



Nervous System: Part I

Introduction to the Nervous System

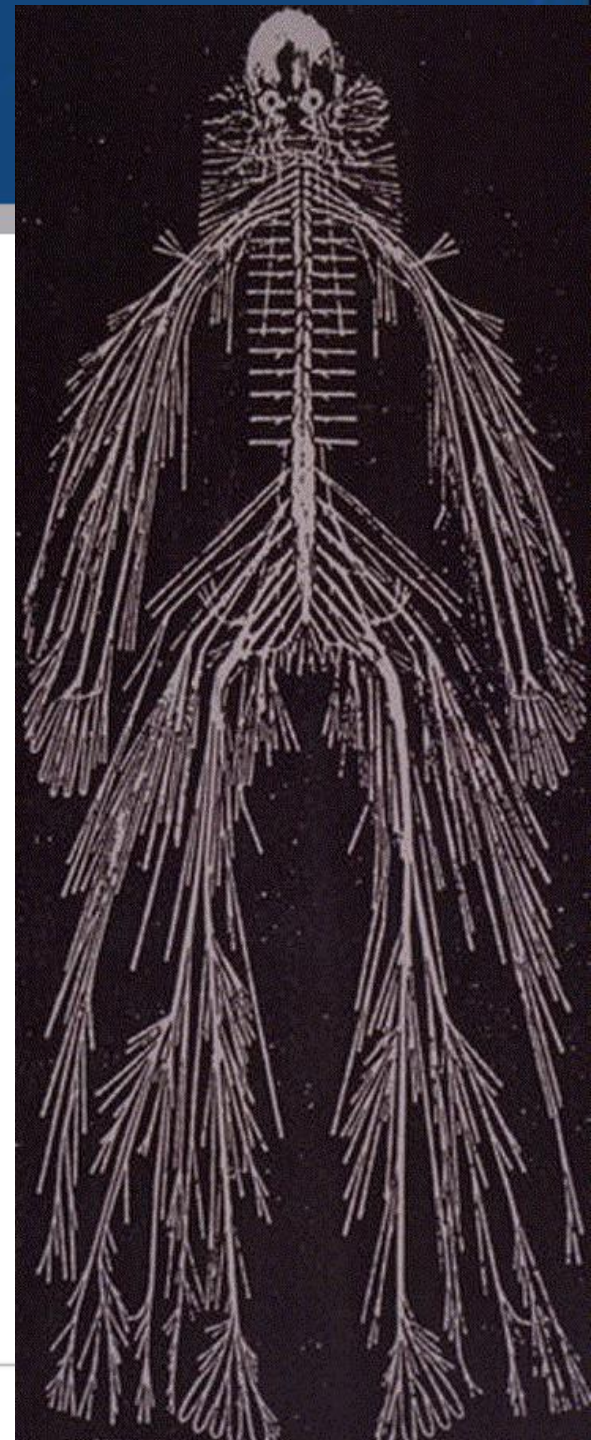
Examine This Image: What body system is shown?



Dr. Rufus B.
Weaver with
Harriet

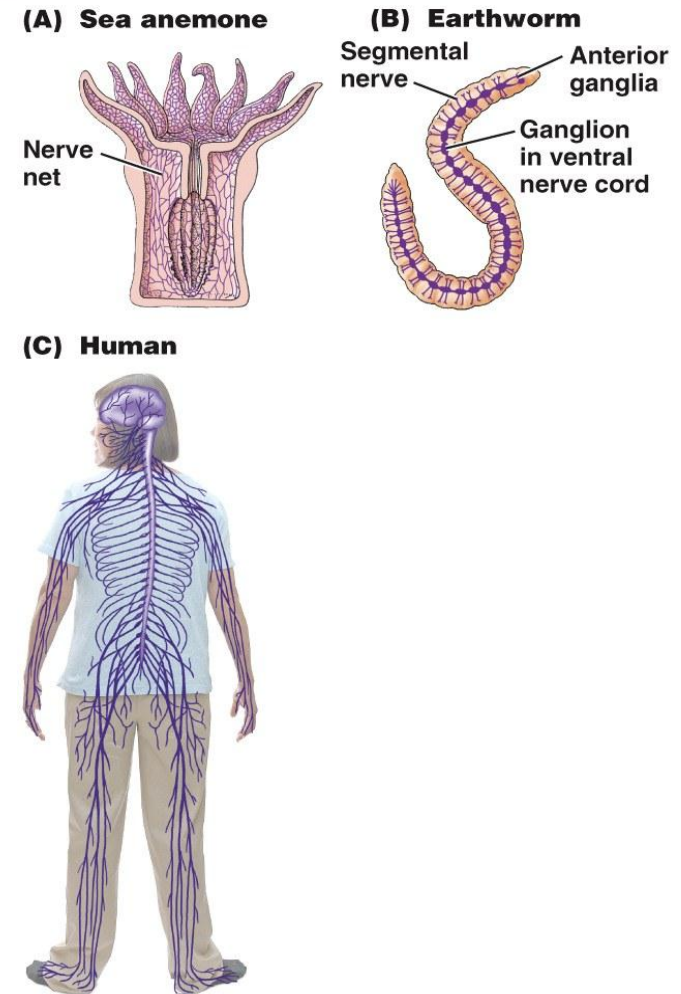
Harriet Donated Her Body to Science

- Dr. Rufus B. Weaver, the school's foremost anatomy professor had a special project in mind for Harriet — a project many colleagues thought impossible.
- Weaver spent five exhausting months — working eight to 10 hours a day — painstakingly removing every bit of bone and flesh from the cadaver leaving only the nervous system and eyes.



Today's Essential Knowledge statement 3.E.2:

- Animals have nervous systems that detect *external* and *internal* signals, transmit and integrate information, and produce responses.

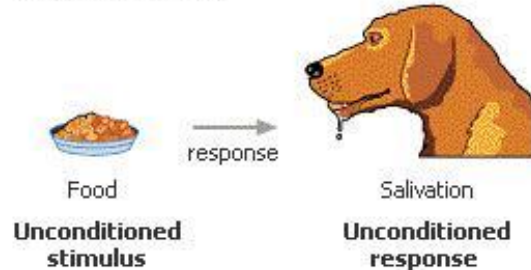


PRINCIPLES OF LIFE, Figure 34.3
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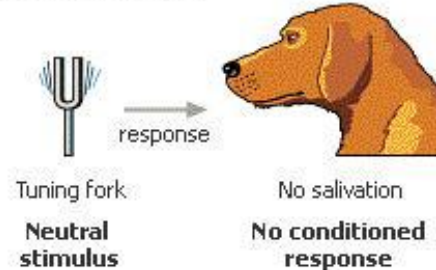
Role of the nervous system

- The nervous system interacts with sensory and internal body systems to coordinate responses and behaviors.

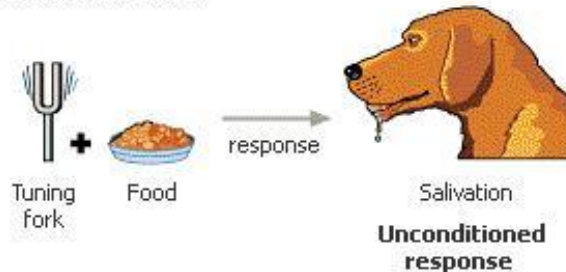
1. Before conditioning



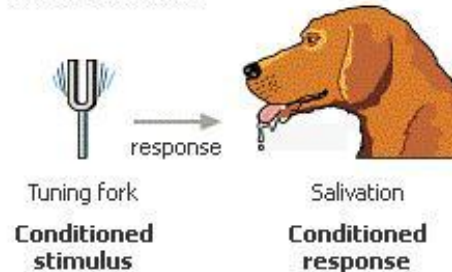
2. Before conditioning



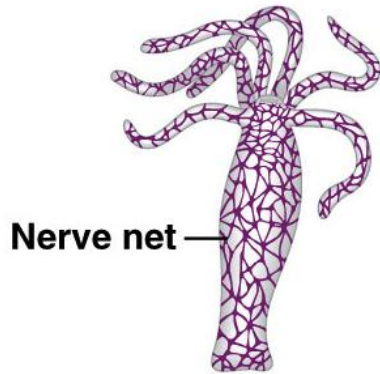
3. During conditioning



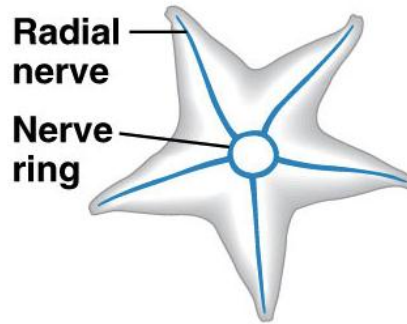
4. After conditioning



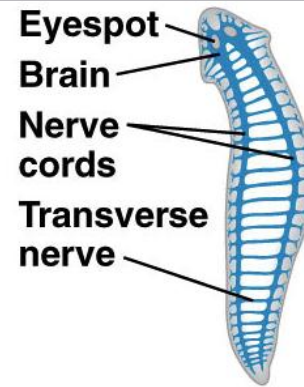
What trends do you notice?



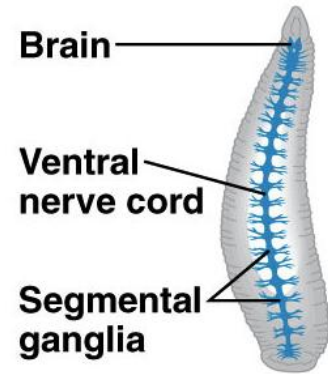
(a) Hydra (cnidarian)



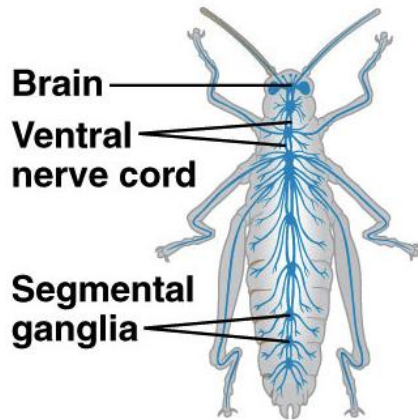
(b) Sea star (echinoderm)



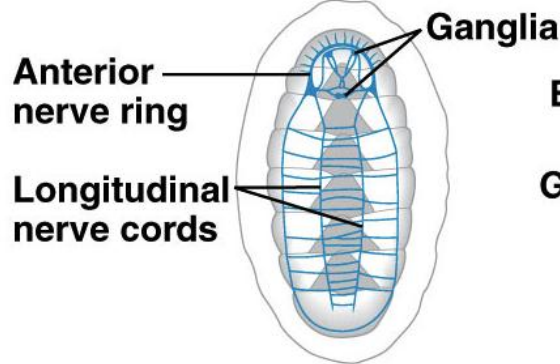
(c) Planarian (flatworm)



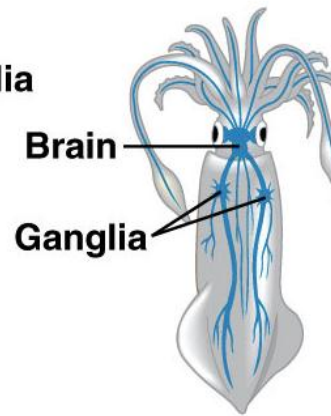
(d) Leech (annelid)



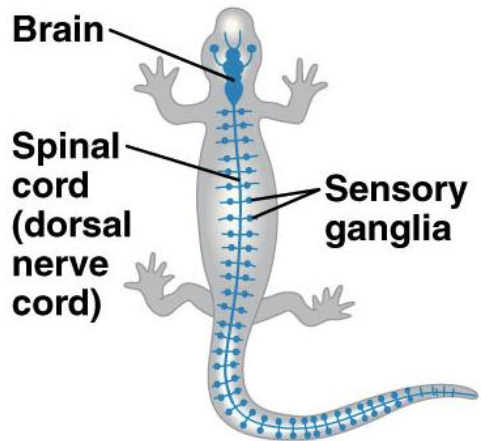
(e) Insect (arthropod)



(f) Chiton (mollusc)



(g) Squid (mollusc)



(h) Salamander (vertebrate)

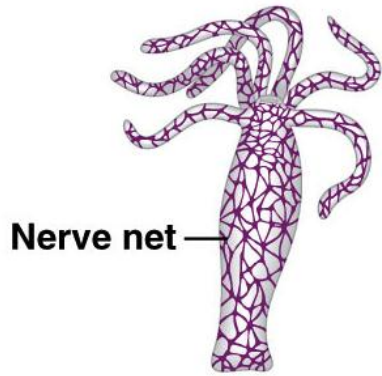


Noteworthy Trends In Development

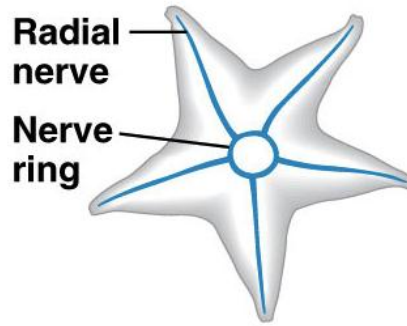
- Increase in ganglia
- Increase in sensory reception
- Increase in cephalization
 - Cephalization is the concentration of nervous tissue in the anterior region of the organism.



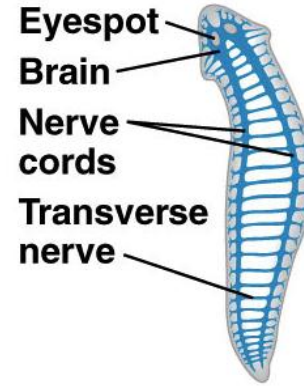
What would be the advantage of having cephalization?



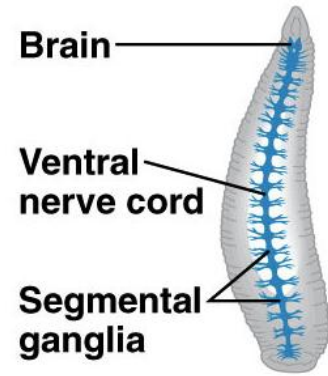
(a) Hydra (cnidarian)



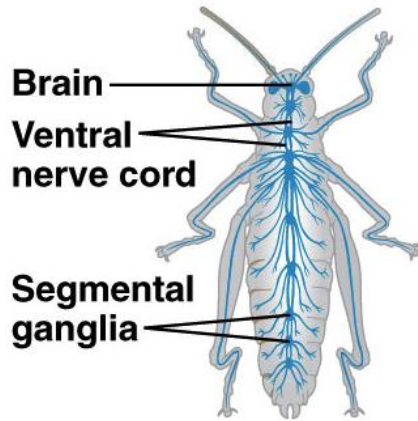
(b) Sea star (echinoderm)



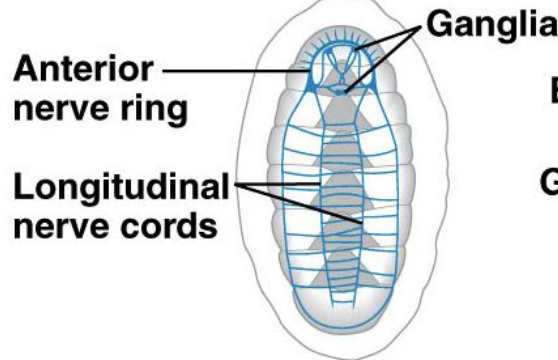
(c) Planarian (flatworm)



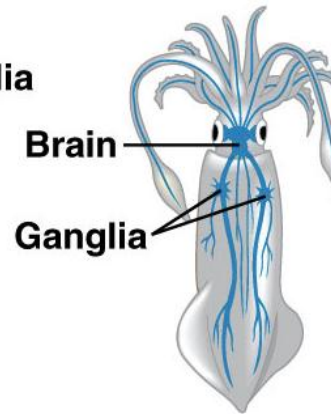
(d) Leech (annelid)



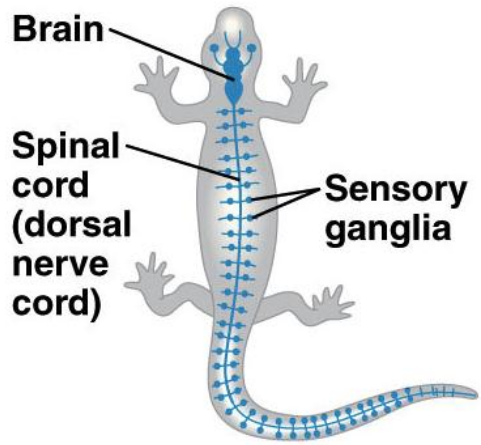
(e) Insect (arthropod)



(f) Chiton (mollusc)



(g) Squid (mollusc)



(h) Salamander (vertebrate)



Human Nervous System

Central nervous system (CNS)

Peripheral nervous system (PNS)

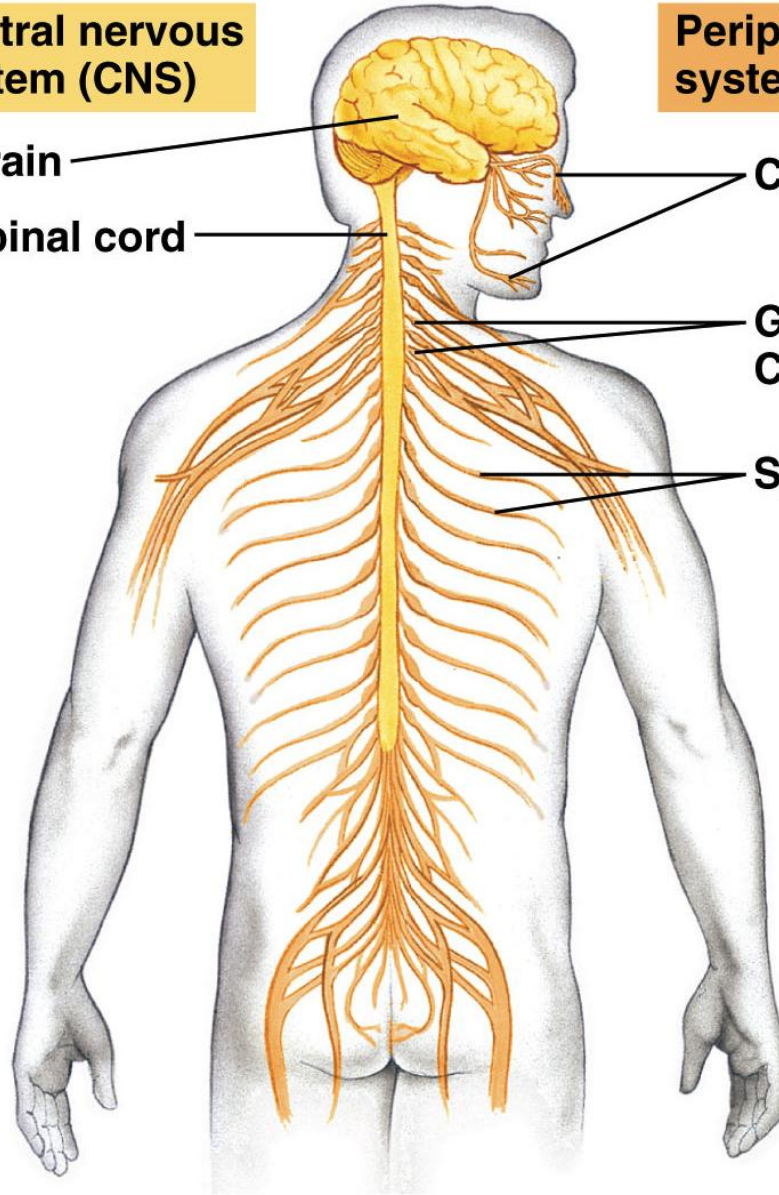
Brain

Spinal cord

Cranial nerves

Ganglia outside CNS

Spinal nerves





Sensory receptor



Sensory input

Integration



Brain and spinal cord



Motor output



Effector

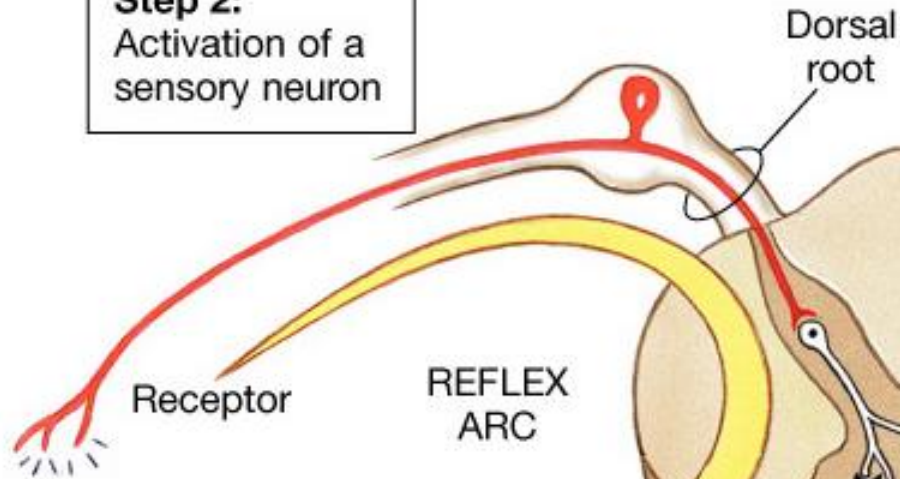
**Peripheral nervous
system (PNS)**

**Central nervous
system (CNS)**

Step 1:
Arrival of stimulus and activation of receptor



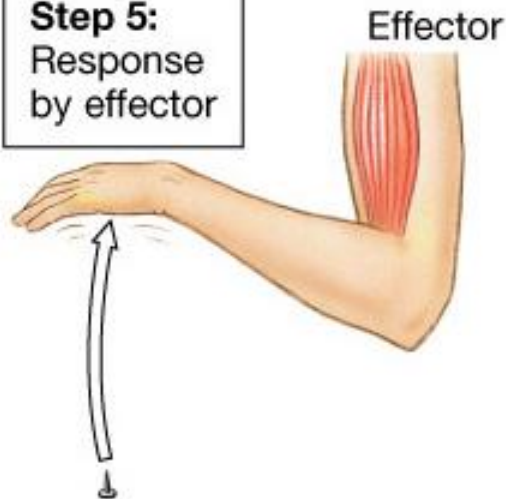
Step 2:
Activation of a sensory neuron



REFLEX ARC

Sensation relayed to the brain by collateral

Step 5:
Response by effector

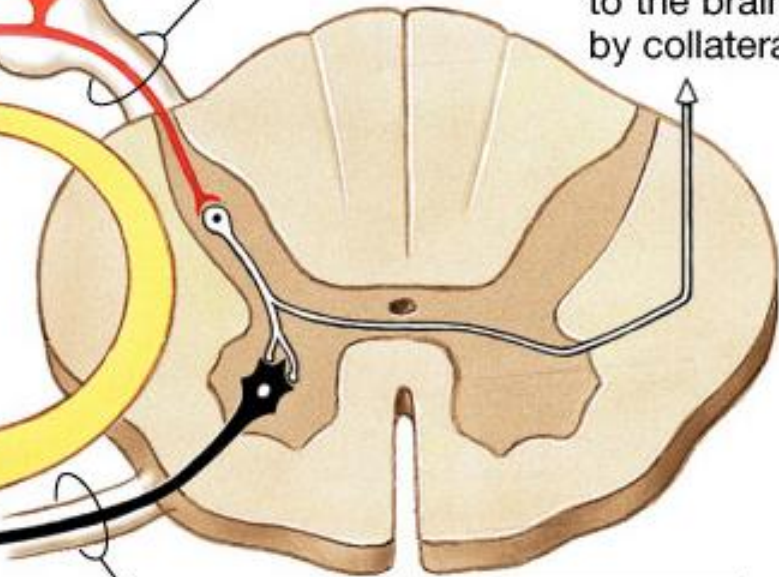


Step 4:
Activation of a motor neuron



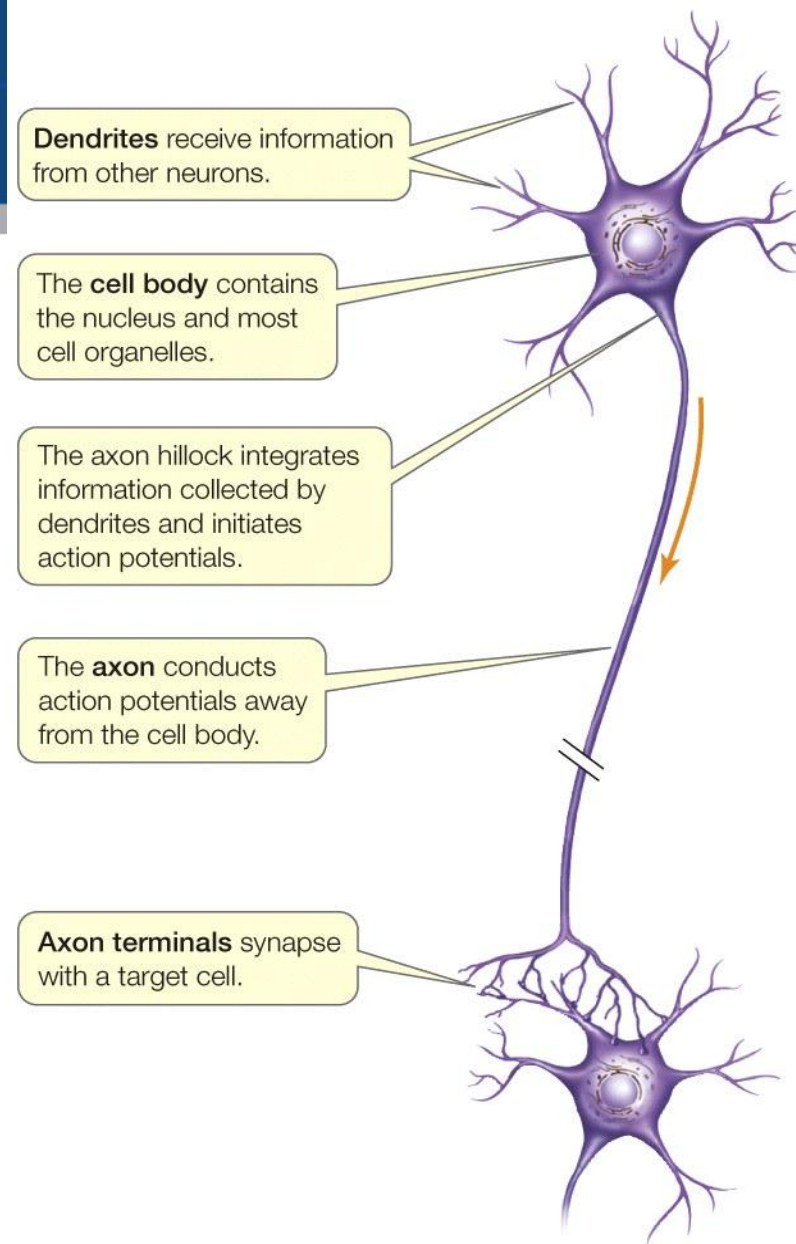
Ventral root

Step 3: Information processing in CNS

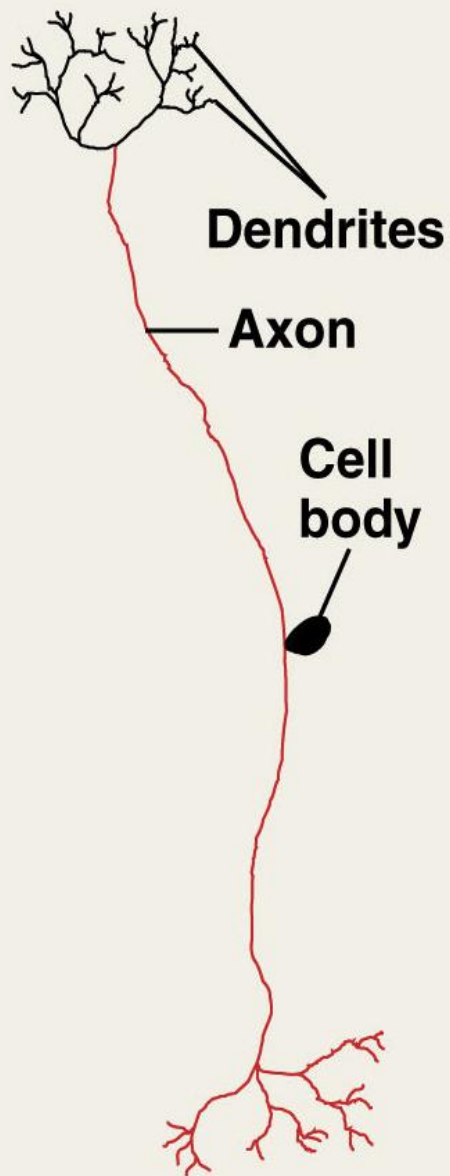


Neuron Defined

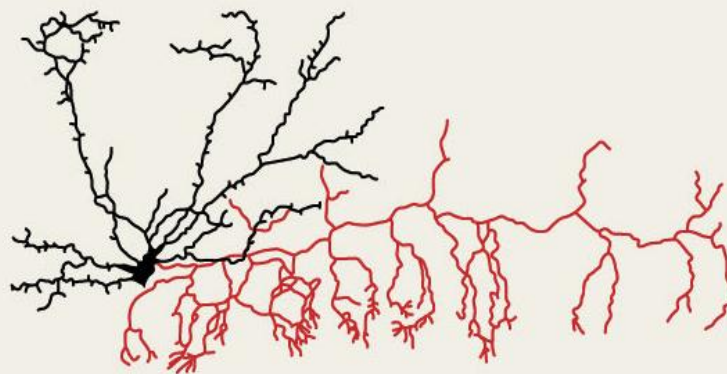
- The basic structure of the nervous system that reflects function.
- The structure of the neuron allows for the detection, generation, transmission, and integration of signal information.



PRINCIPLES OF LIFE, Figure 34.1
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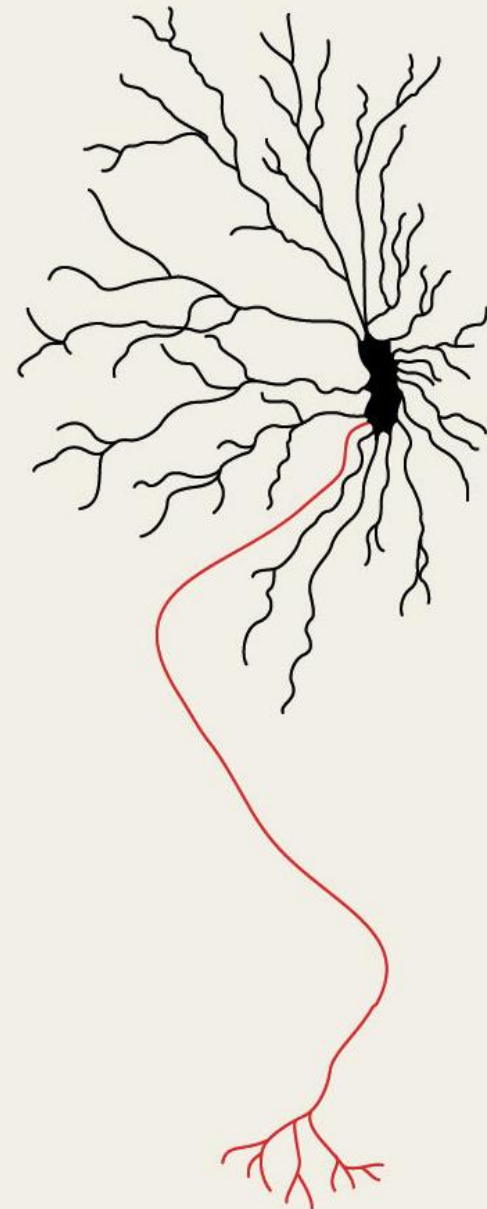


Sensory neuron



**Portion
of axon**

Interneurons



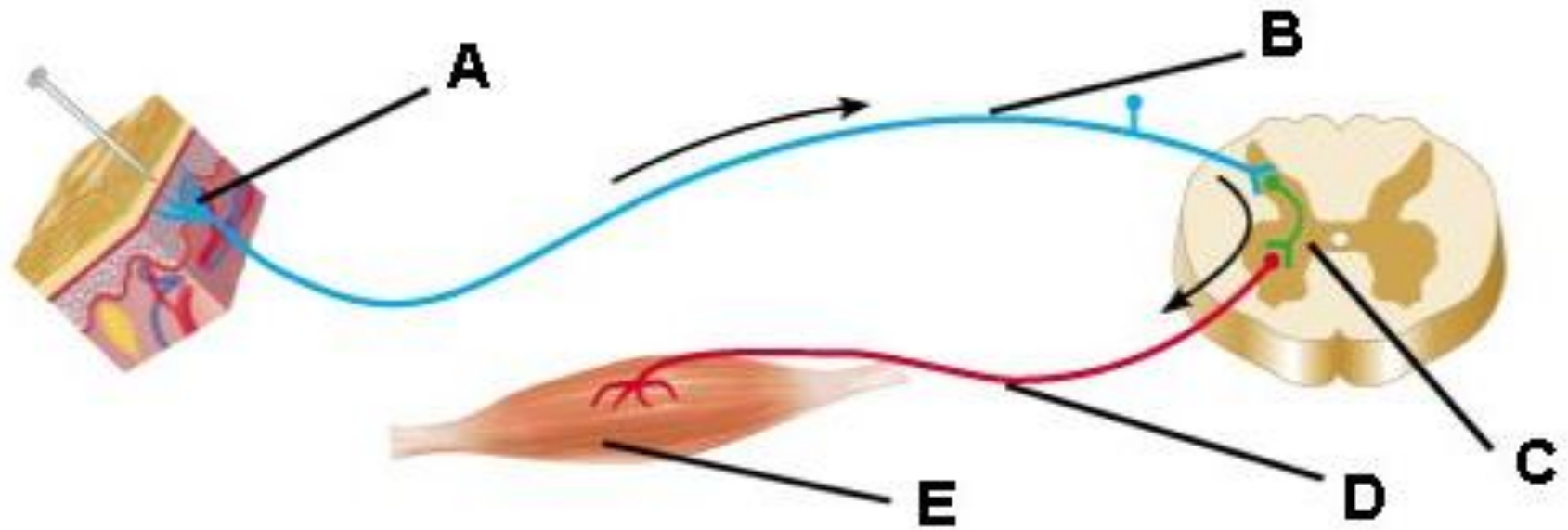
Motor neuron

Neuron

- Neurons are highly specialized for the function of conducting impulses.
- There are three main types of neurons:
 - Sensory neurons
 - Interneurons
 - Motor neurons



Where are the neurons in this reflex arc?



$$(a - b)^2 = a^2 - 2ab + b^2$$



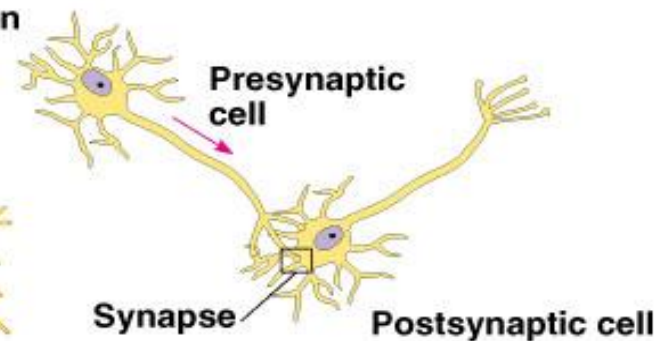
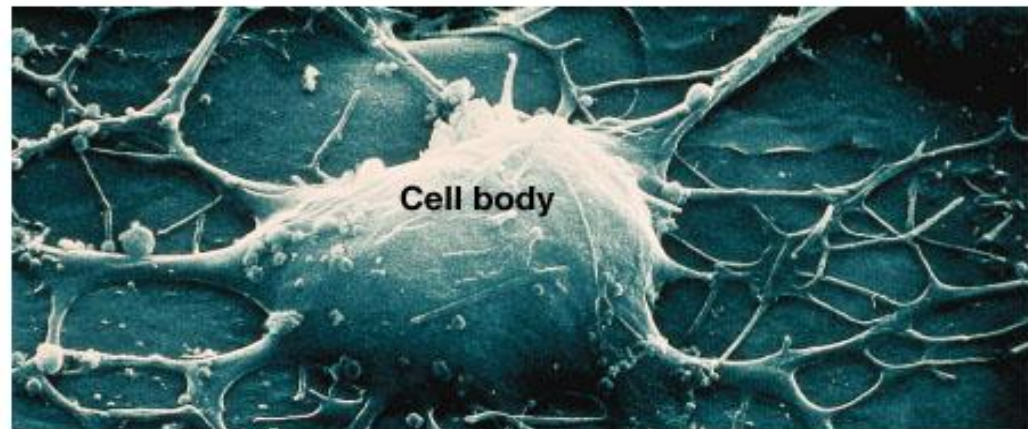
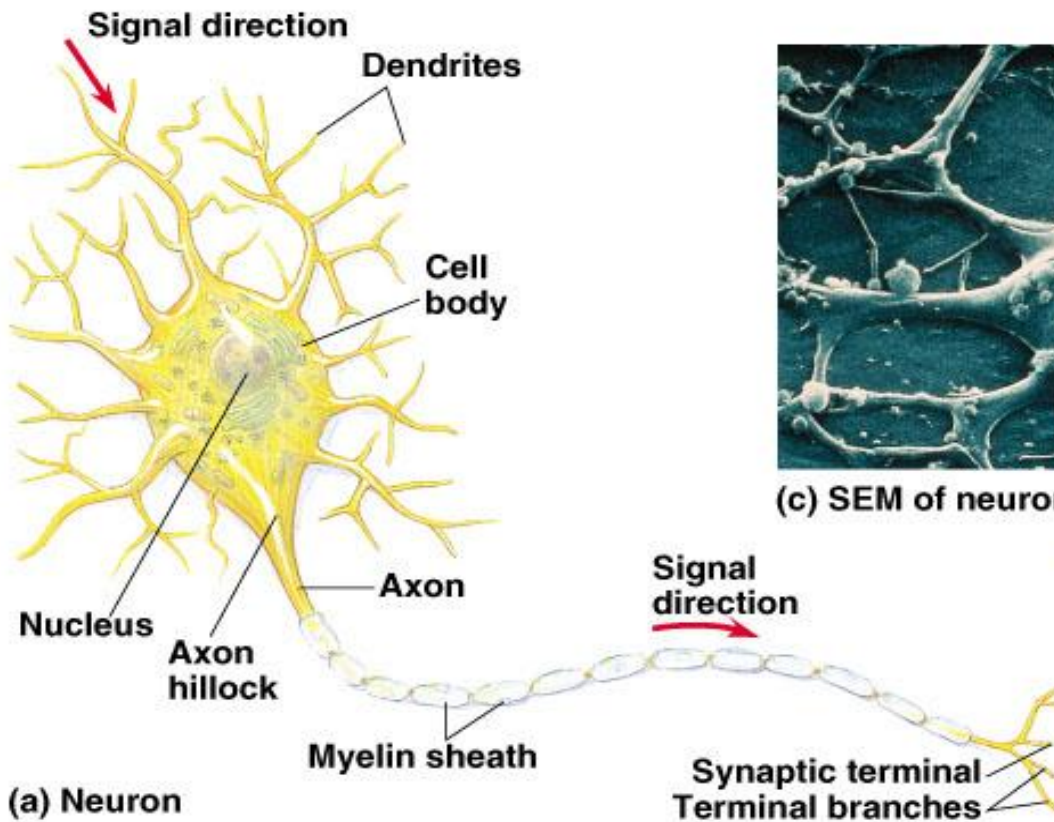
Choose the correct pathway of information flow through neurons while taking a test, starting with reading the question and ending with marking an answer.

- a. interneurons → motor neurons → sensory neurons → effectors
- b. effectors → sensory neurons → interneurons → motor neurons
- c. sensory neurons → interneurons → motor neurons → effectors
- d. interneurons → sensory neurons → motor neurons → effectors



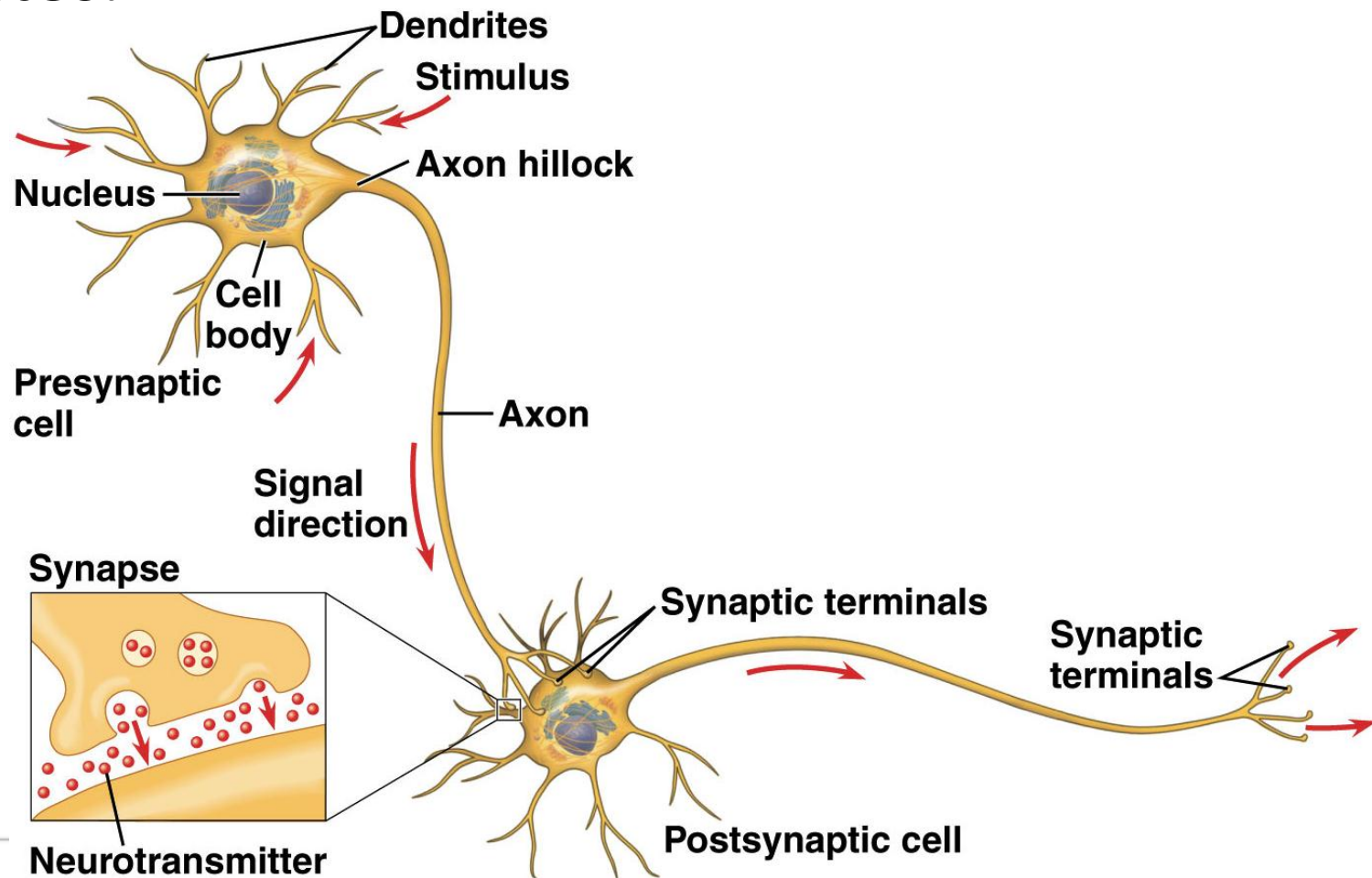
Neuron

- What are some notable differences between this cell compared to a “typical” animal cell?

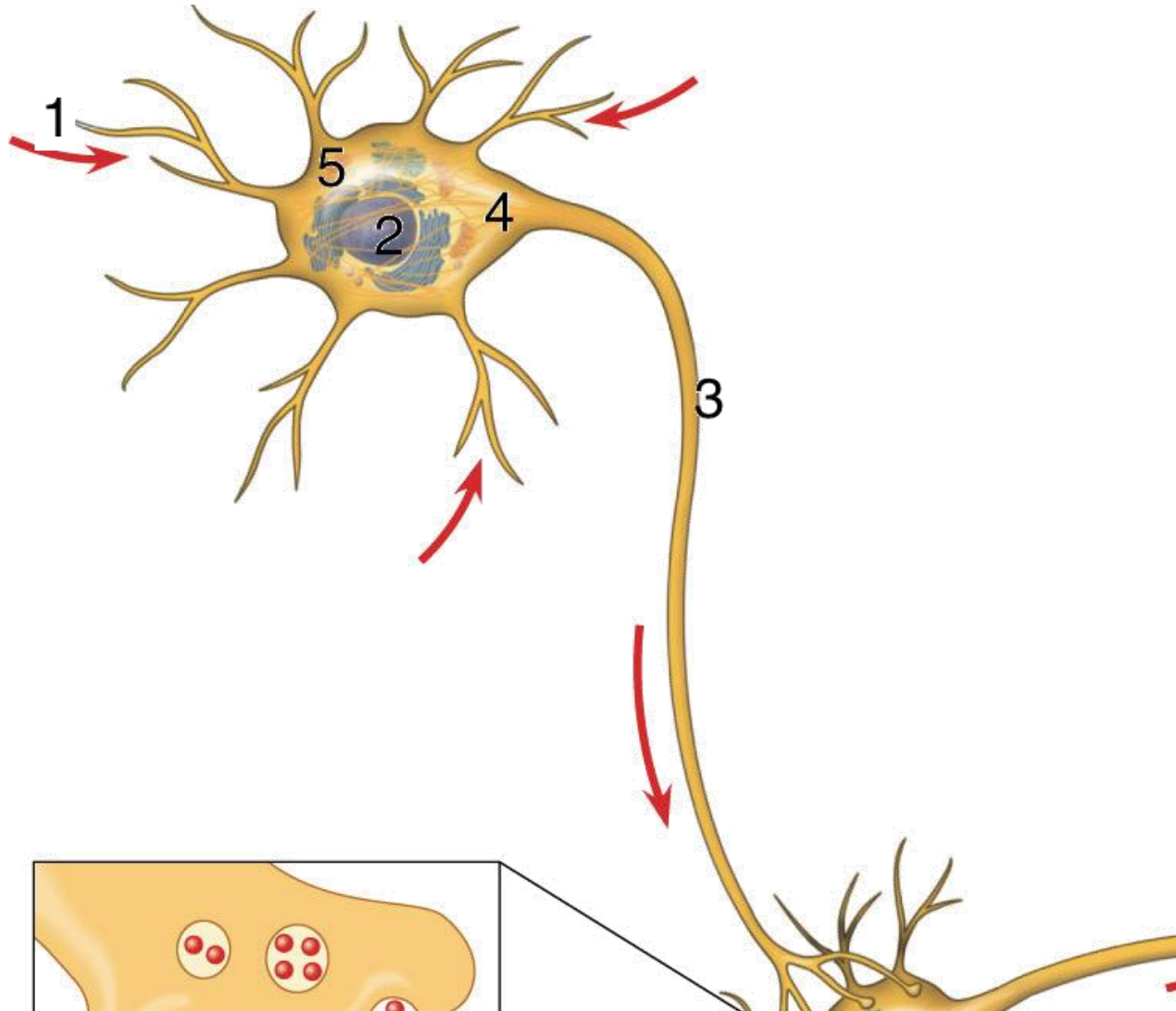


Neuron Anatomy

- A typical neuron has a cell body, axon and dendrites.

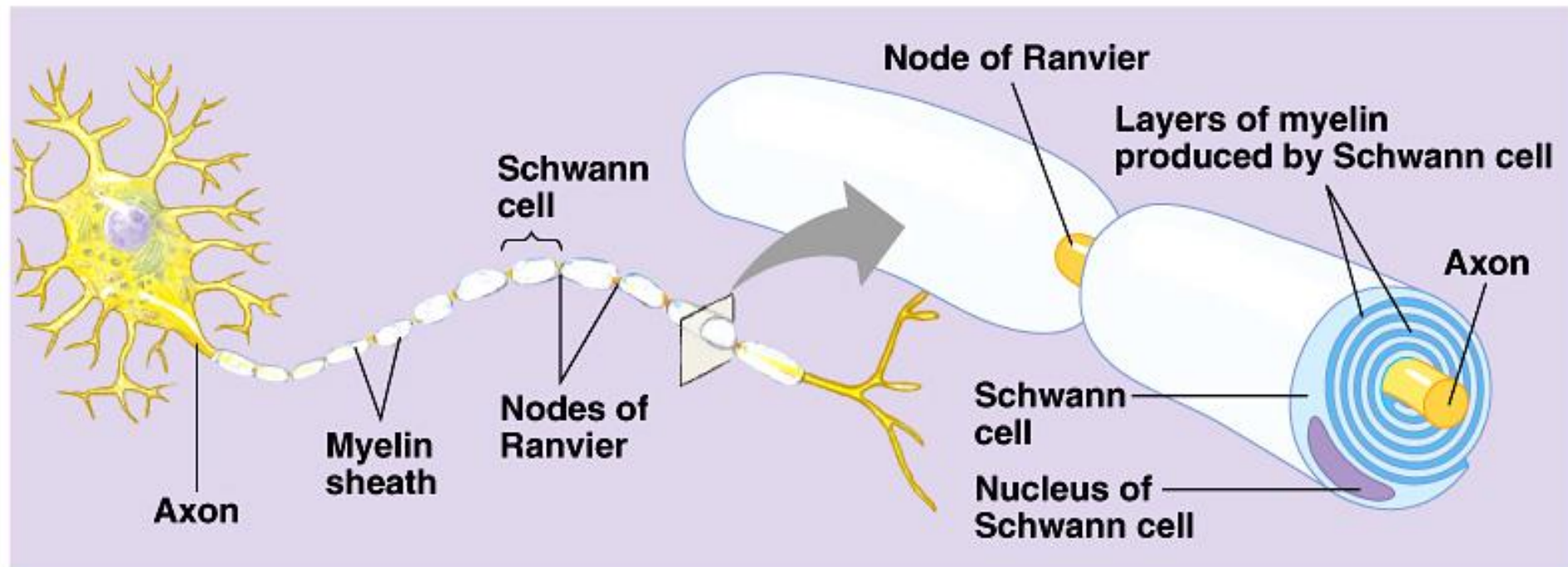


Identify The Numbered Structures



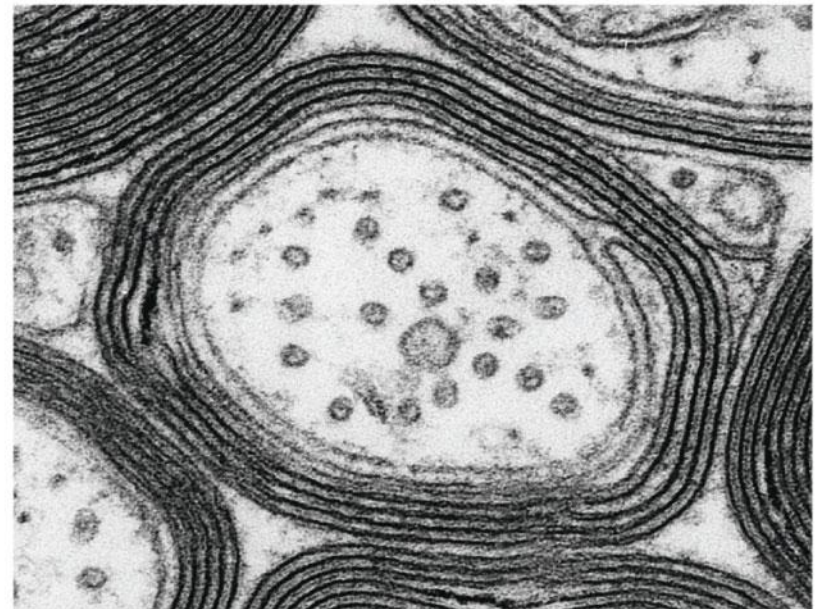
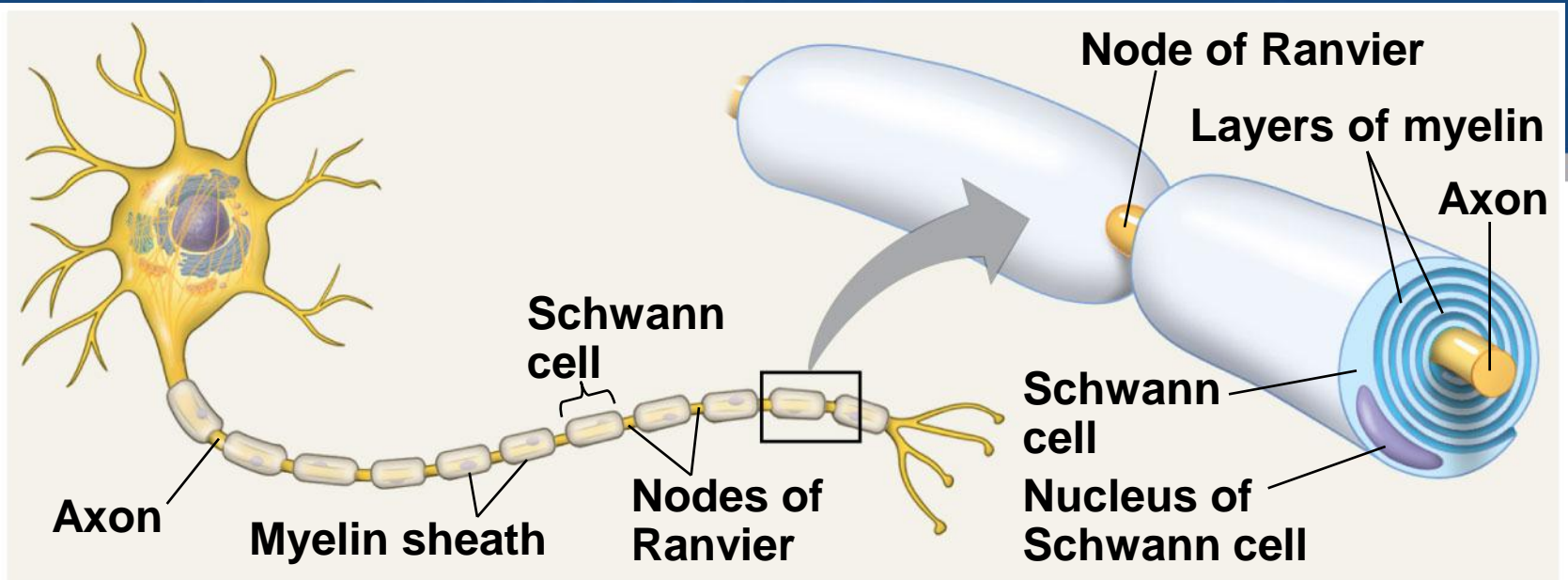
Neuron

- A typical neuron has a cell body, axons and dendrites. Many axons may have a myelin sheath that acts as an electrical insulator.



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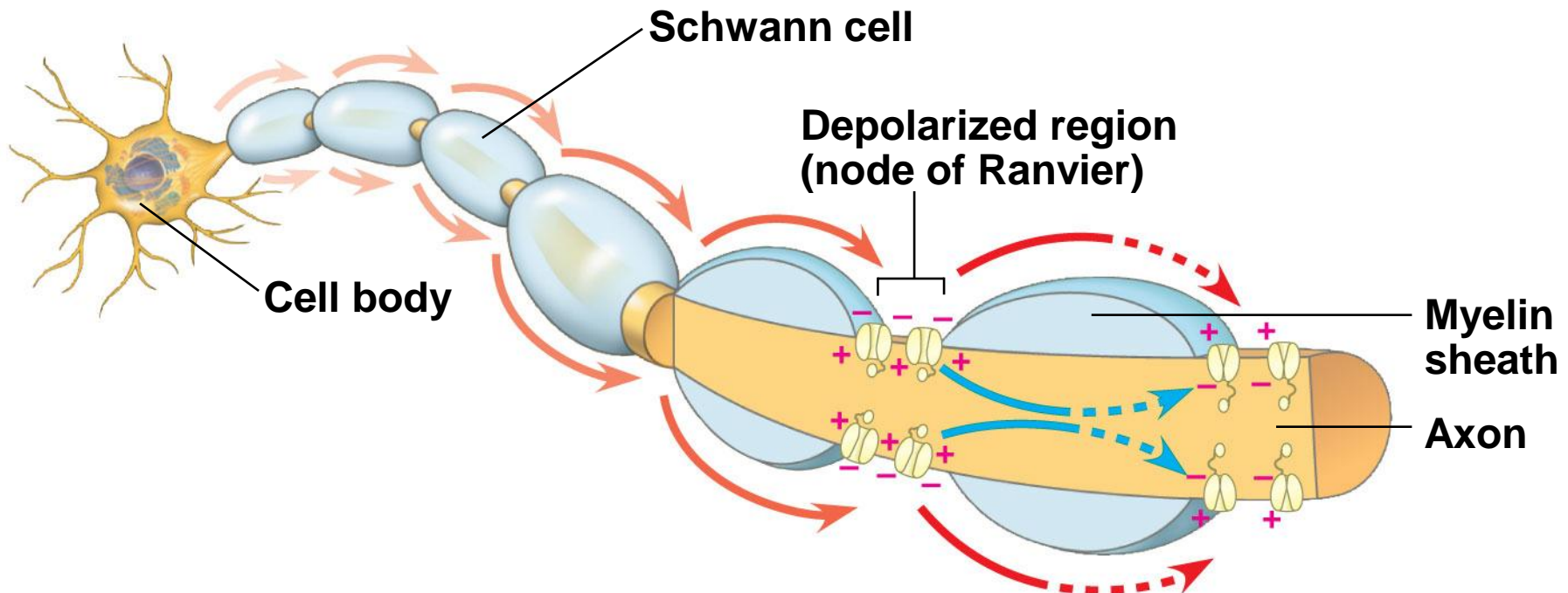




0.1 μm

Saltatory Conduction

- Saltatory conduction. Notice that the conduction along a myelinated axon can occur quickly as large spaces can be skipped and impulse propagation occurs only at the nodes of Ranvier.



Putting It All Together

How are the nerves you saw in Harriet's picture related to neurons?

How are they alike?

How are they different?





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