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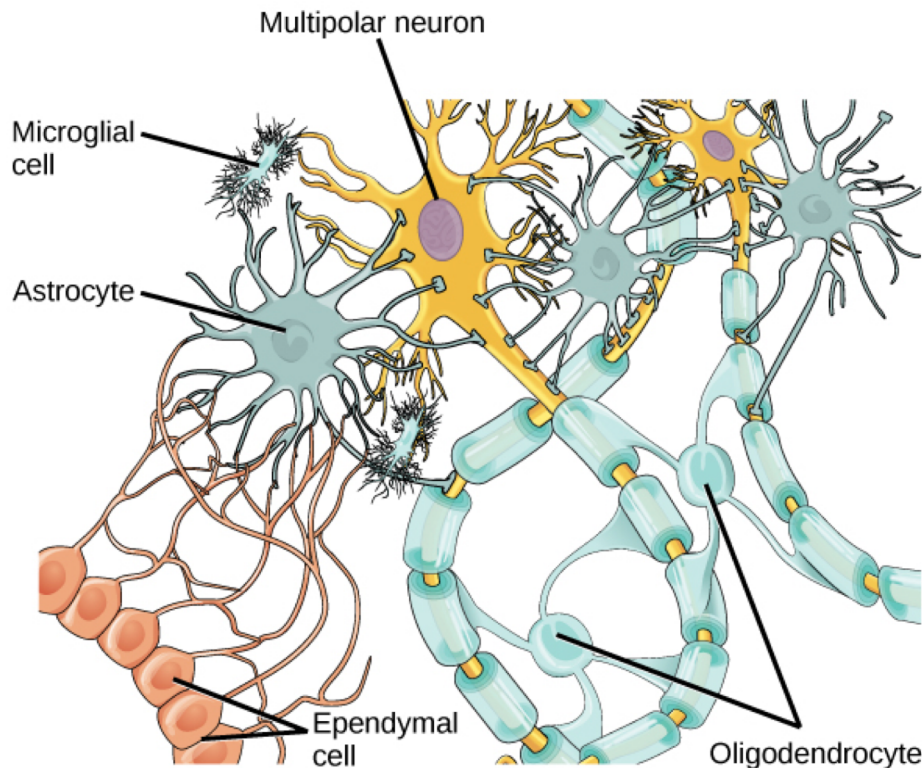
INNSBRUCK

# Glial Cells

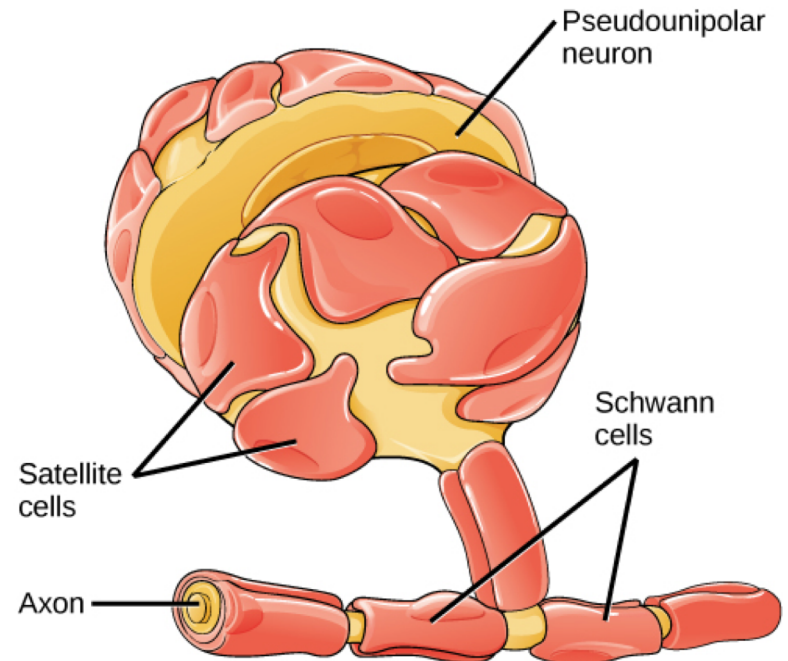
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# Glial Cells

- supporting and protecting cells that occur in the CNS and PNS
- they are non excitable
- in the human brain they are 5 – 10 times more numerous than neurons
- exert vital functions



(a) Central nervous system



(b) Peripheral nervous system

# Ependymal Cells (CNS)

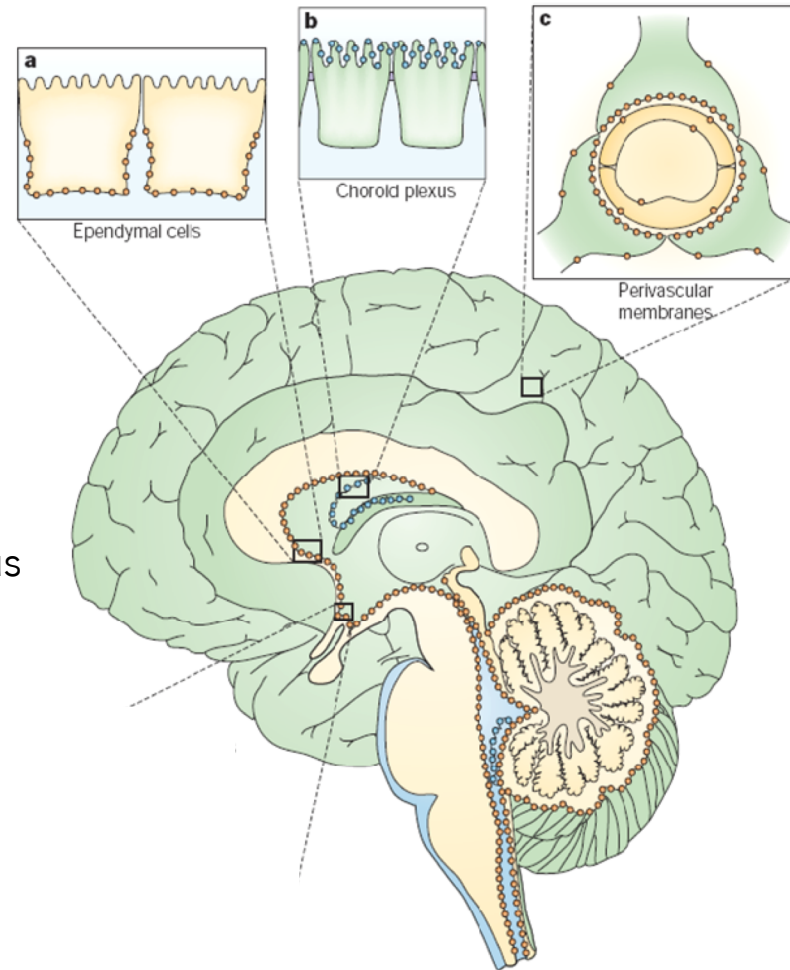
## Ependymocytes

line the central cavities of the brain and spinal column  
have microvilli and may be ciliated  
cilia facilitate the flow of the cerebrospinal fluid (CSF)

## Choroidal epithelial cells

modified ependymal cells present in the choroid plexus  
(production and secretion of CSF)

highly ciliated, form tight junctions that prevent CSF  
from spreading to the adjacent tissue

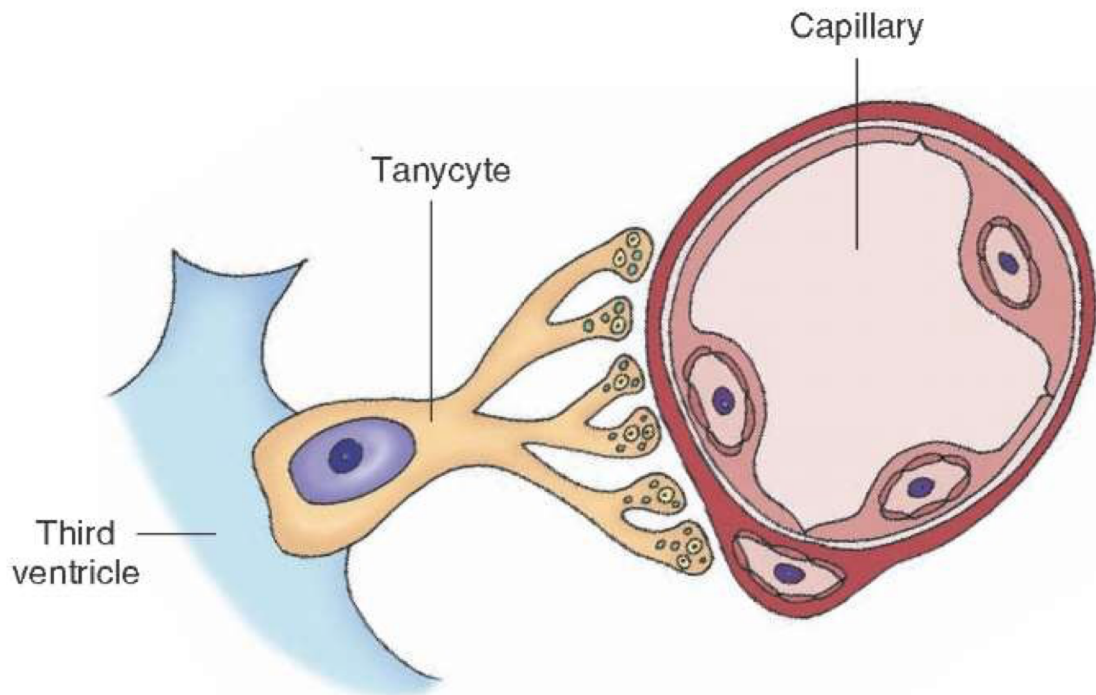


# Ependymal Cells (CNS)

## Tanycytes

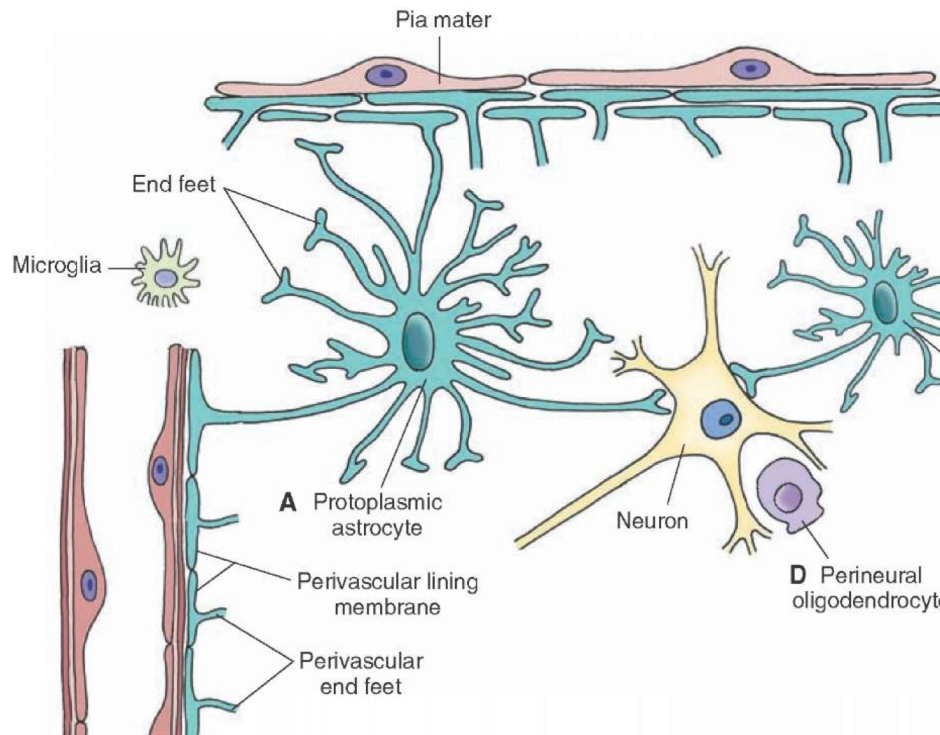
neurons  
from hypothalamic

found in the floor of the third ventricle  
processes extend to blood vessels and  
may transport hormones from CSF to capillaries &  
neurons to the CSF





# Astrocytes (CNS)



## Protoplasmic Astrocytes

are in the grey matter

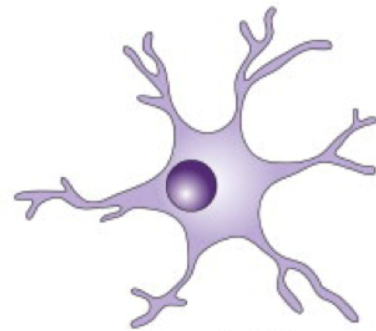
form end-feet on nerve cells, brain capillaries and pia mater

cellular basis of the Blood Brain Barrier

transfer nutrients from the blood vessels to the neurons

may have a role to play in regulating local blood flow within the brain

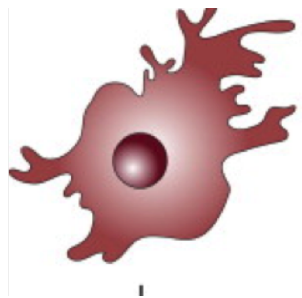
# Microglia (CNS)



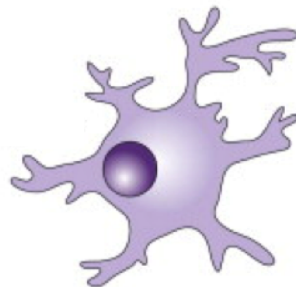
scattered throughout  
the brain

Resident microglia

Brain damage

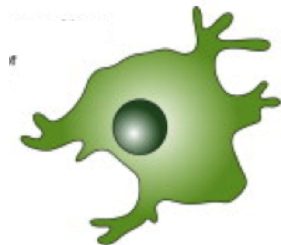


ROS



activated, migratory

Anti-inflammatory cytokines

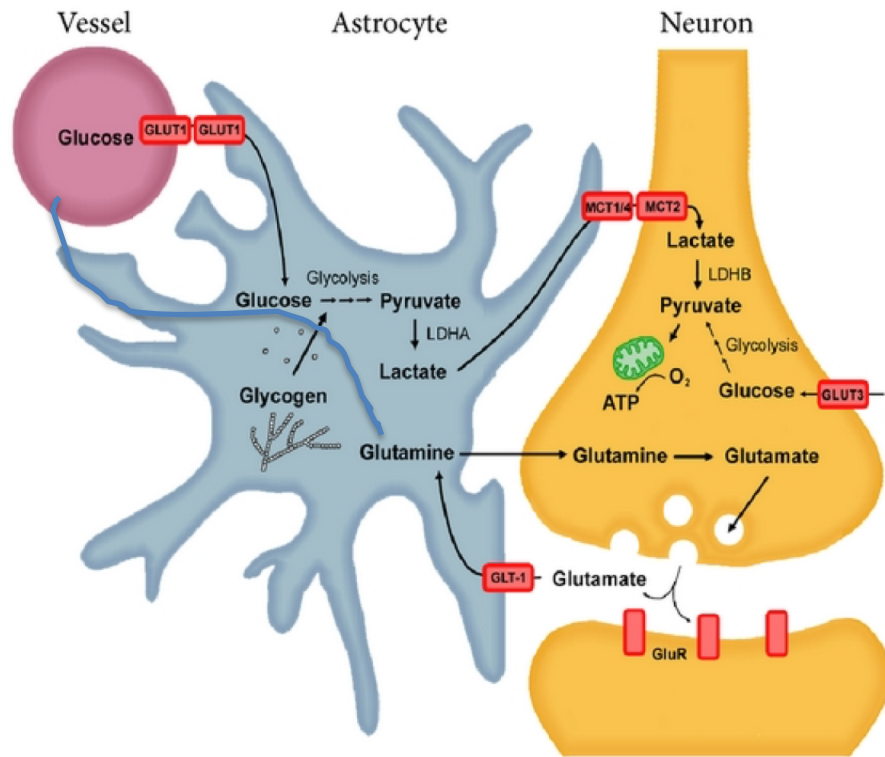


phagocytotic

Release of neuroprotective  
factors

Inflammatory cytokines

# Astrocytes in the metabolism of neurotransmitters



Astrocytes produce Lactate which can be taken up by presynaptic terminals to synthesize Glucose

Neuron terminals synthesise glutamate from glutamine. After release, glutamate needs to be removed from the synapse quickly because accumulation of extracellular glutamate is associated with neuronal toxicity.

Astrocytes play a role in recycling glutamate, by converting it to glutamine, which can be re-used by nerve endings.

Excess glutamine is transported away from the brain in the blood stream.

A similar process occurs for GABA, a major inhibitory neurotransmitter within the CNS. Following its release into the synaptic cleft it is taken up by astrocytes and converted into glutamine which is reused

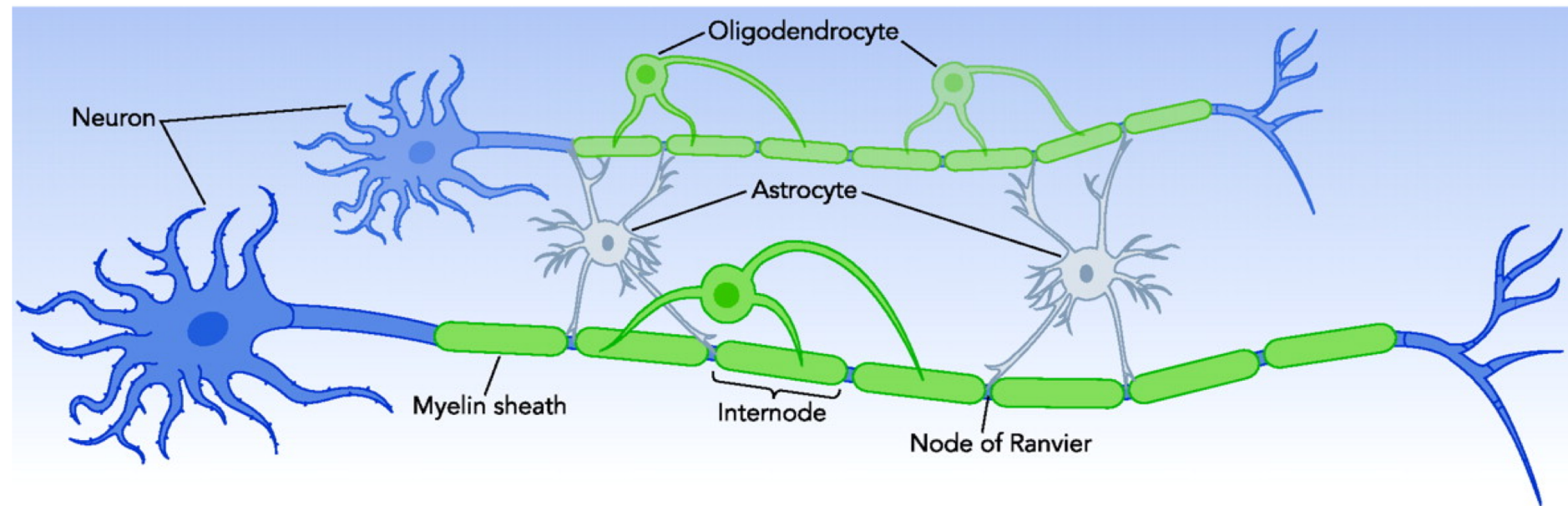
# Astrocytes (CNS)

## Fibrous astrocytes

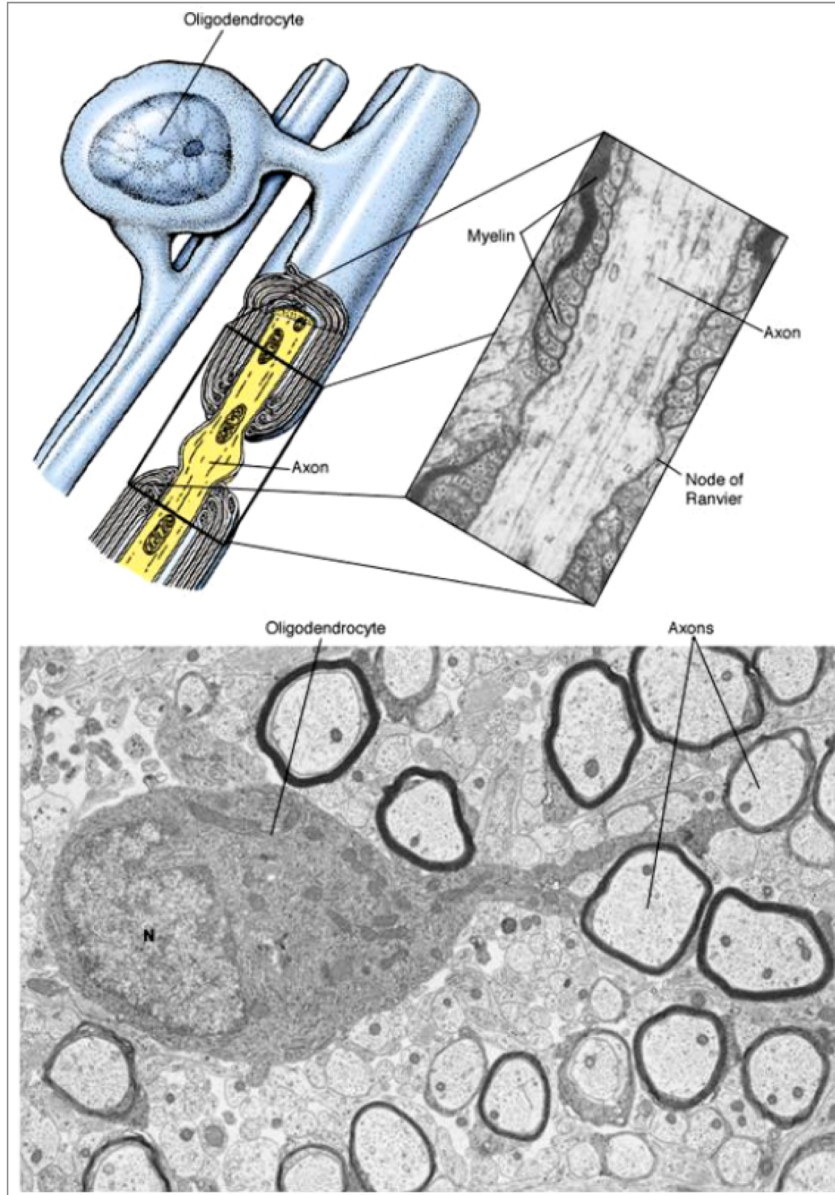
Primarily in white matter between nerve fibers, form contacts at nodes of Ranvier

Have a few thin and long processes, barely branched

Can proliferate upon damage and form glial scar around damaged area

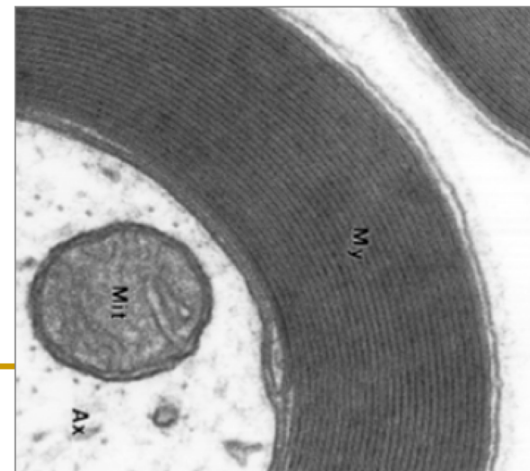


# Oligodendrocytes (CNS)



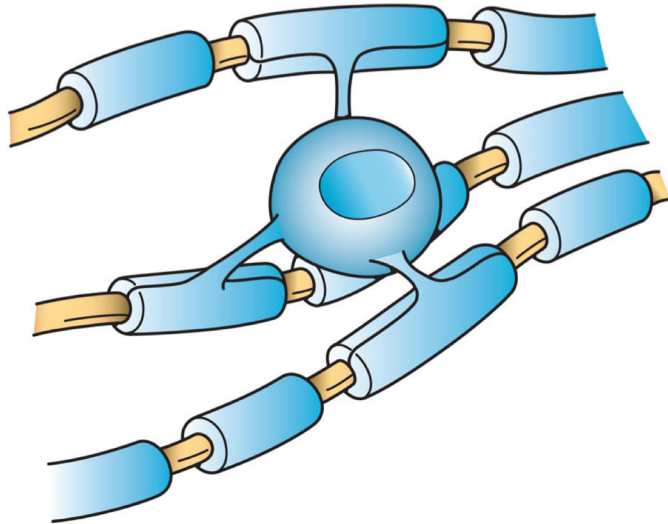
## Myelin

- **Glial cell wraps around axon many times**
  - very thin layers of membrane
  - very little cytoplasm
- **Very compact, so saves space for lots of neurons**
- **Greatly enhances the conduction of the electrical signal**



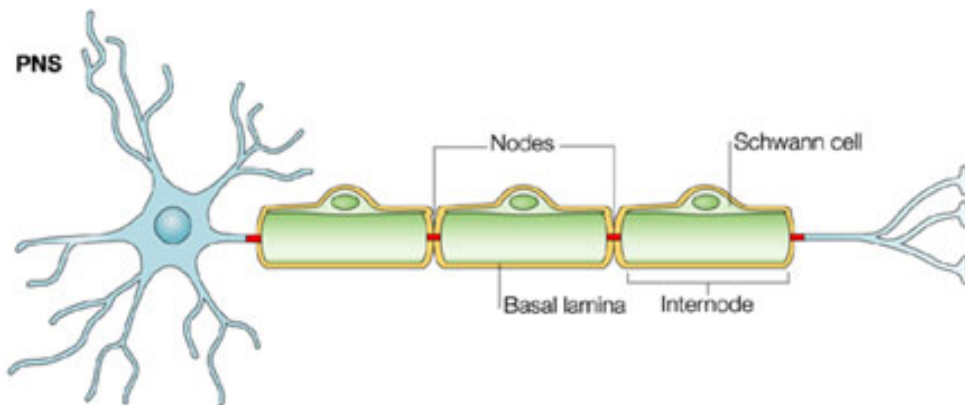


# Schwann cells (PNS)



## Oligodendrocytes in CNS

One can myelinate different axons and several internodes per axon



## Schwann cells in PNS

Myelinate a single internode in a single axon



# Summary

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Name	Location	Function
Astrocyte	Brain & Spinal Cord	anchors neurons to capillaries forms the BBB aids in synaptic activity
Ependymal cells	Line cavities in brain & spinal cord	help to form and circulate CSF
Microglia	Brain & Spinal Cord	phagocytize invading microorganisms and dead nerve tissue
Oligodendrocytes	Brain & Spinal Cord	forms myelin sheeth and insulates
Schwann cells (PNS)		forms myelin sheeth around thick fibers assists axonal regeneration