Neurons/Nerve Impulses/Synapses
Neurons

- Cells that carry messages throughout the nervous system

- 3 types:
  1\textsuperscript{st}: \textbf{sensory neurons} - carry impulses from sense organs to brain;
  2\textsuperscript{nd}: \textbf{motor neurons} - carry impulses from brain to muscles/glands.
  3\textsuperscript{rd}: \textbf{Interneuron}: carry impulses between sensory and motor neurons (connects them)
Parts of a neuron

1\textsuperscript{st} **cell body**: largest part, contains nucleus and most of cytoplasm – most metabolic activity of cell occurs here

2\textsuperscript{nd} **dendrites**: spread out from cell body; short, branched extensions; carry impulses toward the cell body
Parts of a Neuron cont.

3rd axons: (transmit/send signals) long fiber that carries impulses away from cell body.

4th myelin sheath: (lipids) insulating membrane around axon; helps impulse travel faster & smoother

5th Schwann cells- cells of the myelin sheath

- One neuron can have dozens of dendrites but only one axon.*{bonus?}*

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Nerve Impulses

- Messages carried by the nervous system are electrical signals called impulses.

- Impulse begins: neuron stimulated by environment or another neuron (impulse travels rapidly away from cell body) moves toward axon terminals and into the synapse.
The Synapse & Neurotransmitter

- **Synapse**: the location at which a neuron can transfer an impulse to another cell
- **Neurotransmitter**: chemicals used by a neuron to transmit an impulse across a synapse to another cell
Central Nervous System (CNS)
The Central Nervous System (CNS)

- **Main functions of the CNS:**
  1. conveys messages between brain and spinal cord;
  2. processes info, problem solving

- **2 structures make-up the CNS:**
  1. **brain**;
  2. **spinal cord**

- The skull and vertebrae protect these
Both the brain and the spinal cord are wrapped in 3 layers of connective tissue called **meninges**.

Between the meninges and the CNS tissue is a space filled with **cerebral spinal fluid** (CSF).
The Central Nervous System

Functions of the CSF.

1. bathes brain and spinal cord
2. Act as a **shock absorber** that protects CNS
3. allows for **exchange of nutrients** and waste products between **blood** and **nervous** tissue
Peripheral Nervous System (PNS)
Peripheral Nervous System

- **Function**: receives info. from the environment and relays commands from the CNS to organs and glands
- It lies **OUTSIDE** the CNS
- Includes **all nerves** and associated cells that are not part of the **brain and spinal cord**
- *divided into sensory & motor divisions*
  - **Sensory**: transmits impulses from sense organs to the CNS
  - **Motor**: transmits impulses from the CNS to muscles or glands
Divisions of the Nervous System

Nervous system

Peripheral

- Autonomic (controls self-regulated action of internal organs and glands)
  - Sympathetic (arousing)
  - Parasympathetic (calming)

- Somatic
  - Sensory input
  - Motor output (controls skeletal muscles)

Central (brain and spinal cord)
Somatic Nervous System (SNS)

"There's nothing wrong with your reflexes ..."
Somatic Nervous System (SNS)

- regulates activities that are under conscious control
- Movement of skeletal muscles
- Some somatic nerves involved with reflexes & can act with or without conscious control
How a reflex works

- **Stimulus:**
  1. step on tack
  2. simulates sensory neurons
  3. impulse travels to spinal cord
  4. spinal cord interneurons activate motor neurons
  5. impulse travels to motor neuron
  6. muscles in foot contract, pulling foot away (effector muscle = muscle that is moving) [this takes only a fraction of a second]
Autonomic Nervous System (ANS)
Autonomic Nervous System (ANS)

- Regulates activities that are **automatic/involuntary**
- Nerves of ANS control functions **not** under conscious control
- Controls other body systems (ex: when you run, the ANS…)
  1. increase heart rate and blood flow to skeletal muscles
  2. stimulates sweat glands and adrenal gland
  3. decrease contractions of smooth muscle in digestive system
Autonomic Nervous System (ANS) cont

- Divided into 2 sections:
  1. **Sympathetic** - increase heart rate (think “gas pedal”) – Fight or Flight
  2. **Parasympathetic** - decrease heart rate (think “brakes”) – Rest and Digest

- Opposite effect on organs - help body maintain homeostasis

- *most organs controlled by both*