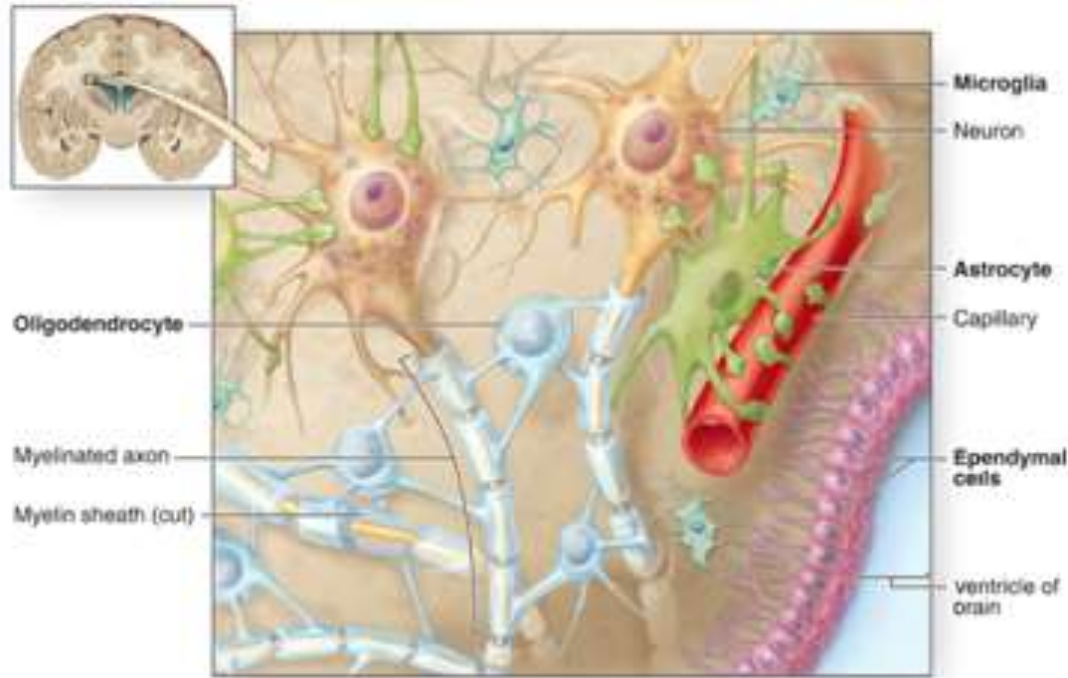


Nervous Tissue/System



BY

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Nervous Tissue

- Composed of interconnecting network of specialized cells called neuron & supported by neuroglial cells.
- About 10,000 million of neurons.
- Properties: sensitivity, conductivity, & responsiveness.

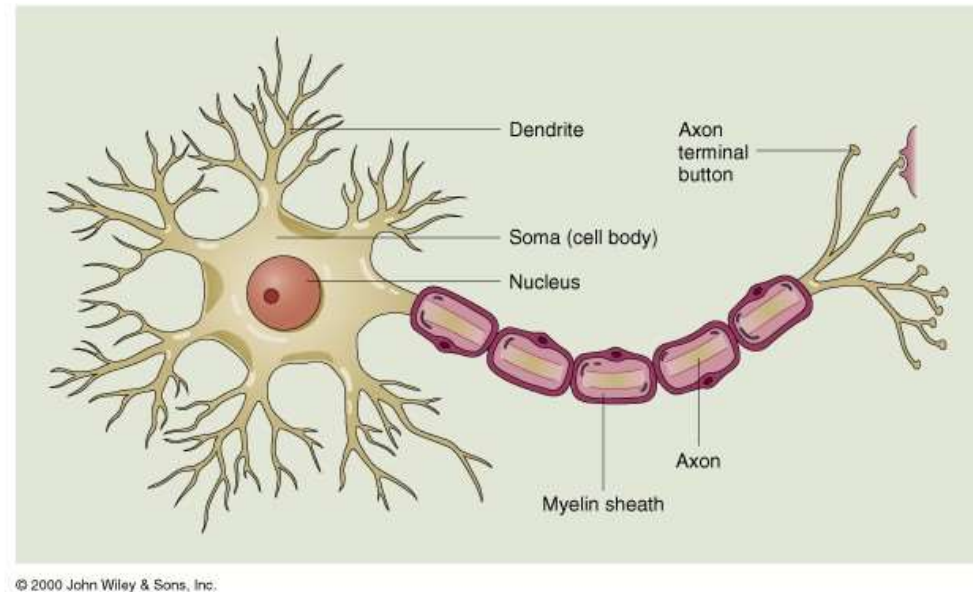
Cell of Nervous Tissue

The nervous tissue is composed of 2 principal types of cells:

1. Excitable cells: Neurons or Nerve cells.
2. Non-excitable cells: Neuroglia.

Neuron

- Structural & functional unit of nervous tissue.
- Consist
 - Cell body
 - Cell processes/ neurites
 - a. Dendrites
 - b. Axons



1. Cell body/Soma/ Perikaryon:

- Enlarged portion of neuron.
- Cell bodies of all neurons are situated in the gray matter of the CNS & in the ganglia of PNS.
- It is about $5\mu\text{m}$ - $100\mu\text{m}$ in diameter.
- Shape may be pyramidal, fusiform, stellate, flask-shaped.
- It contains
 - Nucleus** – is large, euchromatic, spherical & centrally located.

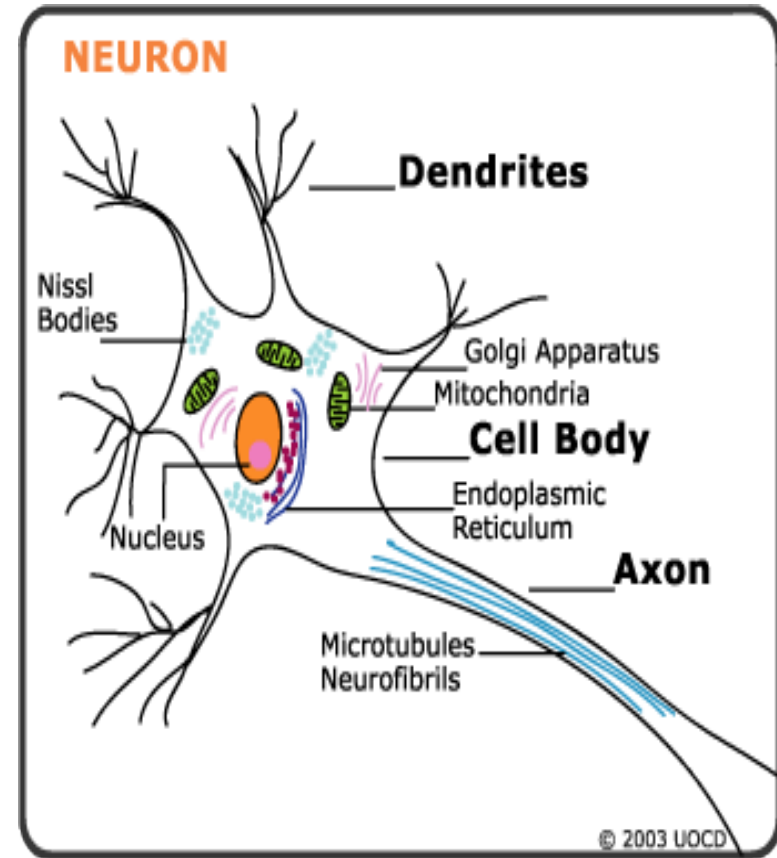
- **Nissl bodies** – composed of large aggregation of rER.
 - basophilic in nature.
 - extend into dendrites but not into axon.
 - function: production of enzymes involved in neurotransmitter synthesis.

- **Golgi complex**

Found near the nucleus

- **Mitochondria**

Rod shaped structure present in the entire cytoplasm & extend in all processes of the neurons.



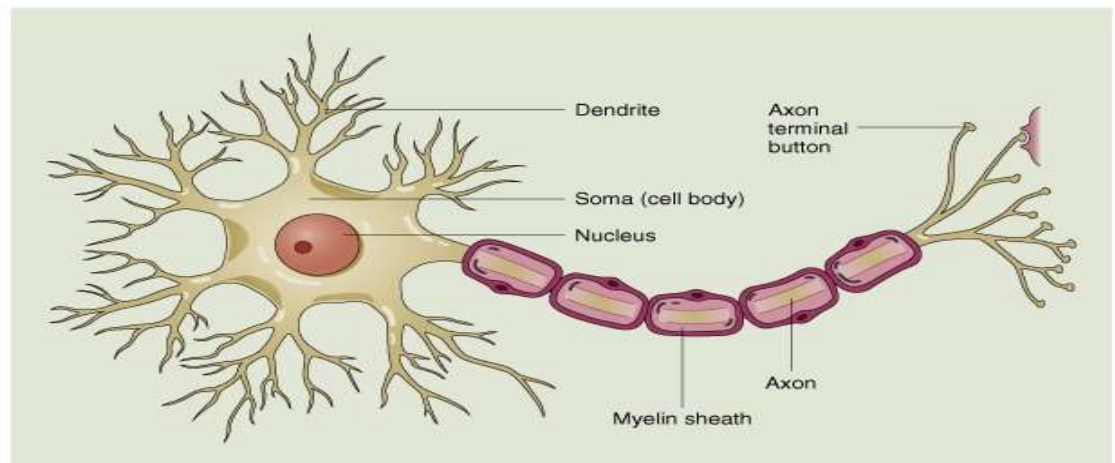
2. Processes of neuron

a. Dendrite

- These are cytoplasmic extension of the cell bodies.
- 1 or more in number, contain neurofibrils, Nissl bodies & mitochondria.
- Convey the impulses from the periphery to the cell body.

b. Axons

- Arises from cone shaped portion of the cell body called axon hillock.
- Devoid of Nissl bodies but contain bundle of microtubules.
- They are generally referred to as nerve fibers.
- Surrounded by myelin sheath, which is derived either from schwann cells(PNS) or Oligodendrocytes(CNS).



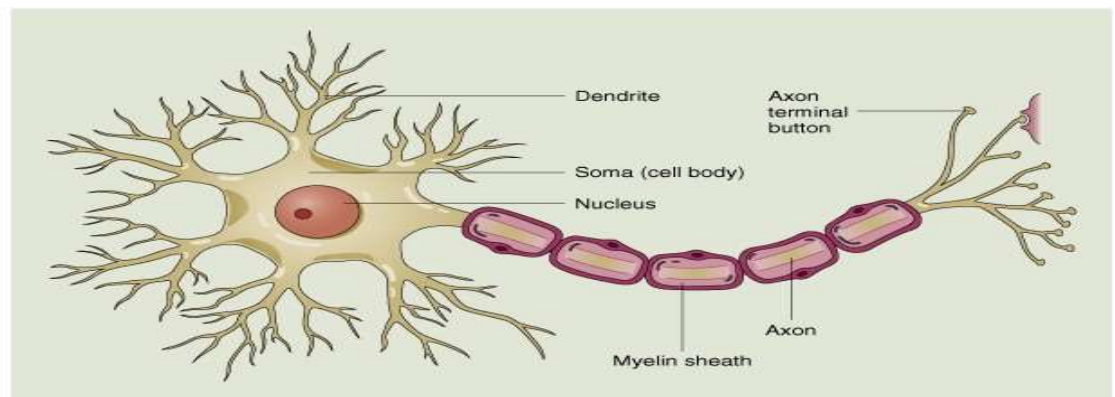
There are several differences between axons and dendrites:

Axons

- Take information away from the cell body
- Smooth Surface
- Generally only 1 axon per cell
- No ribosomes
- Can have myelin sheath
- Branch further away from the cell body

Dendrites

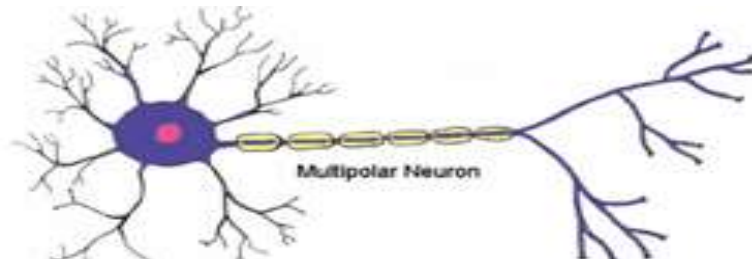
- Bring information to the cell body
- Rough Surface
- Usually many dendrites per cell
- Have ribosomes
- No myelin insulation
- Branch near the cell body



Types of Neuron

1. Acc. to the number of their processes.

- Unipolar neuron- single process. Eg mesencephalic nucleus.
- Pseudounipolar neuron. Eg cranial & spinal ganglia.
- Bipolar neuron- two processes. Eg spiral/cochlear ganglion, bipolar neurons of retina.
- Multipolar neuron – has many processes. Eg neurons in cerebrum & cerebellum.



2. Acc. to the function.

- a. Sensory neuron – receives stimuli from receptor & conduct impulses to CNS. eg; sensory ganglia.
- b. Motor neuron – conducts impulses from the CNS to effectors organs(muscles). eg; ventral horn cells.
- c. Interneuron - connects sensory & motor neurons. eg; most of the ascending & descending tracts.

3. Acc. to the relative length of axons & dendrites.

1. Golgi type I neurons :

- dendrites are short & axons are long.
- These neurons contribute in the formation of the tract of CNS.

2. Golgi type II neurons :

- axons are much shorter and morphologically similar to the dendrites.
- They establish synaptic connection with other neuron.

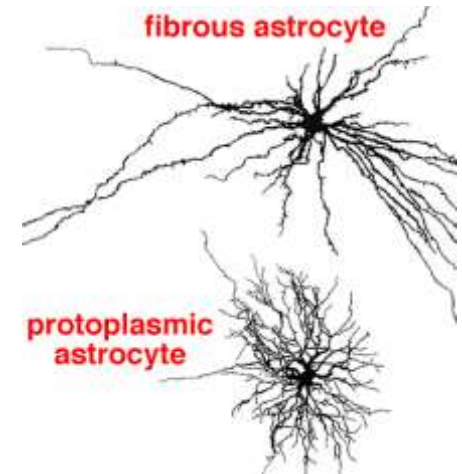
Neuroglia

- They are supporting cell of nervous tissue.
- Provide structural and functional support to the axon.

Neuroglia in the CNS – 4 types

1. Astrocytes :

- Largest & most numerous, & form the main supporting tissue of NS.
- Star-shaped, posses many fine dendrite.
- At the ends of dendrite there are small swelling called foot processes.
- 2 types
 - Protoplasmic astrocytes** – found in the grey matter. Processes are thicker & more branched.
 - Fibrous astrocytes** – found mainly in the white matter. Processes are longer, slender, smooth & less branched.

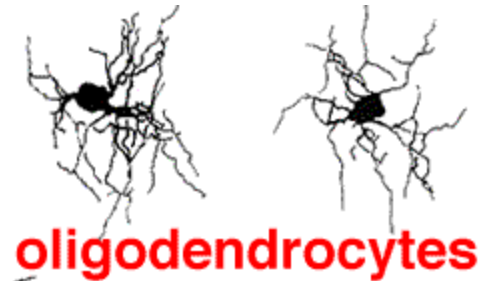


2. Ependymal cell

- They line the ventricles of brain & central canal of the spinal cord.
- Are cuboidal or columnar in shape with cilia projecting from their exposed surface.

3. Oligodendrocytes

- Smaller than astrocytes, possess few processes.
- Found in both grey & white matter.
- Forms myelin sheath around axons in the CNS.



4. Microglia

- Smallest glial/phagocytic cells with few tortuous processes.
- Found along the perivascular coat of blood vessels in CNS.
- Function: remove cell debris, wastes & pathogens that invade the CNS by phagocytosis.

Neuroglia in the PNS

2 types of glial cells in the PNS

1. Satellite cells

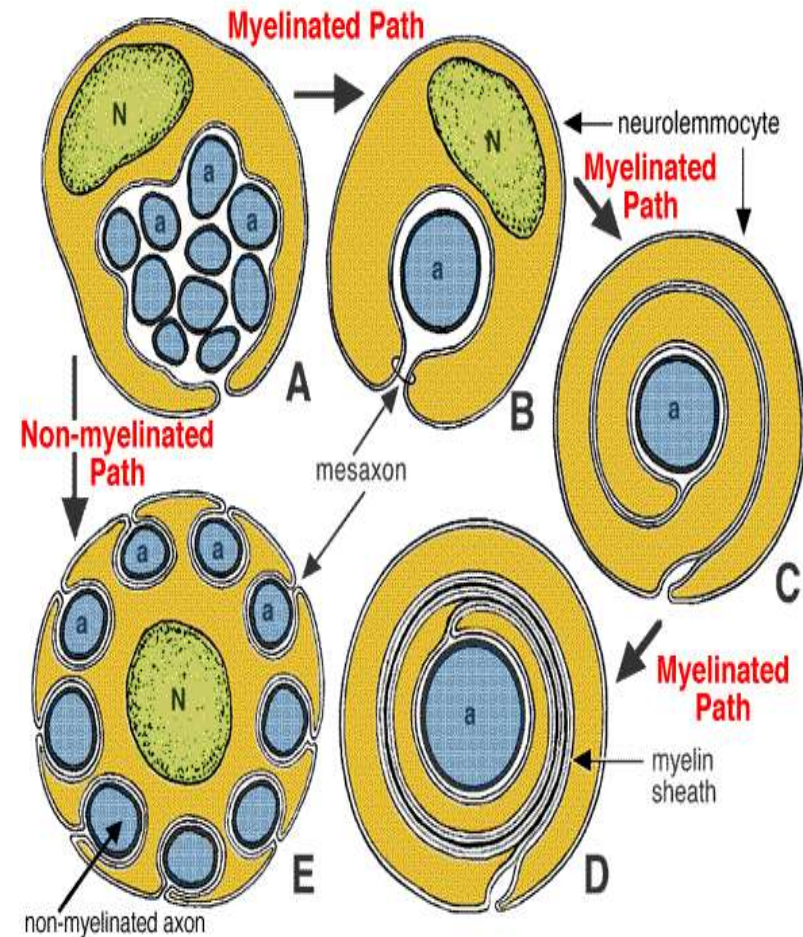
- Surround the nerve cell bodies in peripheral ganglia & provide support & nutrition to them.

2. Schwann cells

- Forms myelin sheath around axons in the PNS.

Nerve fibres

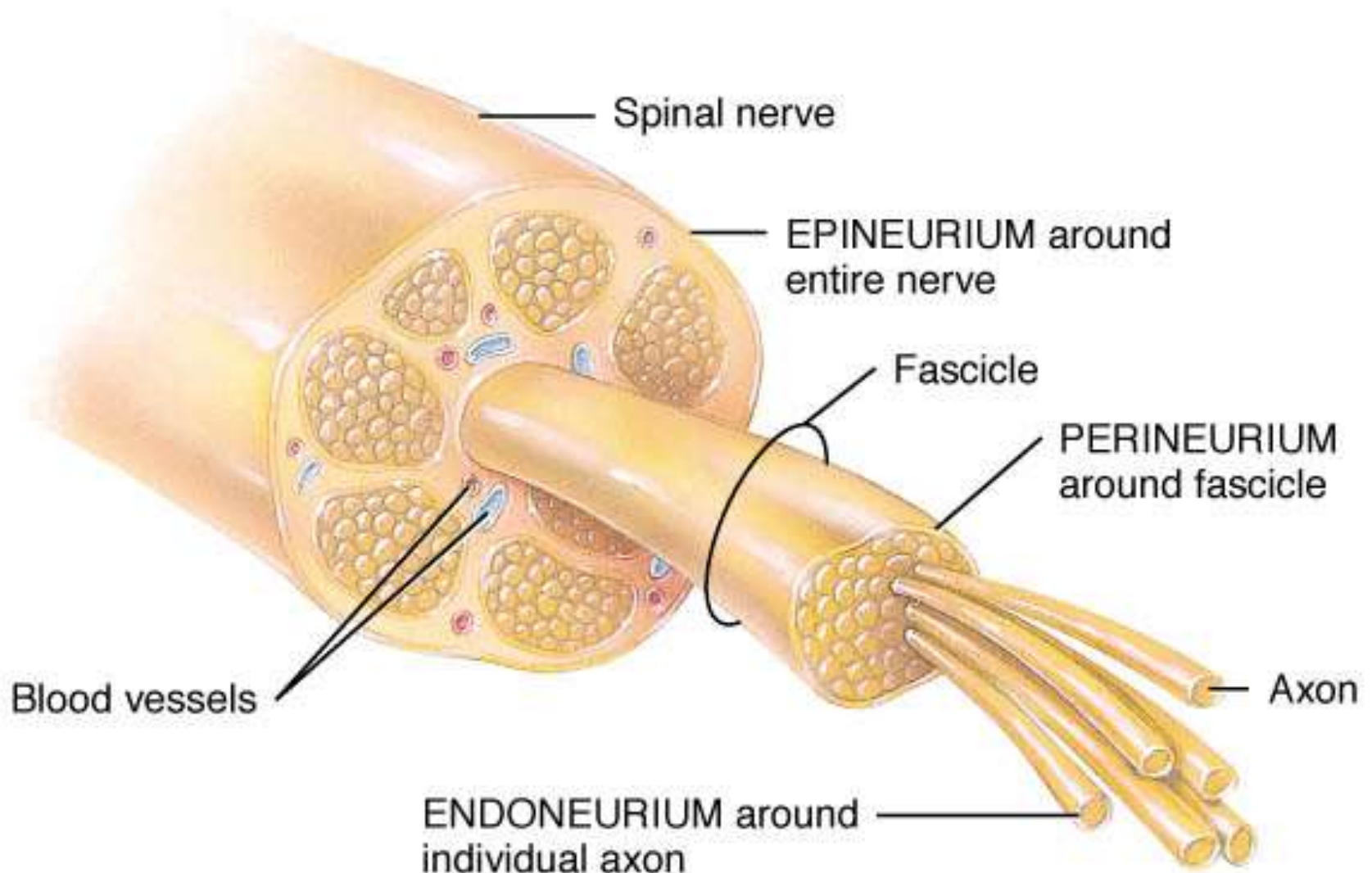
- The Axon of nerve cell is called nerve fiber.
- 2 types
- **Myelinated nerve fibres:** larger diameter axon invaginate into one Schwann cell & are wrapped by concentric layer of Schwann cell plasma membrane forming myelin sheath.
- **Unmyelinated nerve fibres:** many axon with small diameter invaginate into Schwann cell & are simply surrounded by the cytoplasm of Schwann cells.



Nerves

- 3 Types of nerves
 - Sensory nerves contain only the long dendrites of sensory neurons wrapped in myelin
 - Carry impulses from a receptor to the CNS
 - Motor nerves contain only the long axons of motor neurons wrapped in myelin
 - Carry impulses from the CNS to an effector
 - Mixed nerves contain both the long dendrites of sensory neurons and the long axons of motor neurons wrapped in myelin
 - Conduct impulses to and from CNS

Structure of nerve



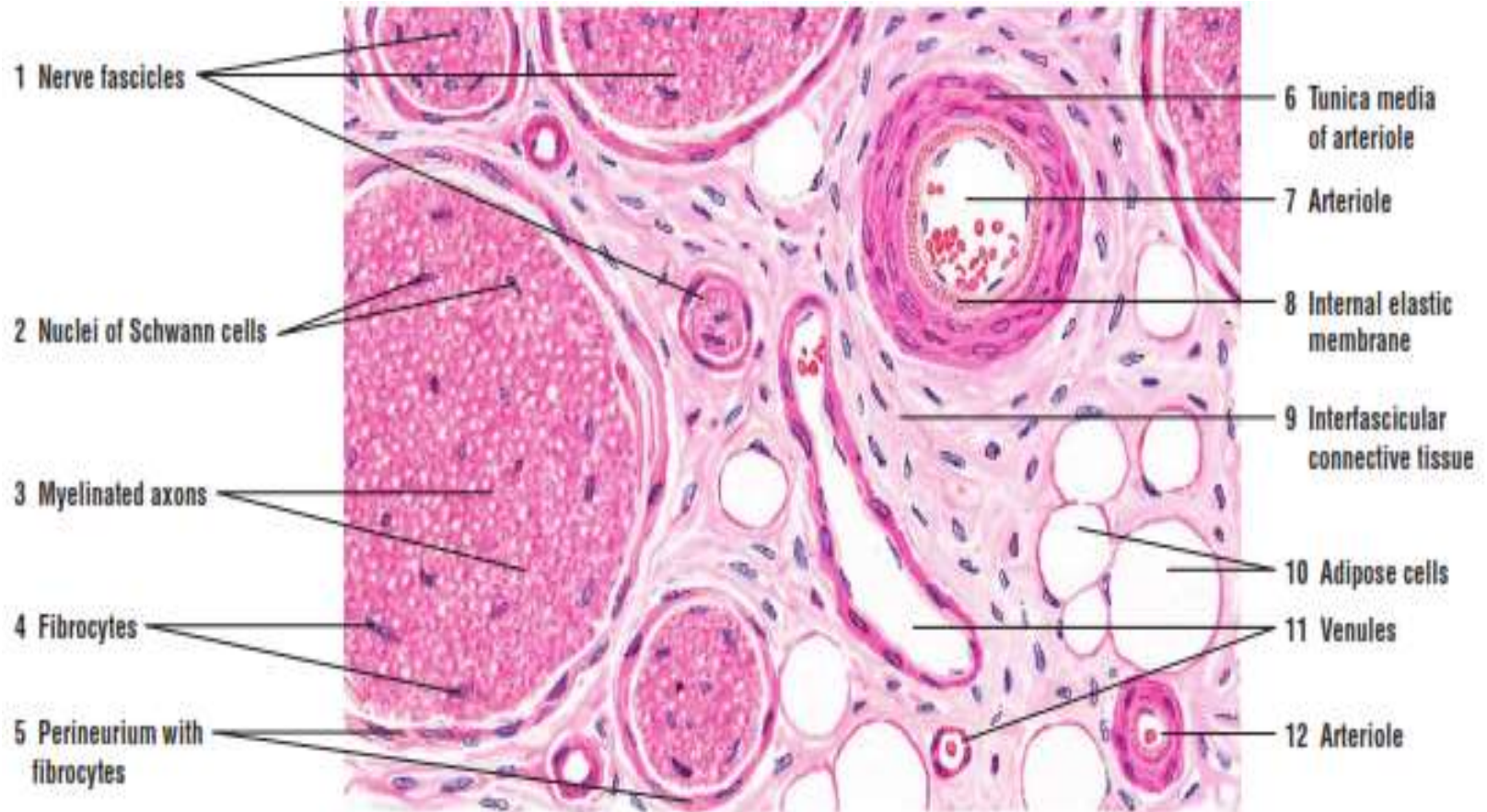


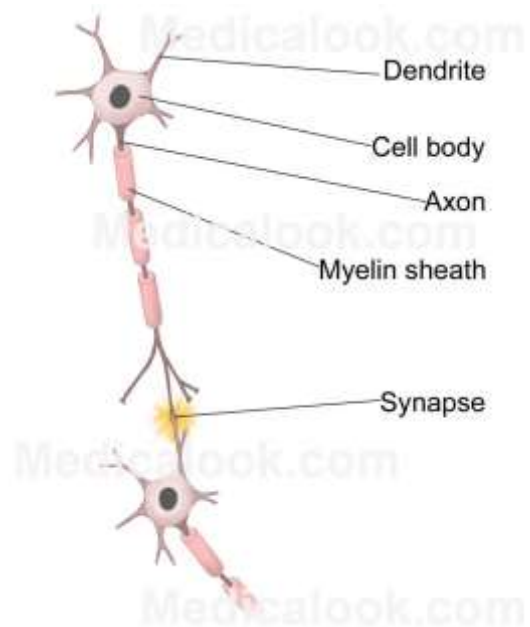
Fig: C.S of nerve

Synapse

- Synapse are the specialised junction between two or more adjacent neurons.

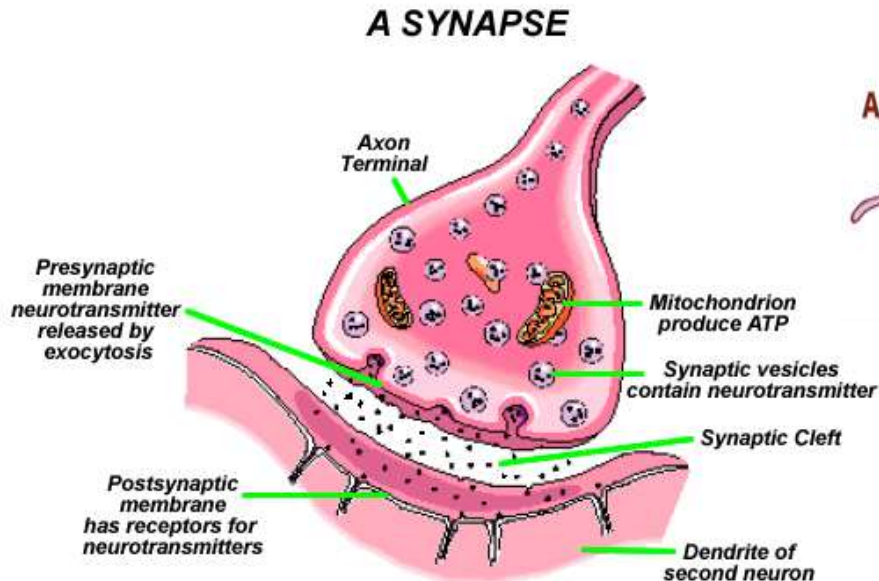
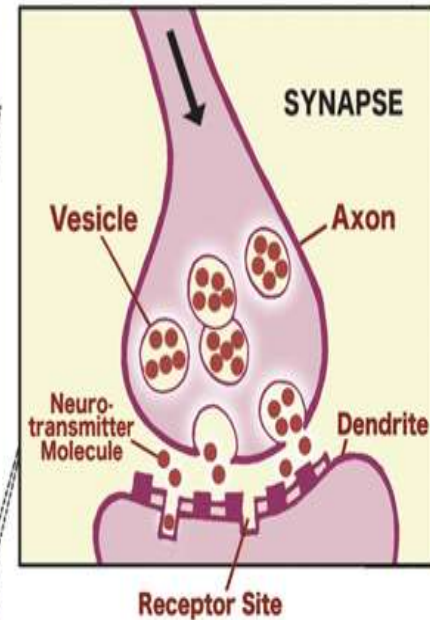
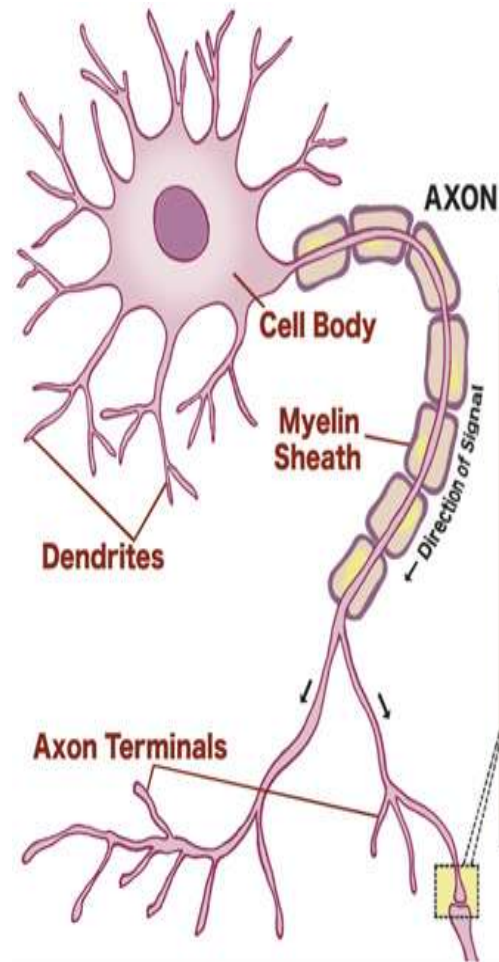
Properties of synapse

1. Nerve impulses passes only in one direction.
2. The passage of the nerve impulses is slightly delayed at the synapse.
3. The synapse is susceptible to fatigue.



Structure of synapse

- Terminal boutons comes contact with dendrites or cell body of another neuron.
- Nerve impulses transmit across the synapse from pre-synaptic to post-synaptic neurons.



Classification of synapses

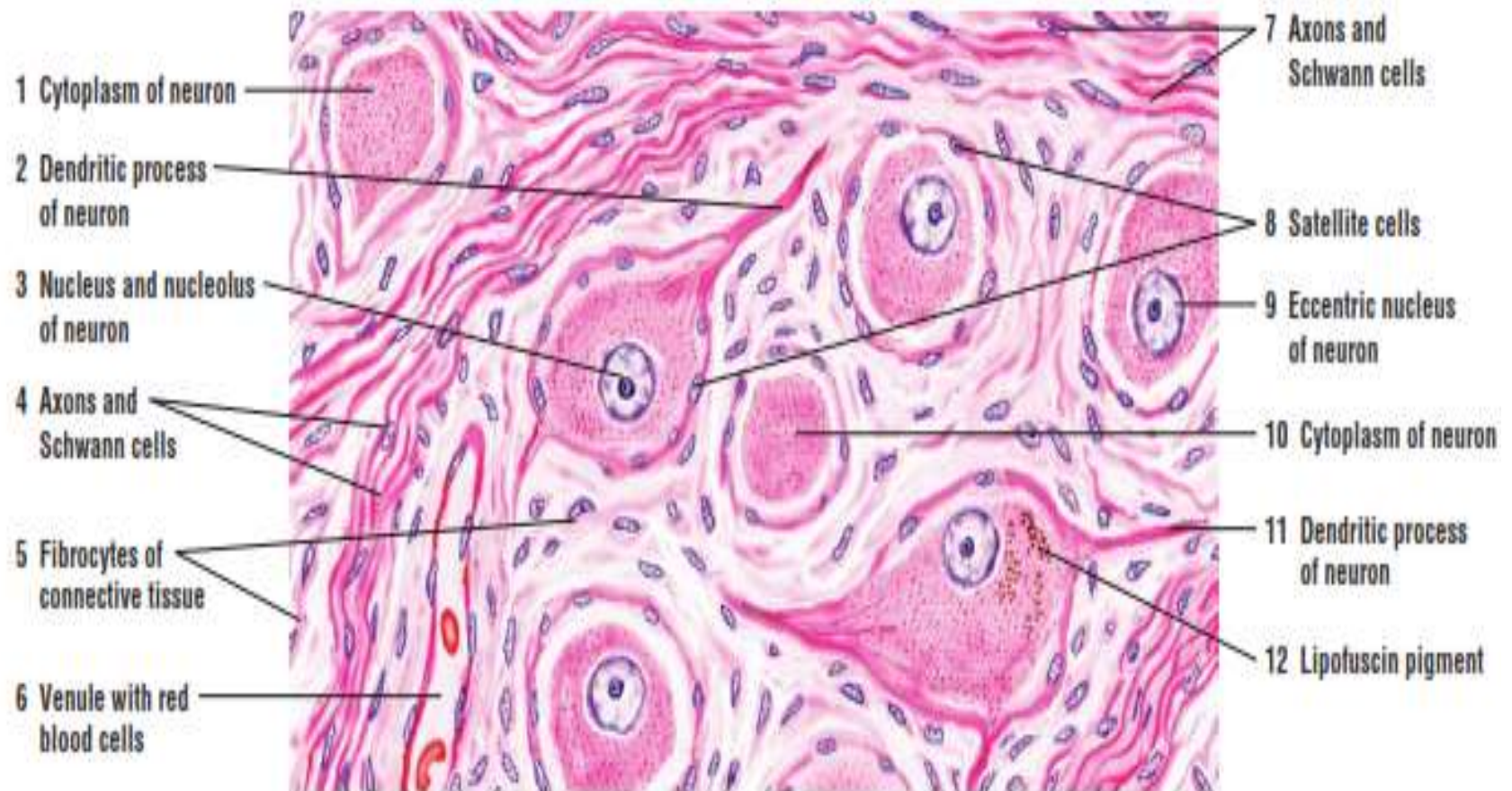
1. Axodendritic – synapse between an axon & a dendrite.
2. Axosomatic – synapse between an axon & a soma.
3. Axoaxonal – synapse between two axons.
4. Somatodendritic – synapse between soma & dendrites.
5. Somatosomatic – synapse between the two soma.
6. Dendrodendritic – synapse between two dendrites.

Ganglia

- Aggregation of cell bodies of neurons outside the CNS.
- On the basis of morphology & function- 2 type of ganglia
 - a. Sensory ganglion- eg; spinal ganglion.
 - b. Motor ganglion – eg; sympathetic ganglion.

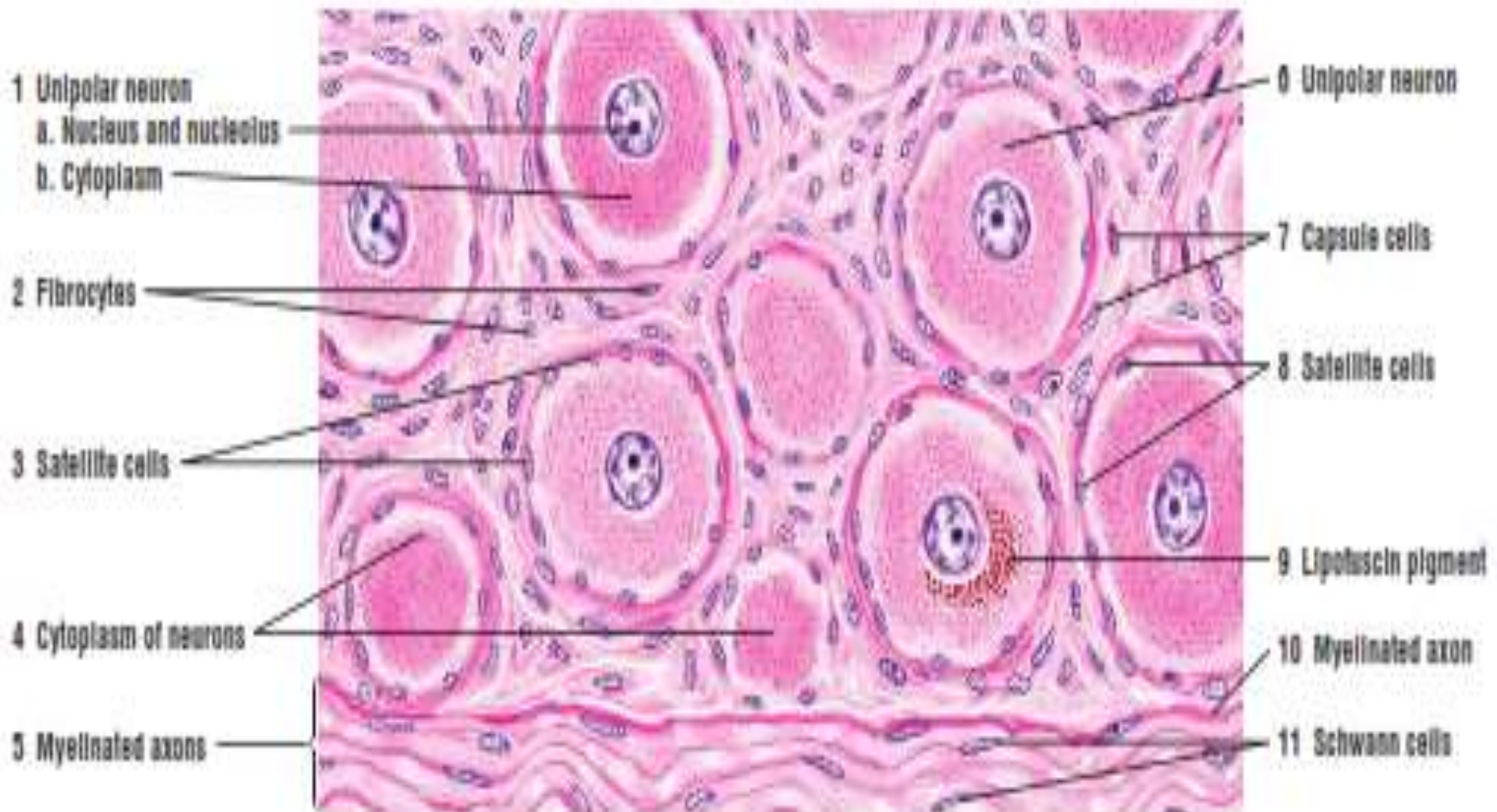
Sympathetic ganglion

- Neurons are multipolar, smaller & more uniform in size.
- Eccentrically placed nuclei.
- Neurons are surrounded by satellite cells.



Spinal ganglion

- Group of rounded unipolar neurons of various size.
- Well defined satellite cells.
- Centrally placed nuclei.



**Thank
You!**

