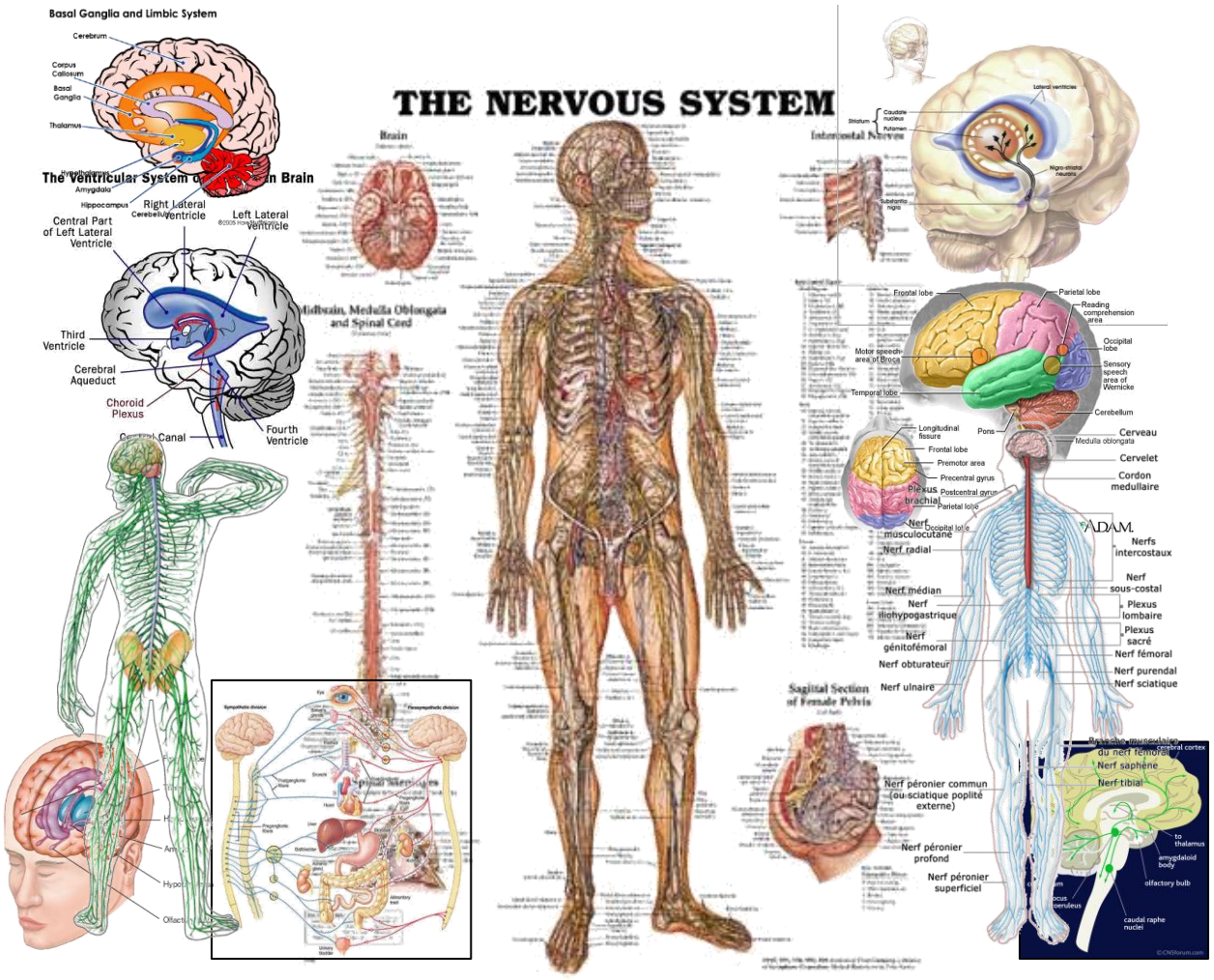
The Nervous System



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Regulating Systems

The functions of the various systems of the body are coordinated and integrated according to the body needs by the two control systems.

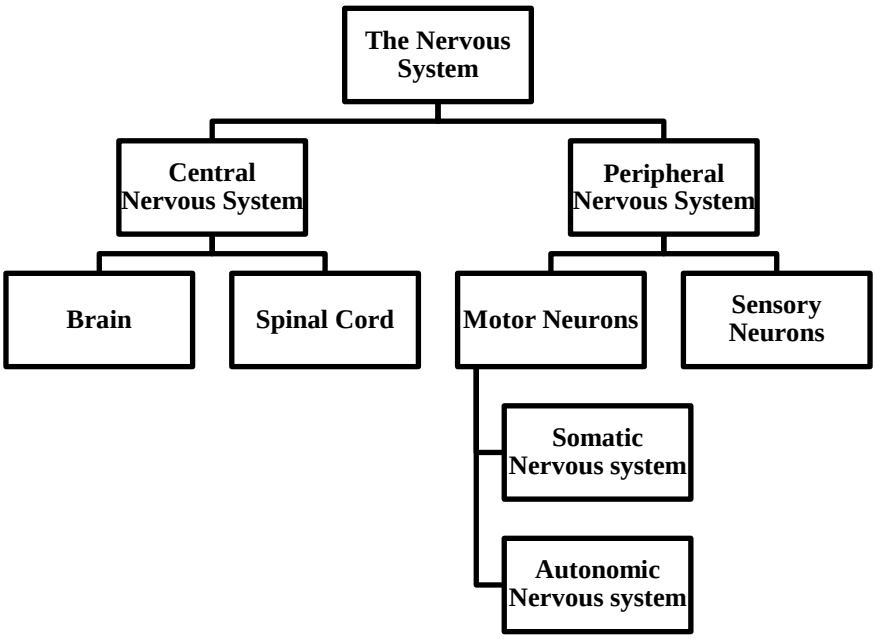
1. The endocrine system:
It is formed of ductless glands (endocrine glands) that secrete chemical messengers called hormones, which are carried by the blood and influence the activity of some distant organs. It acts slowly but has a prolonged action.

2. The nervous system:
It is responsible for rapid and short regulation of the functions of the various systems of the body. It receives millions of signals of information, from the different sensory organs and then integrates them in the CNS to determine the response to be made by the body. It is comprised of billions of cells, which are of two major cell types (from the structural point of view); neurons and glial cells (neuroglia).

Neuron

The neuron is the basic structural unit of nervous tissue, specialized for transmission of action potentials. It is important to note that, the human nervous system functions roughly with about 10 million sensory neurons and ½ million motor neurons. The vast number of central neurons provides abundant circuits for processing and organization of the nervous system.

Nervous System



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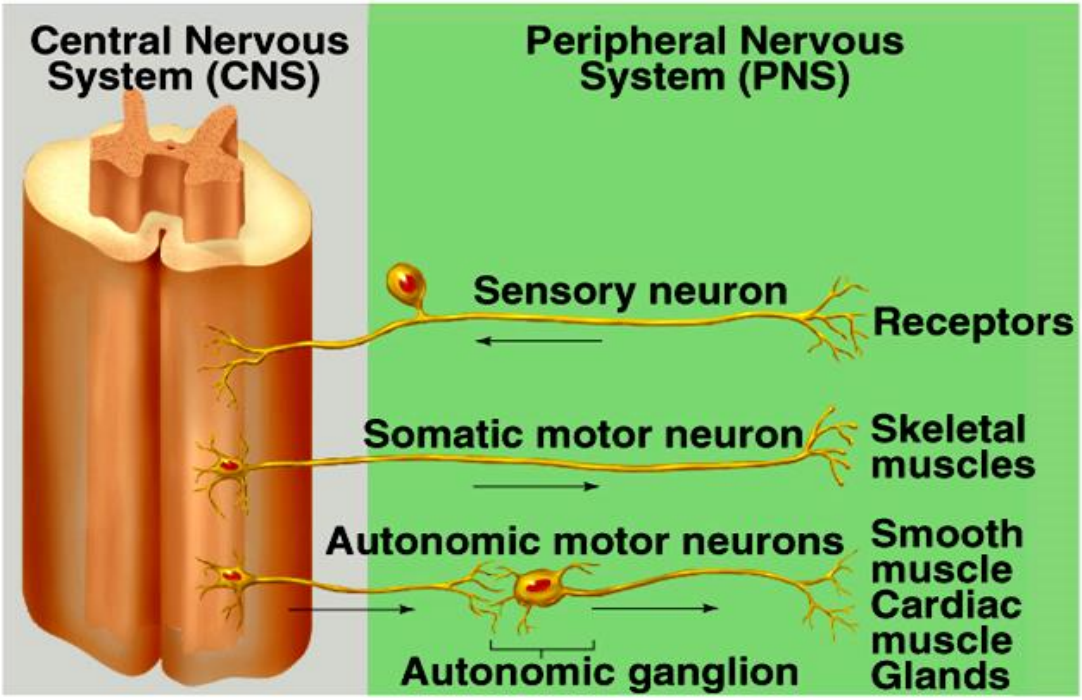
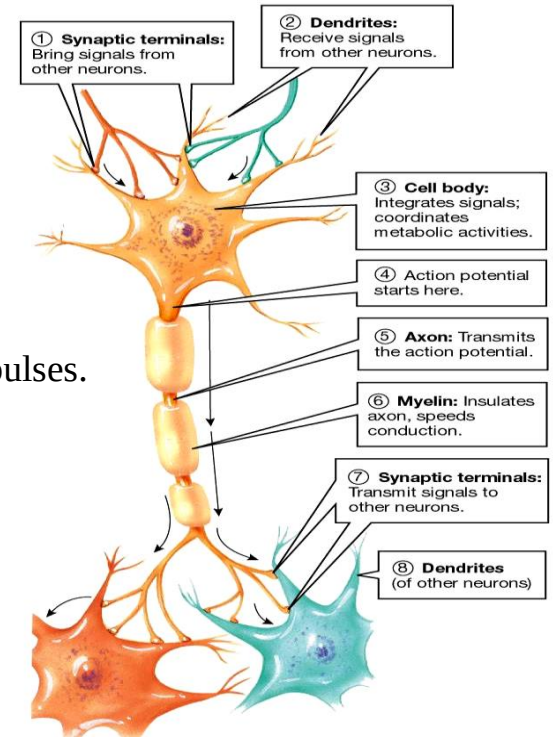


Neurons

The Neuron is the basic structural and functional units of the nervous system. Neurons carry *electrical* messages called impulses throughout the body.

Parts of a Neuron include (**Fig. 5**):

1. **Cell body.**
2. **Dendrites**.
3. **Axon**.
4. **Synaptic terminals**.



Excitability/irritability:

- Ability to produce & conduct electrical impulses.
- Excitable tissues include:

  1-Nerves

  2-All types of muscle.

  (smooth, skeletal& cardiac)

The Neuron Morphology:

Neurons in the mammalian central nervous system come in many different shapes and sizes. However, most have the same parts as the typical spinal motor neuron (multipolar).

The parts of a neuron:

1. The Soma: is the main cell body of the neuron .It acts as a processing center for the nerve fiber.

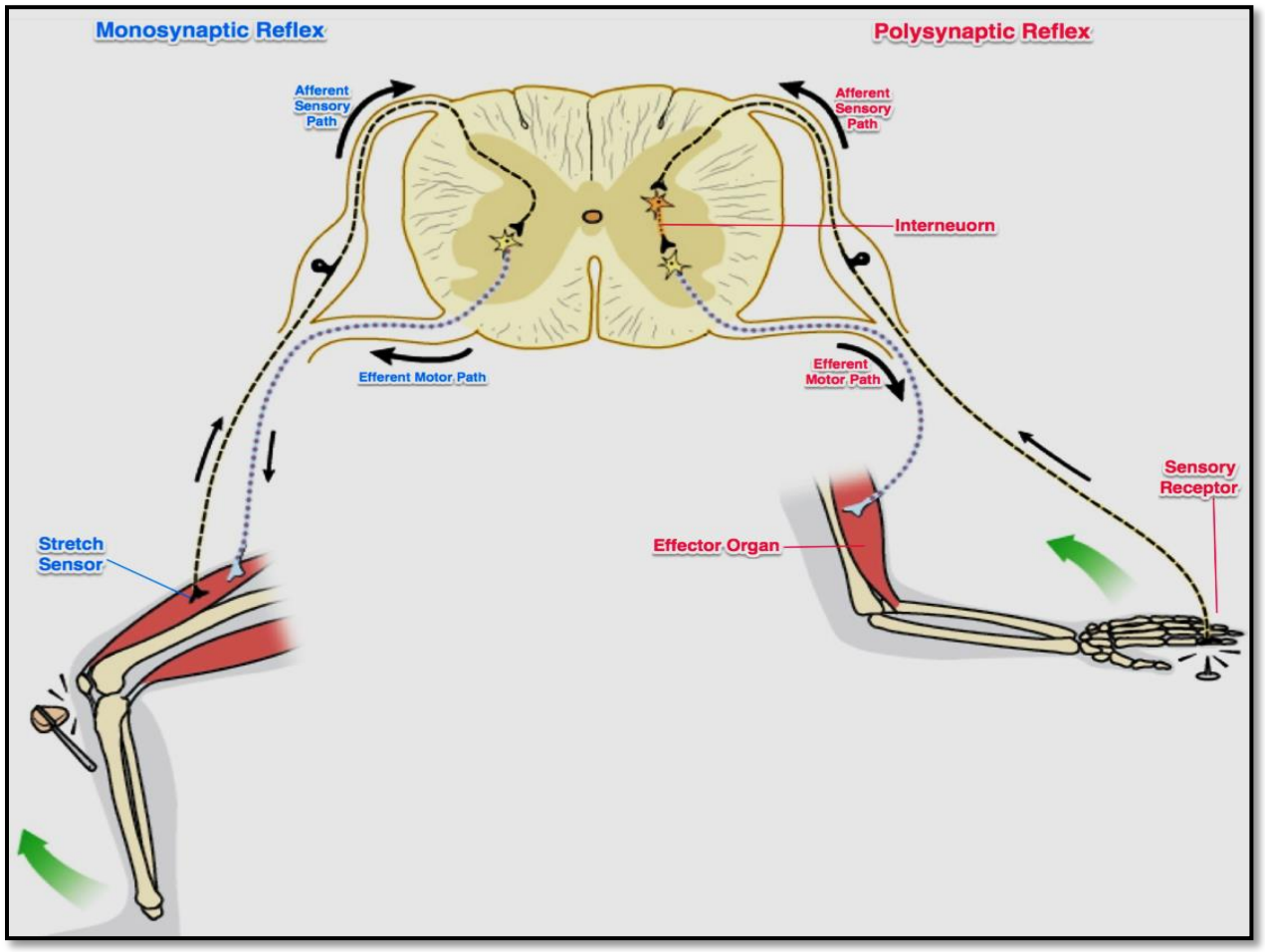
2. The Dendrites: are antenna-like processes that project out from the soma and increase the cell surface area for reception of signals from other neurons.

3. Axon (Nerve Fiber): a single more elongated process which extends for a distance. The axon ends in number of synaptic Knobs, which are also called terminal buttons. These knobs contain granules or vesicles in which the synaptic transmitters secreted by the nerves are stored. Impulses are directed away from the cell body by its axon.

Reflex Arc

The functional unit of the nervous system is the reflex arc which is composed of:

1. A proper Stimulus.
2. A sense organ (Receptor).
3. An Afferent neuron .
4. One or more synapses (Center).
5. An Efferent neuron.
6. An Effector organ.
7. Proper Response.



The Nervous System

The nervous system is divided anatomically into:

A) Central Nervous System (CNS).

B) Peripheral Nervous System.

The Central nervous system

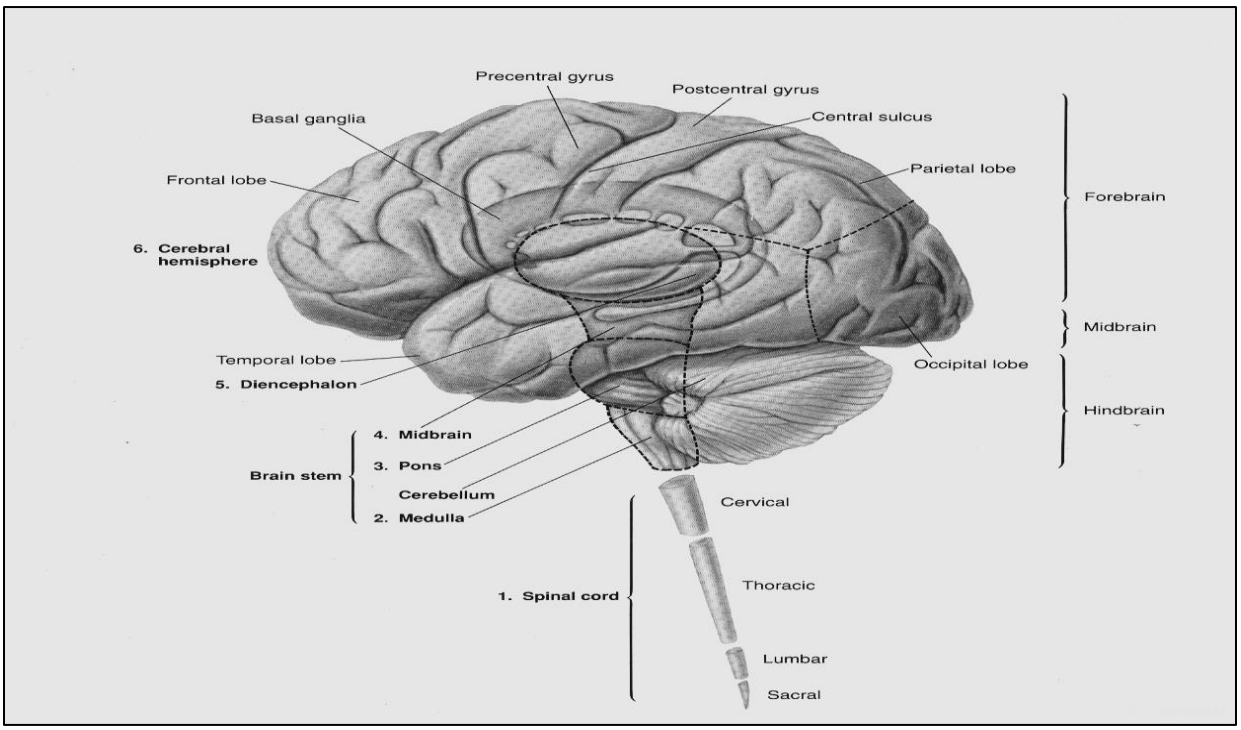
1.The Brain

The Brain is formed of:

- 2 Cerebral Hemispheres.
- Brain Stem: Midbrain, Pons & Medulla.
- Cerebellum.

2. The Spinal Cord

No trace of segmentation can be seen on the surface of the spinal cord but it is convenient to describe it as if it were divided into segments from each of which arises a pair of spinal nerves:
8 cervical, 12 thoracic, 5 lumbar, 5 sacral segments and one coccygeal.



Peripheral Nervous System

Functionally they are two kinds:

1. Afferent or sensory fibers: those carry nerve impulses from the periphery to the central nervous system. They bring information about the external world from receptors (=specialized structures at the terminations of afferent fibers) that are sensitive to stimuli such as light, sound, temperature or pressure.
Also, they bring to the central nervous system information about the internal state of the body, for example tension in muscles or distension in viscera.

2. Efferent or motor fibers: They carry nerve impulses from the central nervous system to muscles, glands and other organs.
According to the site of origin the peripheral nerves may be divided into cranial nerves and spinal nerves.

• **Cranial Nerves:** These are twelve pairs originating from the brain. Each pair has a name; they are also numbered from one to twelve. They may contain only sensory fibers, only motor fibers or mixed sensory and motor fibers.

• **Spinal Nerves:** To each segment of the spinal cord, one pair of spinal nerves is attached.

Functional classification of the nervous system

From the functional point of view, the nervous system can be divided into:

• **Somatic nervous system:** It functions on the basis of reflex arc to affect the activities of skeletal muscles, (voluntary muscles).

• **Autonomic nervous system:** Like the somatic nervous system, it is organized on the basis of the reflex are but controls the involuntary plain muscles, the heart and the secreting glands.