The cell. when depolarization occurs, this charge

The concentration of these same ions is exactly reversed outside the cell. This charge differential represents stored electrical energy, sometimes referred to as membrane potential or resting potential. The negative charge inside the cell is maintained by two features. The first is the selective permeability of the cell membrane, which is more permeable to potassium than sodium. The second feature is sodium pumps within the cell membrane that actively pump sodium out of the cell. When depolarization occurs, this charge differential across the membrane is reversed, and a nerve impulse is produced. Depolarization is a rapid change in the permeability of the cell membrane.

When sensory input or any other kind of stimulating current is received by the neuron, the membrane permeability is changed, allowing a sudden influx of sodium ions into the cell. The high concentration of sodium, or action potential, changes the overall charge within the cell from negative to positive. The local change in ion concentration triggers similar reactions along the membrane, propagating the nerve impulse.

After a brief period called the refractory period, during which the ionic concentration returns to resting potential, the neuron can repeat this process. Nerve impulses travel at different speeds, depending on the cellular composition of a neuron. Where speed of impulse is important, as in the nervous system, axons are insulated with a membranous substance called myelin. The insulation provided by myelin maintains the ionic charge over long distances. Nerve impulses are propagated at specific points along the myelin sheath; these points are called the nodes of Ranvier. Examples of myelinated axons are those in sensory nerve fibers and nerves connected to skeletal muscles. In non-myelinated cells, the nerve impulse is propagated more diffusely.

Chemical Transmission:

When the electrical signal reaches the tip of an axon, it stimulates small presynaptic vesicles in the cell. These vesicles contain chemicals called neurotransmitters, which are released into the microscopic space between neurons (the synaptic cleft). The neurotransmitters attach to specialized receptors on the surface of the adjacent neuron. This stimulus causes the adjacent cell to depolarize and propagate an action potential of its own. The duration of a stimulus from a neurotransmitter is limited by the breakdown of the chemicals in the synaptic cleft and the reuptake by the neuron that produced them.

Formerly, each neuron was thought to make only one transmitter, but recent studies have shown that some cells make two or more.