Medical Biology

Nervous system

The nervous system is responsible for communication between different regions of the body, it is divided into:

CNS (central nervous system) = brain + spinal cord

PNS (peripheral nervous system) =nerves running between the CNS & other tissues.

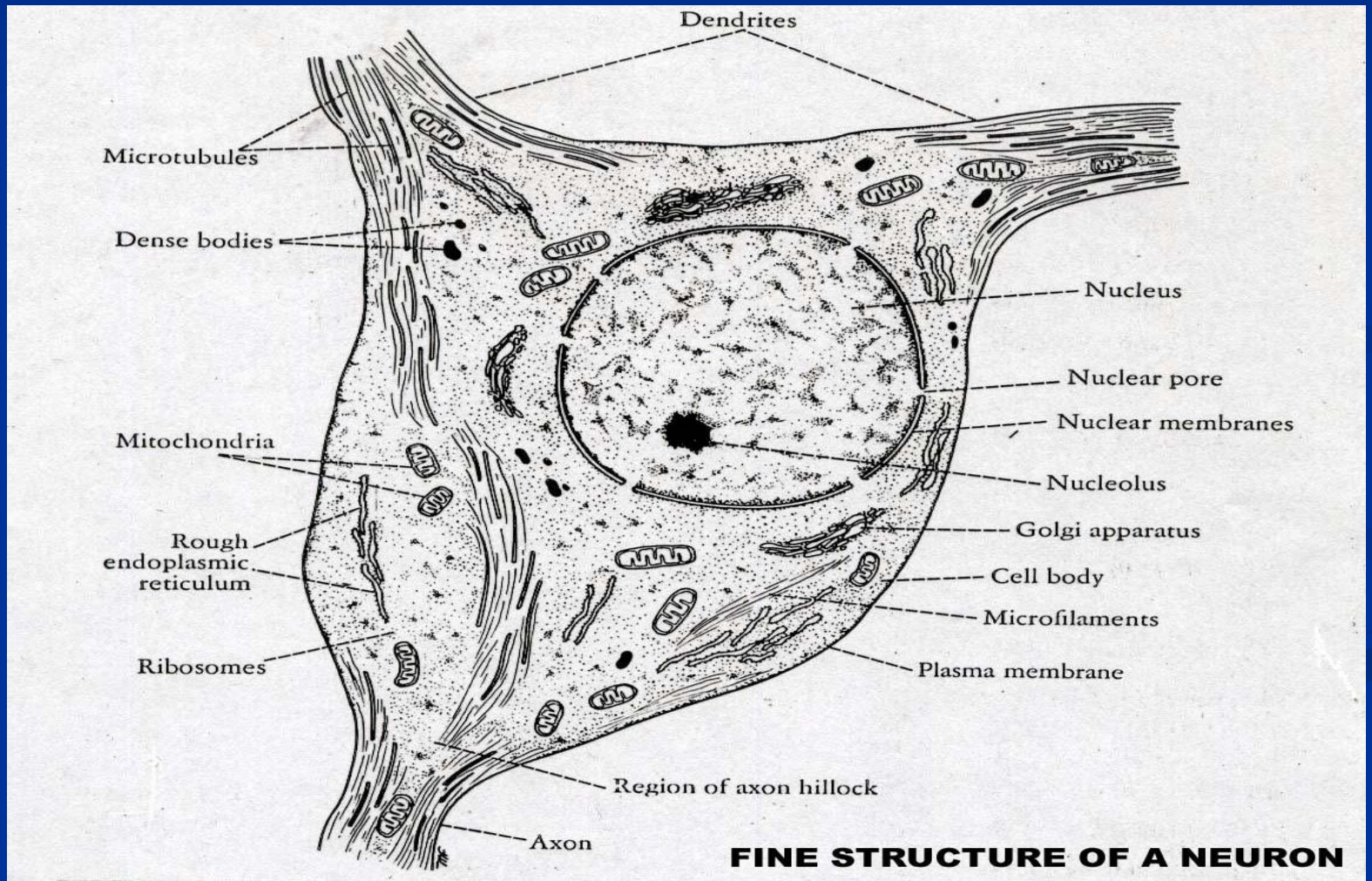
Nervous tissue consists of two major cell types:

neurons and neuroglia.

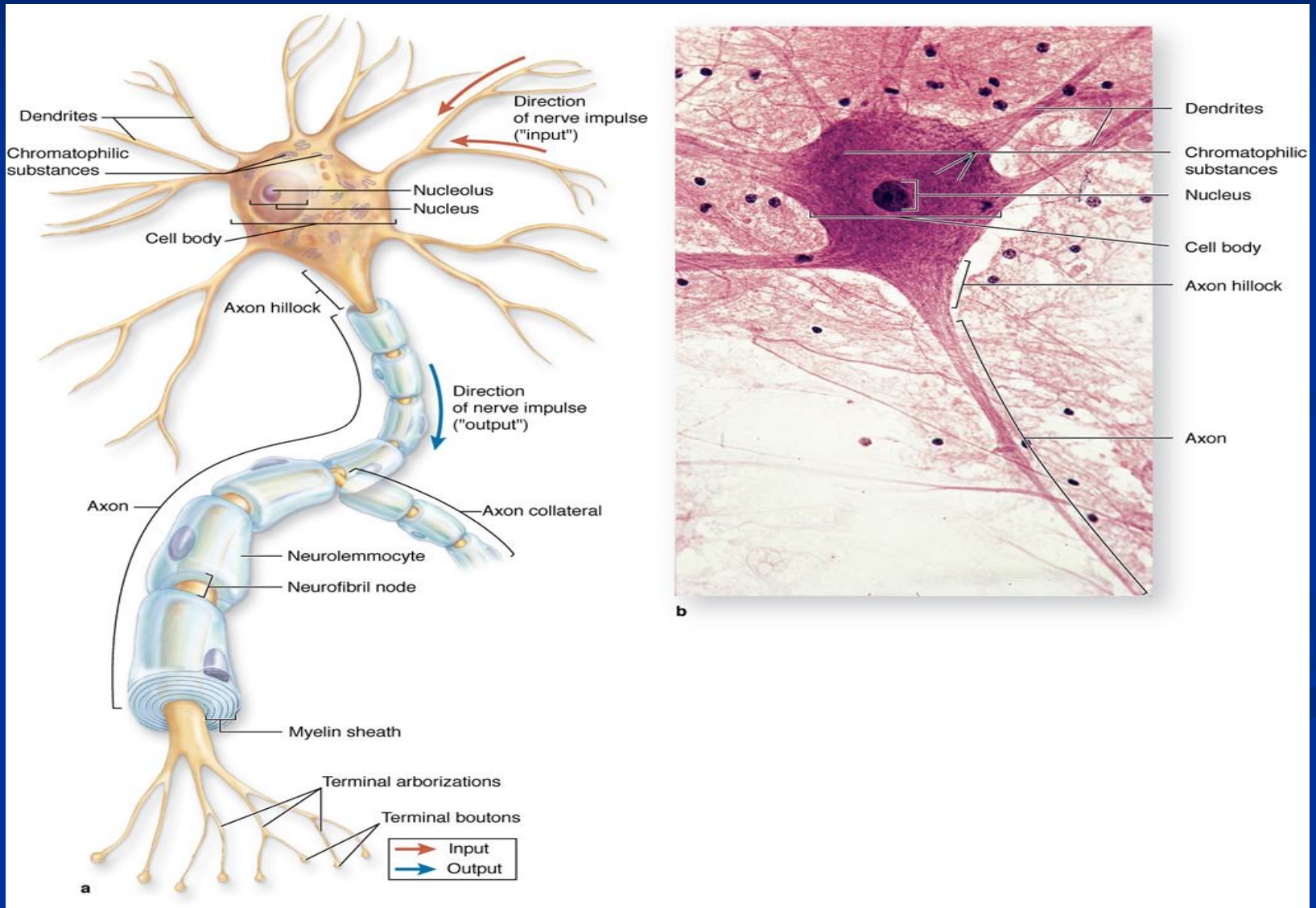
The Neuron:

Is the main functional unit of the nervous system , it consists of :

1. Cell body (perikaryon)



2. Axon
3. Dendrites
4. Terminal button

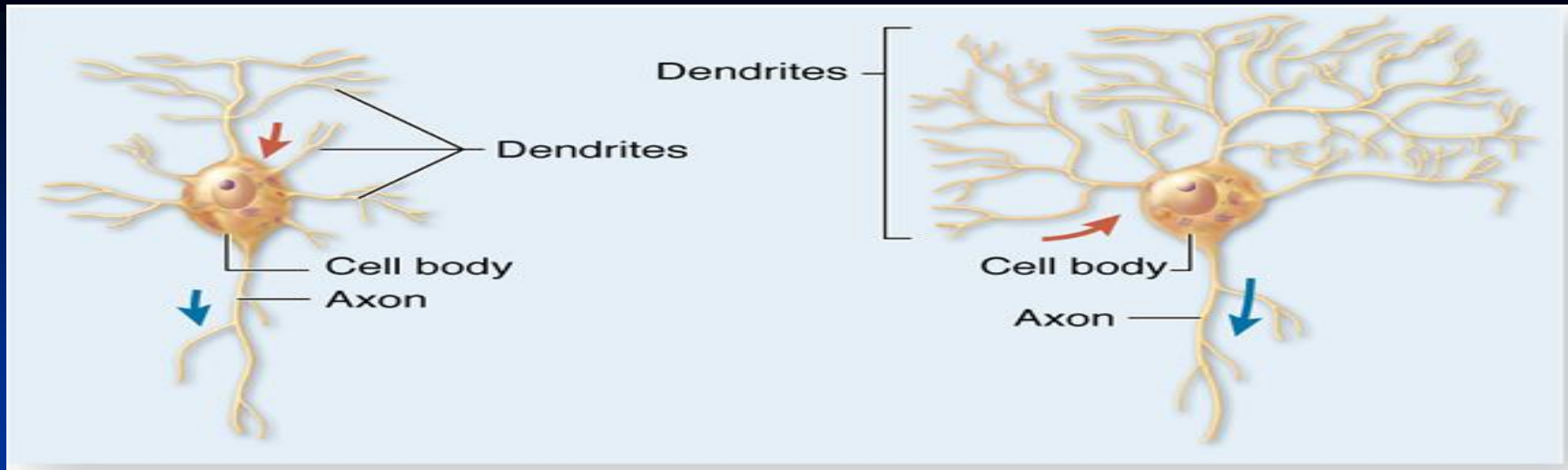


Types of the Neurons: According to shape

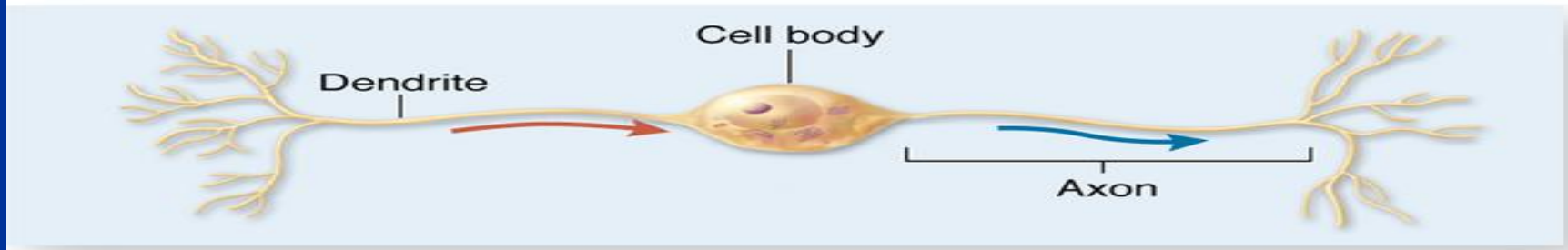
Multipolar (motor) neurons : have large cell body + large axon + many dendritic processes.

Unipolar (pseudounipolar) (sensory) : cell body + one large process divided into 2 branches, one is axon & other is dendrite.

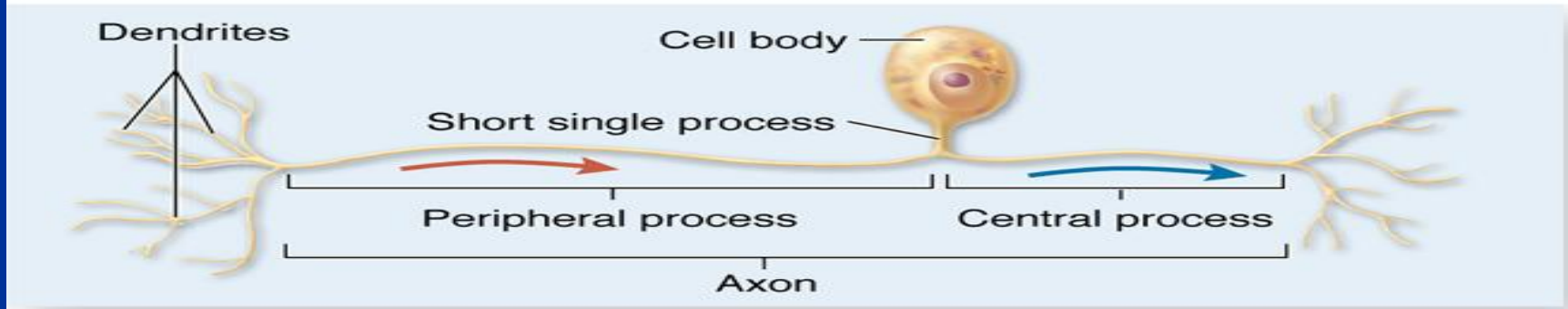
Bipolar : simple cells provide local communications within the CNS having 2 main processes of equal size one axon & other dendrite.



a Multipolar neurons



b Bipolar neuron



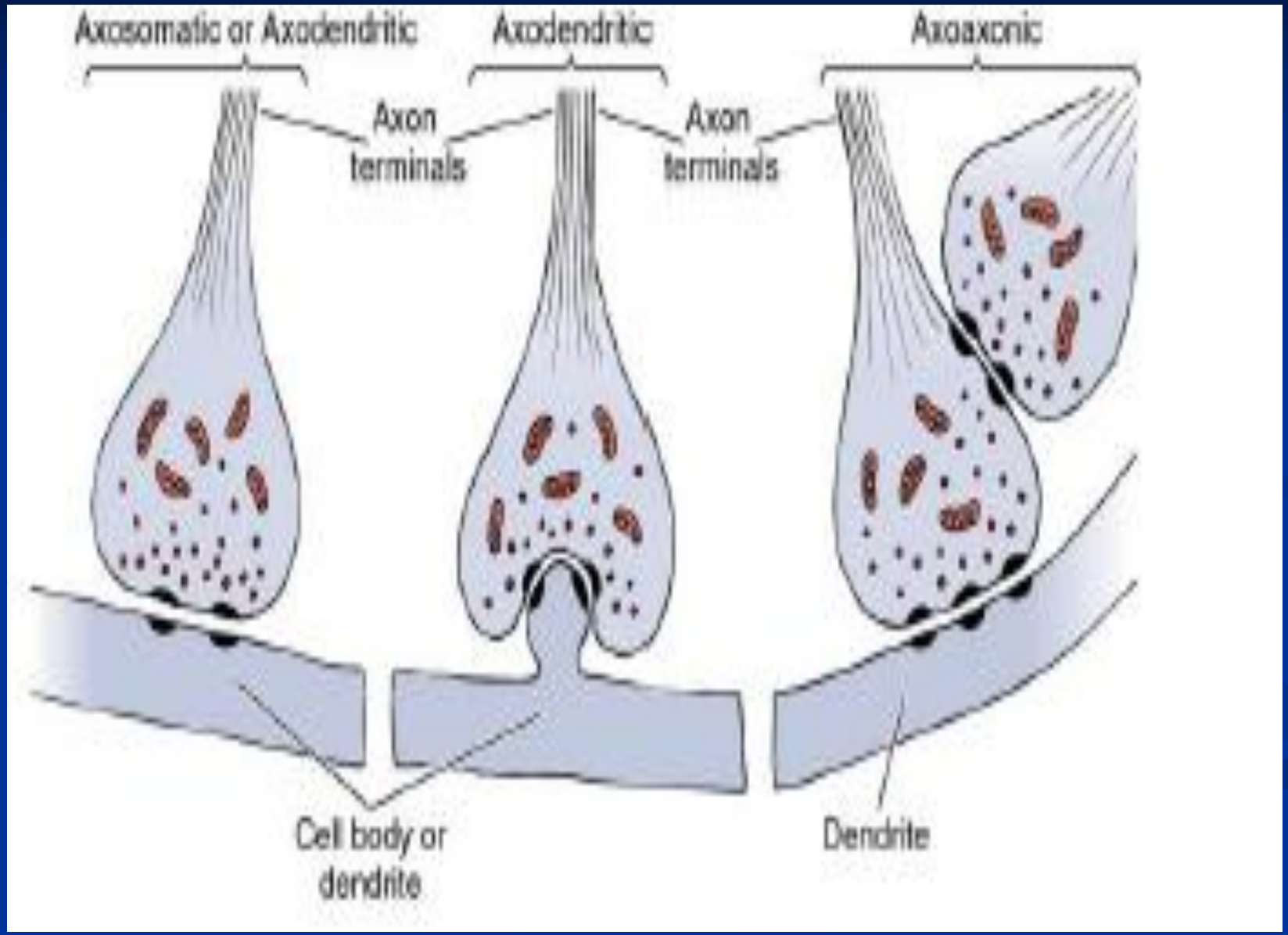
c Unipolar neuron

Input Output

Neurons are of 3 types:

- Sensory (afferent) somatic (pptt) visceral (p)
- Motor (efferent) somatic & visceral
- Interneuron

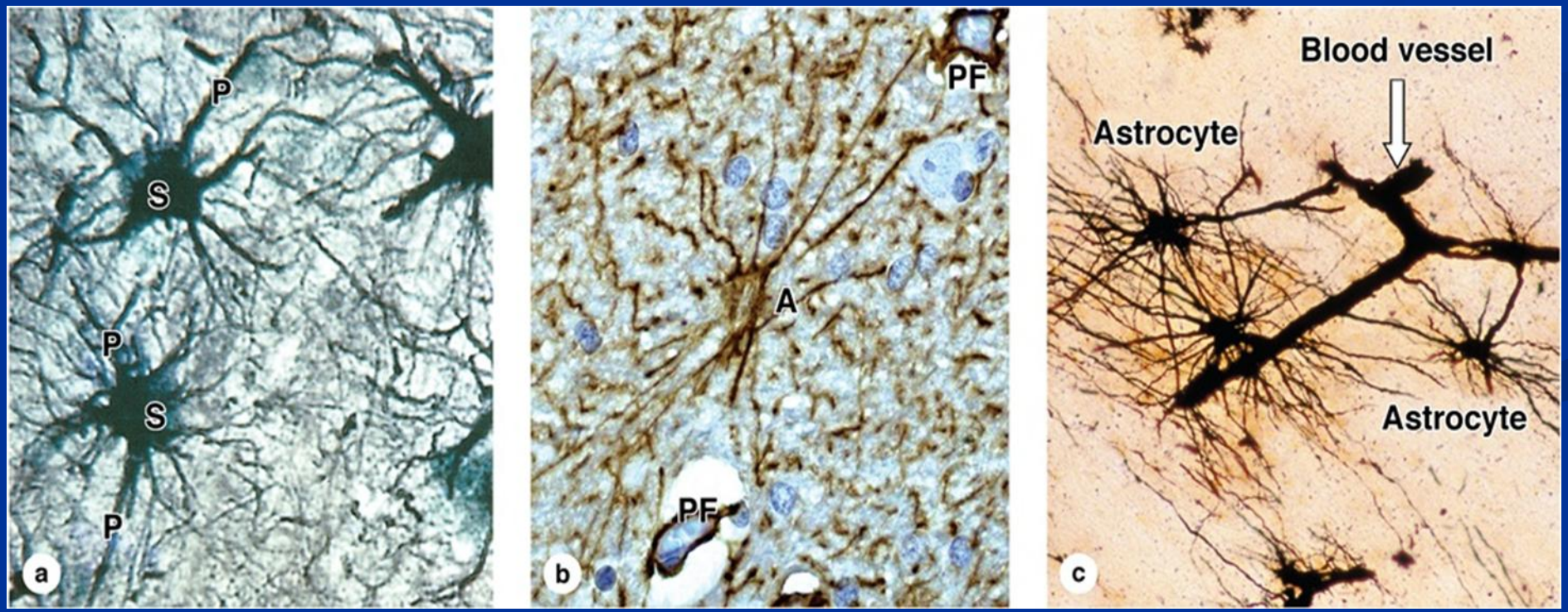
Synapses:


Axosomatic or Axodendritic
Axodendritic
Axoaxonic
Axon terminals
Axon terminals
Cell body or dendrite
Dendrite

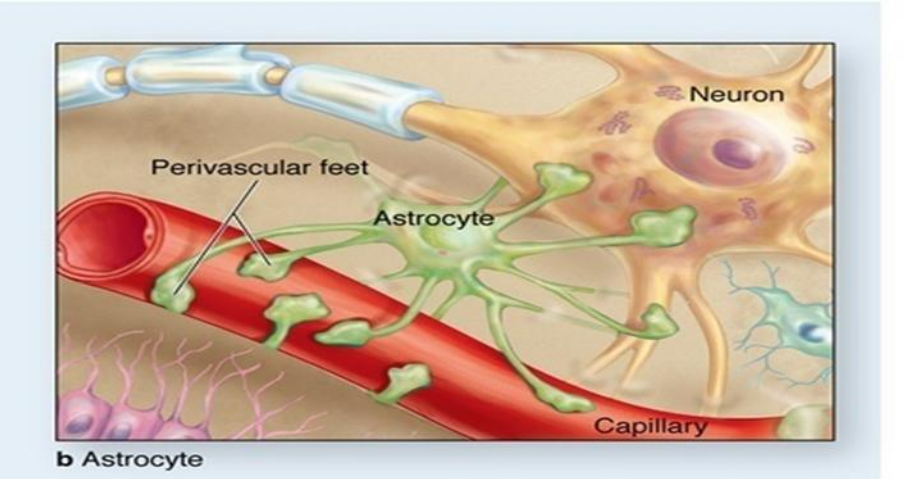
Neuroglia:

- They outnumber neurons by about 10 to 1 in the brain . More than half the volume of the human nervous system is composed of supporting neuroglial cells.

- In the CNS (brain & the spinal cord) there are 4 types of supporting cells:
- **1. Astrocytes:** stellate-shaped cells with fine processes radiating in all directions.

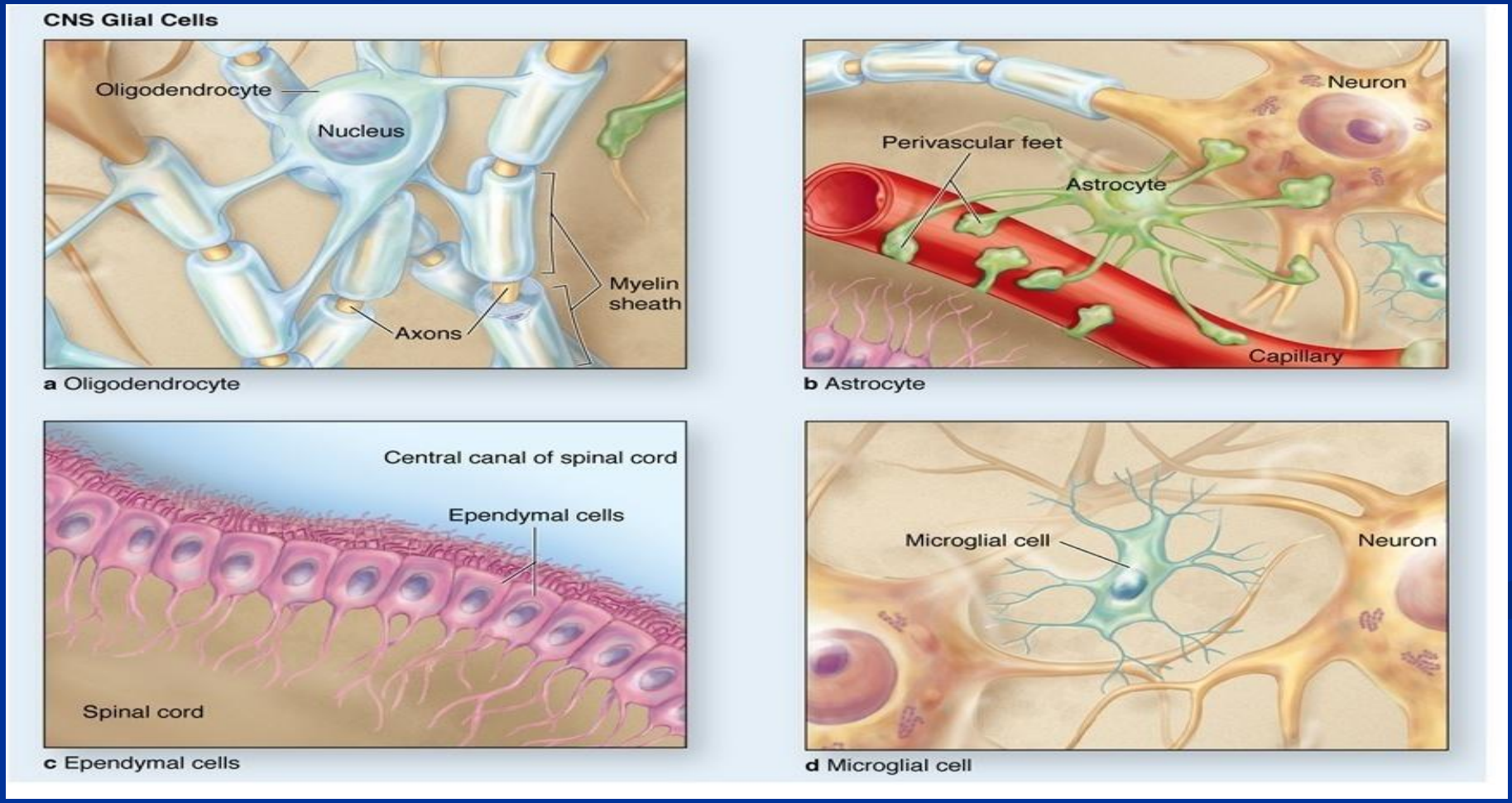


- Astrocyte roles:
- 1. nutritional support
- 2. supporting and scavenging
- 3. blood-brain barrier ------ end feet

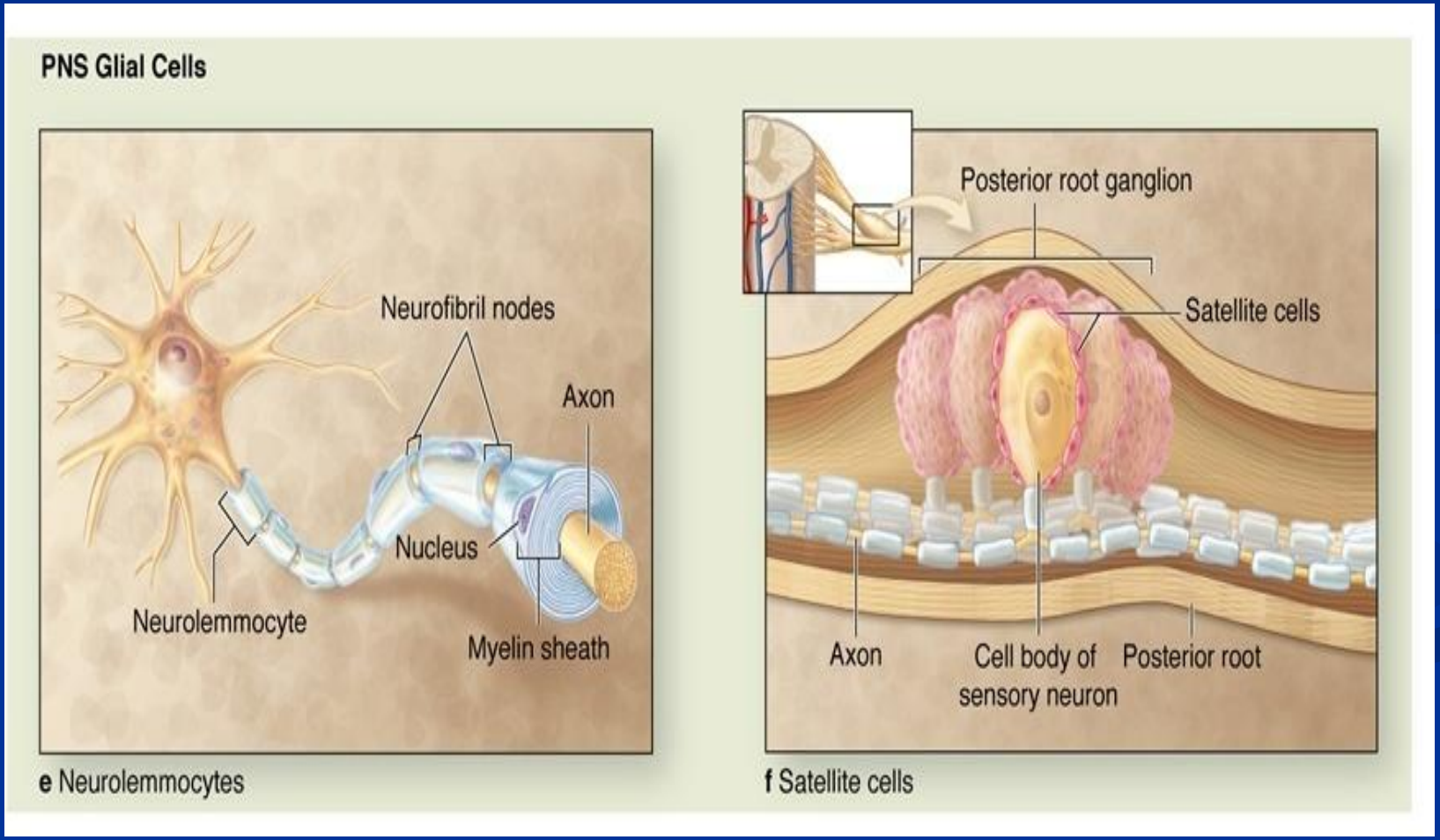


- Astrocytes are of 2 types:
- a. fibrous astrocytes found in the white matter of brain.
- b. protoplasmic astrocyte found in the gray matter of brain.

- 2. Oligodendrocytes:
- 3. Ependymal cells:
- 4. Microglia cells:



- In PNS:
- 5. Schwann cell (neurolemmocytes):
- 6. Satellite cells of ganglia:

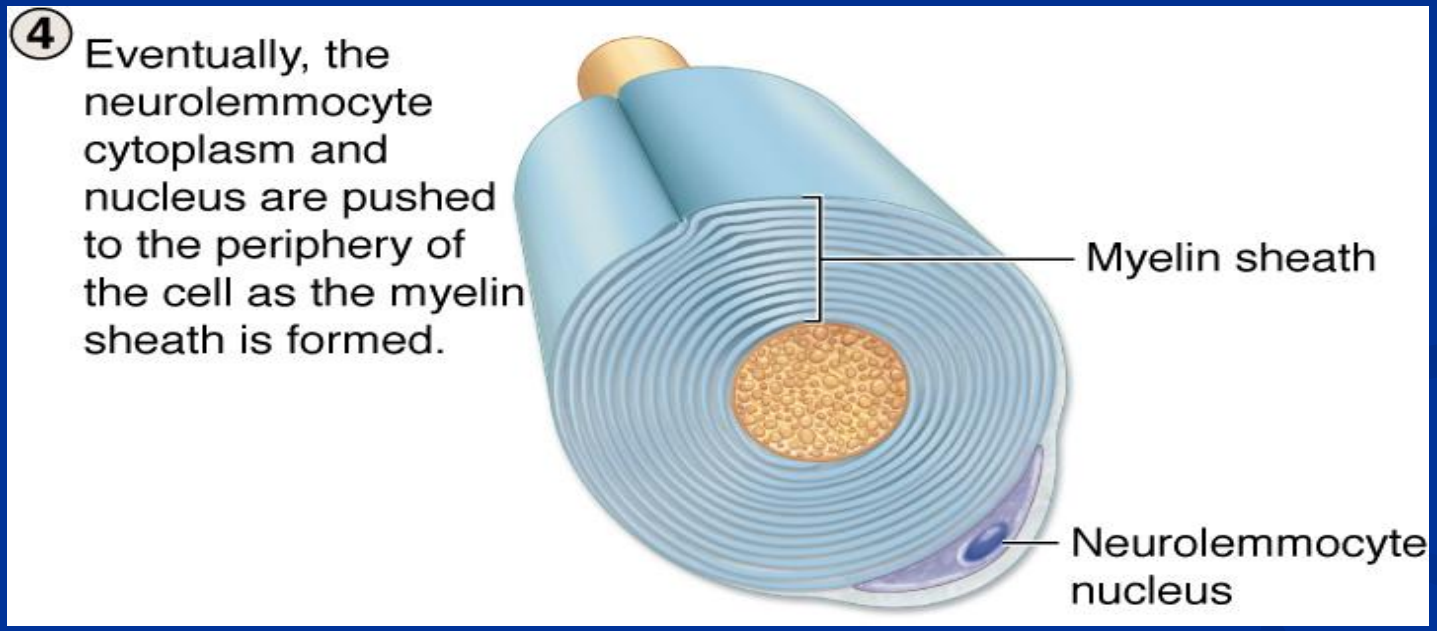


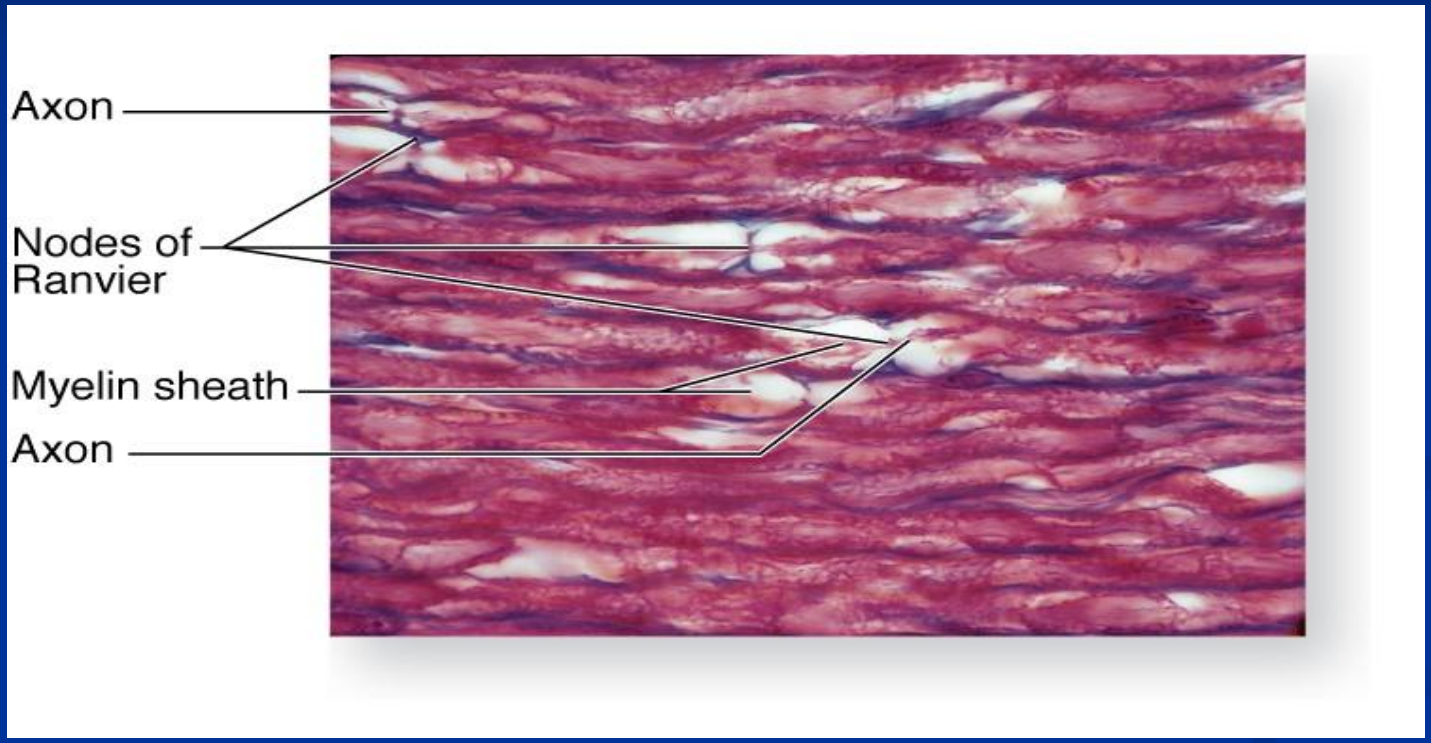
Clinical Notes

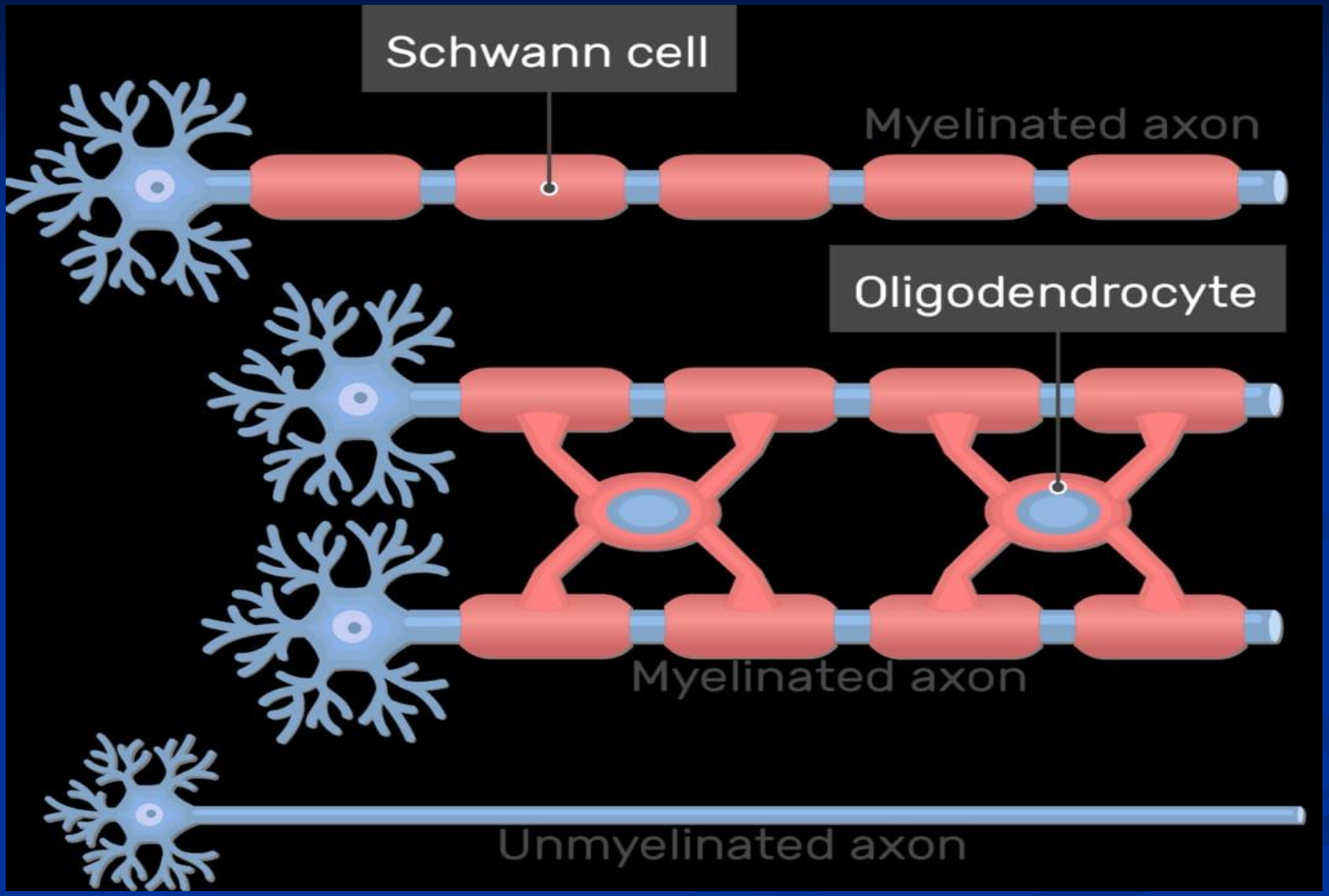
- astrocytoma derived from fibrous astrocyte.

- **The peripheral nervous system**
- The main components of the peripheral nervous system are the nerves, ganglia and nerve endings.
- **Nerves:-** are bundles of nerve fibers surrounded by a series of connective tissue sheaths.
- **Nerve fibers:-**

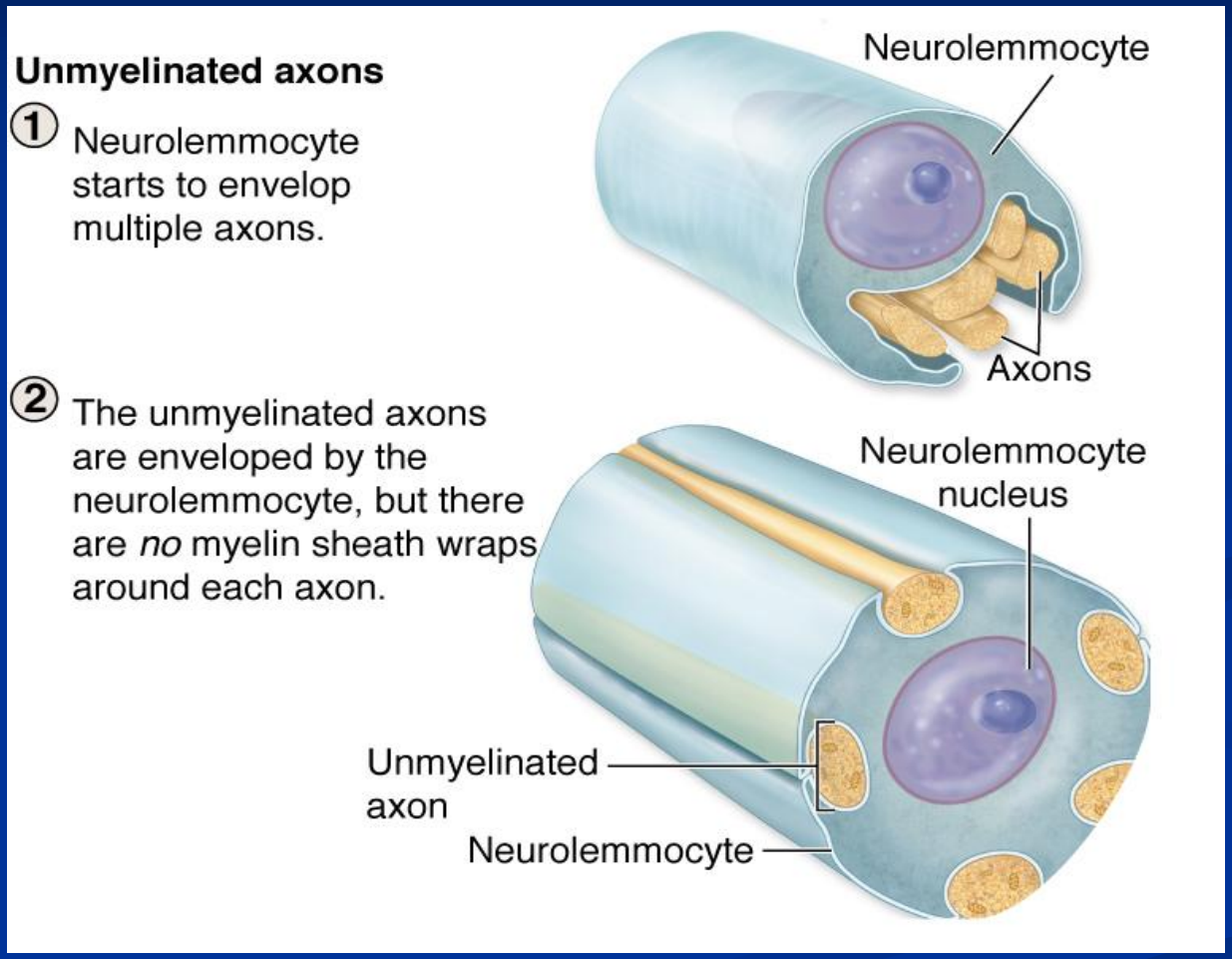
- There are 2 types of nerve fibers:
- **Myelinated nerve fibers:**




Axon
Nodes of Ranvier
Myelin sheath
Axon

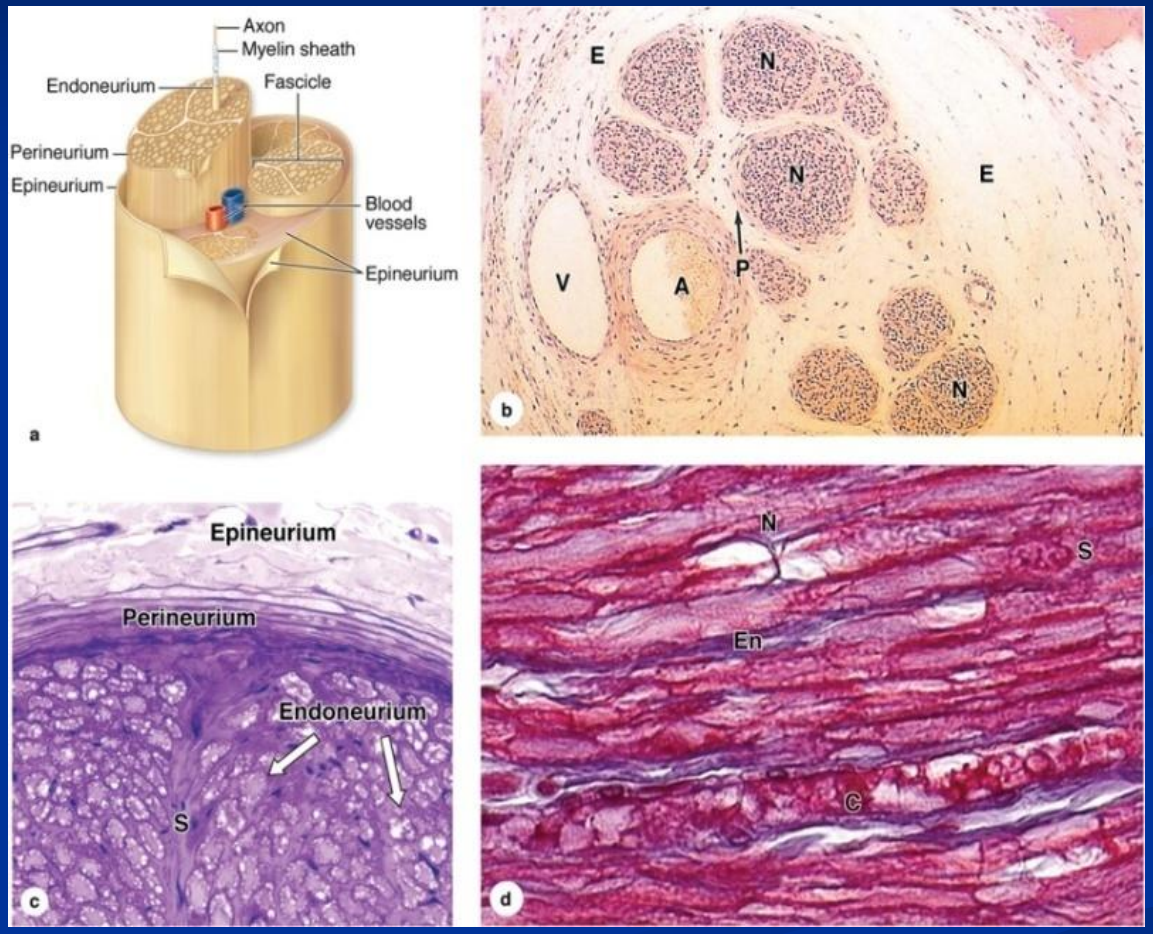

Schwann cell
Myelinated axon
Oligodendrocyte
Myelinated axon
Unmyelinated axon

- **unmyelinated nerve fibers:**



	Myelinated axons		Non-myelinated axons
1.	Transmission of nerve impulse is faster	1.	Transmission of nerve impulse is slower
2.	Myelinated axon has a myelin sheath.	2.	Myelin sheath is absent
3.	Node of Ranvier is present between adjacent myelin sheaths.	3.	Node of Ranvier is absent
4.	Found in the brain, the spinal cord, the cranial and spinal nerves	4.	Found in autonomous and somatic neural systems
5.	Schwann cells are observed inside the myelin sheath	5.	Schwann cells are not observed inside the myelin sheath

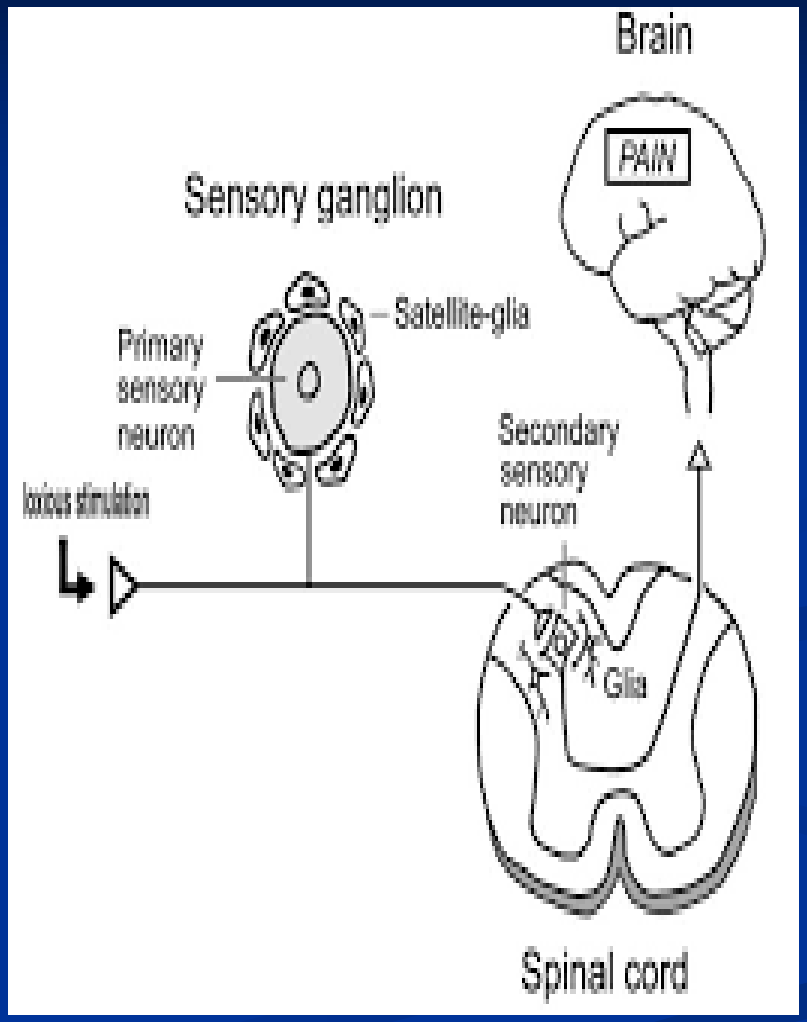
- **Peripheral nerves:**



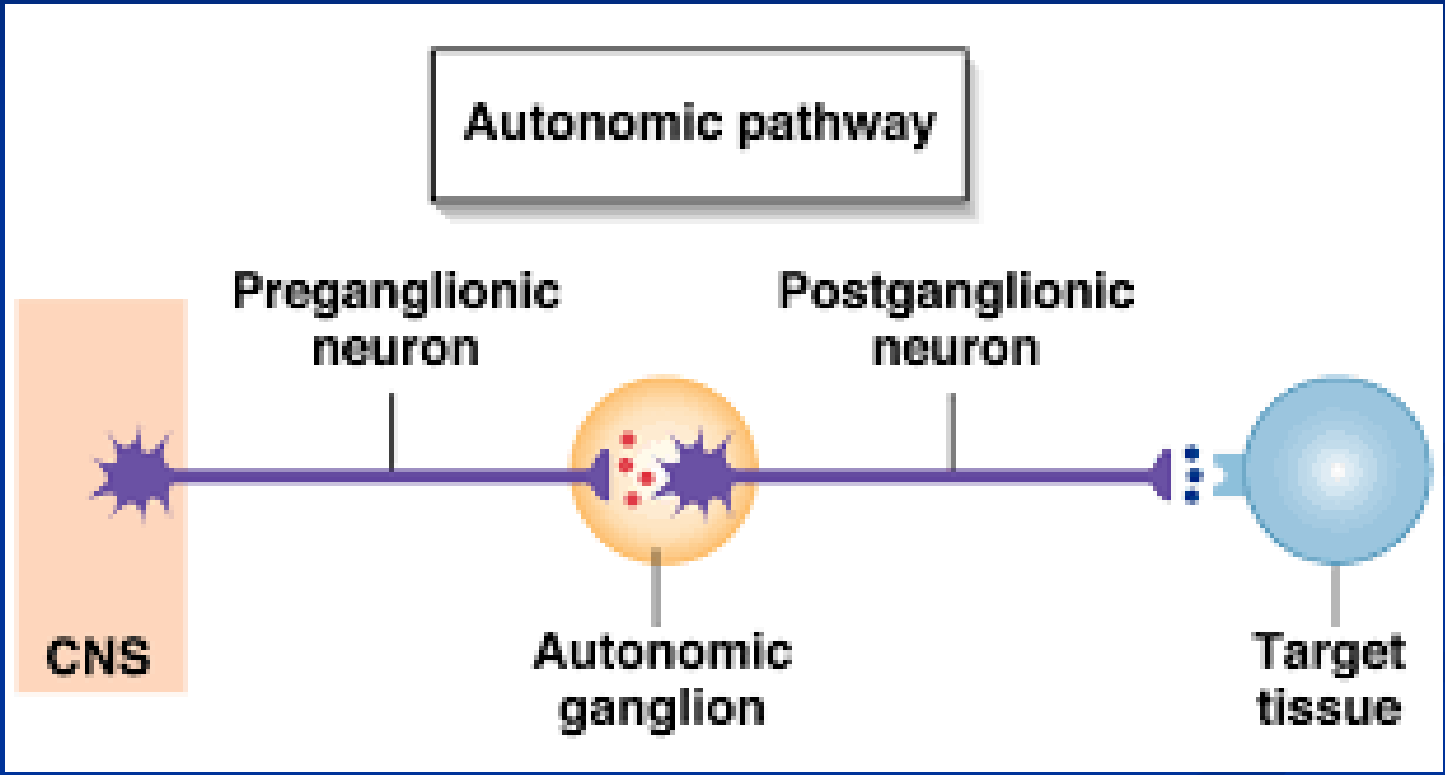
- **Ganglia:**
- Ganglia are aggregations of cell bodies of neurons with glial cells located outside the CNS. They serve as relay stations in the PNS to transmit nerve impulses, one nerve enters and other exits from each ganglion. There are 2 types of ganglia: sensory and autonomic.

- 1. sensory ganglia: receive afferent impulses that go to the CNS.
- a. cranial ganglia:
- b. spinal ganglia:

The neurons of these ganglia are unipolar (pseudounipolar).



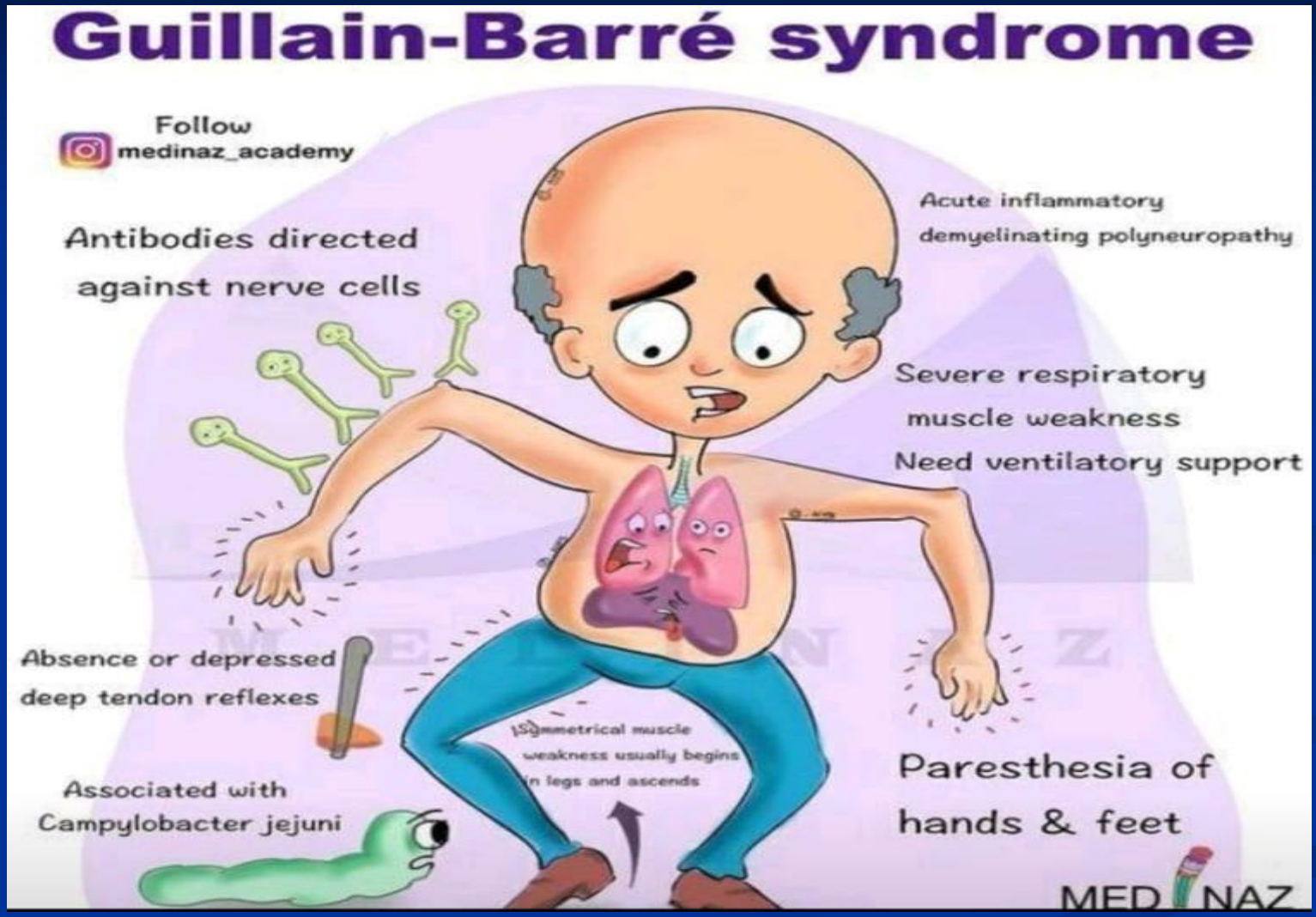
- 2. autonomic ganglia:



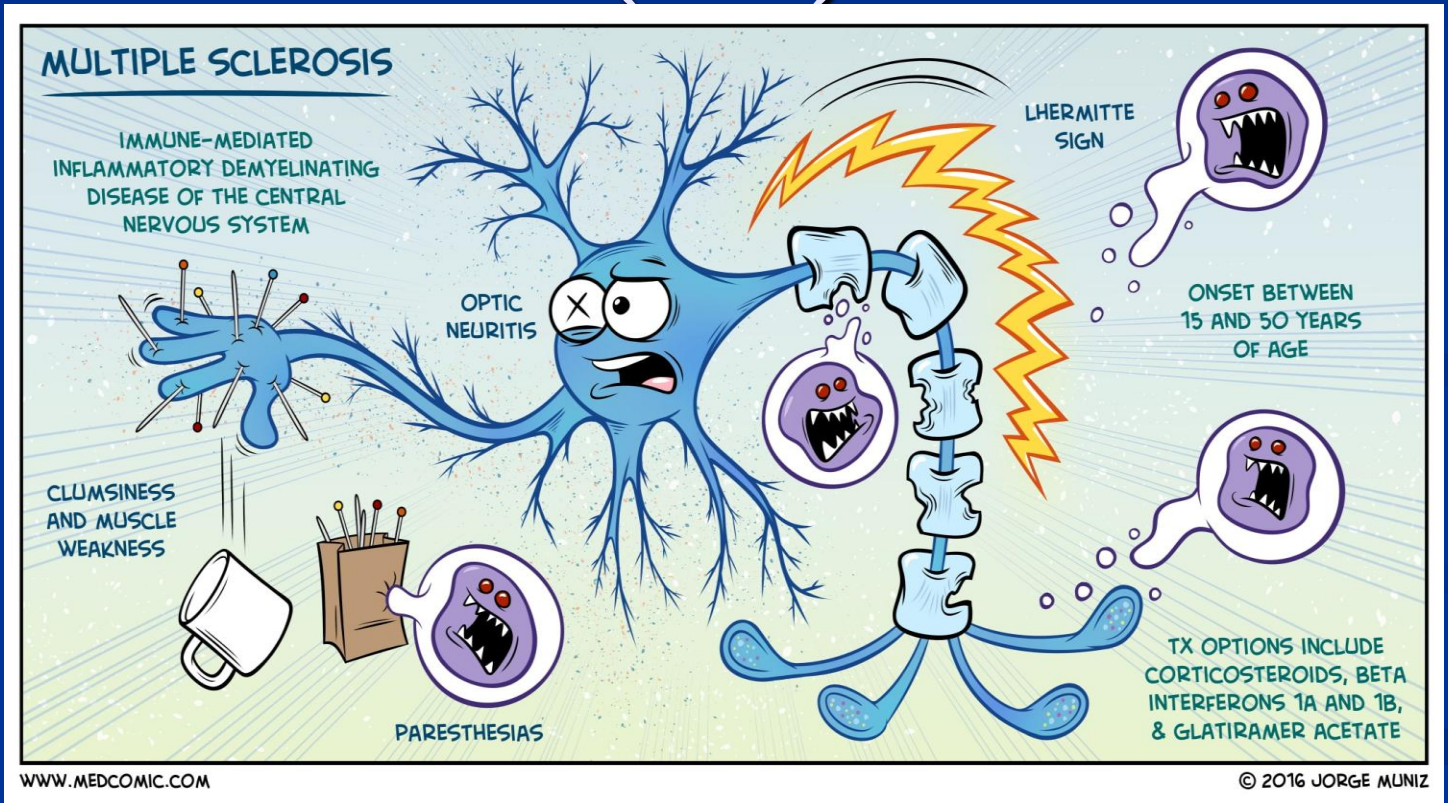
Clinical notes:

1. Demyelinating Diseases

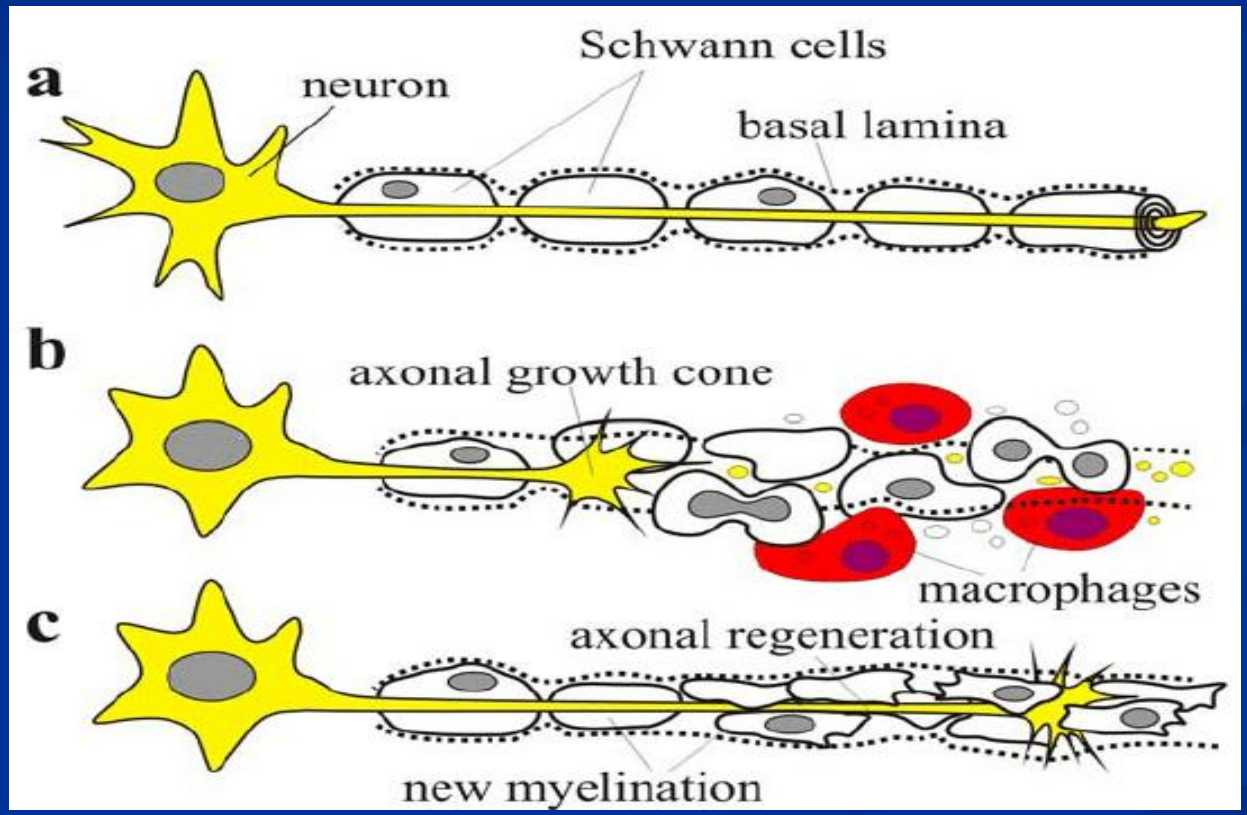
2. Guillian-Barre syndrome (GBS)


Guillain-Barré syndrome
Follow
medinaz_academy
Antibodies directed
against nerve cells
Acute inflammatory
demyelinating polyneuropathy
Severe respiratory
muscle weakness
Need ventilatory support
Absence or depressed
deep tendon reflexes
Symmetrical muscle
weakness usually begins
in legs and ascends
Associated with
Campylobacter jejuni
Paresthesia of
hands & feet
MEDINAZ

3. Multiple sclerosis (MS)



4. Injured fibers in peripheral nerves



Thank you