General view of nervous coordination

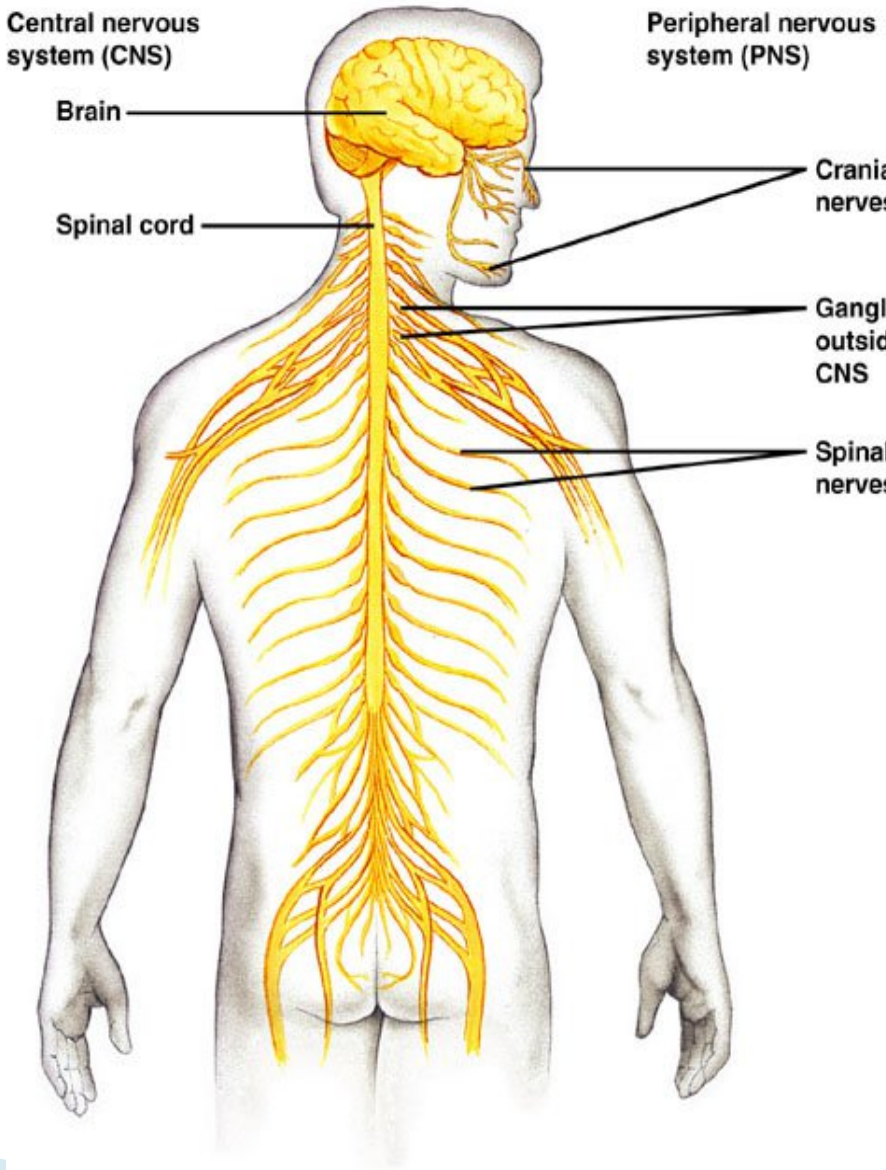
Ram Balak Mahto
Guest faculty
Zoology department
v.s.j college Rajnagar Madhubani
Class 12th
7908055676

Irritability

- The ability to respond to environmental stimuli is a fundamental property of life.
- Single celled organisms respond in a simple way – e.g. avoiding a noxious substance.
- The evolution of multicellularity required more complex
  - mechanisms for communication between cells.
    - Neural mechanisms – rapid, brief
    - Hormonal mechanisms – slower, long term

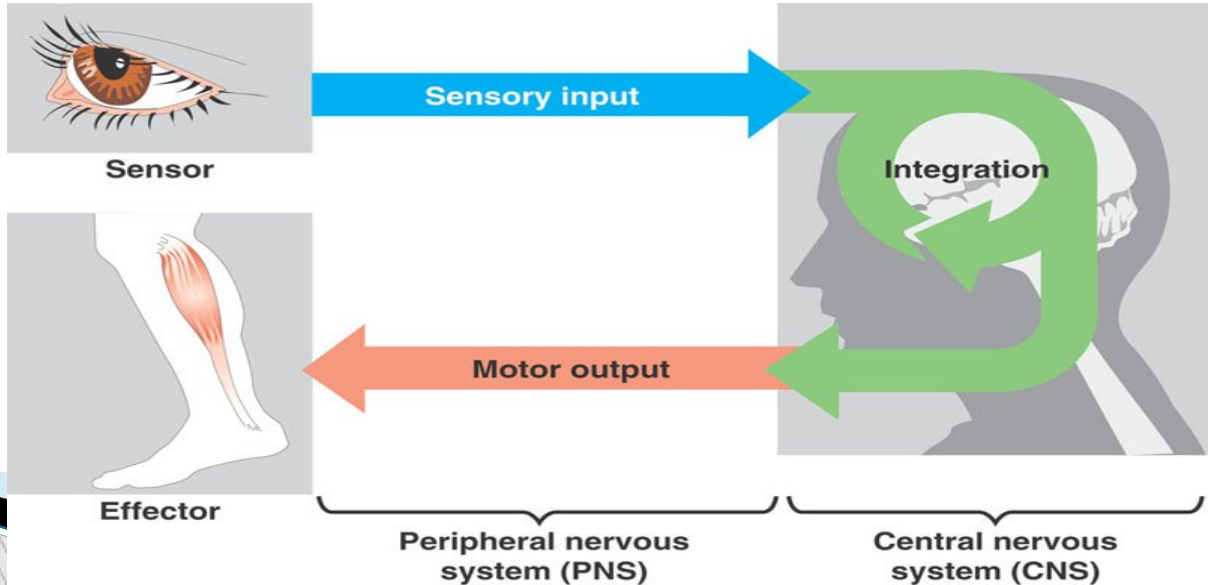
CNS & PNS

- **Central Nervous System (CNS)** – includes the brain and spinal cord.
- **Peripheral Nervous System (PNS)** – includes motor and sensory neurons.



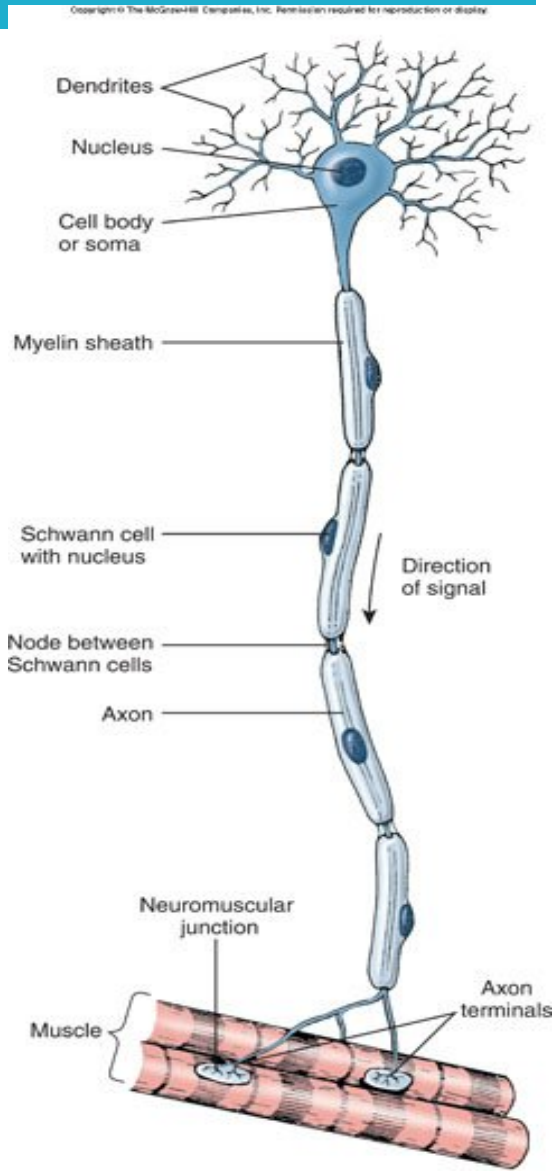
Neurons

- A **neuron** (nerve cell) is the functional unit of the nervous system.
  - **Sensory (afferent) neurons** carry impulses from sensory **receptors** to the CNS.
  - **Motor (efferent) neurons** carry impulses away from the CNS to **effectors** (muscles and glands).
  - **Interneurons** connect neurons together.



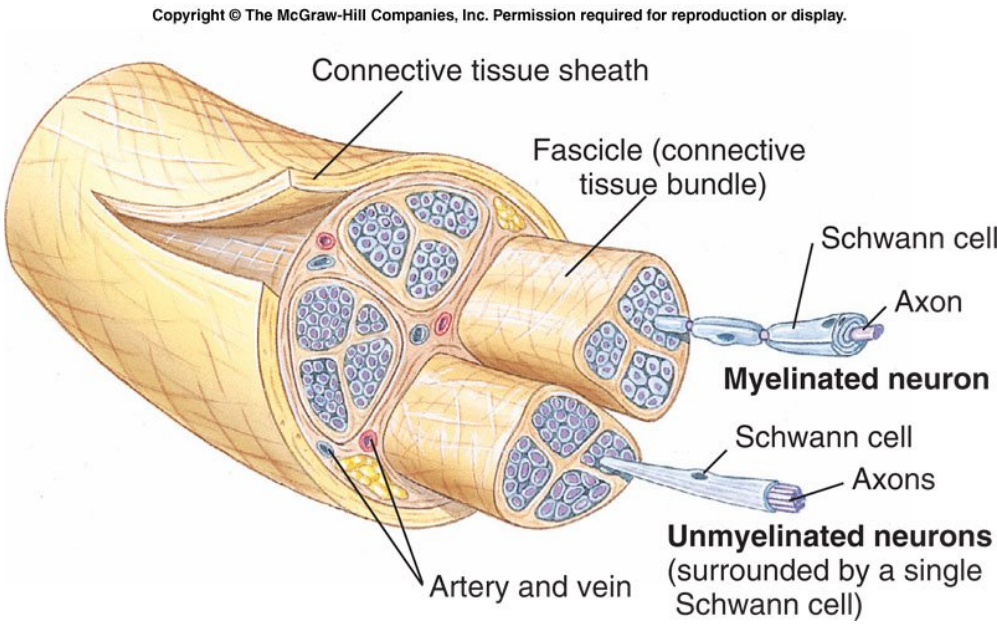
Neurons

- Two types of cytoplasmic processes extend from the cell body.
  - **Dendrites** bring signals in to the cell body.
    - Often highly branched.
  - **Axons** carry signals away from the cell body.



Nerves

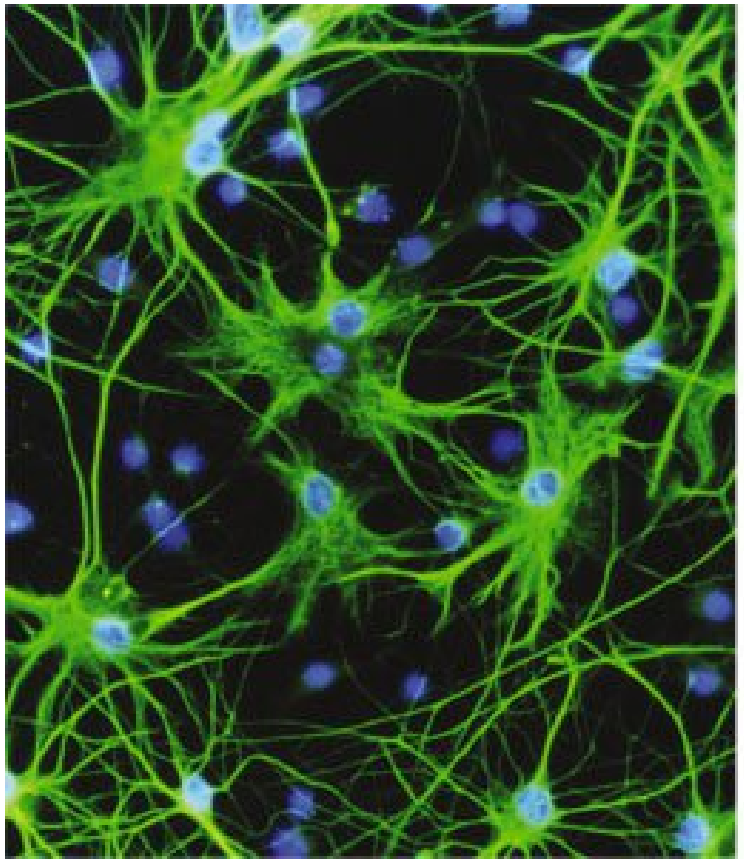
- **Nerve processes (usually axons) are often bundled together, surrounded by connective tissue, forming a nerve.**
  - **Cell bodies are located in the CNS or in ganglia (bundles of cell bodies outside the CNS).**



Glial Cells

- Non-neural cells that work with neurons are called **glial cells**.

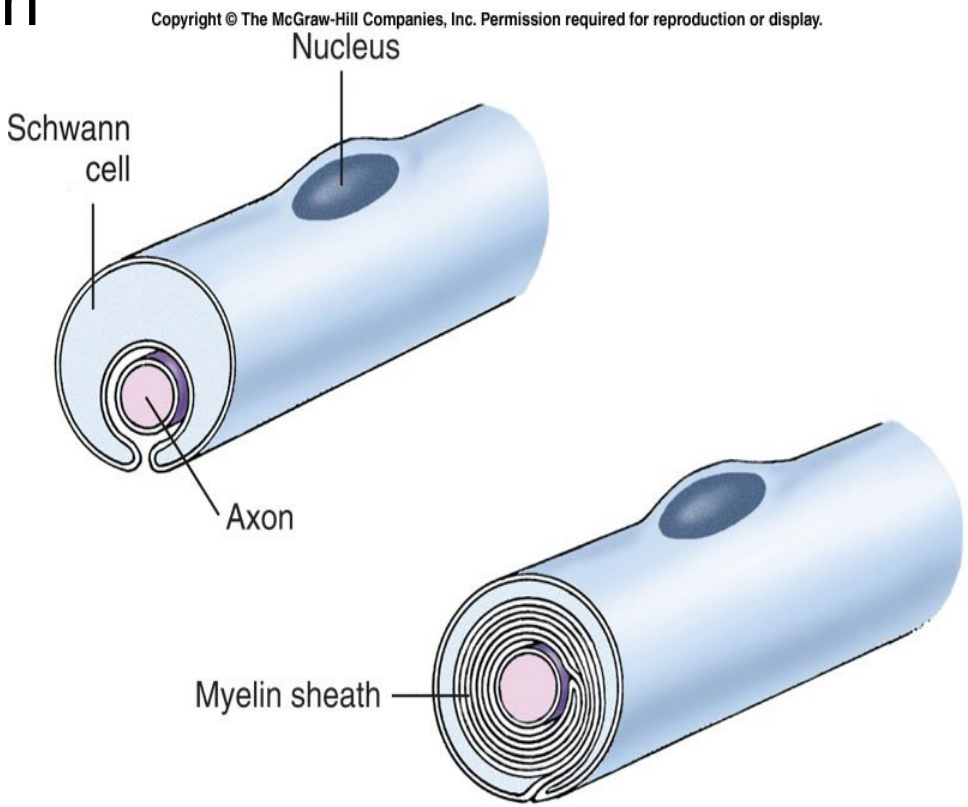
  - **Astrocytes** – star-shaped cells that serve as nutrient and ion reservoirs for neurons.



Glial Cells

- The axon is covered with an insulating layer of lipid-containing **myelin**, which speeds up signal propagation.

- Concentric rings of myelin are formed by **Schwann cells** in the PNS and **oligodendrocytes** in the CNS.



Action Potential

- A nerve signal or **action potential** is an electrochemical message of neurons.
  - An **all-or-none** phenomenon – either the fiber is conducting an action potential or it is not.
  - The signal is varied by changing the ***frequency*** of signal conduction.

The Nerve Impulse

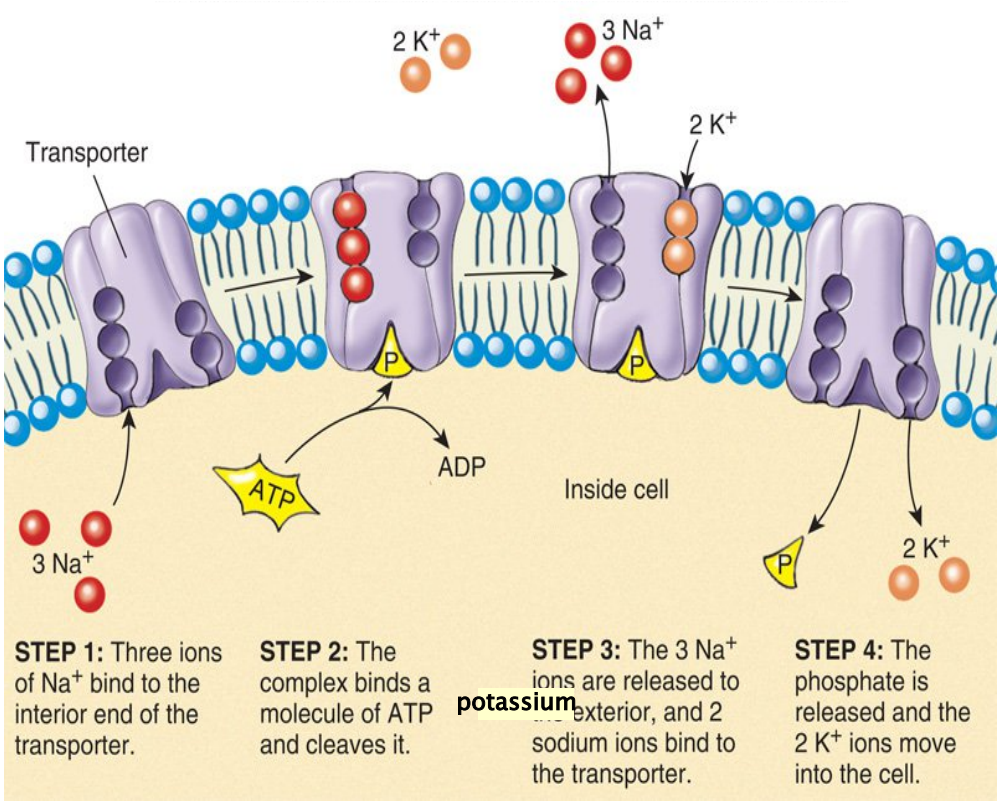
- Across its plasma membrane, every cell has a voltage called a **membrane potential**.
- The inside of a cell is negative relative to the outside.

The Nerve Impulse

- Neuron at rest – active transport channels in the neuron's plasma membrane pump:
  - Sodium ions (Na^+) **out** of the cell.
  - Potassium ions (K^+) **into** the cell.
- More sodium is moved out; less potassium is moved in.
  - Result is a negative charge inside the cell.
  - Cell membrane is now **polarized**.

Sodium-Potassium Exchange Pump

- Na^+ flows into the cell during an action potential, it must be pumped out using **sodium pumps** so that the action potential will continue.



potassium

Thank you