The **nervous system** controls and coordinates the activities of cells, tissues, and organs.
The **endocrine system** also plays a large role in control and coordination.
The nervous system is more dominant. Its mechanisms are faster, more widespread, and more specific.
The nervous system sends information via both **electrical** and **chemical signals**.
The endocrine system relies solely on blood borne chemical messengers known as **hormones**.

The nervous system has 3 basic functions:

1. **Sensory input** – the nervous system uses special cells (**sensory receptors**) to monitor the internal and external environments.
2. **Integration** – the nervous system processes sensory information and determines the proper course of action.
3. **Motor output** – the nervous enacts a response by an organ/tissue/cell (i.e., an **effector**) in response to a change in the internal or external environment.

The nervous system has 2 main divisions:

1. **Central nervous system** – the brain and the spinal cord. The primary function of the CNS is the integration and processing of information.
2. **Peripheral nervous system** – the nervous tissue outside of the CNS (i.e., outside of the dorsal body cavity). **Spinal nerves** carry information between the tissues and the spinal cord while **cranial nerves** carry information between the tissues and the brain.

The PNS is subdivided into the:

1. **Sensory afferent division** – cells carrying information from sensory receptors to the CNS.
2. **Motor efferent division** – cells carrying commands from the CNS to the effector organs.

The motor efferent division of the PNS is further subdivided into the:

1. **Somatic nervous system** – cells sending signals from the CNS to skeletal muscles.
2. **Autonomic nervous system** – cells sending signals from the CNS to smooth muscle, cardiac muscle, and glands.

The ANS is further subdivided into a **sympathetic division** (the "fight or flight" division) and a **parasympathetic division** (the "rest and digest" division).

The primary cell of nervous tissue is the **neuron**. The neuron is responsible for sending sensing information, integrating and processing, and issuing motor commands. Neurons are supported by cells known as **glial cells**.

The functions of glial cells include:

1. Maintaining the neuron's surrounding chemical environment.
2. Facilitating nutrient transfer to neurons.
3. Destroying neuronal debris and microorganisms.
4. Lining the cavities of the brain and spinal cord.
5. Insulating the neuron fibers that transmit electrical signals.

There are billions of neurons in the human body and there is diversity of neuron shape and size.
A typical neuron consists of a cell body (called the **soma**) and one or more slender processes.
The soma is the site of basic cellular functions. It contains the nucleus (with chromosomes) as well as the major organelles. The ER is quite well developed and is referred to as the **Nissl body**.

Although neurons are capable of electrical signaling, the signals used to between neurons or between neurons and effectors are chemical signals and many of them are manufactured by the abundant ER.

The shape of the neuron is maintained by protein filaments known as **neurofibrils**.

The soma is the primary site of integration within the neuron. It is also part of the receptive region that receives signals from other neurons. Most somata are found within the protective environs of the skull and vertebral column (i.e., within the CNS).

A group of somata in the CNS is referred to as a **nucleus** (note the new use of this word).
A group of somata outside the CNS (i.e., in the PNS) is known as a **ganglion**.

There are 2 types of neuronal processes that extend from the soma: **dendrites** and **axons**.

Dendrites form the main region upon which a neuron is signaled by other neurons.
Dendrites typically send electrical signals (amplitude based) towards the cell body.
A neuron can have many dendrites. However, there is usually only on axon per neuron.

The axon conducts electrical impulses (frequency based) from the cell body towards the effector cells.
The beginning of the axon is a conical region of the cell body known as the **axon hillock**.
An axon may branch as it travels from the soma towards effector cells.
Branches are known as **axon collaterals**. At its endpoint(s) the axon will branch enormously.
The resulting processes are known as **telodendria**. Each telodendrion will end at a point adjacent to an effector cell. The endings of the telodendria are known as **axon terminals**.
The junction between a telodendrion and the effector cell is known as a **synapse**.
Electrical impulses are conducted from the cell body to the axon terminals.
In response to the frequency of these impulses, the axon terminals will releases chemical messengers (**neurotransmitters**) that will diffuse towards and affect the effector cells.
The axon terminals contain membranous bags (**synaptic vesicles**) that are full of neurotransmitters.
The electrical impulses are actually conducted by the plasma membrane of the axon (the **axolemma**).
Many axons are surrounded by an insulating material known as the **myelin sheath**.
The myelin sheath increases the conduction speed of electrical impulses and protects the axons.
Axons in the PNS are surrounded by a myelin sheath that is composed of **Schwann cells** that wrap around the axon. The outer plasma membrane of a Schwann cell is known as the **neurilemma**.
The adjacent Schwann cells that are wrapping around an axon do not touch one another.
The gaps between them are known as **nodes of Ranvier**.

The # and arrangements of axon and dendrites allow neurons to be structurally classified in 3 ways:

1. **Multipolar neurons** – have 3 or more processes (1 axon & the rest dendrites). (99% of neurons.)
2. **Bipolar neurons** – have 2 processes, 1 axon and 1 dendrite that extend from opposite sides of the cell. Examples of bipolar neurons include olfactory neurons and retinal neurons.
3. **Unipolar neurons** – have 1 short process that quickly divides into a **peripheral process** which usually is extended to a sensory receptor and a **central process** that extends into the CNS. Unipolar neurons are weird in that the process is essentially an axon. However, it contains dendrite-like receptive area at the distal end of the peripheral process. Most sensory neurons are unipolar neurons.

Neurons are functionally classified in 3 ways as well:

1. **Sensory neurons –** transmit electrical impulses from sensory receptors in the skin or internal organs towards or into the CNS. A.k.a. **afferent neurons**.
2. **Motor neurons** – transmit electrical impulses from the CNS to the effector organs/cells. Typically multipolar. A.k.a. **efferent neurons**.
3. **Interneurons** –btwn the sensory and motor neurons. Transmit information through the CNS and are the sites of integration. 99% of neurons are interneurons. A.k.a. **association neurons**.