



HISTOLOGY

DPT
2ND SEMESTER
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Nervous Tissue

- A specialized tissue for communication
- Controls and coordinates body functions
- Main part of nervous system
- **Includes:**
- Brain
- Spinal cord
- Peripheral nerves



Definition of Nervous Tissue

- **What is Nervous Tissue?**
- Tissue specialized to receive and transmit impulses
- Helps body react quickly to changes
- Made of excitable cells called neurons
- **Main Property**
- Irritability → ability to respond to stimulus
- Conductivity → ability to conduct impulses
- **Example**
- Feeling pain after touching a needle



Functions of Nervous Tissue

- Receives sensory information
- Processes information
- Sends commands to muscles and glands
- Controls voluntary and involuntary actions
- Helps in memory, learning, and emotions
- **Example**
- Seeing food and feeling hungry



Divisions of Nervous System

- **Central Nervous System (CNS)**
- Brain
- Spinal cord
- **Function**
- Control center of body
- **Peripheral Nervous System (PNS)**
- Cranial nerves
- Spinal nerves



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- **Function**
- Carries messages between body and CNS
- **Example**
- Brain sends signal to hand muscles for writing



Brain

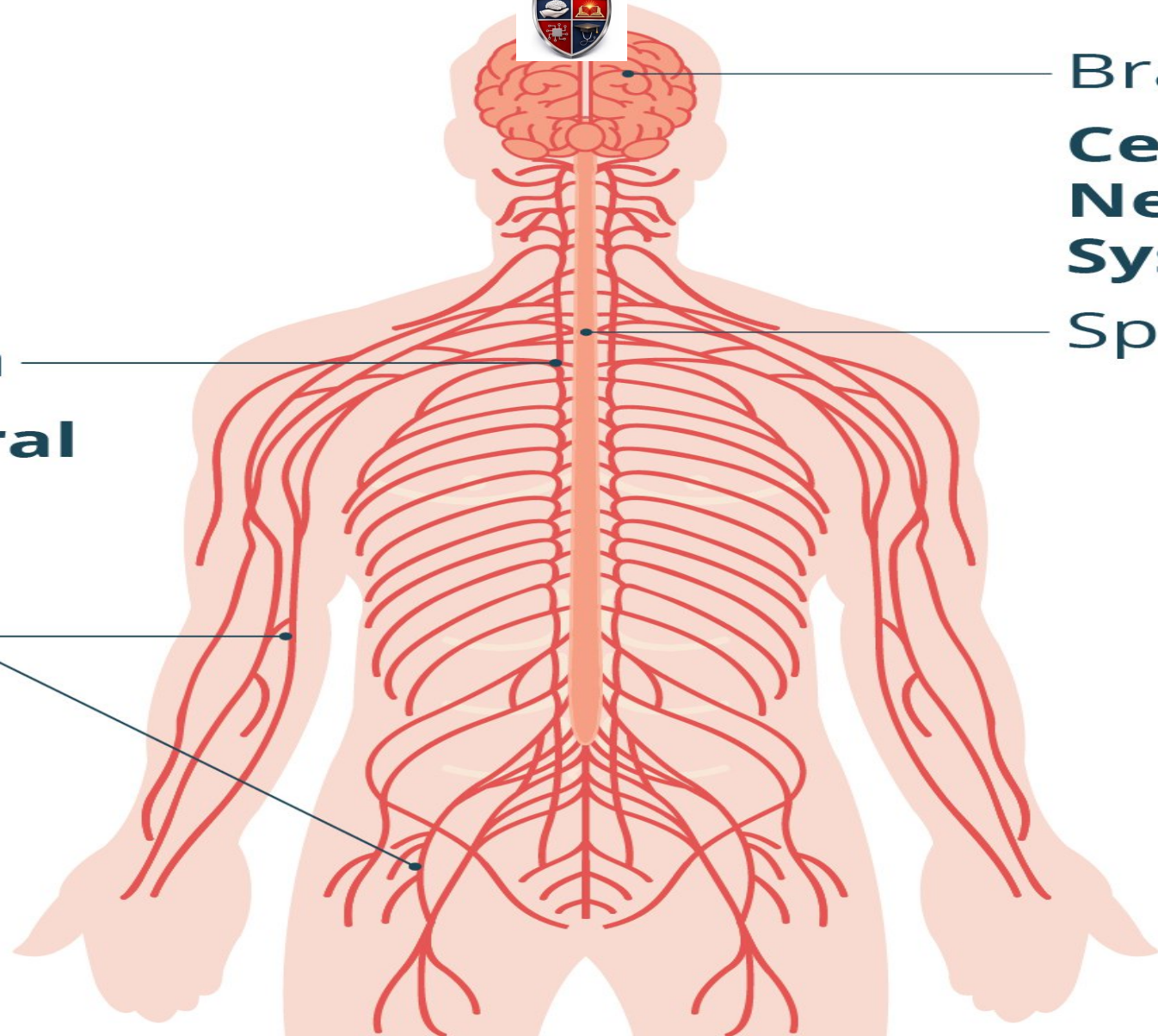
**Central
Nervous
System**

Spinal cord

Ganglion

**Peripheral
Nervous
System**

Nerves



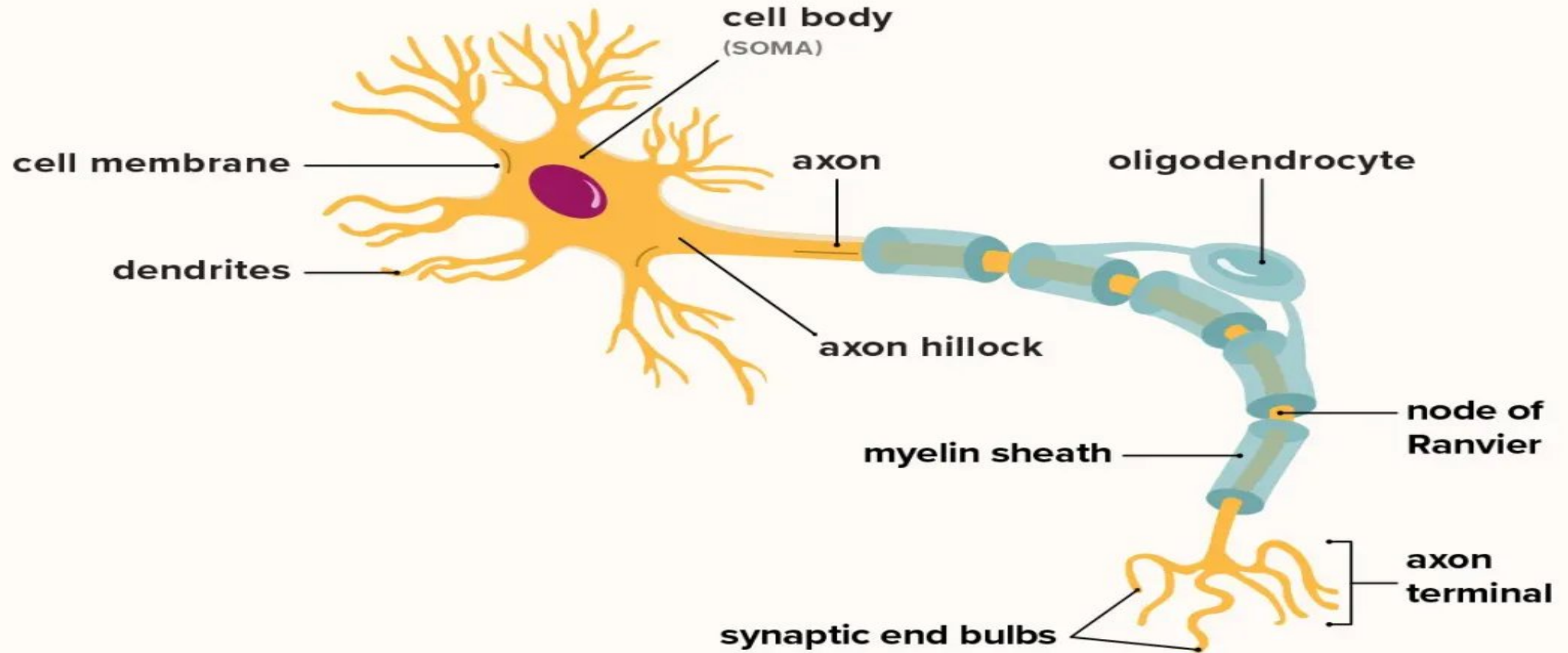


Components of Nervous Tissue

- **Two Main Components**
- **1. Neurons**
- Functional cells
- Conduct nerve impulses
- **2. Neuroglia (Glial Cells)**
- Supporting cells
- Protect and nourish neurons
- **Example**
- Neurons = workers
- Neuroglia = helpers and protectors



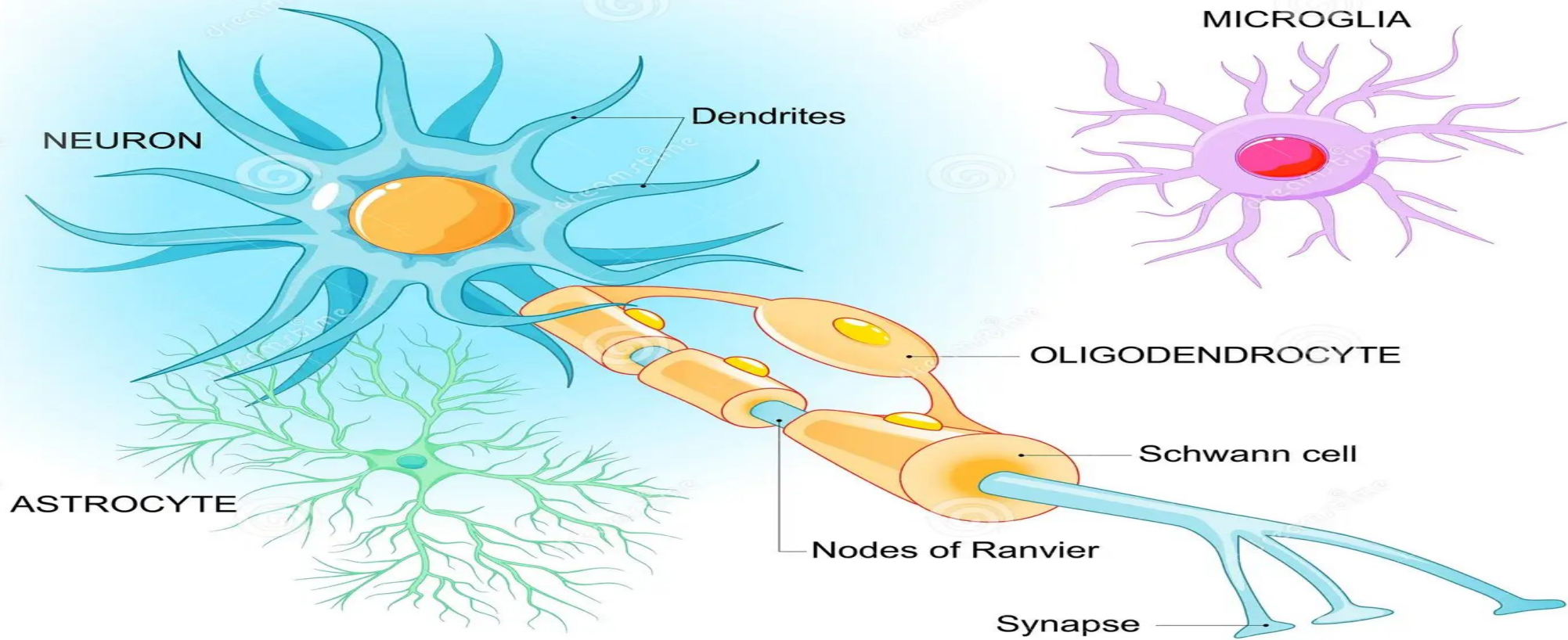
Structure of a neuron



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Neuron and Glial cells



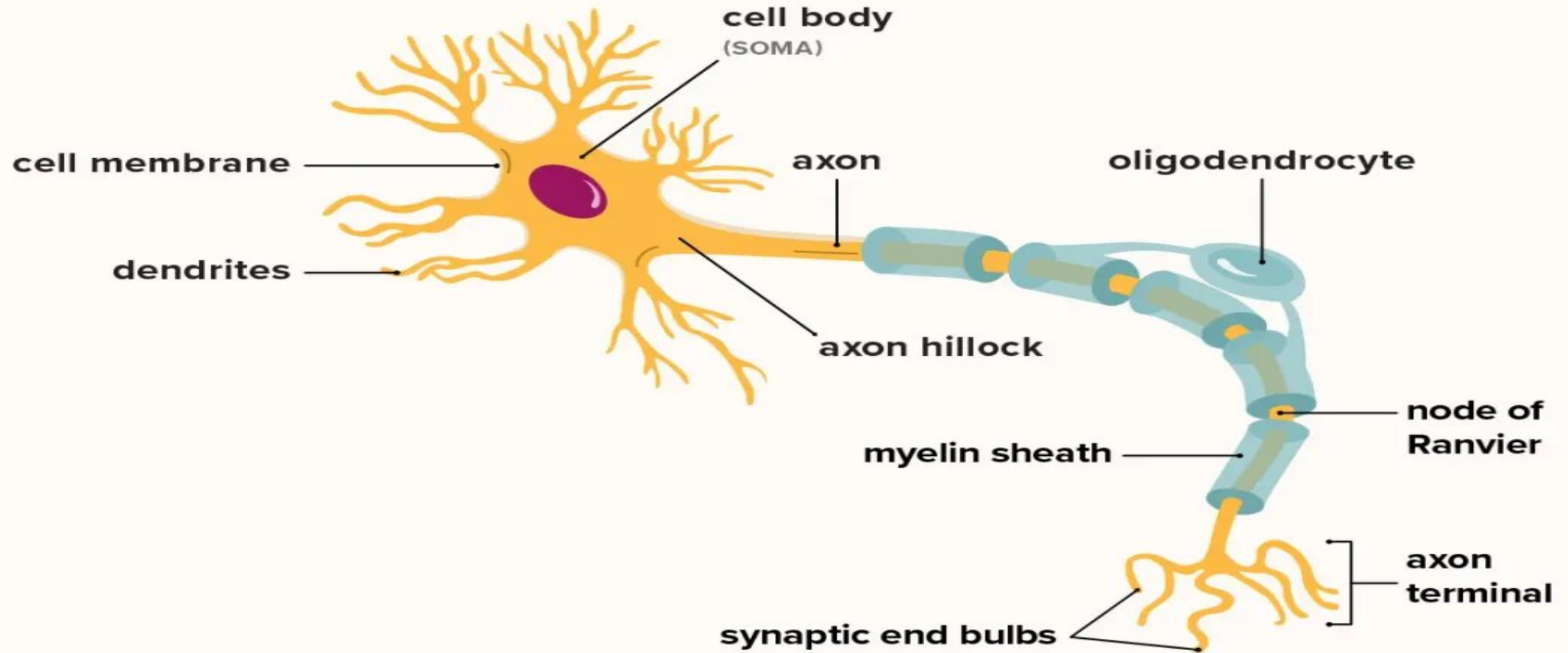


Neuron

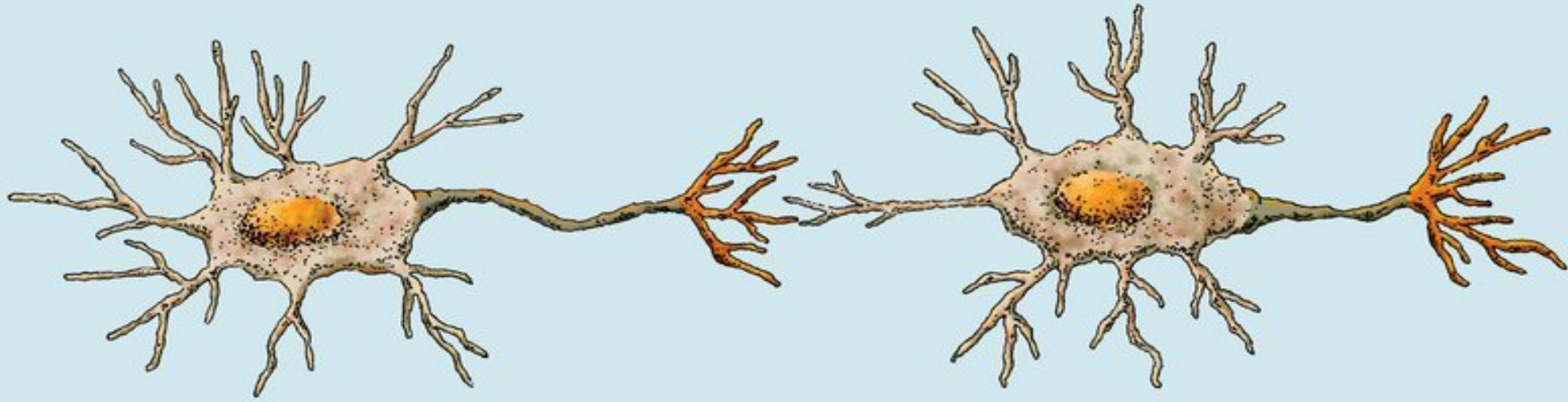
- **Definition**
- Structural and functional unit of nervous tissue
- **Functions**
- Receive impulses
- Conduct impulses
- Transfer impulses to other cells
- **Characteristics**
- Long living cells
- Do not divide usually
- High metabolic activity



Structure of a neuron



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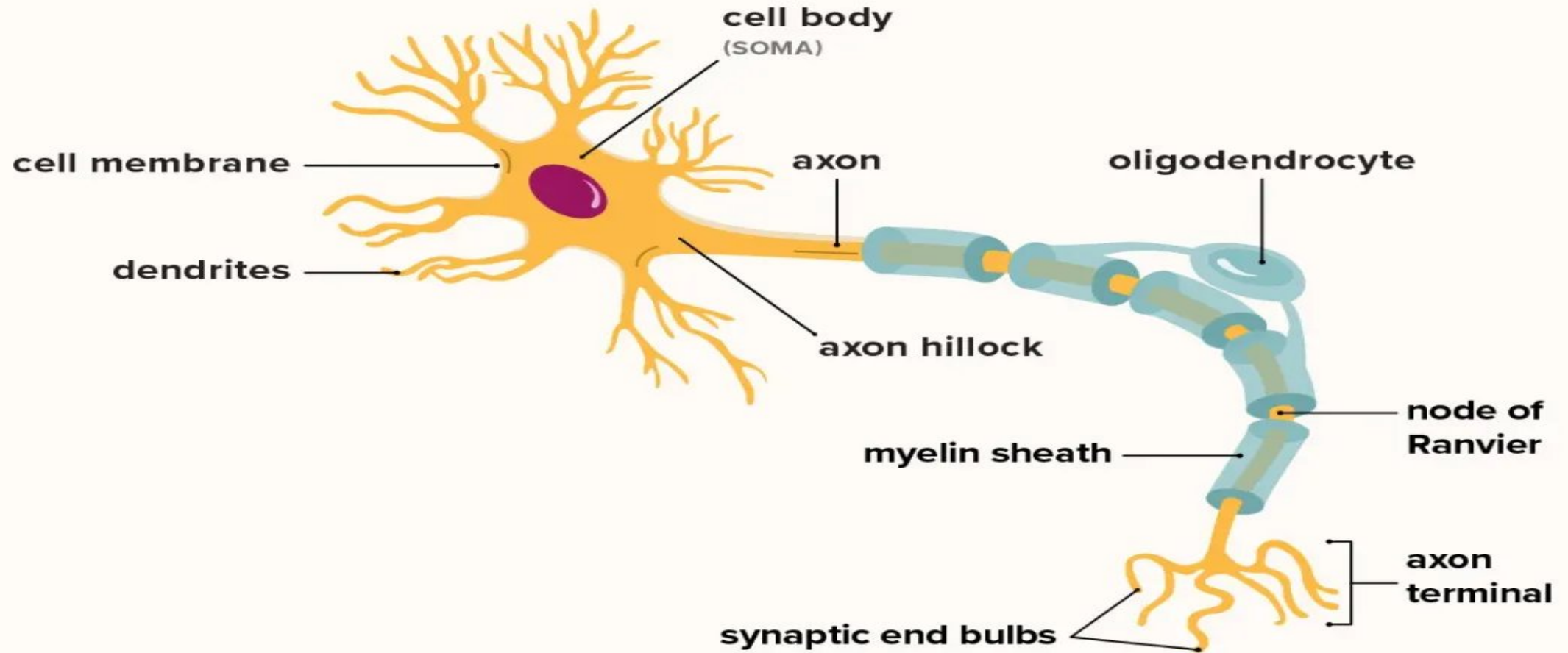


Structure of Neuron

- **1. Cell Body (Soma)**
 - Contains nucleus and cytoplasm
 - Controls activities of neuron
- **2. Dendrites**
 - Short branched processes
 - Receive impulses toward cell body
- **3. Axon**
 - Single long process
 - Carries impulses away from cell body



Structure of a neuron



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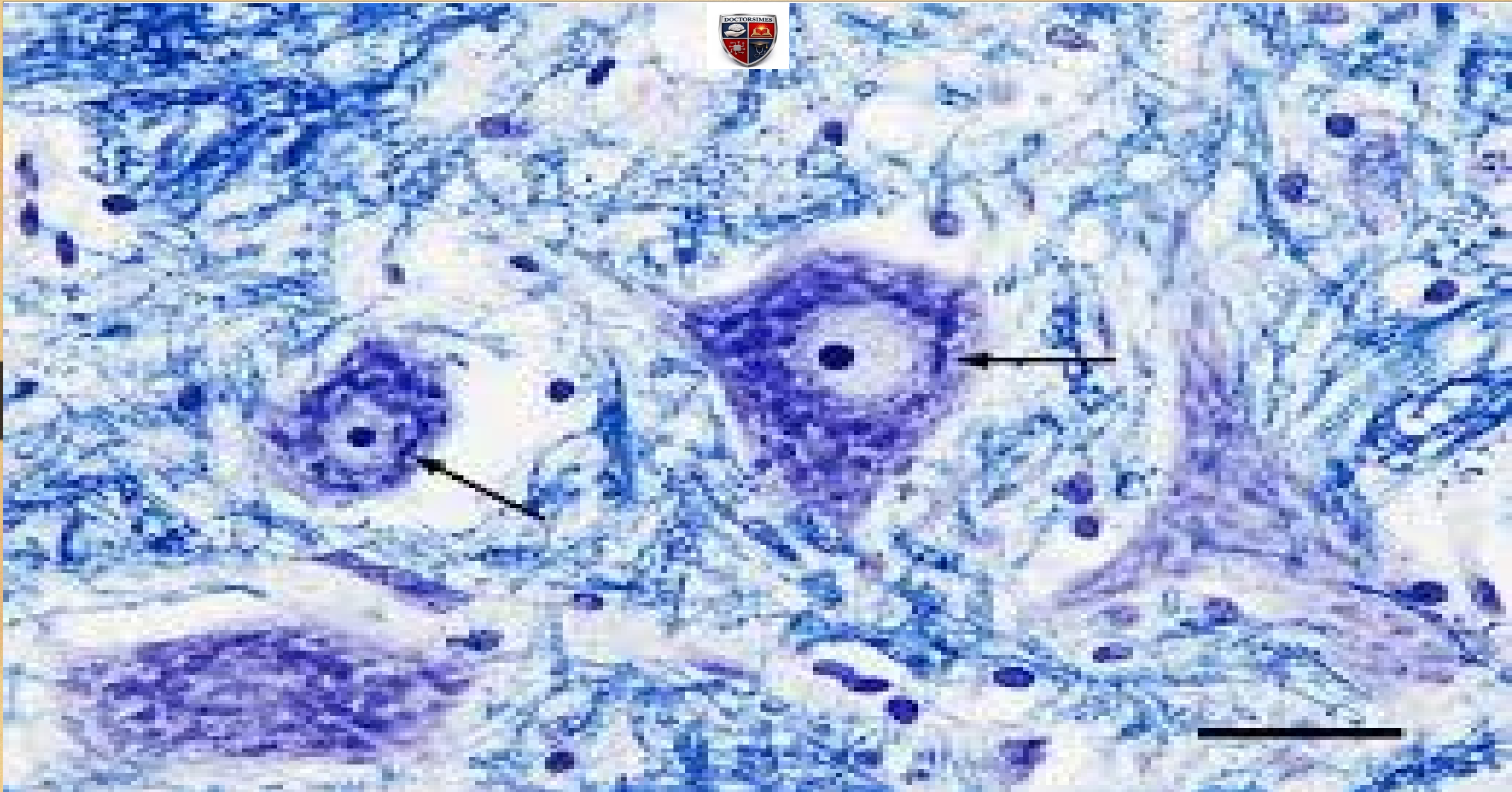
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- **Example**
- Dendrites = receiving antenna
- Axon = transmission wire



Cell Body Details

- **Nucleus**
- Large and pale
- Contains nucleolus
- **Nissl Bodies**
- Rough ER in neuron
- Help in protein synthesis
- **Neurofibrils**
- Supportive fibrils inside neuron
- **Example**
- Nissl bodies act like protein factories



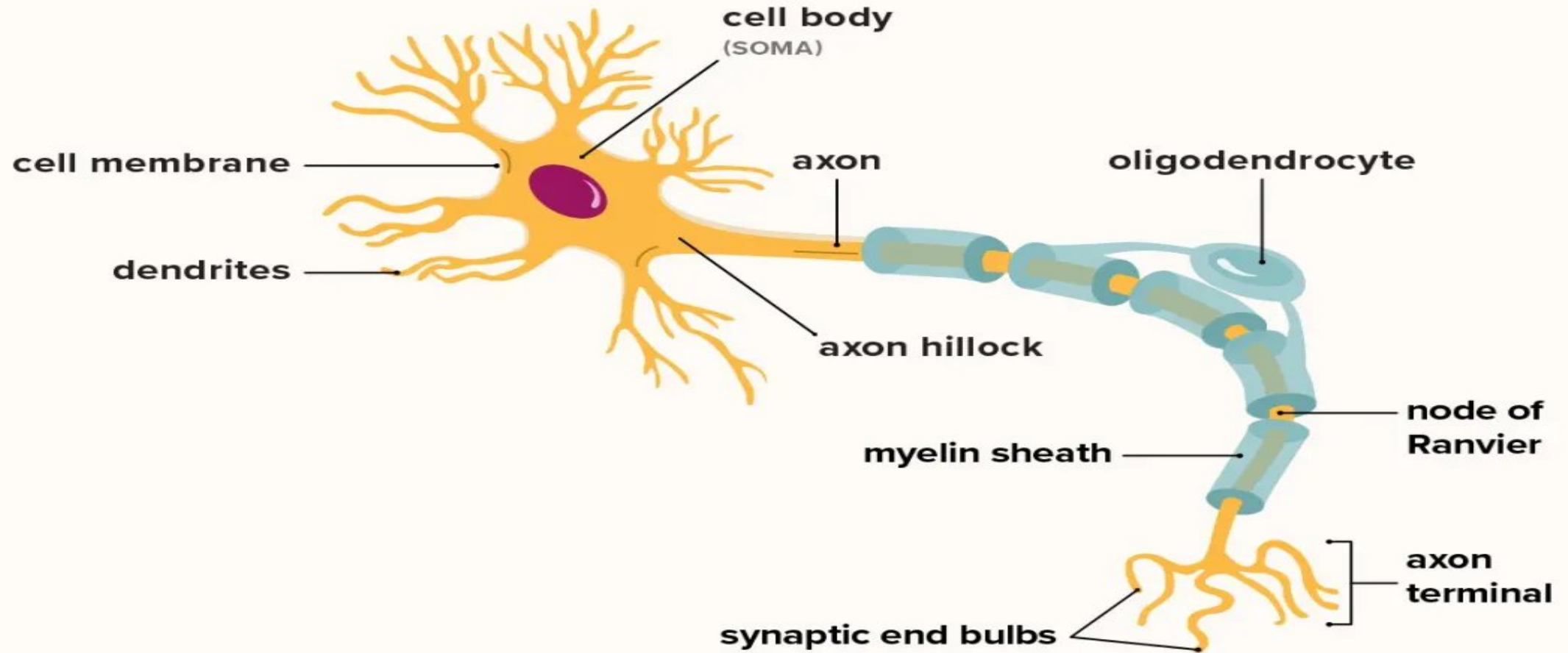


Dendrites

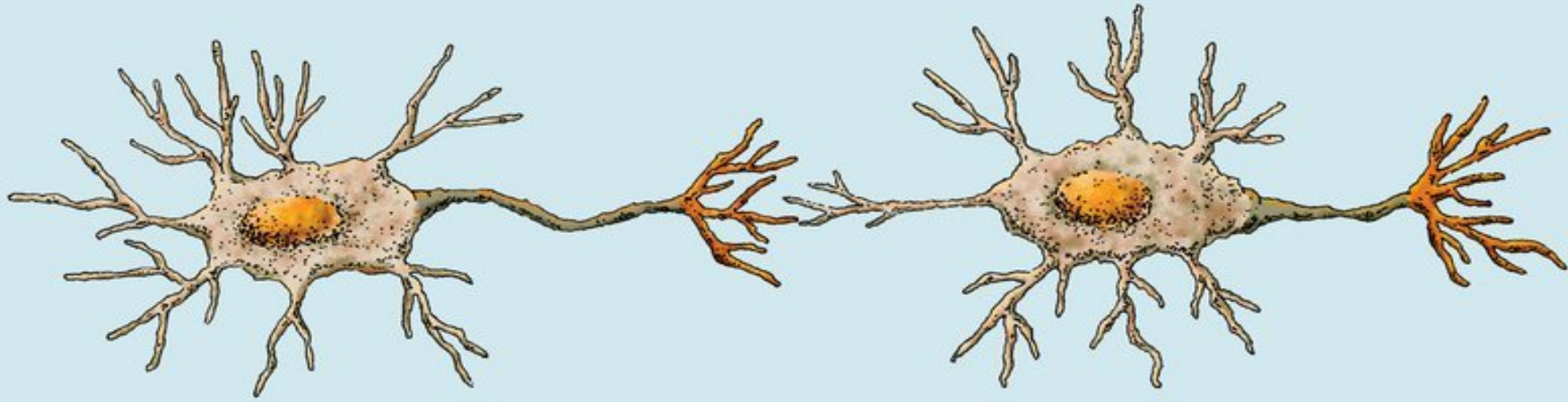
- **Features**
- Multiple short branches
- Conduct impulses toward soma
- Increase surface area for receiving signals
- **Function**
- Receive information from environment or other neurons
- **Example**
- Tree branches collecting signals



Structure of a neuron



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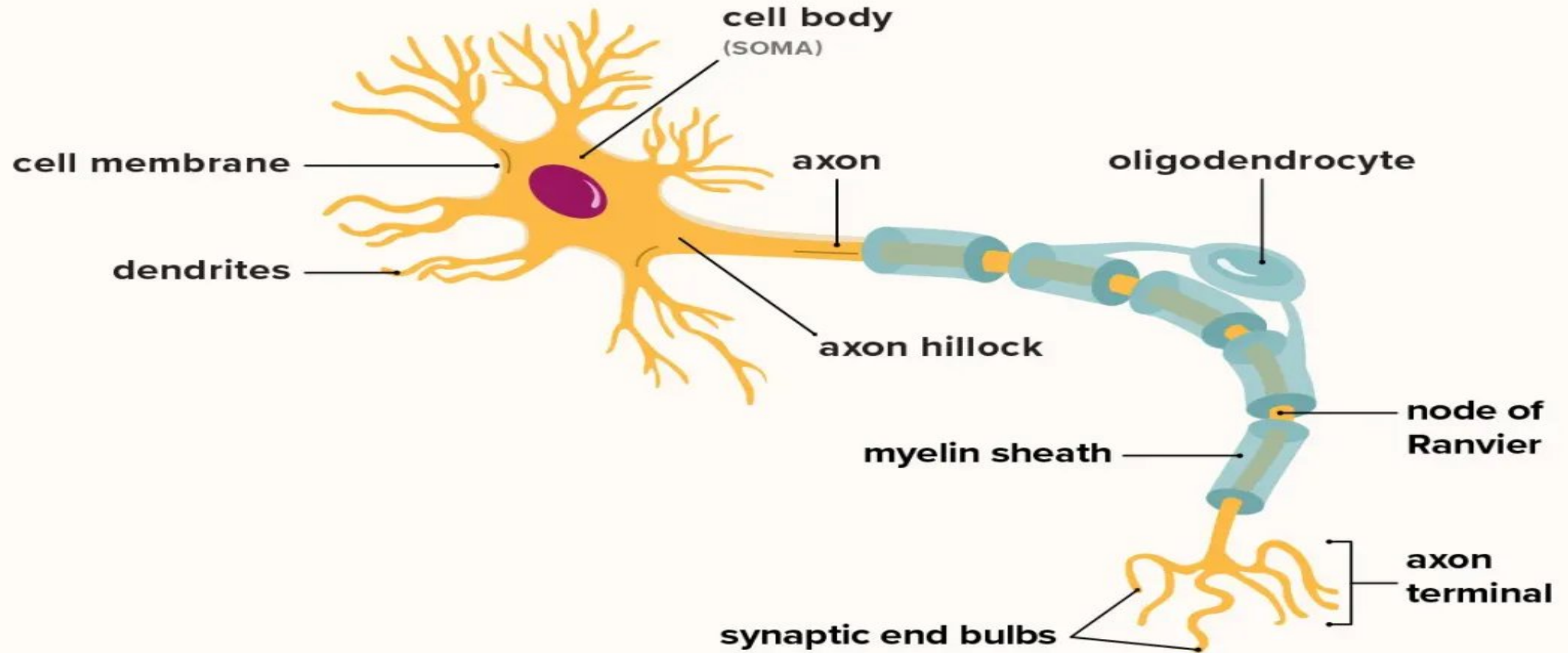


Axon

- **Features**
- Usually single and long
- Starts from axon hillock
- May be covered by myelin sheath
- **Function**
- Conducts impulses away from cell body
- **Example**
- Electric cable carrying current



Structure of a neuron



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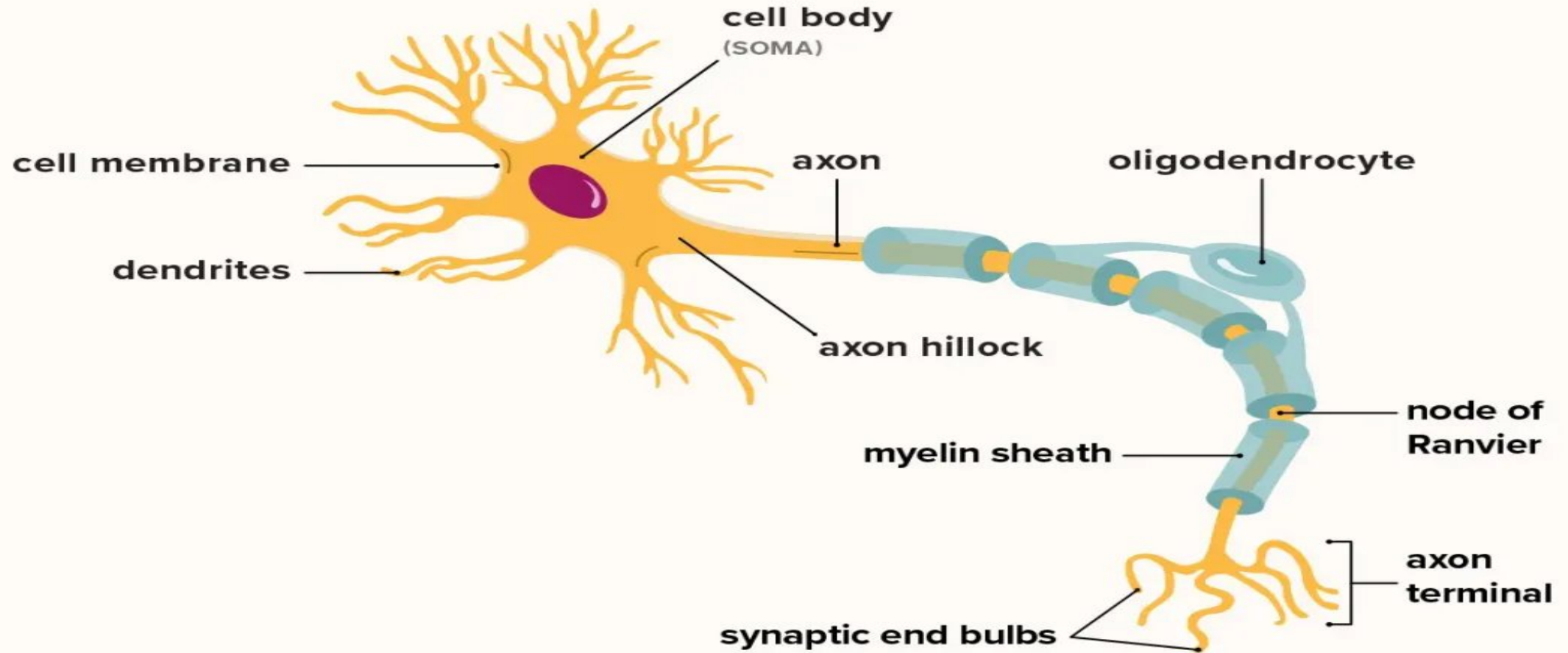


Axon Terminal & Synapse

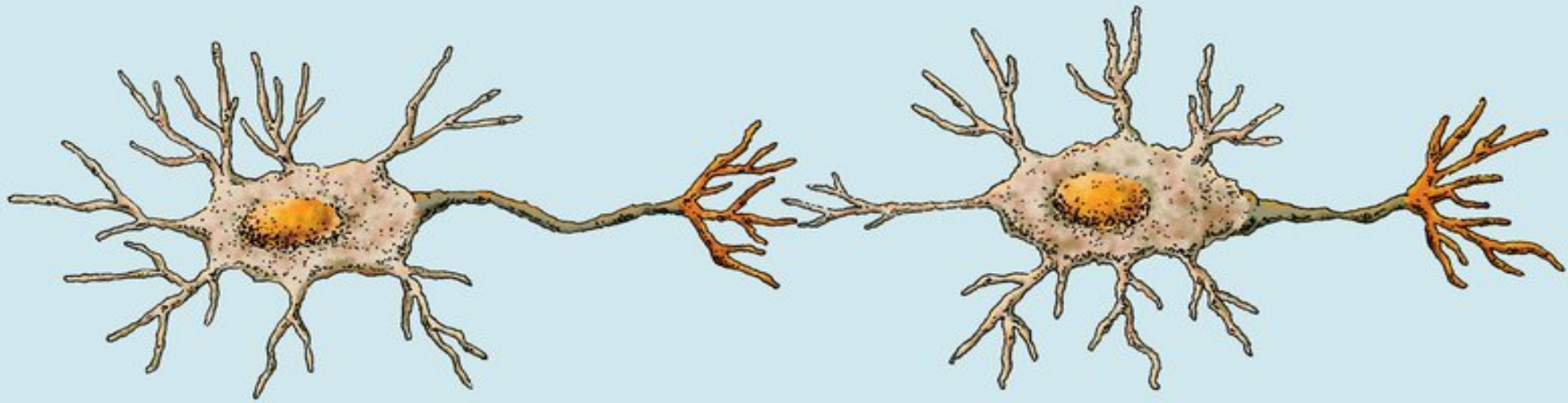
- **Axon Terminal**
- End branches of axon
- **Synapse**
- Junction between two neurons
- **Function**
- Transfers impulse through neurotransmitters
- **Neurotransmitters**
- Acetylcholine
- Dopamine
- Serotonin



Structure of a neuron



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CONTINUED

- **Example**
- Like sending a text message from one phone to another



Classification of Neurons (Functional)

- **Sensory Neurons**
- Carry impulses to CNS
- **Example**
- Feeling heat or pain
- **Motor Neurons**
- Carry impulses from CNS to muscles
- **Example**
- Moving hand to write



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- **Interneurons**
- Connect neurons inside CNS
- **Example**
- Help in reflex actions

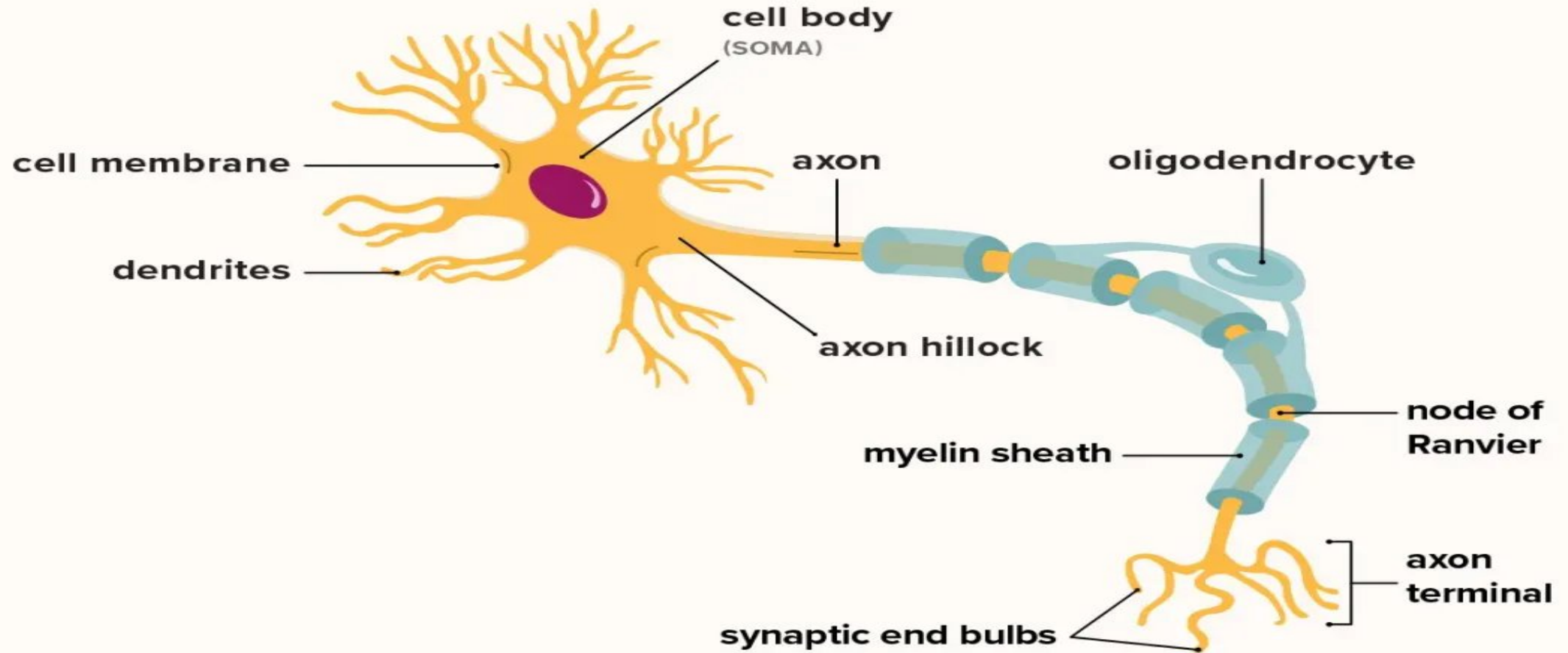


Nerve Fibers

- **Types**
- **Myelinated Fibers**
- Covered by myelin sheath
- Conduct impulses rapidly
- White appearance
- **Unmyelinated Fibers**
- No myelin sheath
- Slow conduction
- **Example**
- Myelin acts like insulation around electric wires



Structure of a neuron



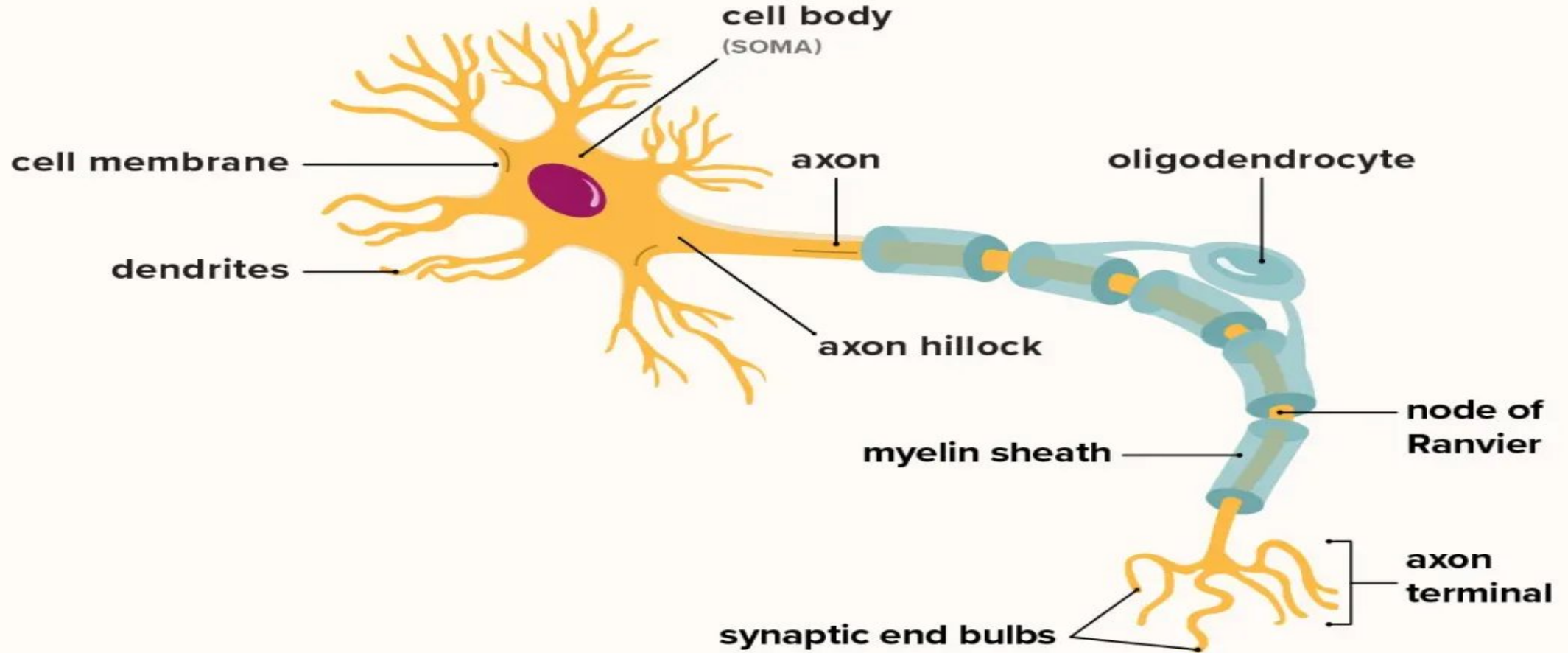
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Myelin Sheath

- **Definition**
- Lipid-rich covering around axon
- **Functions**
- Protection of axon
- Increases speed of conduction
- **Formed By**
- **CNS**
- Oligodendrocytes
- **PNS**
- Schwann cells

Structure of a neuron



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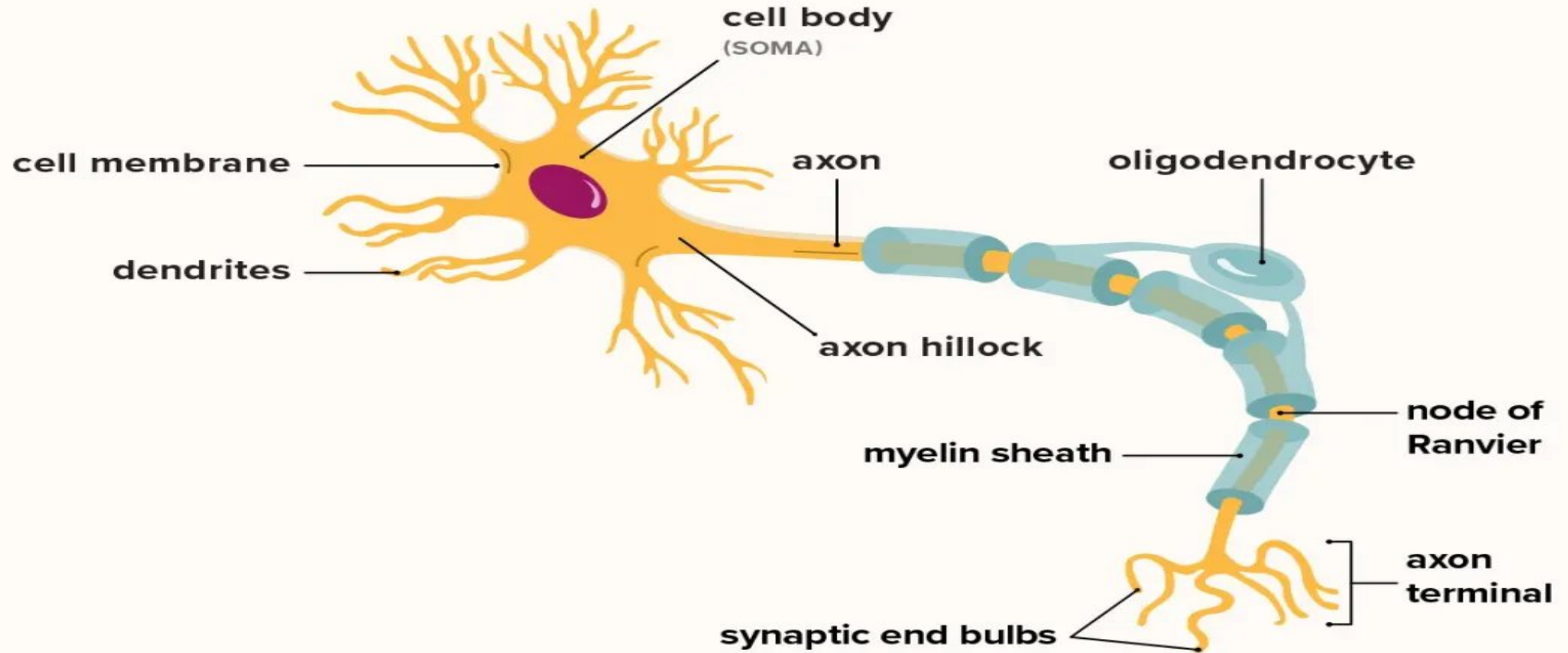


Nodes of Ranvier

- **Definition**
- Gaps between myelin sheath
- **Function**
- Allow rapid conduction of impulses
- Saltatory conduction occurs here
- **Example**
- Impulse jumps from node to node like jumping stairs



Structure of a neuron



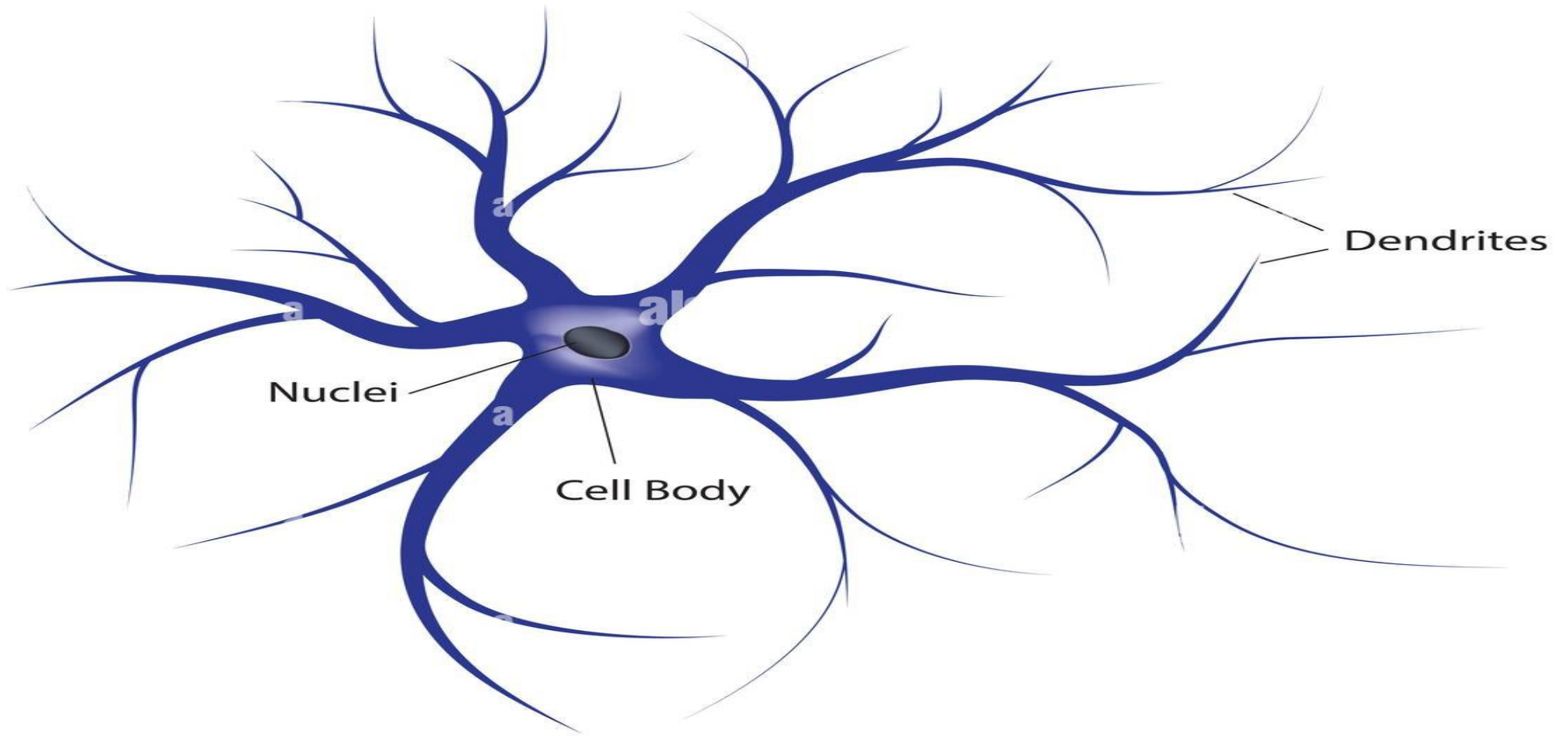
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Neuroglia

- **Definition**
- Non-nervous supporting cells
- **Functions**
- Support neurons
- Nutrition
- Protection
- Repair
- Myelin formation

NEU  **GLIA**
(Supporting cell)





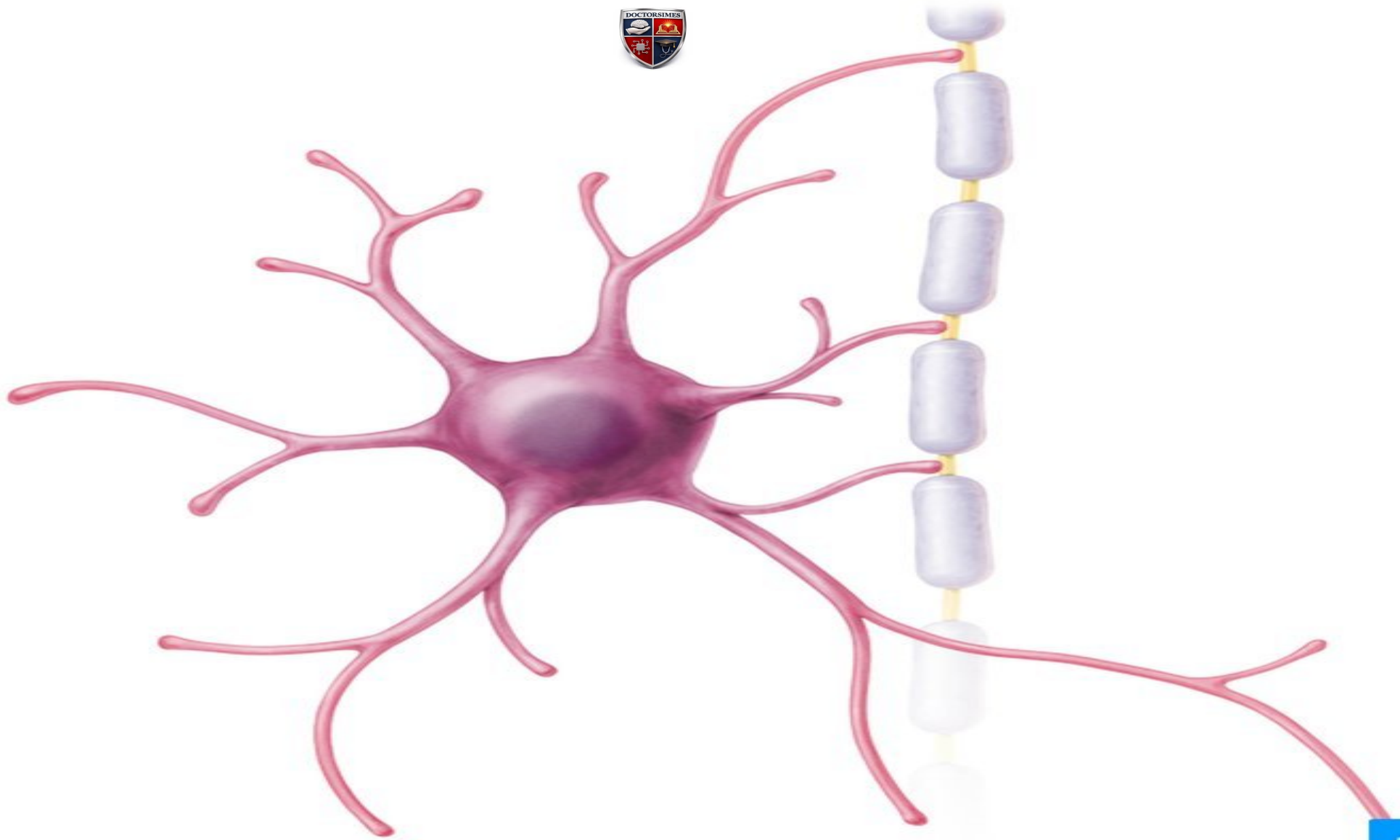
Types

- Astrocytes
- Oligodendrocytes
- Microglia
- Ependymal cells
- Schwann cells
- Satellite cells



Astrocytes

- **Features**
- Star-shaped cells
- **Functions**
- Support neurons
- Maintain blood-brain barrier
- Supply nutrients
- **Example**
- Caretakers of neurons

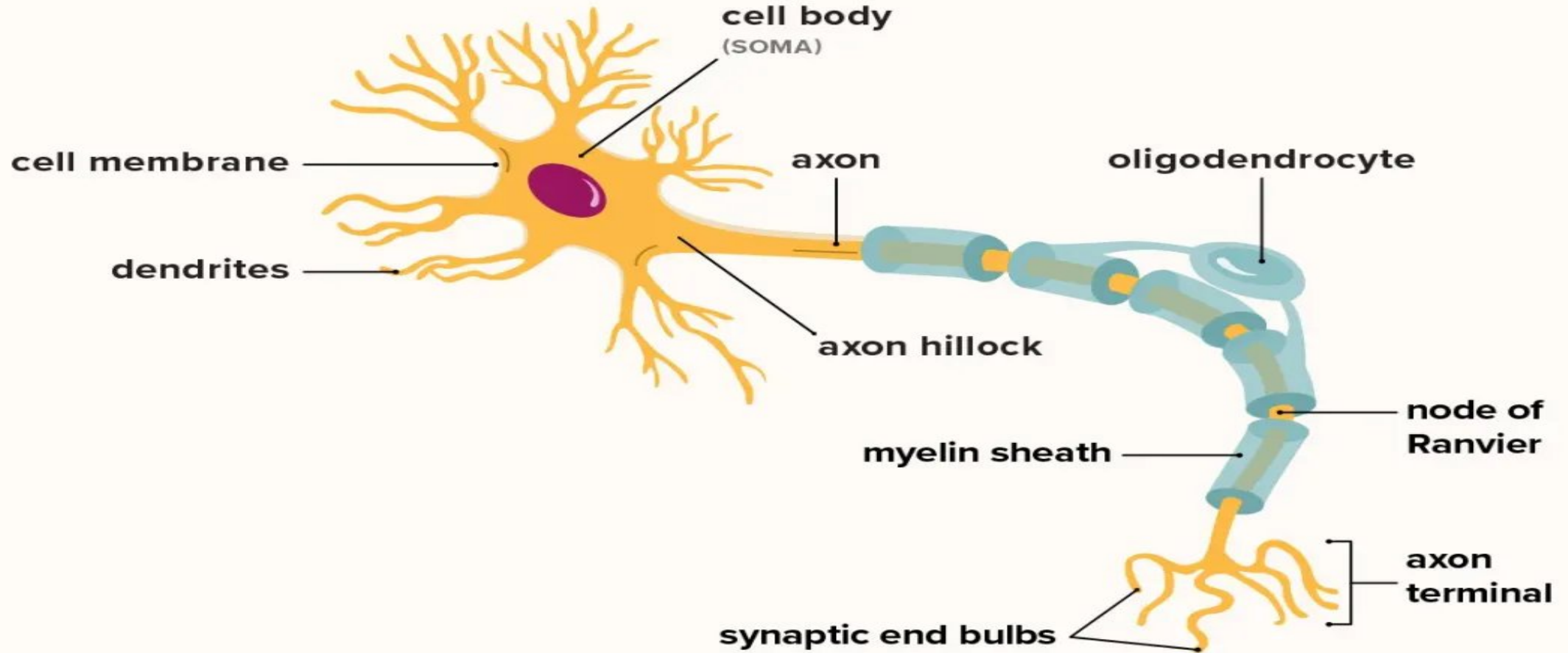




Oligodendrocytes

- **Functions**
- Form myelin sheath in CNS
- **Importance**
- Faster nerve conduction
- **Clinical Relation**
- Damaged in multiple sclerosis

Structure of a neuron

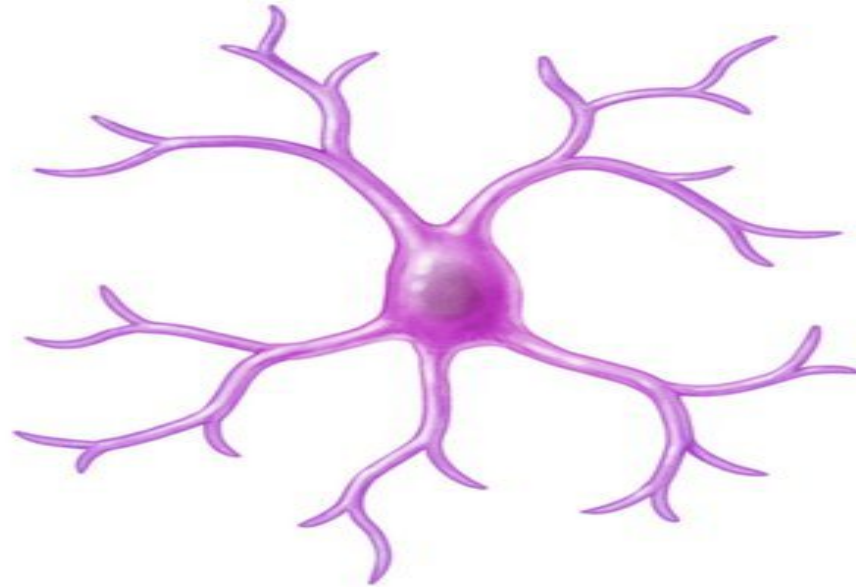


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Microglia

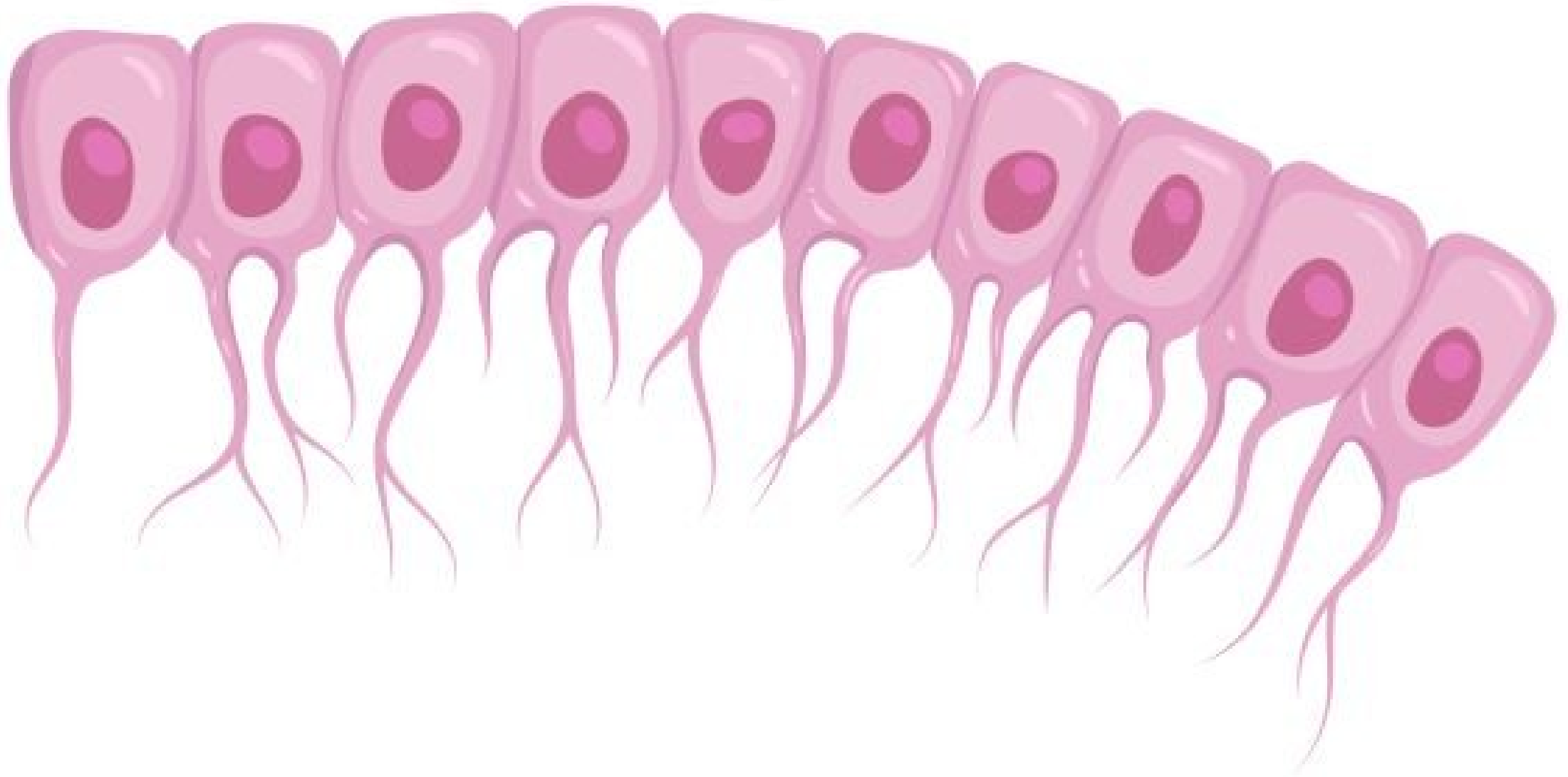
- **Functions**
- Defense cells of CNS
- Phagocytosis of debris and bacteria
- **Example**
- Security guards cleaning damaged material





Ependymal Cells

- **Functions**
- Line ventricles of brain
- Line central canal of spinal cord
- Help produce and circulate CSF
- **CSF Functions**
- Protection
- Nutrition
- Shock absorption





Schwann Cells & Satellite Cells

- **Schwann Cells**
- Form myelin in PNS
- Help regeneration of nerve fibers
- **Satellite Cells**
- Surround neuron cell bodies in ganglia
- Provide support and nutrition

Types of Neuroglia

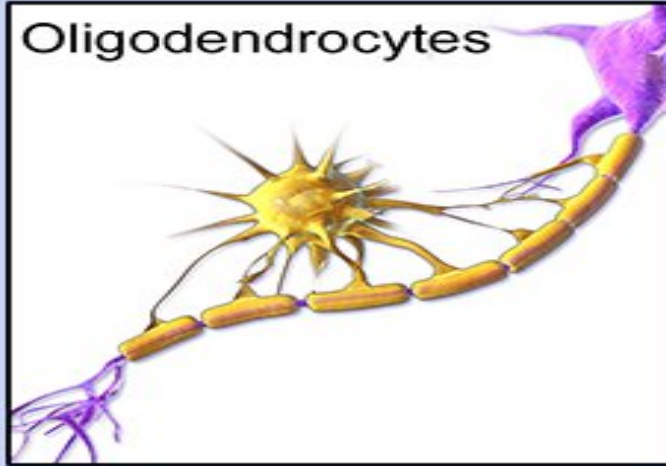


Central Nervous System

Ependymal cells



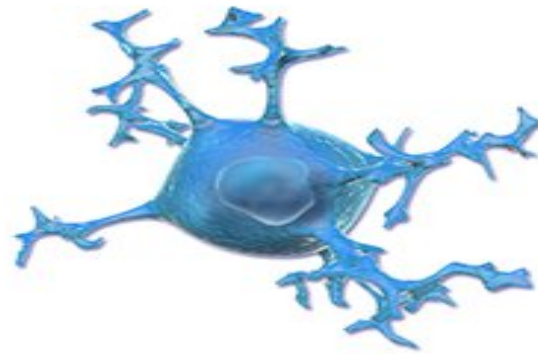
Oligodendrocytes



Astrocytes

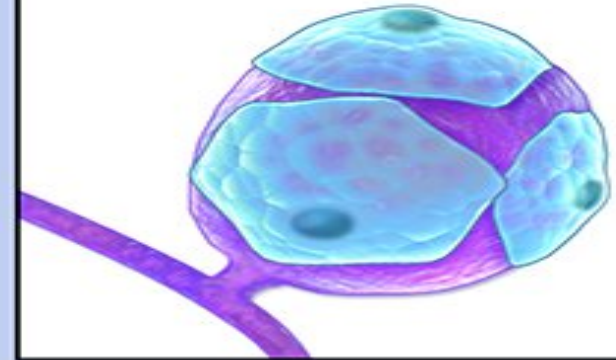


Microglia



Peripheral Nervous System

Satellite cells



Schwann cells





CONCLUSION OF THE LECTURE

- Nervous tissue controls communication
- Neurons are functional cells
- Neuroglia support neurons
- Myelin increases conduction speed
- CNS and PNS coordinate body activities



**ANY
QUESTIONS**





THANK YOU