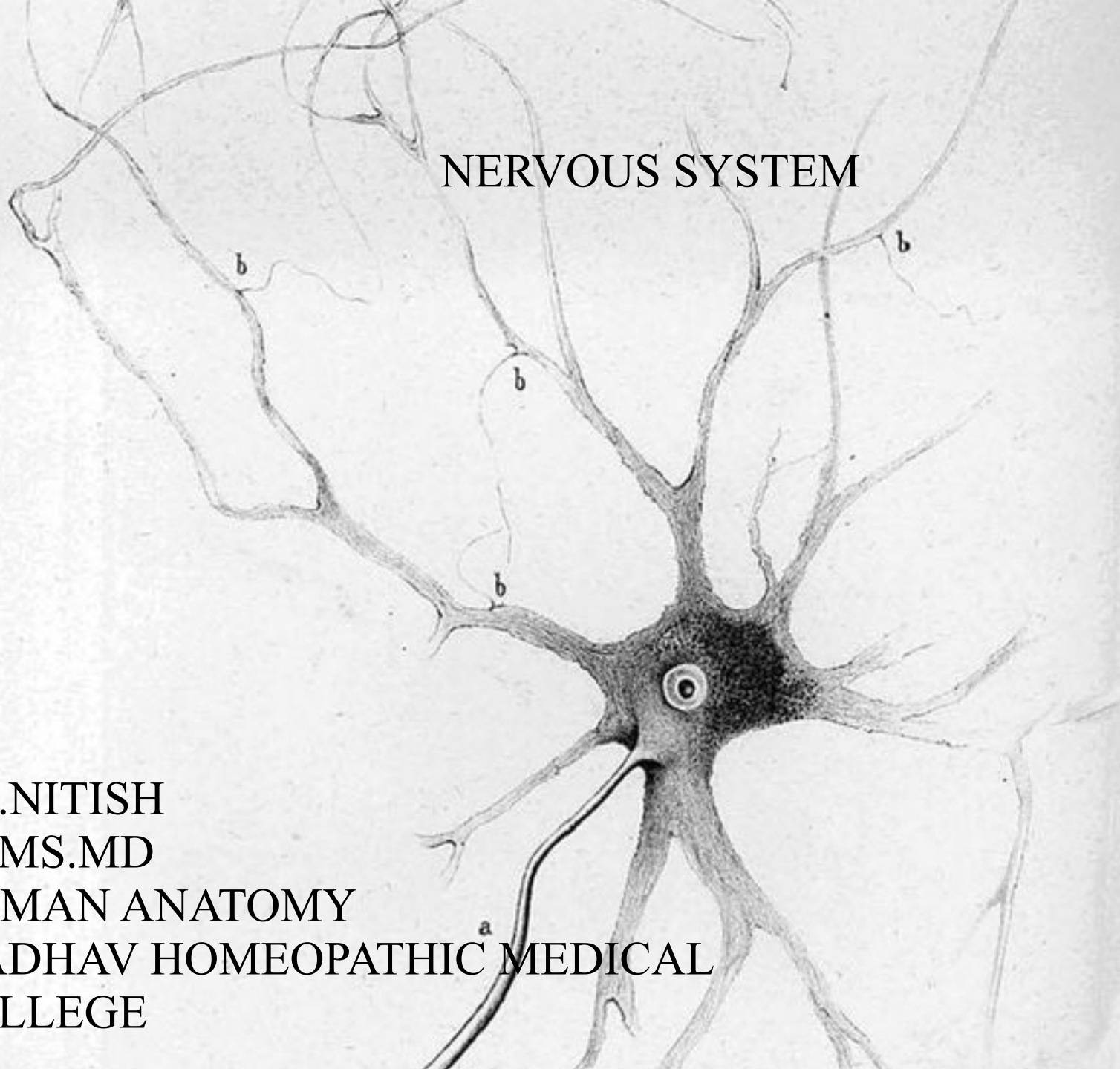
NERVOUS SYSTEM



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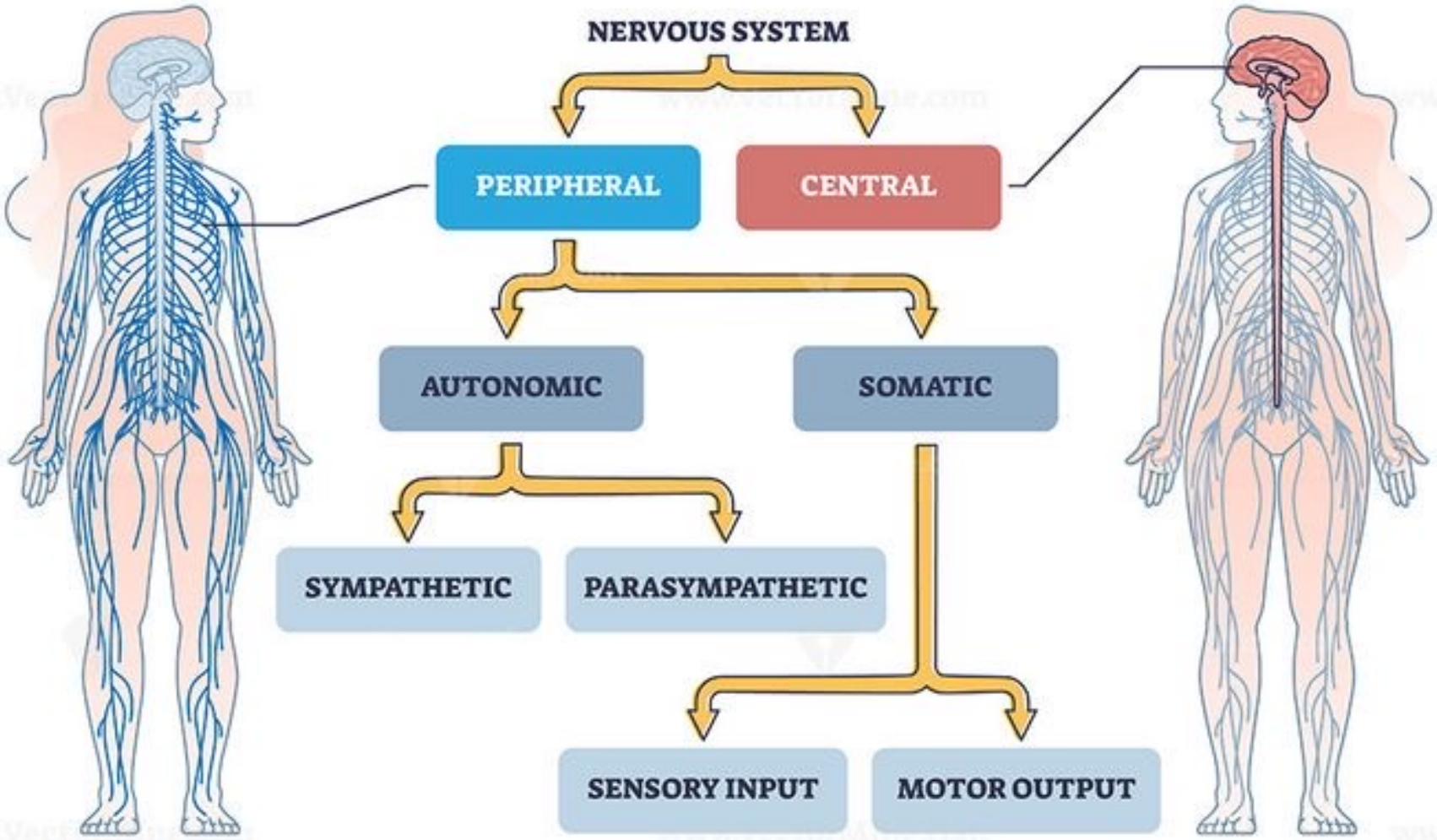
Introduction

- Nervous system is the chief controlling and co-ordinating system of the body.
- It is responsible for judgement, intelligence and memory.

Average weight of adult brain = 1500gm
Since brain floats in cerebrospinal fluid ,it
Only weighs 50 gm

DIVISIONS OF THE NERVOUS SYSTEM



- **Central Nervous System-** Which comprises brain and spinal cord.It is responsible for integrating, coordinating the sensory information and ordering appropriate motor actions.
- **Peripheral Nervous System**
  Cranial Nerve = 12 pair
  Spinal Nerve= 31 pair
  These provide afferent impulse to CNS and carries efferent impulses to muscles, gland and blood vessels.

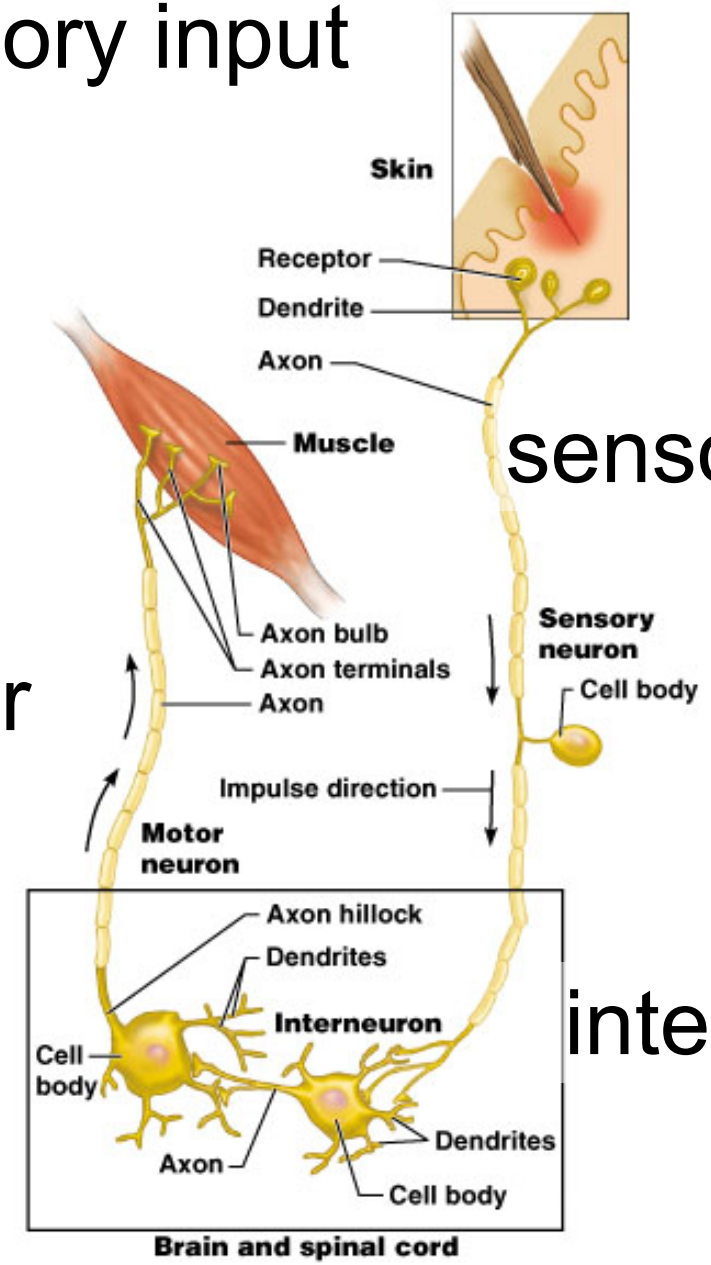
sensory input

motor input

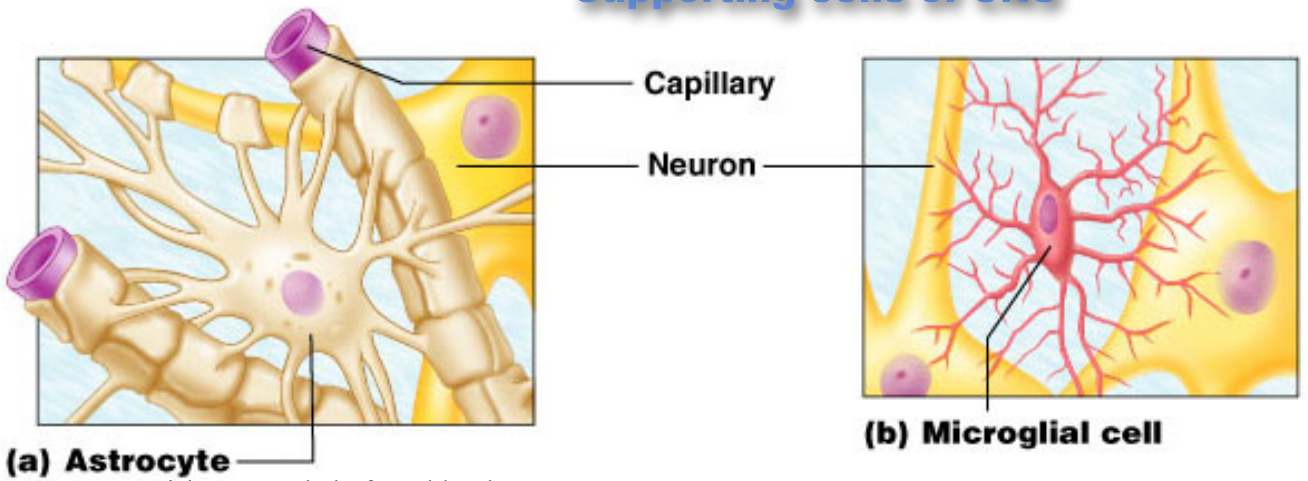
effector

sensory receptor

integration

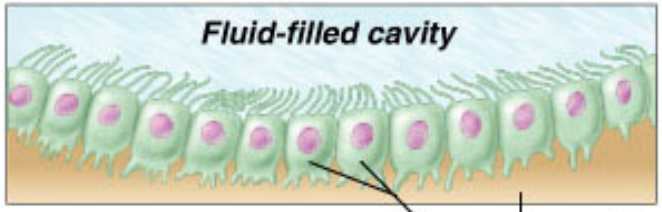


Neuroglia Cells
Supporting cells of CNS



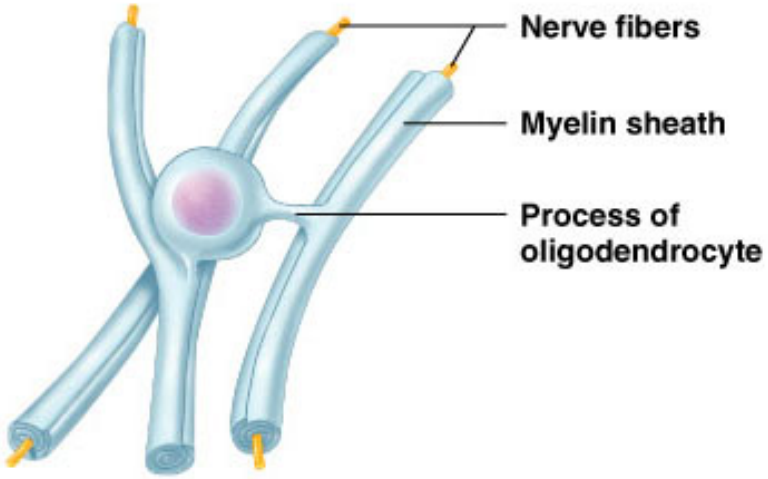
Perform phagocytosis, engulfing Microorganism and cellular debris

Nourish neuron, help form blood Brain barrier and provide structural Support

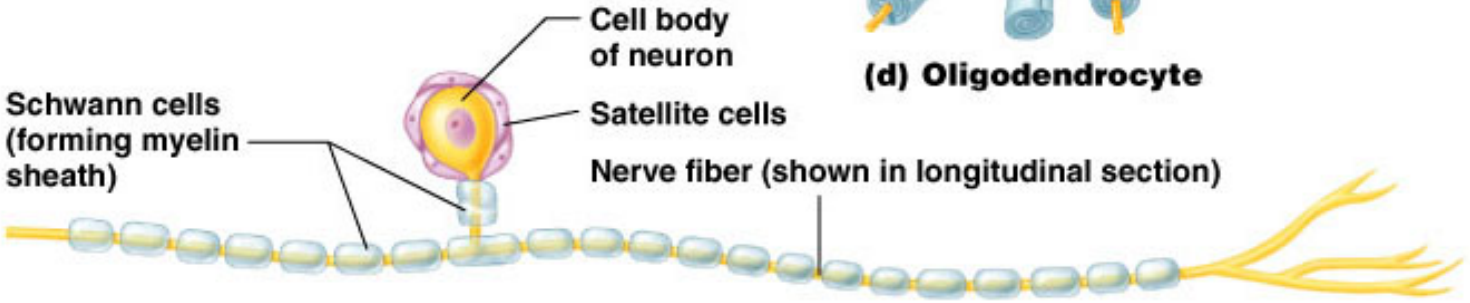


(c) Ependymal cells

Brain or spinal cord tissue

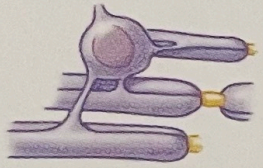
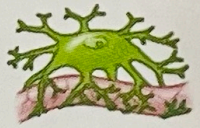
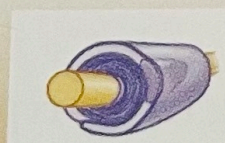


(d) Oligodendrocyte

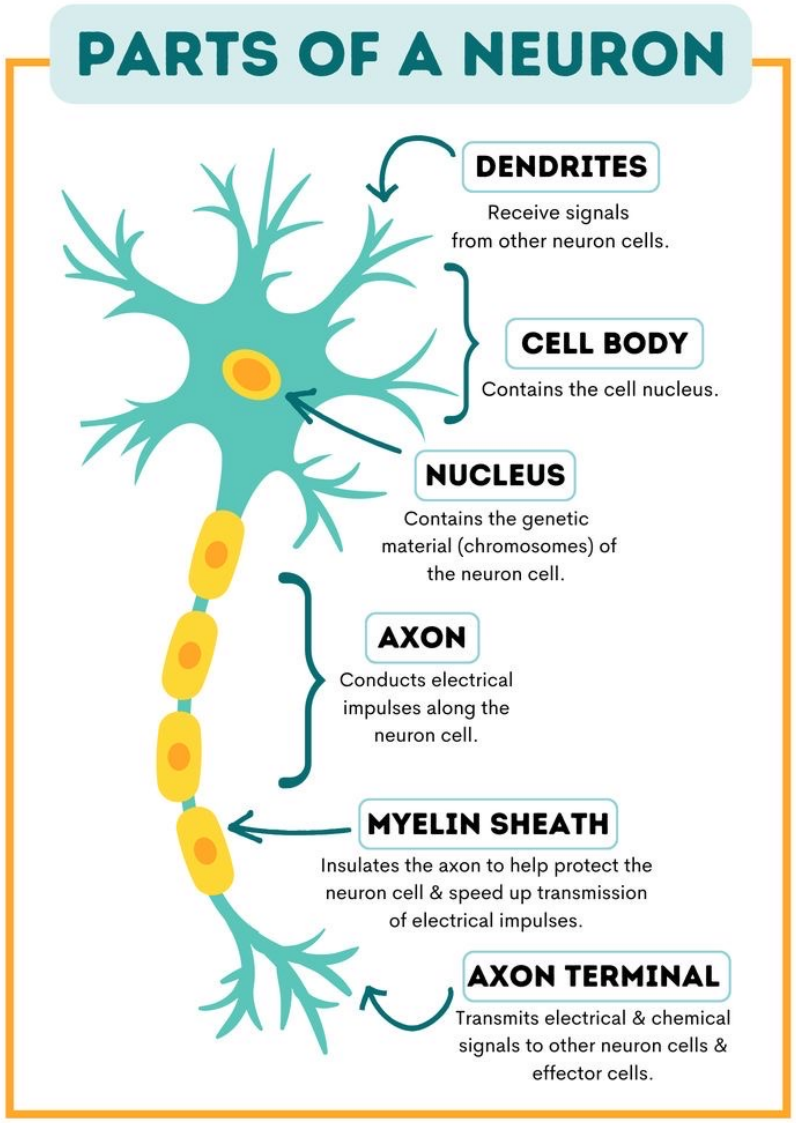


(e) Sensory neuron with Schwann cells and satellite cells

Types of Glial Cells

Cell Type	Function
Neuroglia of CNS	
Oligodendrocytes 	Form myelin sheath in the brain and spinal cord; speed signal conduction
Ependymal cells 	Line spinal cord and cavities of the brain; secrete cerebrospinal fluid
Microglia 	Perform phagocytosis, engulfing microorganisms and cellular debris
Astrocytes 	Extend through brain tissue; nourish neurons; help form blood-brain barrier; attach neurons to blood vessels; provide structural support
Neuroglia of PNS	
Schwann cells 	Form myelin sheath around nerves in PNS; form neurilemma

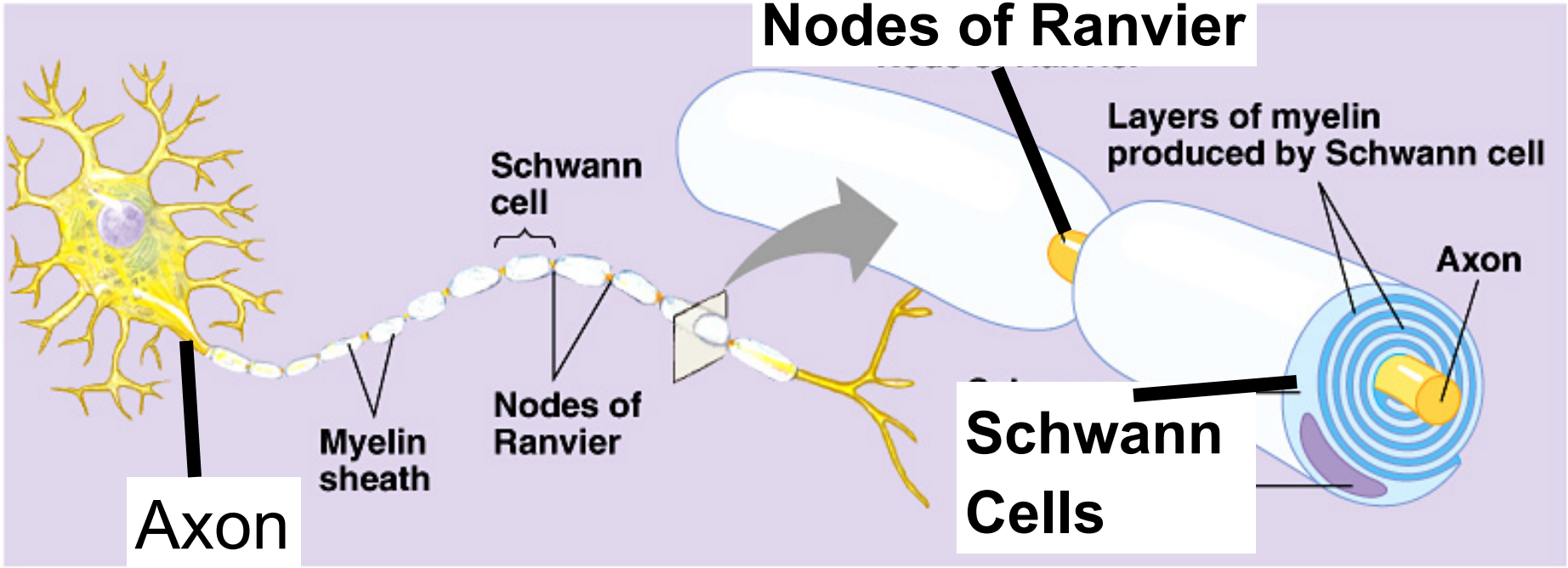
Typical Neuron



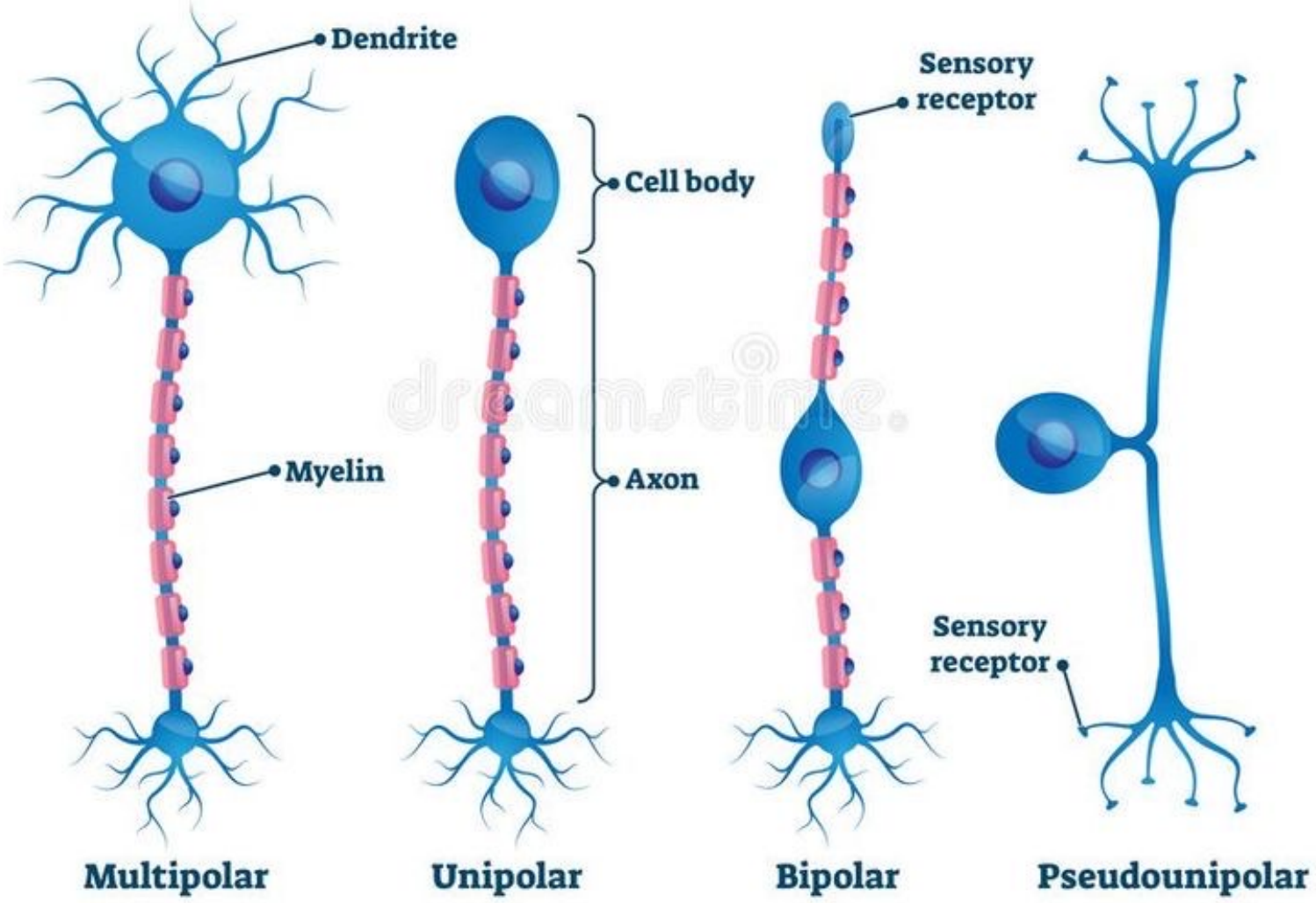
Cell body collectively they form grey matter and the nuclei in the CNS and Ganglia in the PNS

Myelin Sheath

& Shwann Cell

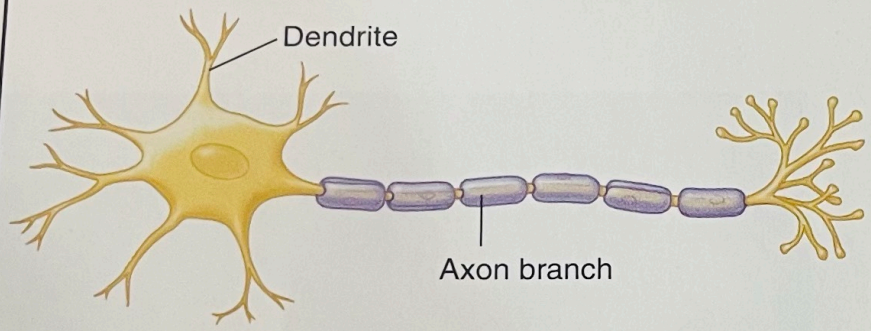


TYPES OF NEURONS



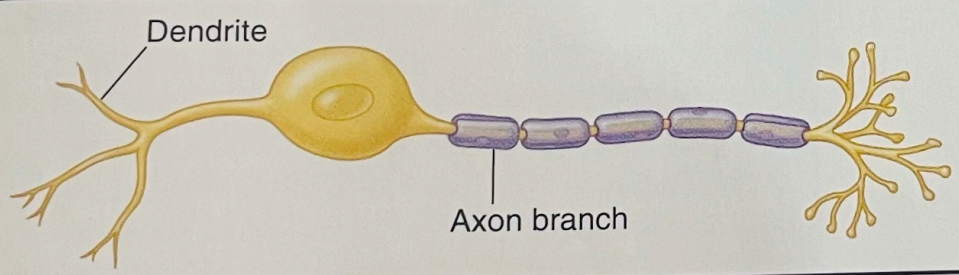
Types of Neurons

Neurons vary greatly in both size and shape. They also vary according to the type, number, and length of projections.



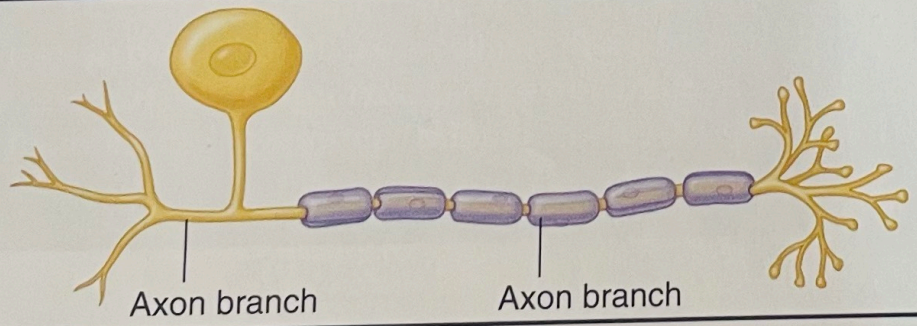
Multipolar neurons

Multipolar neurons have one axon and multiple dendrites. This is the most common type of neuron and includes most neurons of the brain and spinal cord.



Bipolar neurons

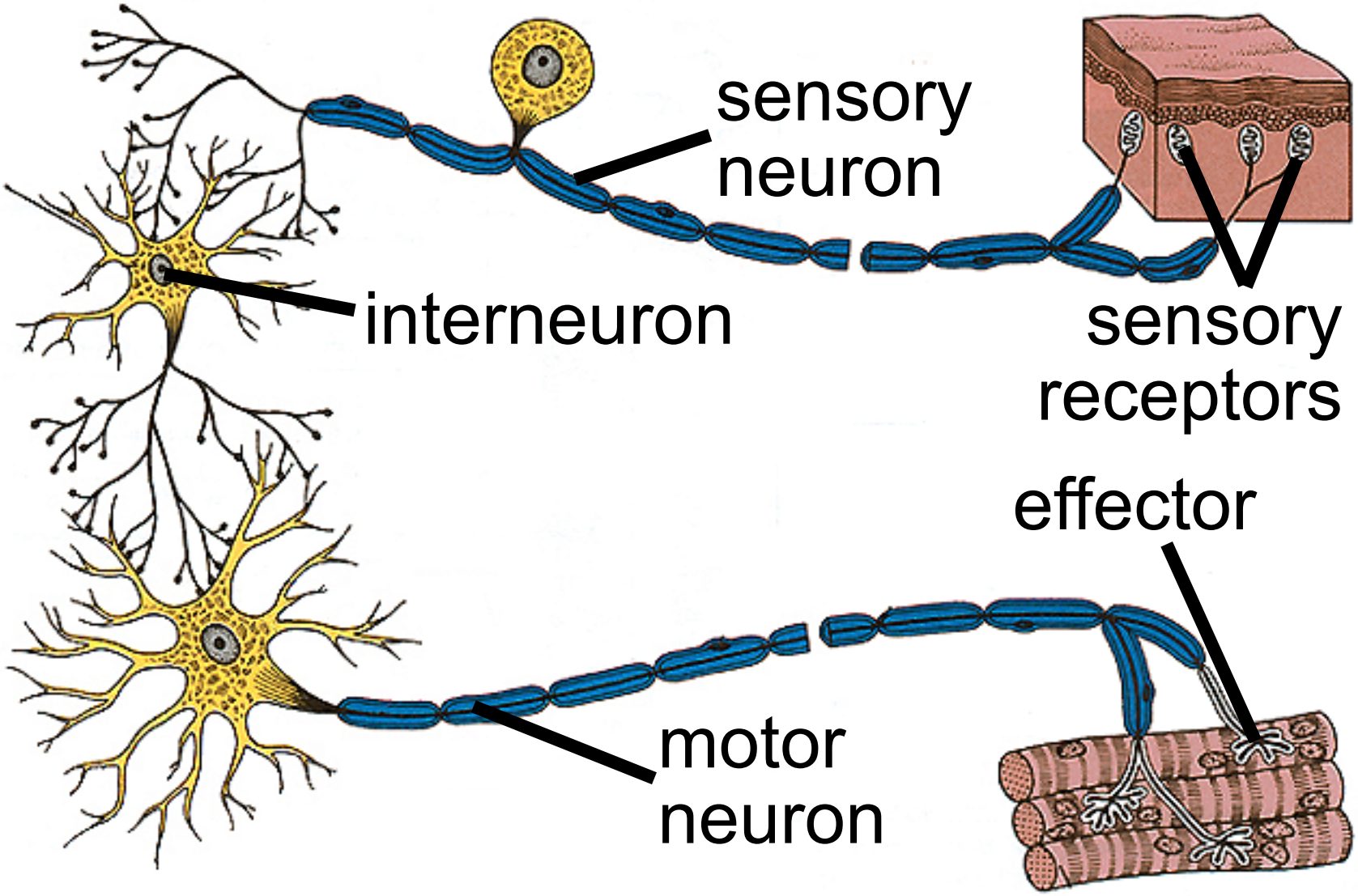
Bipolar neurons have two processes: an axon and a dendrite with the cell body in between the two processes. These neurons can be found in the retina of the eye and olfactory nerve in the nose.



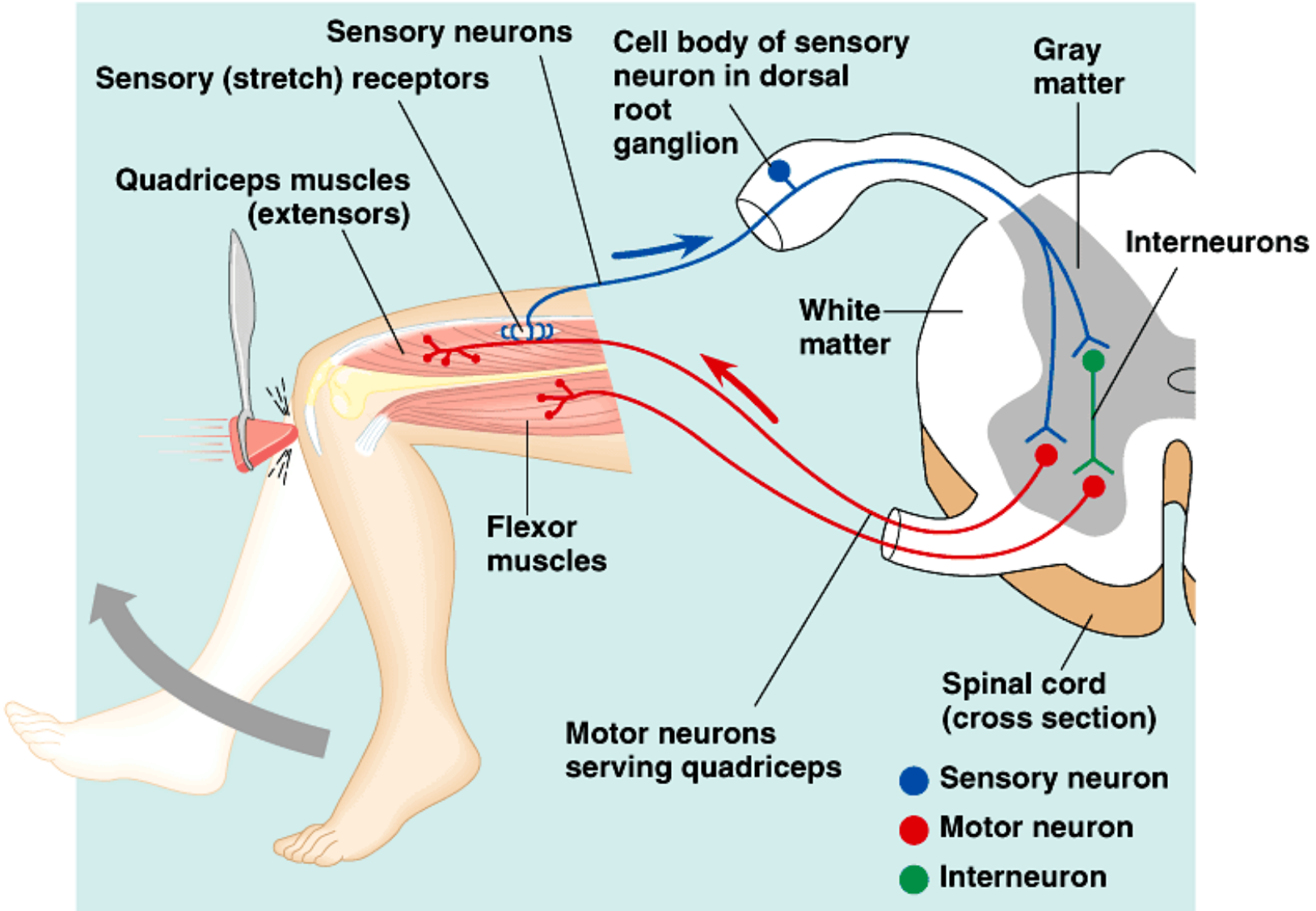
Unipolar neurons

Unipolar neurons have one process—an axon—that extends from the cell body before branching in a T shape. These neurons mostly reside in the sensory nerves of the peripheral nervous system.

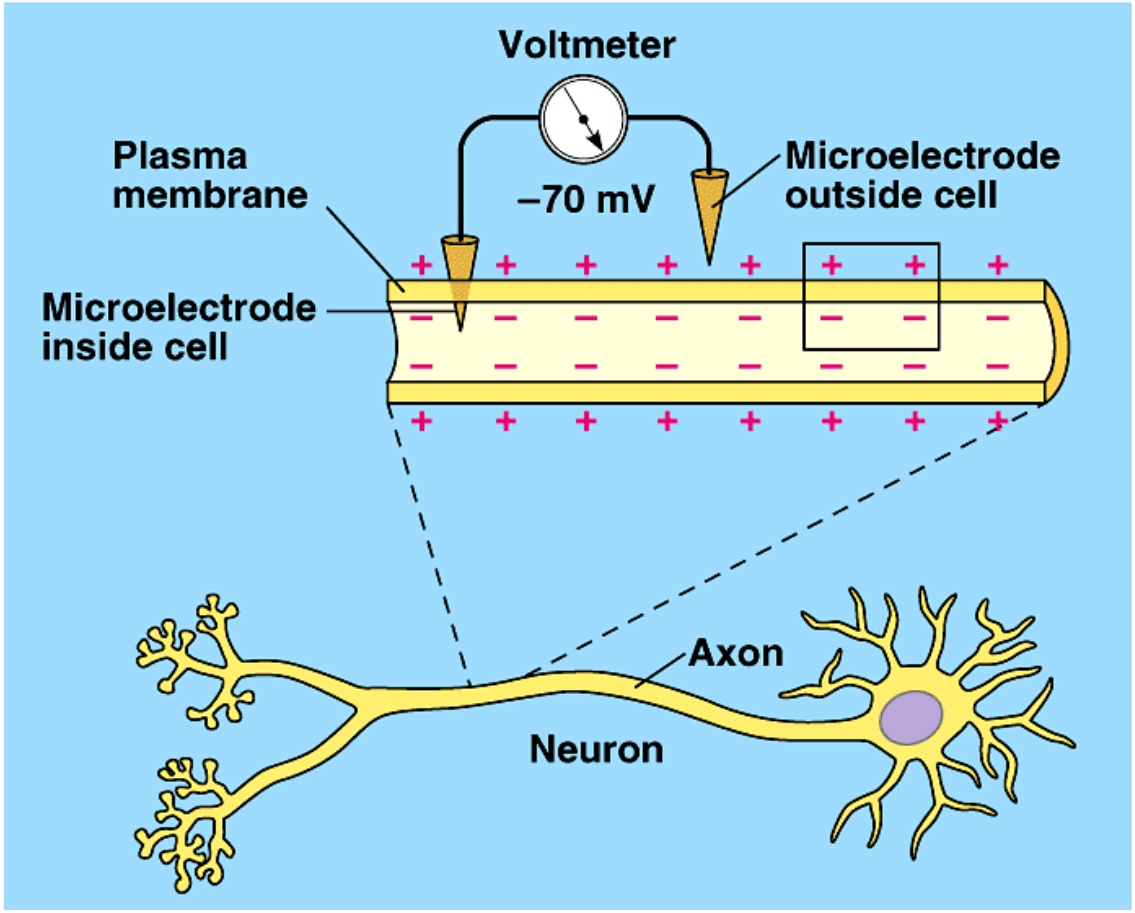
Neuron Interaction & Integration



- A Simple Nerve Circuit – the Reflex Arc.
  - A **reflex** is an autonomic response.

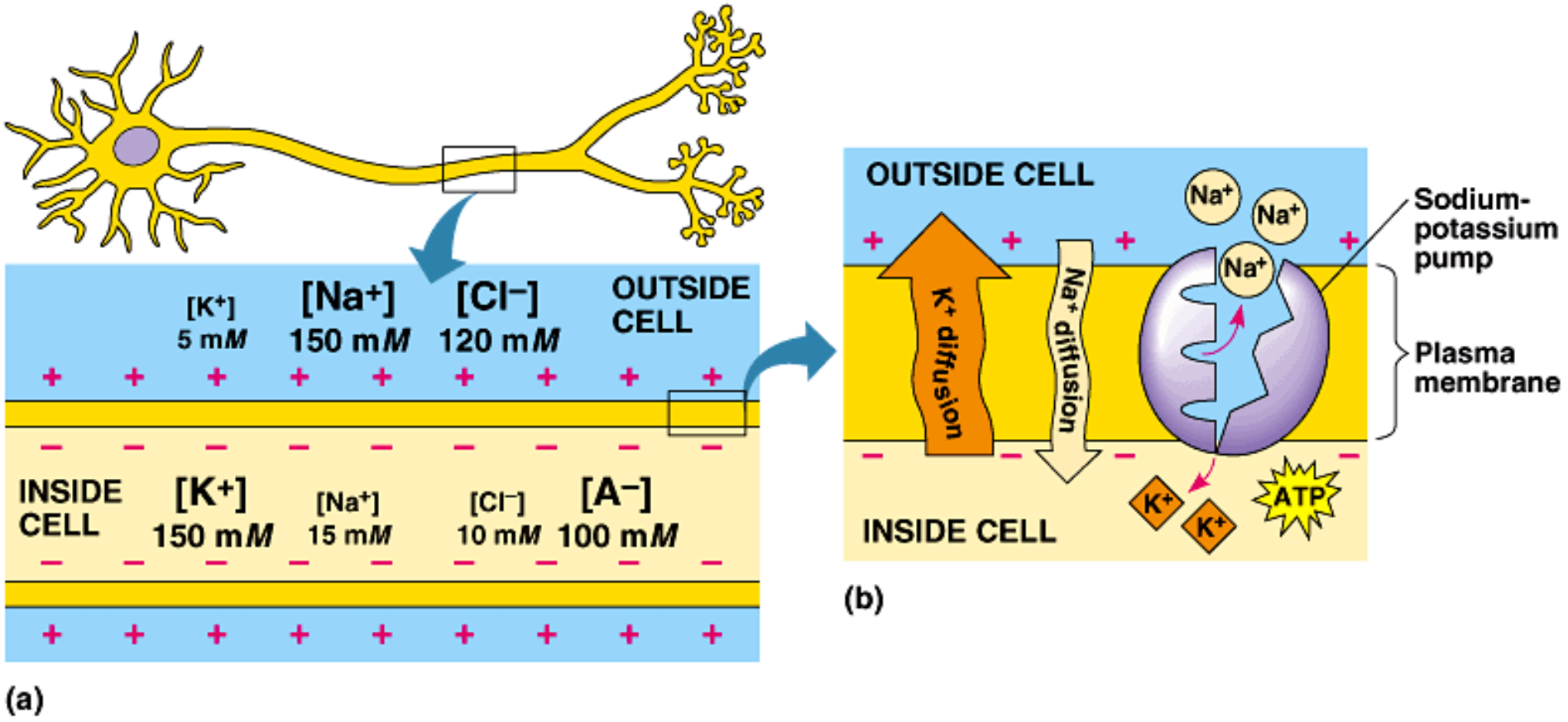


- Measuring Membrane Potentials.

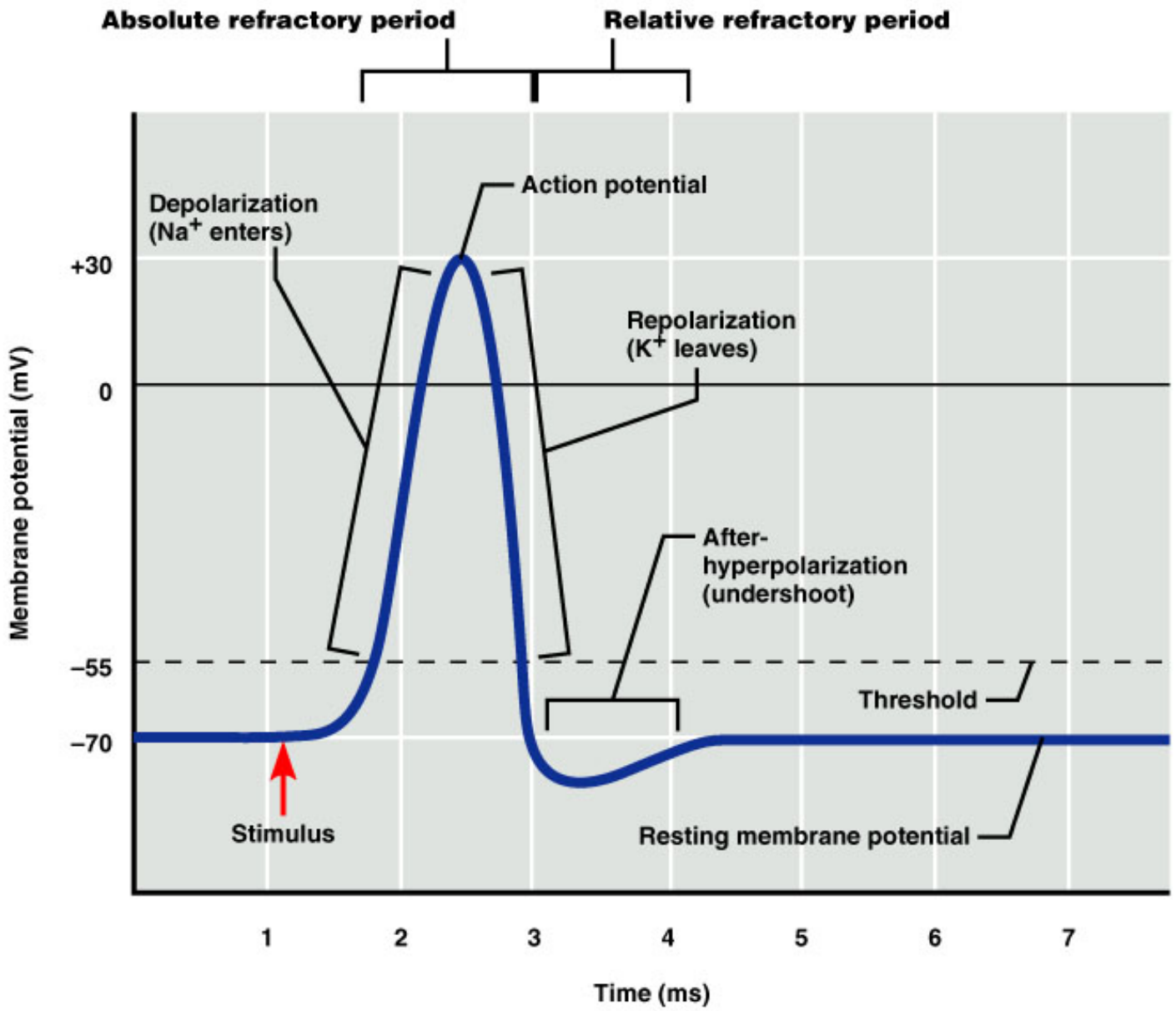


  - An unstimulated cell usually have a **resting potential** of -70mV.

- **Ungated ion channels** allow ions to diffuse across the plasma membrane.
  - These channels are always open.



Refractory Period



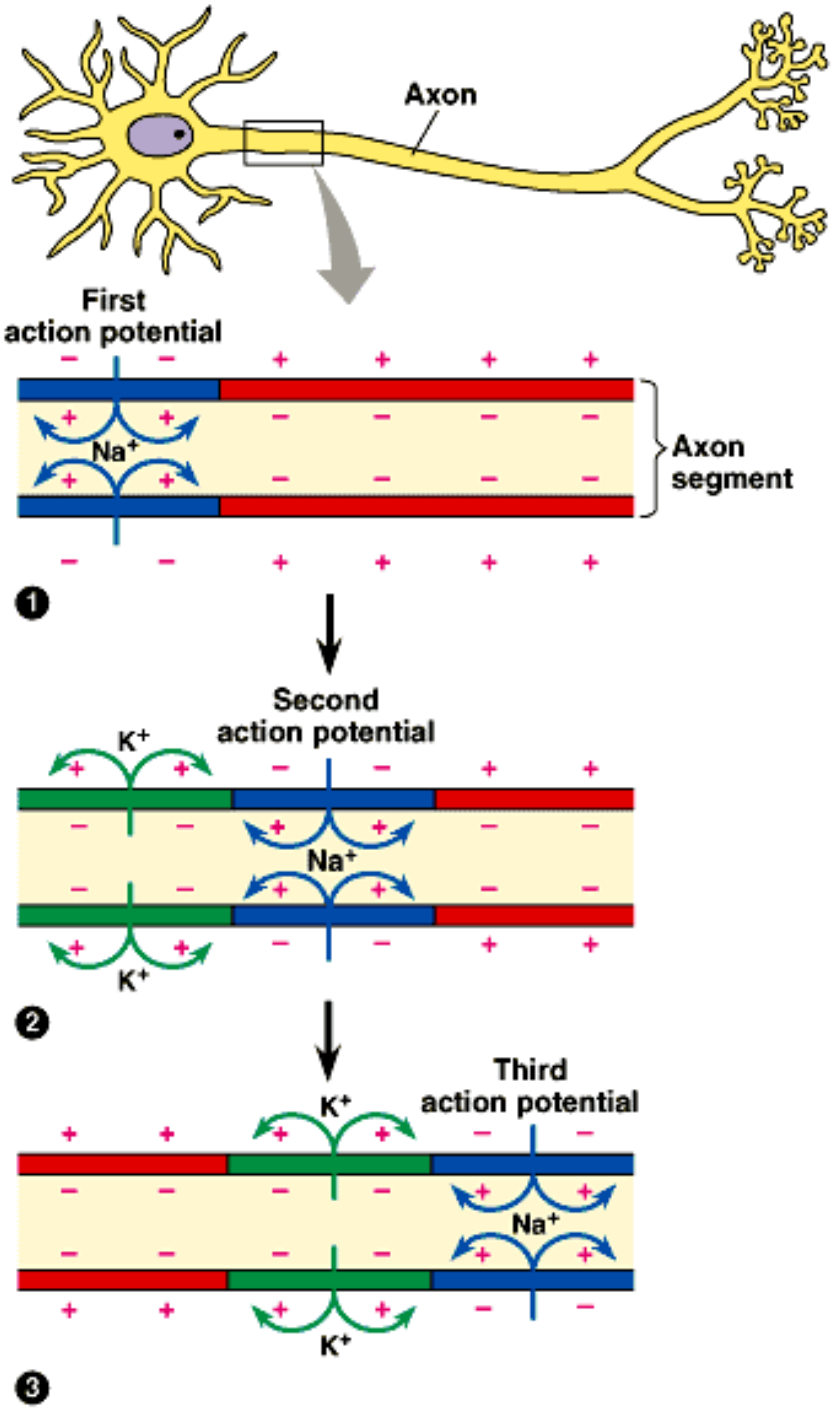
Nerve impulses propagate themselves along an axon

- The action potential is repeatedly regenerated along the length of the axon.
  - An action potential achieved at one region of the membrane is sufficient to depolarize a neighboring region above threshold.
    - Thus triggering a new action potential.
    - The refractory period assures that impulse conduction is unidirectional.

Depolarization

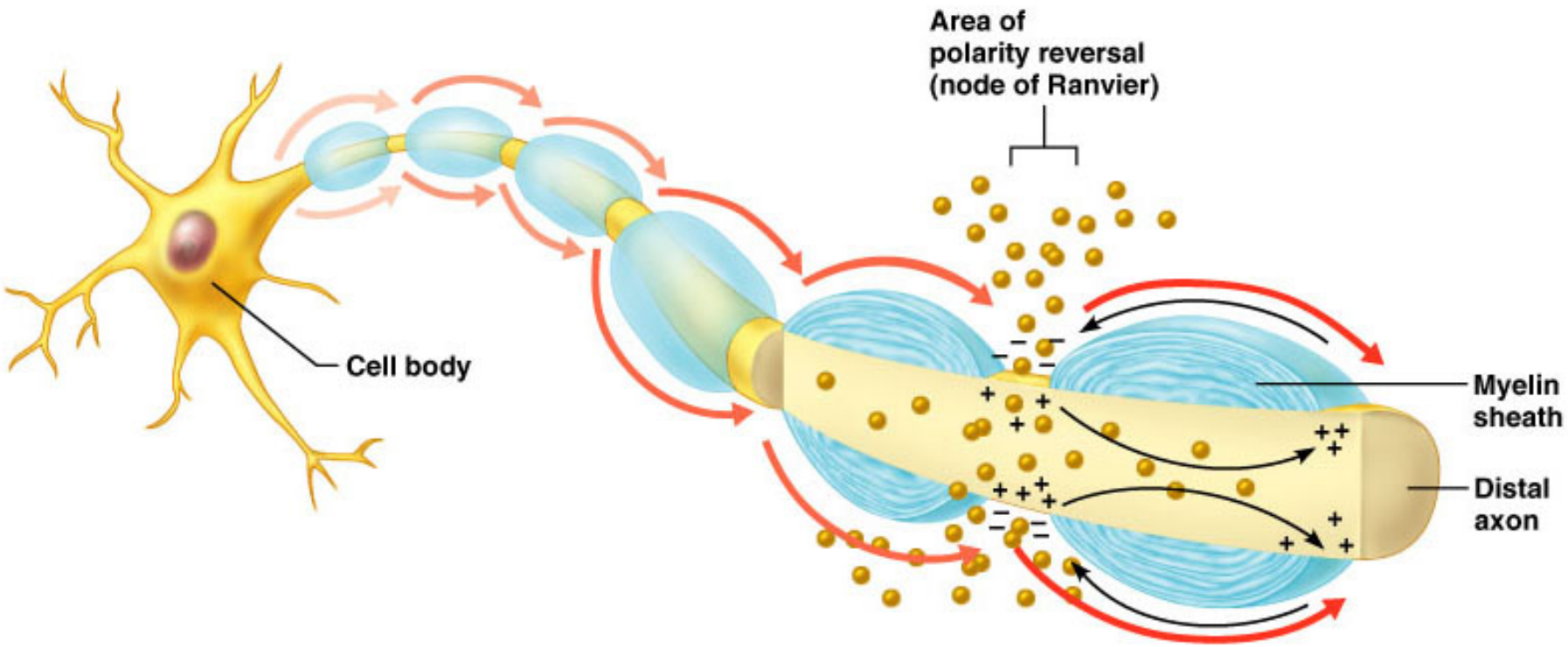
Action potential

Repolarisation

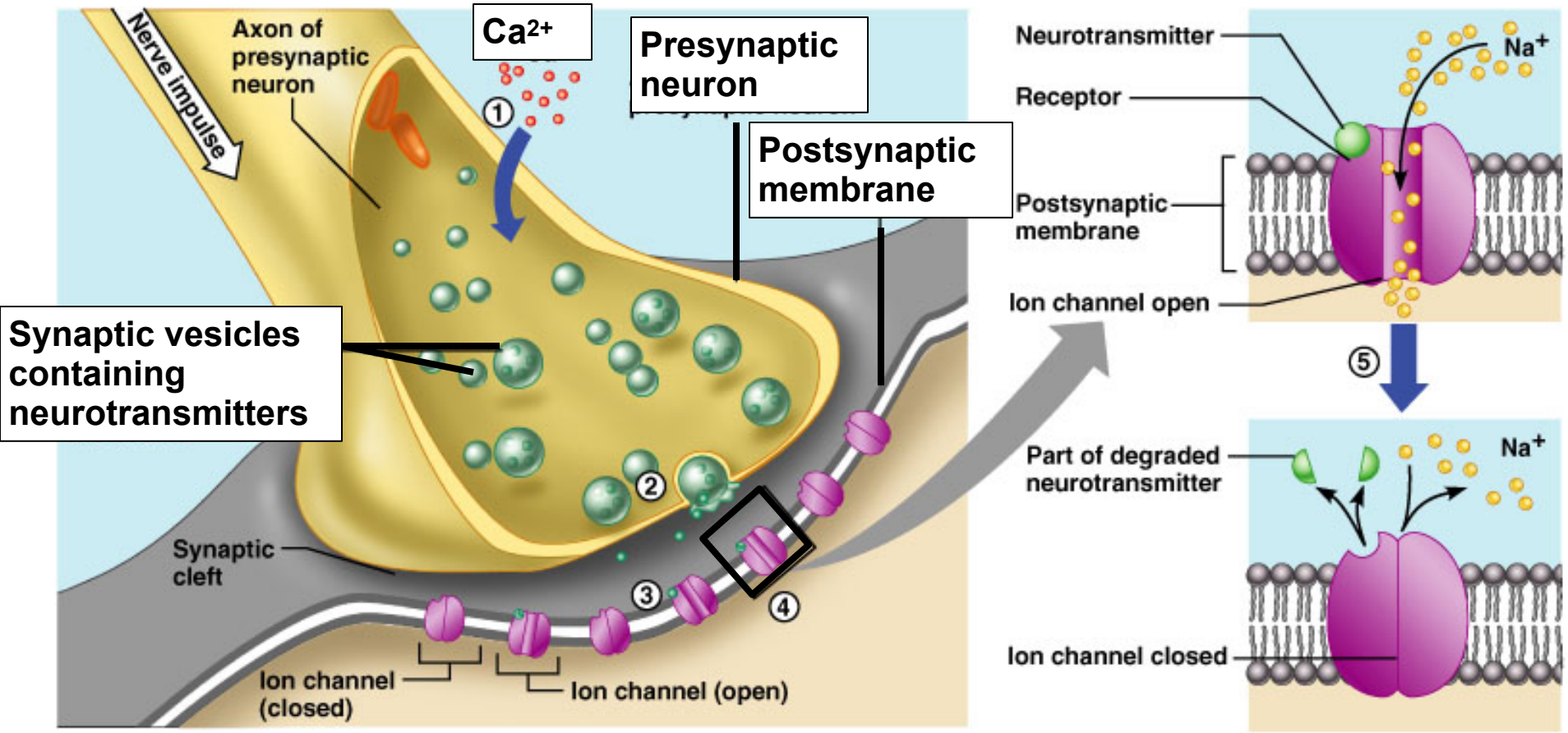


Saltatory Conduction

- **Saltatory conduction.**
  - In myelinated neurons only unmyelinated regions of the axon depolarize.
    - Thus, the impulse moves faster than in unmyelinated neurons.



Synapses

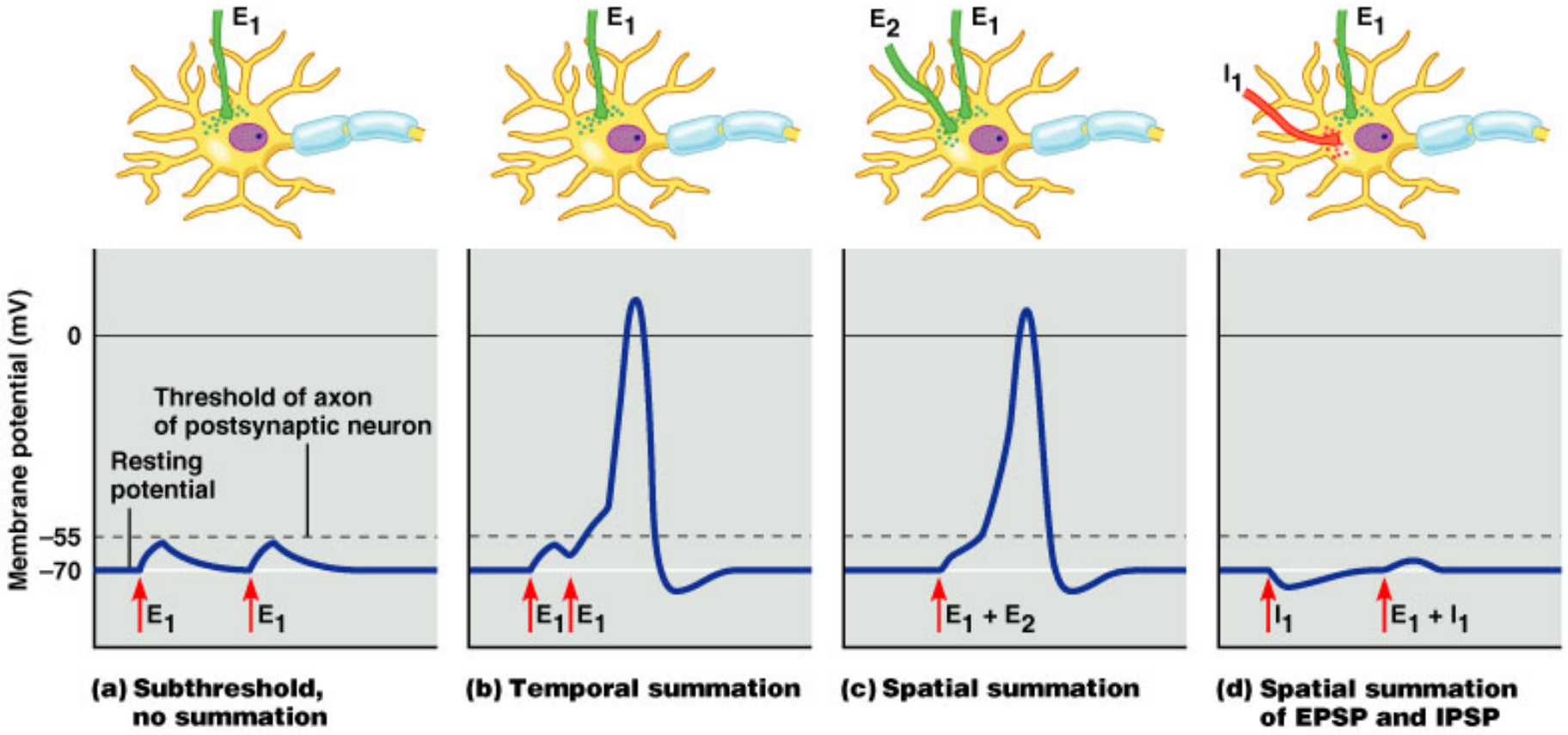


Neural integration occurs at the cellular level

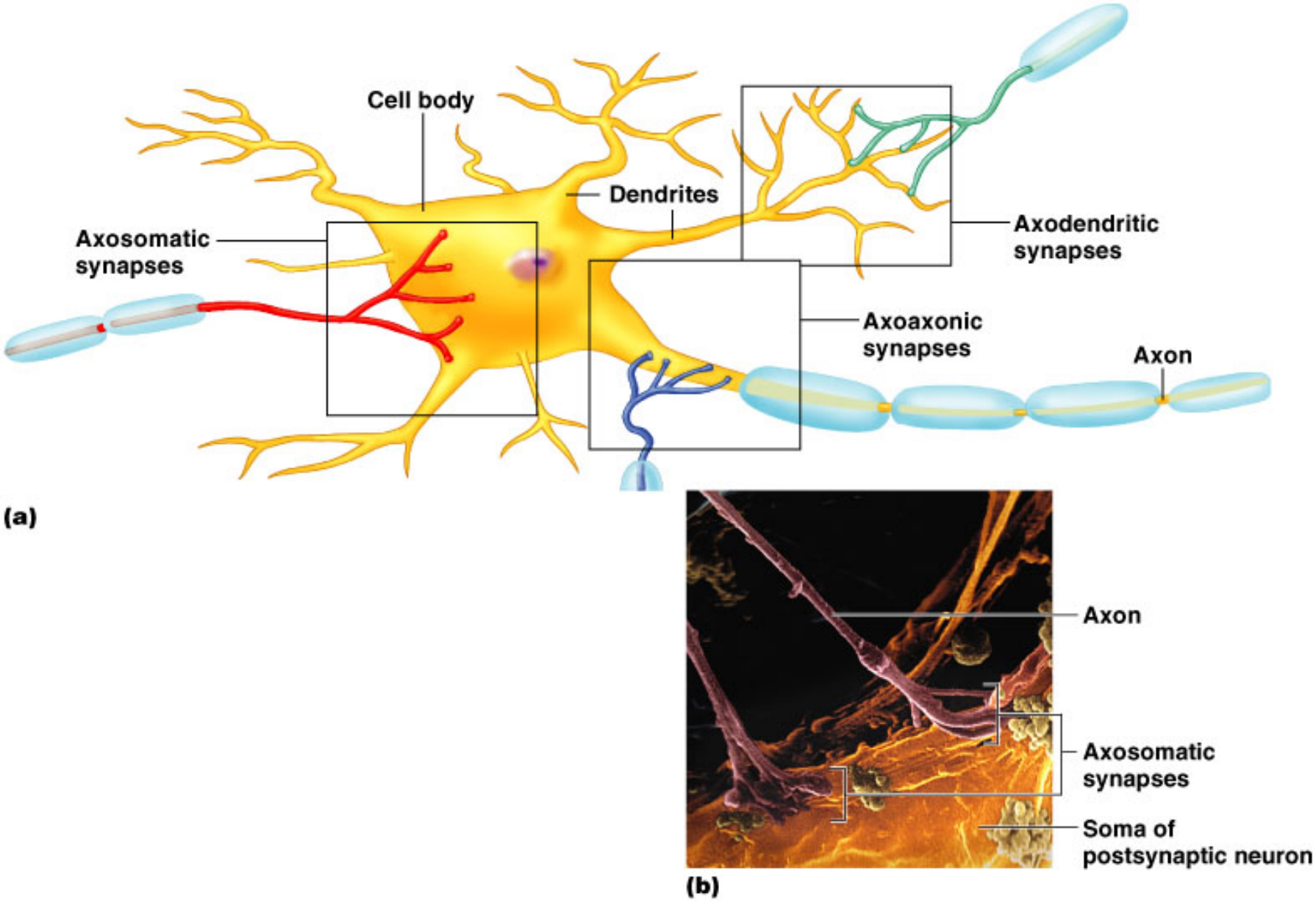
- **Excitatory postsynaptic potentials (EPSP)** depolarize the postsynaptic neuron.
  - The binding of neurotransmitter to postsynaptic receptors open gated channels that allow Na^+ to diffuse into and K^+ to diffuse out of the cell.

- **Inhibitory postsynaptic potential (IPSP)** hyperpolarize the postsynaptic neuron.
  - The binding of neurotransmitter to postsynaptic receptors open gated channels that allow K+ to diffuse out of the cell and/or Cl- to diffuse into the cell.

EPSP & IPSP

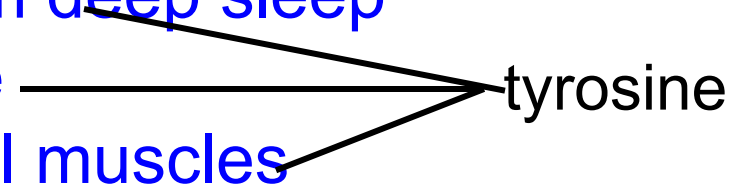

E1
E1
E2
E1
I1
E1
Membrane potential (mV)
0
–55
–70
Threshold of axon of postsynaptic neuron
Resting potential
E1
E1
E1
E1
E1 + E2
I1
E1 + I1
(a) Subthreshold, no summation
(b) Temporal summation
(c) Spatial summation
(d) Spatial summation of EPSP and IPSP

Synapses


Cell body
Dendrites
Axosomatic synapses
Axodendritic synapses
Axoaxonic synapses
Axon
(a)
Axon
Axosomatic synapses
Soma of postsynaptic neuron
(b)

Neurotransmitters

- **Acetylcholine**- slows heart rate; PNS
- **Glutamate**- most prevalent neurotransmitter in the brain
- **Aspartate**- in CNS
- **GABA**- inhibitory neurotransmitter
- **Glycine**- inhibitory neurotransmitter
- **Norepinephrine**- awakening from deep sleep
- **Epinephrine**- increase heart rate
- **Dopamine**- movement of skeletal muscles
- **Seratonin**- sensory perception, temp regulation, mood, sleep
- **Nitric oxide**- may play a role in memory and learning
- **Enkephalin**- inhibit pain impulses by suppressing release of substance P
- **Substance P**- enhances perception of pain



NERVE INJURY

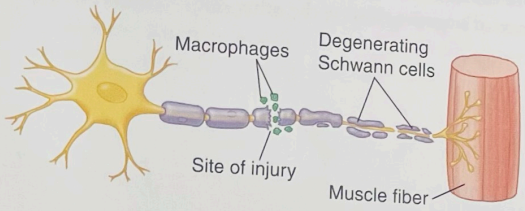
» When nerve are injured, their to repair themselves

» **Causes-** Cut, crushing injury, or other type of trauma

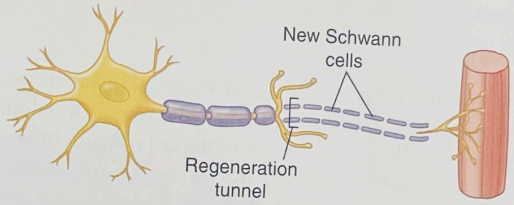
Repair of Nerve Fibers

When nerves are injured (such as from a cut, crushing injury, or some other type of trauma), their ability to repair themselves depends upon the extent of the injury as well as their location. Nerves in the peripheral nervous system can regenerate as long as the soma and neurilemma are intact. Because nerves in the central nervous system lack a neurilemma, they cannot regenerate. Therefore, most injuries to the brain and spinal cord cause permanent damage. The following figures illustrate the repair process in a somatic motor neuron.

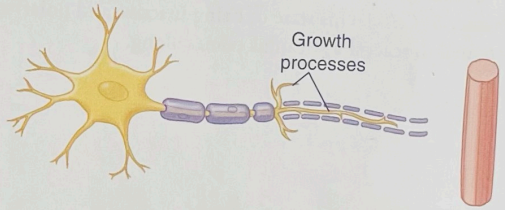
1 When a nerve fiber is cut, the distal portion of the axon is separated from its source of nutrition. Consequently, it begins to degenerate along with the myelin sheath and Schwann cells. Macrophages move in to clean up the resulting debris.



2 Because the muscle fibers normally innervated by the nerve are deprived of nervous input, they begin to atrophy, or shrink. Meanwhile, the severed portion of the axon sprouts new growth processes. At the same time, the neurilemma forms a tunnel near the site of the injury; new Schwann cells grow within the tunnel.



3 When one of the new growth processes finds its way into the tunnel, it begins to grow rapidly (3 to 5 mm/day). At that point, the other growth processes begin to retract.



4 The new fiber continues to grow, guided by the tunnel, until it reestablishes contact with the muscle. After that occurs, the reinnervated muscle fibers regrow.

HOMEOPATHIC TREATMENT OF NERVE INJURY

- **HYPERICUM**- Injury to parts rich in sentient nerve-fingers, toe, matrices of nails, palms or soles-where the intolerable pain show nerve are severely involved

» Kali Phos – For Numbness of Hands and Feet

Kali Phos is an effective medicine for nerve damage cases with numbness of hands and feet. The numbness can also be present in arms and legs. Sometimes burning sensation may be felt on toes and soles. It is also indicated if the numbness is localised specifically to the fingertips. Other than numbness its use is also recommended to manage prickling sensation in hands and feet. Additionally, muscle weakness can attend to the above symptoms in cases needing it.

»

PLUMBUM METALLICUM

Plumbum Met is a well indicated medicine that plays a supportive role to manage cases in which there is severe muscle weakness or paralysis which is accompanied with wasting (atrophy) of muscles. In some cases that require it pain in limbs of tearing or lightening like may be felt. Along with pain, numbness, tingling or twitchings can also be present in the limbs.

AGARICUS

Both these are great nerve medicines and remain very effective to manage muscle twitching. In cases needing Agaricus the twitchings are marked in the eyes, eyelids, and facial muscles, cheeks, limbs. Another main symptom to use Agaricus is unsteady walking with a tendency to tumble over everything in the way. While Zincum Met is indicated for cases having twitchings in face and limbs.

Gelsemium – For Loss of Balance and Coordination while Walking

This medicine is prepared from the bark of the root of the plant Gelsemium Sempervirens having the common name yellow jasmine. It belongs to the family loganiaceae. It is very significant medicine for managing cases where a person has loss of balance and coordination while walking. He has difficulty with walking and his gait is unsteady because of inability to control muscle movements. He staggers on attempting to walk. This medicine is also prominently indicated to manage muscle weakness and paralysis. Lastly this medicine is very useful for pain in the back side of the head (occipital headache).

THANK YOU