

Today you will:



- identify different types of receptors of the body
- differentiate between the function of glial cells and neurons
- list the three types of neurons
- describe the structure of a neuron
- identify the direction of impulse flow through a neuron

The nervous system collects information about the external and the internal environment with a wide variety of receptors located throughout the body.

**exteroceptors** - receive information from outside world

**interoceptors** - provide information about bodies internal environment

chemoreceptors - sensitive to chemicals

baroreceptors - sensitive to pressure

osmosreceptors - sensitive to body fluid (water) levels

mechanoreceptors - sensitivie to vibrations, touch, etc (such as in the ear)

photoreceptors - sensitive to light, such as in the eyes

pain receptors - pain

thermoreceptors - detect temperature

**Effectors** -

# Neurons

There are two types of cells in the nervous system:

1. **Glial cells** - also known as neurological cells; are non-conducting, important for structural support and metabolism of the nerve cells (*for every 10 neurons we have 50 glial cells*)
2. **Neurons** - are the actual nerve cells, the functional unit of the nervous system
  - carry nerve impulses from one point to another
  - impulses are tiny electric charges carried by a neuron
  - They are living, nucleated cells possessing special extensions called the nerve processes which carry impulses a considerable distance

## **There are three types of neurons:**

### **Sensory neurons** (afferent fibres)

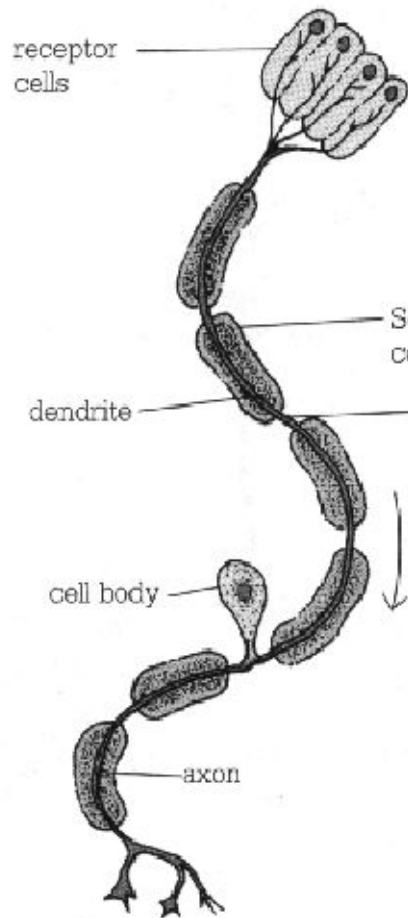
- relay information to CNS for processing (**reception**)
- Cell body usually near the middle of the cell (relatively)

### **Interneurons** (association neurons)

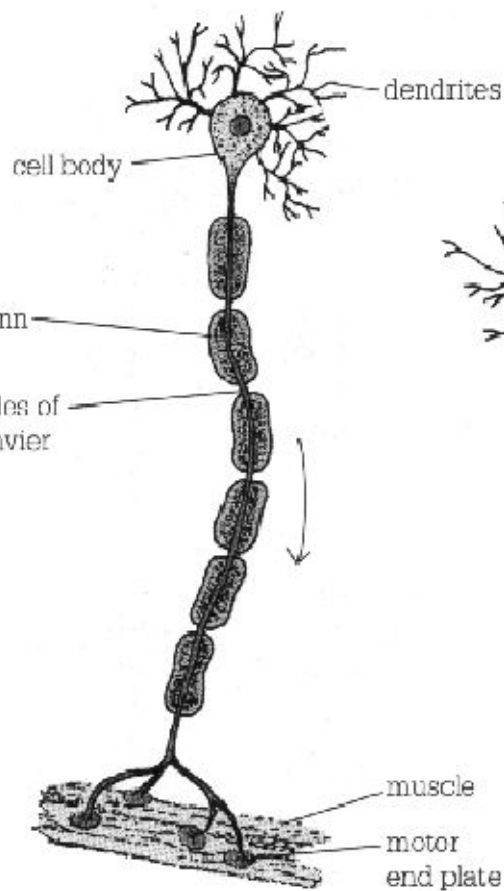
- mostly in the brain and spinal cord
- integrate and interpret sensory information and connect to motor neurons  
(interpretation by CNS)

### **Motor neurons** (efferent neurons)

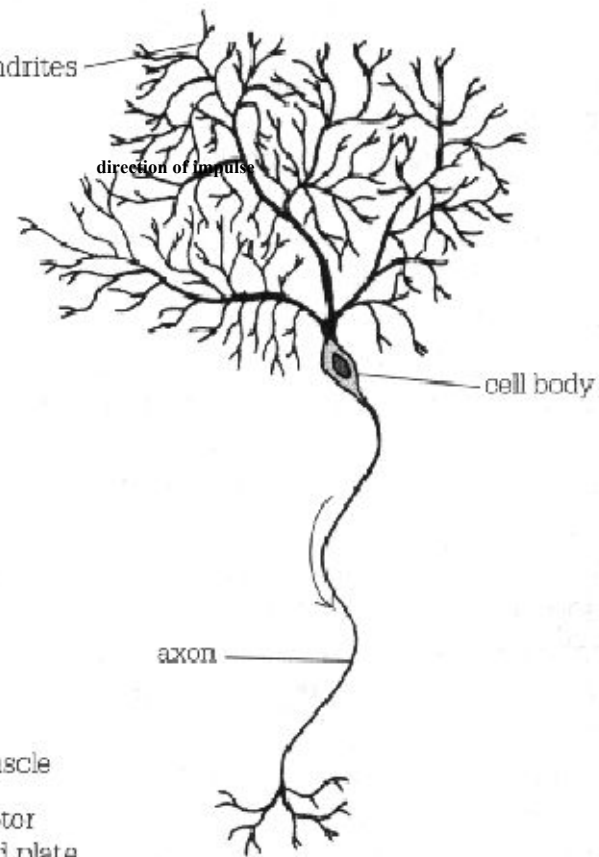
- relay information to effectors (ex., muscles and glands)
- cell body usually at dendrite end (located in the spinal cord)



(a) sensory neuron



(b) motor neuron



(c) association neuron

## Parts of a Neuron

There are three parts of a neuron:

### 1. Dendrites

- short and extensively branched
- receive information from sensory receptors or another neuron and conduct the impulse **towards** the cell body

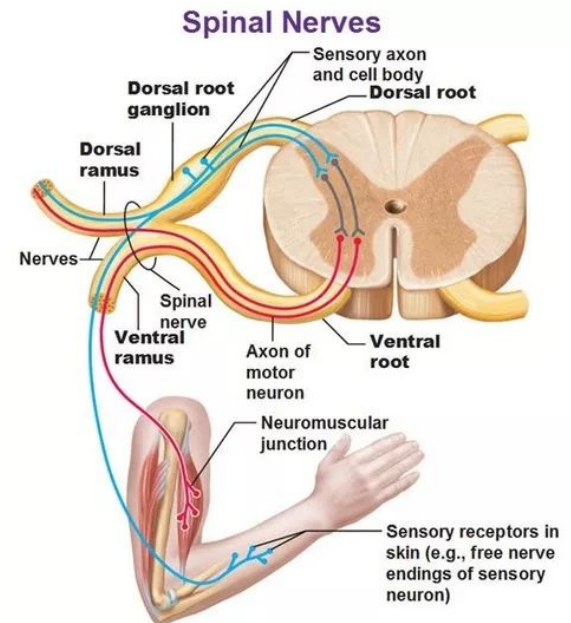
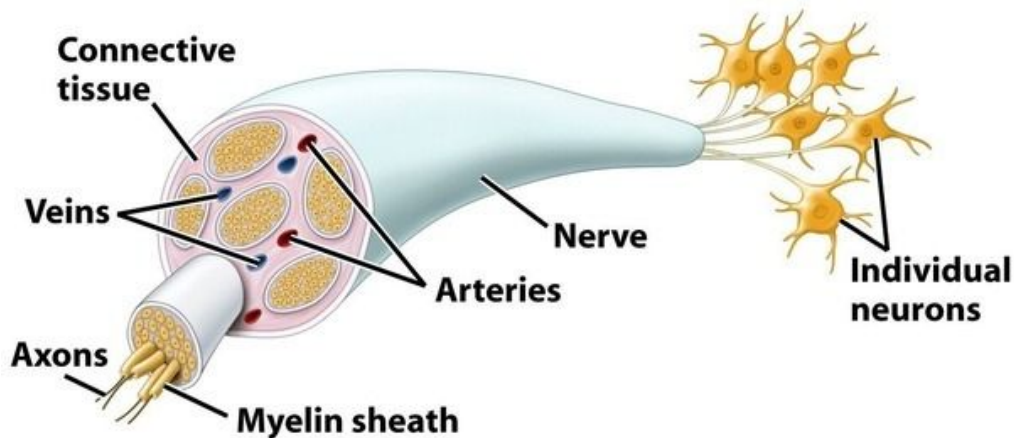
### 2. Cell Body

- contains a nucleus and "neuroplasm" (cytoplasm)
- the neuroplasm flows into the extensions (dendrites and axons)
- **The cell body is the factory of the neuron. It produces all the proteins for the dendrites, axons and synaptic terminals and contains specialized organelles such as the mitochondria, Golgi apparatus, endoplasmic reticulum, ribosomes to provide energy and make the parts, as well as a production line to assemble the parts into completed products.**

### 3. Axon

- longer (up to 1 m in length) and less branched
- *sciatic nerve extends from lower part of spinal cord to muscles of lower leg and foot*
- each cell has one axon and many axons bundle together to form a **nerve**
- the cell bodies of the axons bundled together forming **ganglia** outside the spinal cord
- carries impulses **away** from the cell body towards an effector or another neuron
- diameter of axon affects the speed of transmission

**A nerve is composed of many neurons bundled together.**



## **Myelinated Nerves**

Axons are covered by a white, fatty protein sheath called **myelin**

**Myelin sheath** has two functions:

1. It insulates the axon, preventing the loss of chemical ions, which are necessary for transmission of impulses.
2. It speeds transmission.

The myelin sheath is formed of flat **Schwann cells** that wrap around the axon like a jellyroll. Between the Schwann cells are the **Nodes of Ranvier**, gaps that boost or help to push the impulse along. The nerve impulses jump from one node to another.

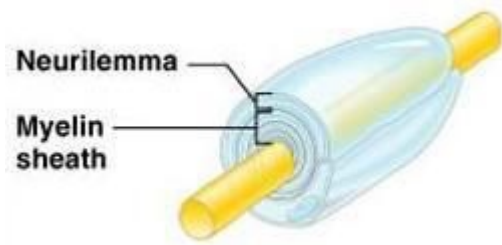
**Absence of Myelin Sheath = Unmyelinated Nerve Cells**

**Myelination** occurs during the last few months before birth and 1st year of life. Amount of myelin increases from birth to maturity.



## Neurilemma

- a delicate membrane covering myelinated nerve fibers
  - promotes the regeneration of damaged axons
  - allows the rejoining of severed neurons
- 
- PNS nerves have a neurilemma
  - CNS nerves have either:
    - a. white matter - myelinated and has a neurilemma
    - b. grey matter - no myelin sheath; will not regenerate after injury, **any damage is permanent**



## Multiple Sclerosis

- caused by the destruction of the myelin sheath that surrounds the nerve axons.
- the myelinated nerves in the brain and spinal cord are gradually destroyed as the myelin sheath hardens and forms scars which prevent normal impulse transmission
- symptoms include double vision, speech difficulty, jerky limb movements, and partial paralysis of the voluntary muscles

### **Home work:**

- complete p 410 #1-4
- tomorrow we will look at the reflex arc