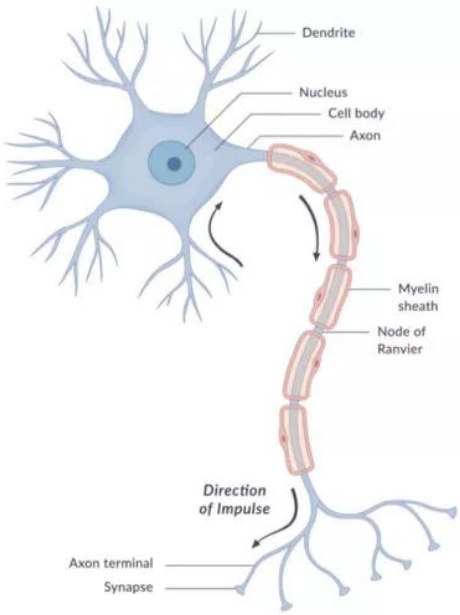
Neurons

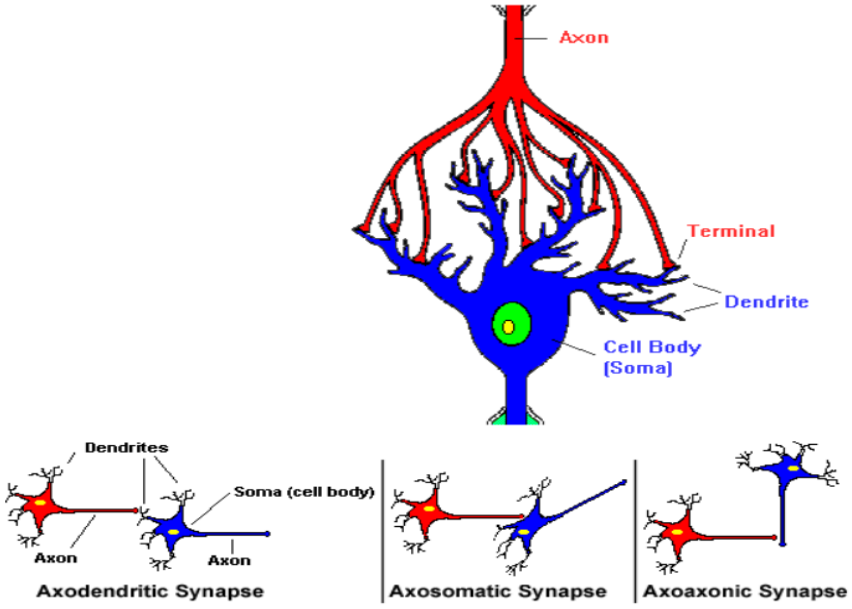
A neuron consists of three major parts:

1. **Cell Body:** The central cell body contains the neuron's nucleus, associated cytoplasm, and other organelles.
2. **Axons:** This part of the neuron transmits information and extends away from the soma or cell body. It typically carries signals away from the cell body, but occasionally receives impulses from axoaxonic connections.
3. **Dendrites:** Dendrites are similar to axons, but tend to be multibranched extensions that typically carry signals toward the cell body. They generally receive neurochemical impulses from the axons of other cells.



Neurons usually have one axon (can be branched, however). Axons usually terminate at **a synapse** through which the signal is sent to the next cell, most often through **a dendrite**. This is known as an **axodendritic connection**. However, axons can also terminate on the cell body, an **axosomatic connection**, or on the length of another axon, known as an **axoaxonic connection**. Unlike axons, dendrites are usually more numerous, shorter and more branched. As with other structures in organisms, there are exceptions. There are three types of neurons: **sensory, motor,**

and **interneurons**. Sensory neurons transmit impulses from sensory organs (eyes, skin, etc.) to the central nervous system. These neurons are responsible for your five senses. Motor neurons transmit impulses from the brain or spinal cord toward muscles or glands. Interneurons relay impulses within the central nervous system and act as a link between sensory and motor neurons. Bundles of fibers composed of neurons form nerves. Nerves are sensory if they consist of dendrites only, motor if they consist of axons only, and mixed if they consist of both.

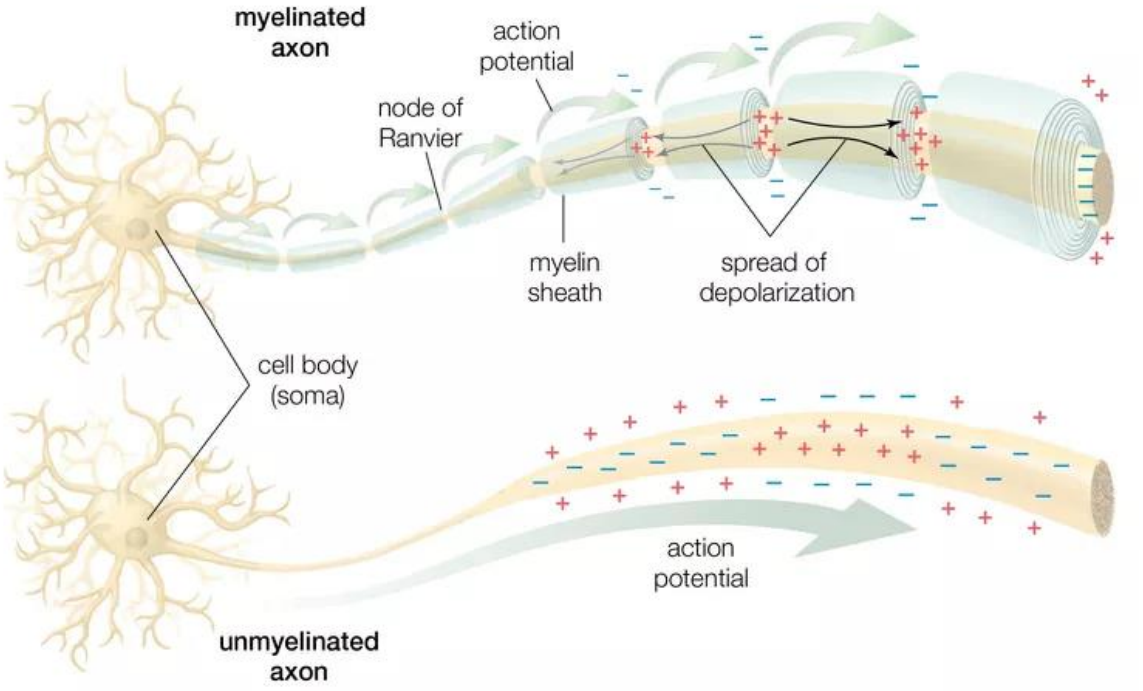


Nerve Impulses

Information is communicated among nervous system structures through nerve signals. Axons and dendrites are bundled together into what are called nerves. These nerves send signals between the brain, spinal cord, and other body organs via nerve impulses. Nerve impulses, or action potentials, are electrochemical impulses that cause neurons to release electrical or chemical signals that initiate an action potential in another neuron. Nerve impulses are received at neuronal dendrites, passed through the cell body, and are carried along the axon to the terminal branches. Since axons can have numerous branches, nerve impulses can be transmitted to numerous cells. These branches end at junctions called synapses.

It is at the synapse where chemical or electrical impulses must cross a gap and be carried to the dendrites of adjacent cells. At electrical synapses, ions and other molecules pass through gap junctions allowing for the passive transmission of electrical signals from one cell to the other. At chemical synapses, chemical signals called neurotransmitters are released which cross the gap junction to stimulate the next neuron. This process is accomplished by exocytosis of the neurotransmitters. After crossing the gap, neurotransmitters bind to receptor sites on the receiving neuron and stimulate an action potential in the neuron.

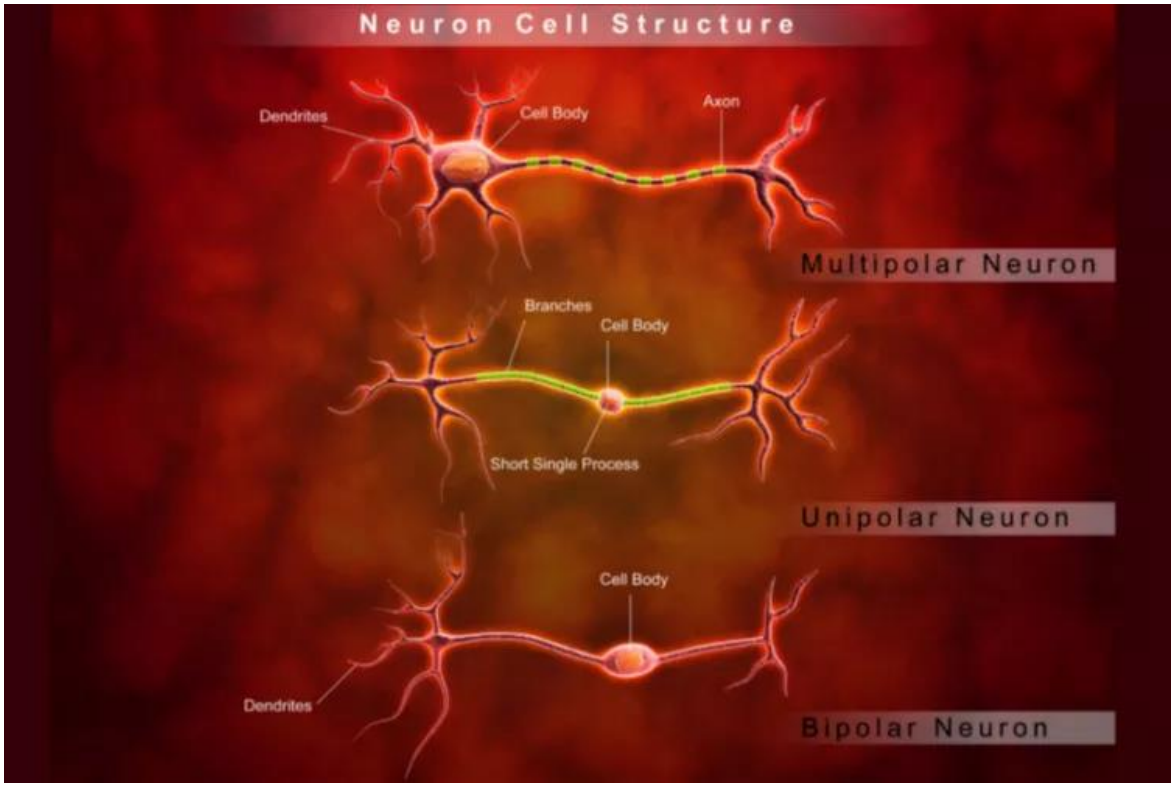
Nervous system chemical and electrical signaling allow for quick responses to internal and external changes. In contrast, the endocrine system, which uses hormones as its chemical messengers, is typically slow-acting with effects that are long-lasting. Both of these systems work together to maintain homeostasis.



Neuron Classification

There are three main categories of neurons. They are **multipolar, unipolar,** and **bipolar neurons**.

1. **Multipolar neurons** are found in the central nervous system and are the most common of the neuron types. These neurons have a single axon and many dendrites extending from the cell body.
2. **Unipolar neurons** have one very short process that extends from a single cell body and branches into two processes. Unipolar neurons are found in spinal nerve cell bodies and cranial nerves.
3. **Bipolar neurons** are sensory neurons consisting of one axon and one dendrite that extend from the cell body. They are found in retinal cells and olfactory epithelium.



Glial Cells

Glial cells, sometimes called **neuroglia**, do not conduct nerve impulses but perform a number of support functions for nervous tissue. Some glial cells, known as **astrocytes**, are found in the brain and spinal cord and form the **blood-brain barrier**. **Oligodendrocytes** found in the central nervous system and **Schwann cells** of the peripheral nervous system wrap around some neuronal axons to form an insulating coat known as the **myelin sheath**. The myelin sheath aids in the faster conduction of nerve impulses. Other functions of glial cells include nervous system repair and protection against microorganisms.