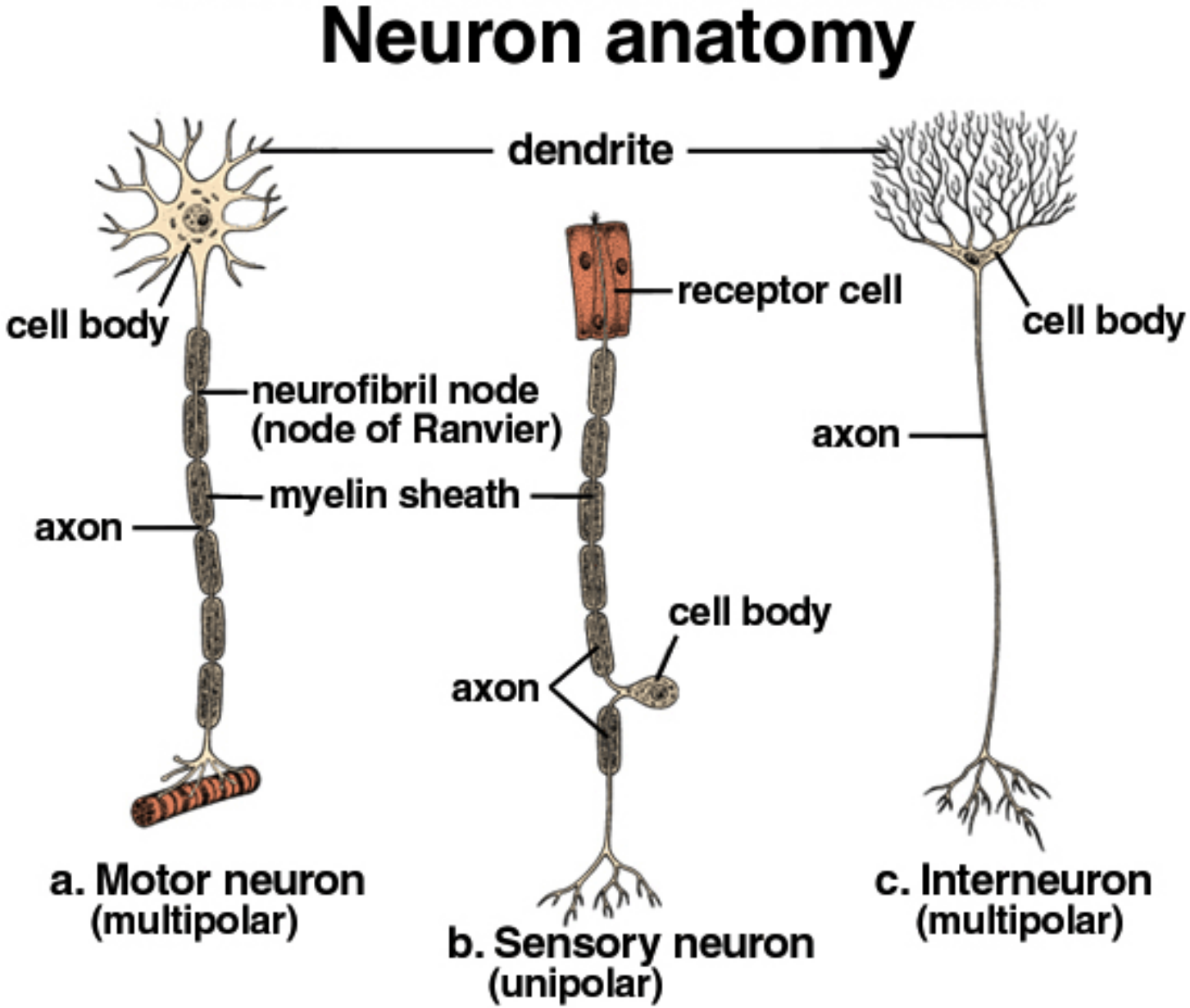


Types of Neurons

- There are 3 types of neurons.

1. **Sensory Neurons** → Neurons located near *receptor* organs (skin, eyes, ears).
   - Function: receive incoming stimuli from the environment.
2. **Motor Neurons** → Neurons located near *effectors (*muscles and glands)
   - Function: Carry impules to effectors to initiate a response.
3. **Interneurons** → Neurons that relay messages between other neurons such as sensory and motor neurons. (found most often in Brain and Spinal chord).

Types of Neurons



Nerves

- Nerves → Collections of neurons that are joined together by connective tissue.

- Responsible for transferring impulses from receptors to CNS and back to effectors.

Sympathetic Effects

- Fight, Fright or flight response
- Release of Neurotransmitters (NT)-
  - Norepinephrine (NT) from postganglionic fibers
  - Epinephrine (NT) from adrenal medulla

Sympathetic Effects

- Mass activation prepares for intense activity
  - Heart rate (HR) increases
  - Bronchioles dilate
  - Blood [glucose] increases

Sympathetic Effects

- GI motility decreases
- Contraction of sphincters
- Relaxation of
  - Detrusor muscle
  - Ciliary muscle
- Mydriasis

Parasympathetic Effects

- Normally not activated as a whole
  - Stimulation of separate parasympathetic nerves.
- Release ACh as NT
- Relaxing effects-
  - Decreases HR.
  - Dilates visceral blood vessels.
  - Increases digestive activity.

Parasympathetic Effects

- Bronchonstriction
- GI motility increases
- Relaxation of sphincters
- Contraction of
  - Detrusor muscle
  - Ciliary muscle
- Miosis

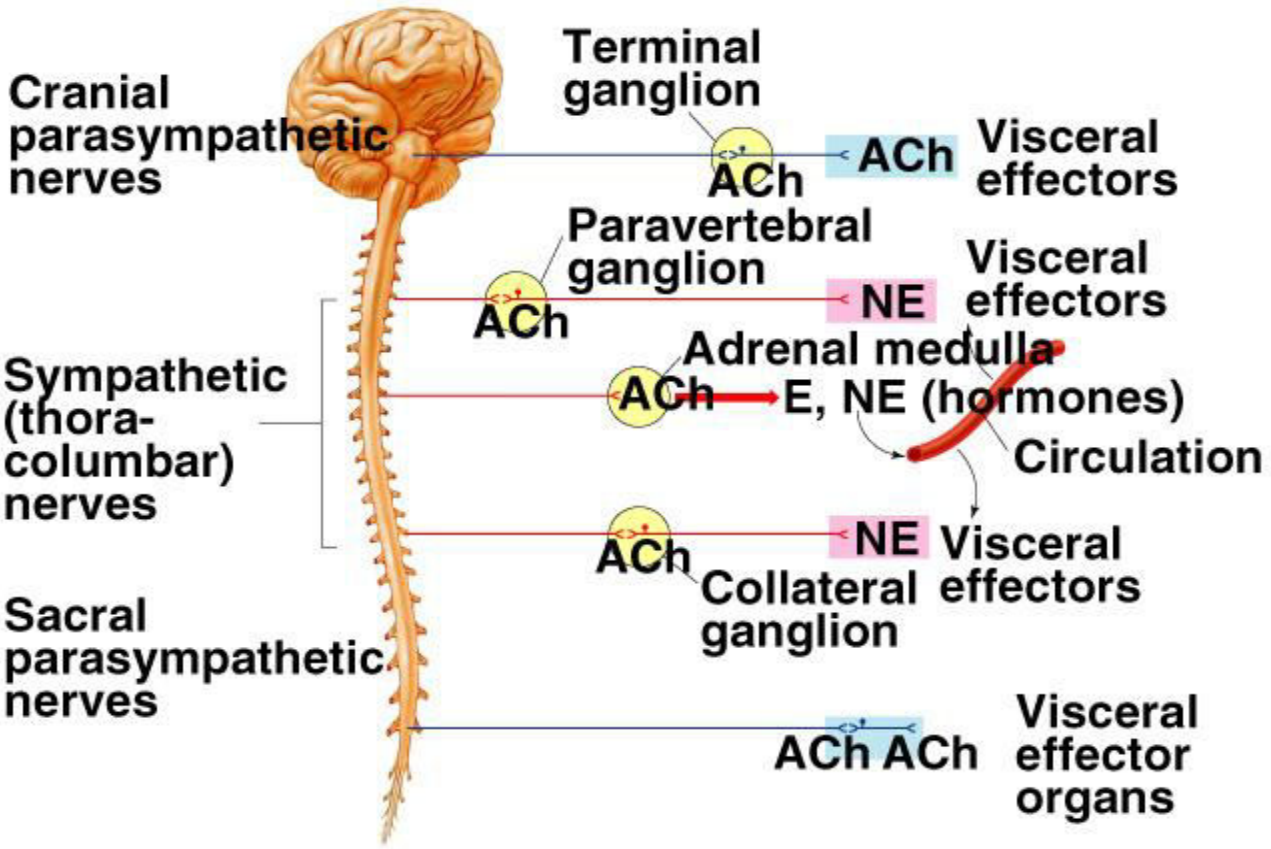
Adrenergic and Cholinergic Synaptic Transmission

- ACh is NT for all preganglionic
  - Sympathetic fibers
  - Parasympathetic fibers
- Transmission at these synapses is termed cholinergic
- All preganglionic fibers terminate in autonomic ganglia

Adrenergic and Cholinergic Synaptic Transmission

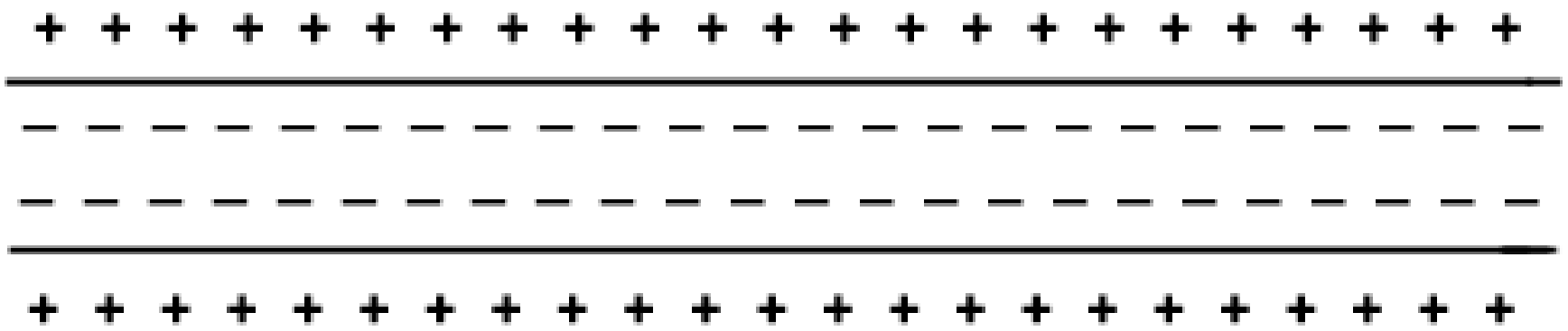
- ACh is NT released by -
  - Most postganglionic parasympathetic fibers
  - Some postganglionic sympathetic fibers
- Postganglionic autonomic fibers innervate the target tissue

Adrenergic and Cholinergic Synaptic Transmission



How Do Neurons Operate?

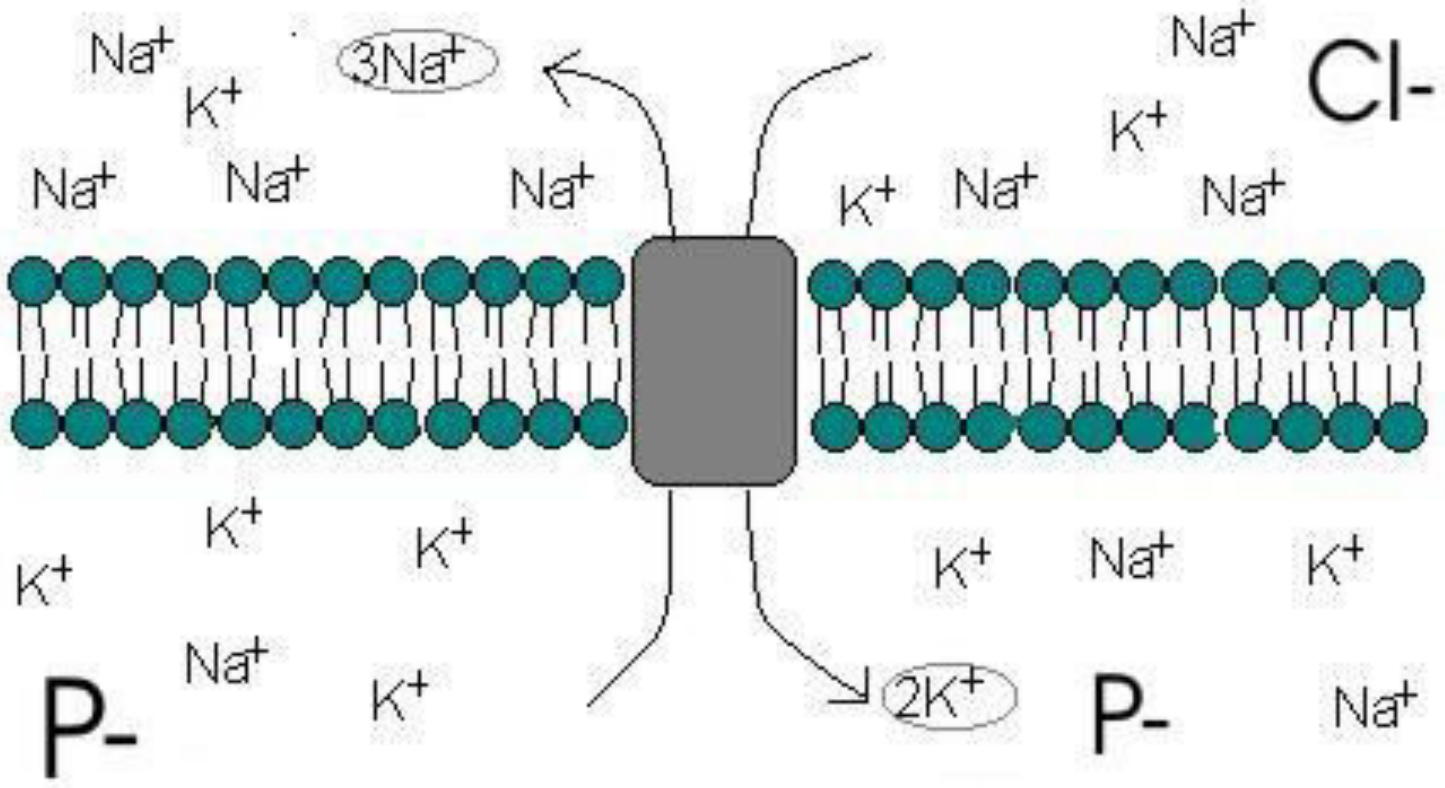
- Neuron at Rest → Resting Potential
  - Occurs when the neuron is at rest.
  - A condition where the *outside* of the membrane is *positively(+)* charged compared to the inside which is *negatively(-)* charged.
  - Neuron is said to be ***polarized.***
  - Neuron has a voltage difference of -70 mV



Section of an axon during the resting potential.

How is resting potential maintained?

Ion Distribution



How is resting potential maintained?

- At rest, the sodium gates are closed.
- Membrane is 50 times more permeable to K^+ ions causing them to “leak” out.
- This causes outside of membrane to have an abundance of + charges compared to inside. The inside of the membrane is negative compared to the outside. This is helped by the (-) proteins etc.
- The “sodium-potassium” pump pulls 2 K^+ ions in for 3 Na^+ ions sent out. This further creates a charge difference!!