GirlsGotSTEAM x Simply Neuroscience Build a Neuron Workshop!

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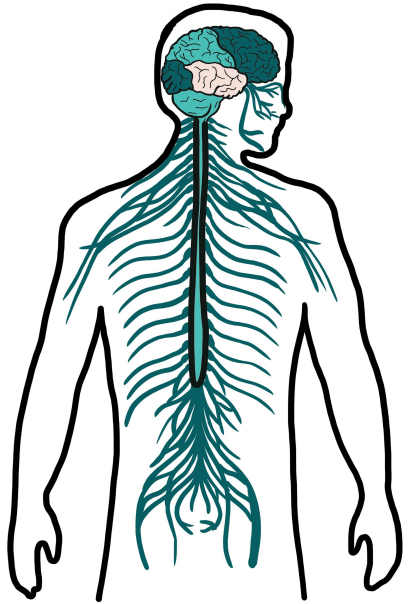
Today, we will build models of the neuron and learn about all of the different parts of this amazing cell and the nervous system. Let’s get started!

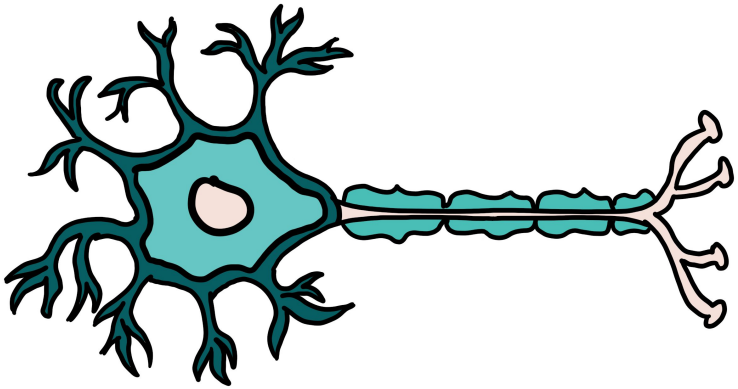
The Nervous System

- The nervous system is the communication system used by the body and brain to control all the organs, physical and mental reactions that take place.
- Our nervous system is what allows us to have continuous thoughts, actions, and emotions.
- There are three principal functions of the nervous system:
  - Sensory Input
  - Integration
  - Motor Output



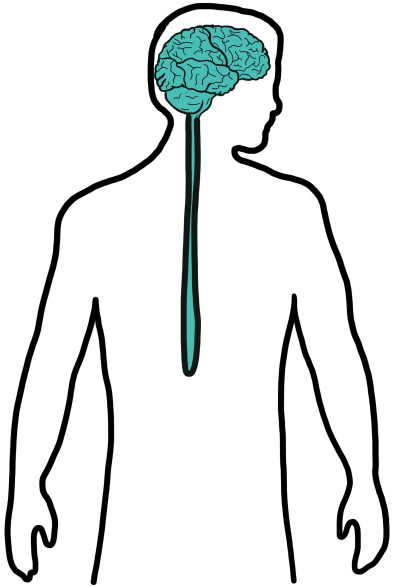
What is a Neuron?

- The Neuron is the basic working unit of the brain that transmits information to other nerve cells, muscles, or glands
- The mammalian brain contains **between 100 million and 100 billion neurons**, depending on the species!
- Each neuron is composed of three main parts: the cell body, dendrites, and an axon.



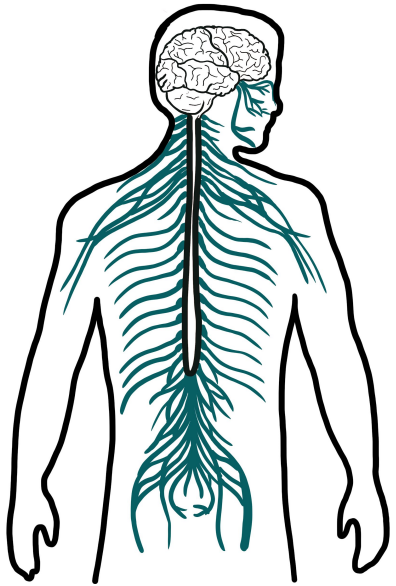
The Central Nervous System

- Communication system that the body uses through the brain and spinal cord.
- This system is central because it combines information from the entire body and coordinates activity and balance with all other organ systems.
- Division of the central nervous system:
  - White matter - Consists of Glial Cells and Axons
  - Gray matter - Consists of Glial Cells and Neurons



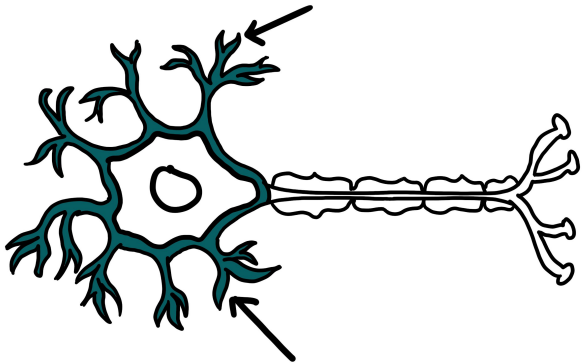
The Peripheral Nervous System

- Communication system that the body uses through everything other than the brain and spinal cord such as nerves and ganglia
- **Peripheral nervous system** is divided into **two parts**: the somatic nervous system and the autonomic nervous system.
- **Autonomic nervous system** is split into two parts: the sympathetic and parasympathetic nervous systems.



Dendrites

- Special action sites which bring information **into** the cell body from other nerve cells.
- Transmit electrical stimulation to the soma so that the neuron can pass the message along to other neurons through its axon.
- Dendrites in different parts of the body are activated by various stimuli such as light, touch, temperature, and movement.



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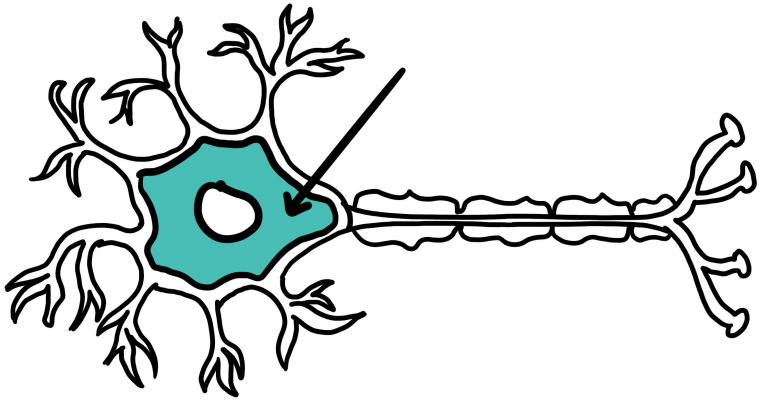
Soma

- Cell body of the neuron which contains the nucleus.
- Connects the dendrite and the axon which receive and send signals to other neurons.
- Does not play an active role in receiving and sending signals, but makes sure the entire cell functions properly and is in charge of keeping the cell's DNA intact.



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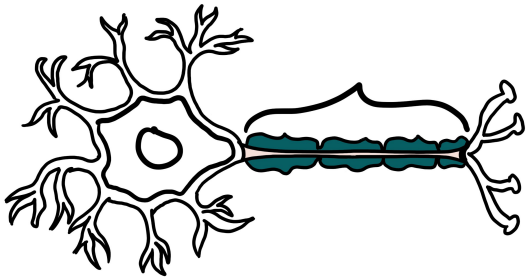
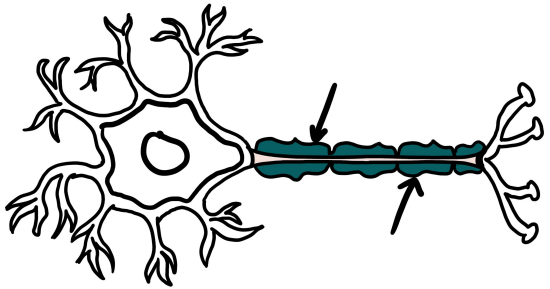
Axon

- Special cellular extension that comes from the cell body at a site called the axon hillock
- Carries information away from the cell body to the dendrites of a neighboring neuron
- Some axons are enveloped by Schwann Cells (provide structural and metabolic support)
- Classified on the basis of presence or absence of myelin sheath
    - Myelinated = Layers of Schwann Cells
    - Non-Myelinated = No Schwann Cells



Myelin

- A fatty covering which envelops many axons and allows action potentials to be spread at a much greater velocity.
- If an axon has myelin, the information that it sends can travel faster than an axon without myelin.
- Myelin is produced by support cells called glia (in the nervous system).

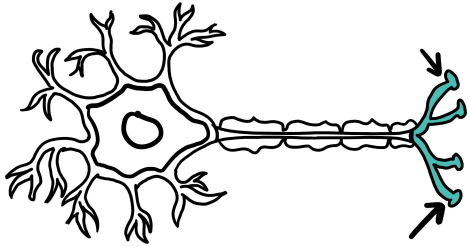


Presynaptic terminals

The presynaptic terminal contains the neurotransmitter, mitochondria, and other organelles.

Action Potential:

- Electrical signal travels down axon to presynaptic terminal
- Causes synaptic vesicles to move to presynaptic membrane
- Vesicles fuse with presynaptic membrane and release neurotransmitters into the synaptic gap
- Neurotransmitters travel across synaptic gap and bind on the other side with receptors on the postsynaptic terminal
- Postsynaptic cell will be either more or less likely to fire an action potential, depending on whether the impulse is excitatory or inhibitory.



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Now that we've introduced you to the different parts of a neuron and the nervous system, let's get started on the model!

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Congratulations on building your very own Neuron!

Please go to the “Reflect” section of your SciNotebooks and discuss the following about your experience:

- What was difficult?
- What was easy?
- What would we do differently next time?

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Congratulations on completing the Build a Neuron Workshop! It's time to end off with some discussion questions:

- What is something we learned today?
- Why is the nervous system important?
- What do neurons do?
- What are the different parts of a neuron?