

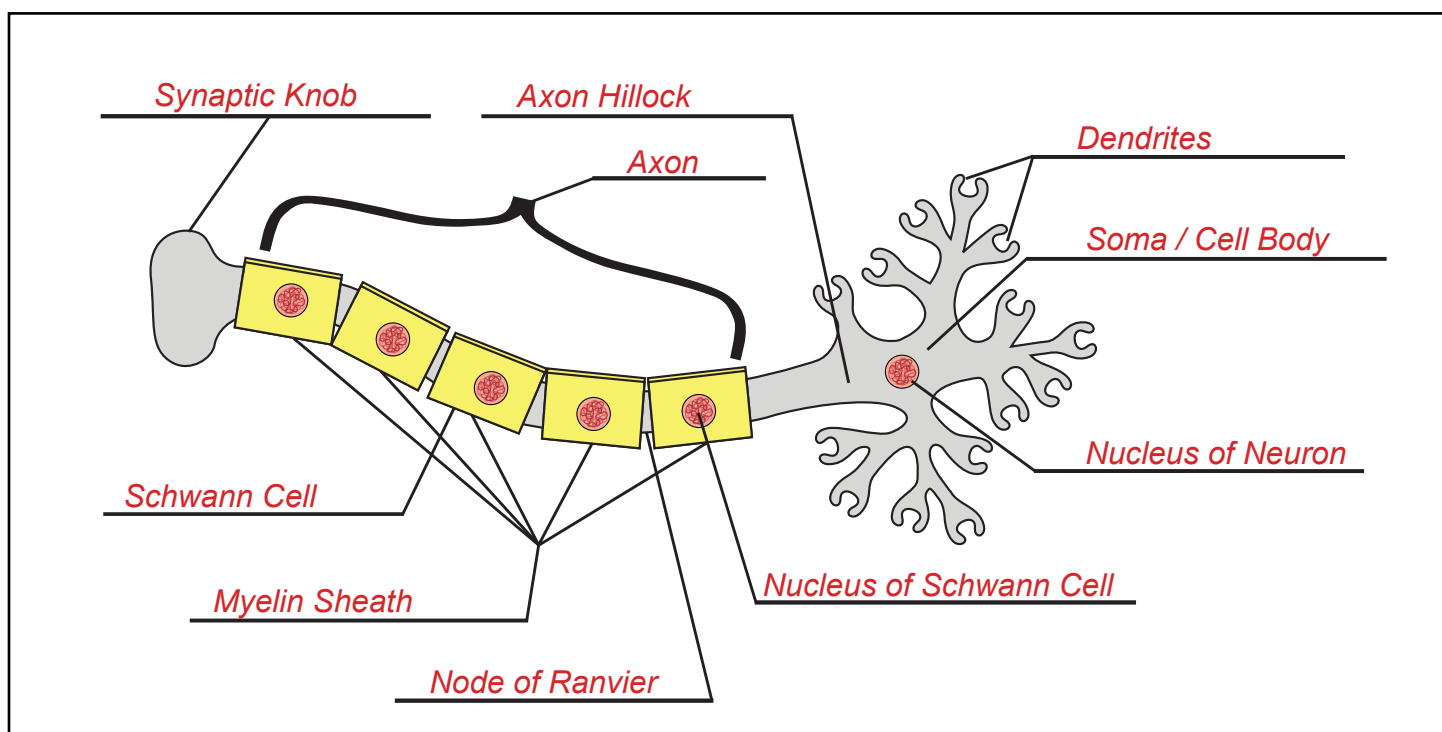
## In Brief: Key Teaching Points for the Neuron Modeling Kit®

### Student Learning Objective: How Do Organisms Detect, Process and Use Information About the Environment?

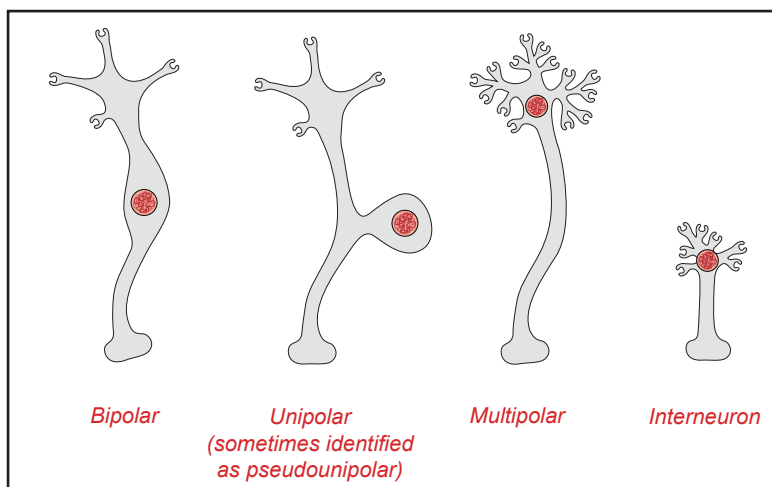
Using this kit teachers can guide their students to:

- Construct and identify the parts of a multipolar neuron.
- Distinguish between a multipolar neuron, bipolar neuron, unipolar neuron, and interneuron.
- Describe the differences between the cells that compose the myelin sheath in the central and peripheral nervous systems.
- Model simple and complex neural communication pathways.

### Identifying the Parts of a Multipolar Neuron

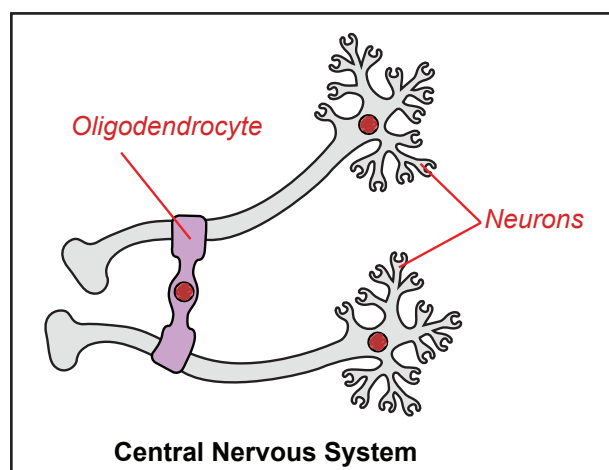
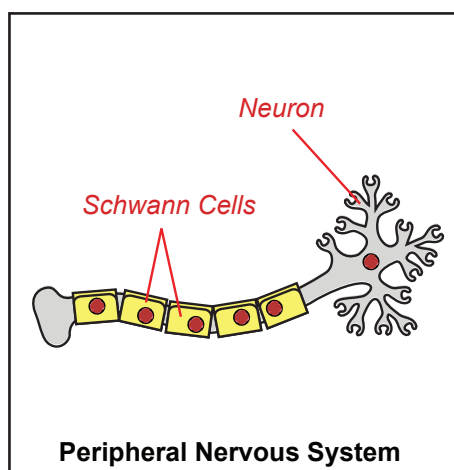


## Identifying Types of Neurons



Type of Neuron Based on Structure	Location	Functional Class	Abundance
<i>multipolar</i>	<i>PNS/CNS</i>	<i>motor/efferent</i>	<i>Most abundant/ major CNS neuron</i>
<i>bipolar</i>	<i>special sense organs</i>	<i>most sensory</i>	<i>least common but typically found in the retina of the eye, olfactory epithelium and vestibulocochlear nerve</i>
<i>unipolar (pseudounipolar)</i>	<i>chiefly PNS</i>	<i>most sensory</i>	<i>commonly found in spinal cord and cranial nerves</i>
<i>interneuron (a special kind of multipolar neuron)</i>	<i>CNS</i>	<i>Conducts impulses from afferent to motor neurons</i>	<i>most abundant (over 100 billion)</i>

## The Myelin Sheath

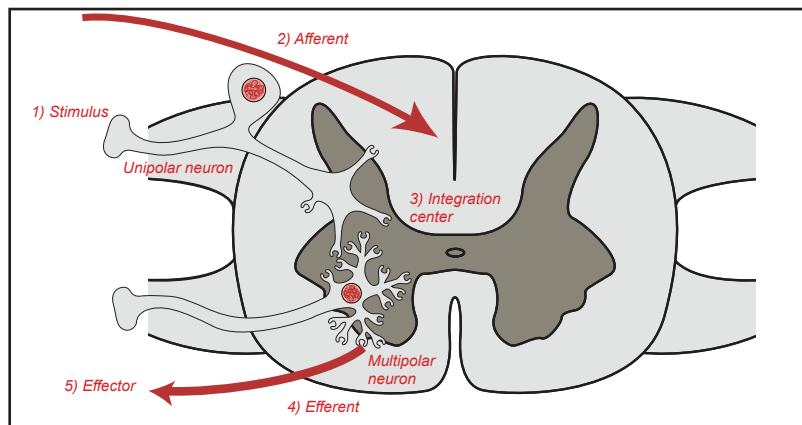


## Modeling Neural Communication Pathways

**Monosynaptic Reflex** – one synapse between the sensory neuron and the motor neuron

**Ipsilateral Reflex** – the neural pathway is on one side of the spinal cord

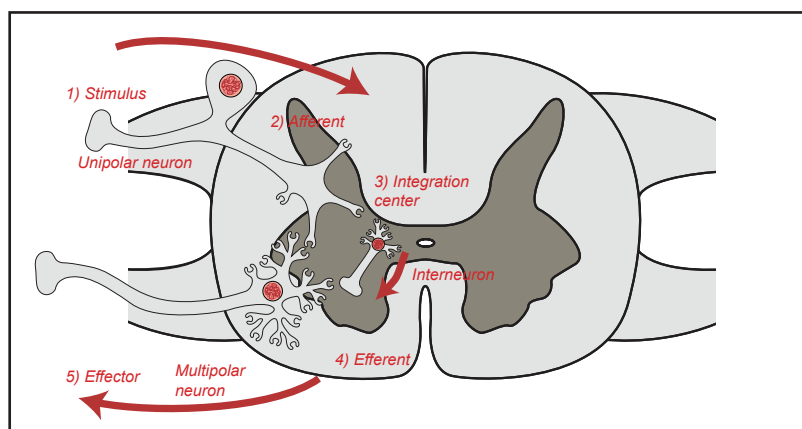
**Example: Knee-Jerk Reflex**



**Polysynaptic Reflex** – more than one synapse between the sensory neuron and the motor neuron

**Ipsilateral Reflex** – the neural pathway is on one side of the spinal cord

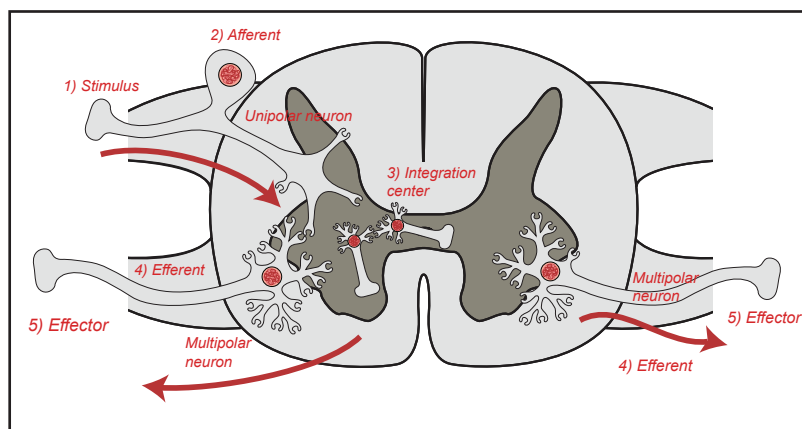
**Example: The Withdrawal Reflex**



**Polysynaptic Reflex** – one synapse between the sensory neuron and the motor neuron

**Contralateral Reflex** – the neural pathway involves both sides of the spinal cord

**Example:** When stepping on a nail, the leg with the foot that is stepping on the nail pulls away, while the other leg bears the weight of the body.



The Neuron Modeling Kit® can be borrowed from the MSOE Model Lending Library ([cbm.MSOE.edu/LendingLibrary](http://cbm.MSOE.edu/LendingLibrary)) or purchased from 3D Molecular Designs ([3dmoleculardesigns.com](http://3dmoleculardesigns.com)). Find complete lessons and activities at <http://www.3dmoleculardesigns.com/Teacher-Resources/Neuron-Modeling-Kit.htm>.