# Nerve Regeneration Part I

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The central nervous system is a control system of the body made up of the brain and spinal cord. Electrical signals travel from the CNS (central nervous system) to the PNS (peripheral nervous system) and the brain controls effector cells, which carry out the physiological responses "requested" by the brain.

The fundamental cell of the brain is the neuron, which is made up of a cell body, dendrites (branch like extensions off of the cell body, which conduct electrical signals away from their tips to the cell body), and at least one axon (a long extension off of the cell body which conducts electrical signals away from the cell body toward its terminal end).

Nerves are bundles of axons from different neurons that carry electrical signals in the same direction. Nerves are the essential intermediates that connect the brain to effector cells and if they are damaged, the signals are interrupted and the neurons will not be able to carry out the "requests" from the brain.

Nerve damage can come from either trauma or disease. Two examples of traumatic nerve damage are, carpel tunnel syndrome (which is caused by the compression of nerves) and motor vehicle accidents (which leads to the severance of nerves). An example of a disease that damages nerves is multiple sclerosis, which causes the breakdown of the insulating myelin that surrounds the axon. Myelin is made up of one or more layers of phospholipids which speeds up the conduction rates of the electrical signals.

The CNS has limited ability to fix its damaged nerves, unlike the PNS. Both the CNS and PNS contain glial cells, which support neurons physically and metabolically. The CNS and PNS contain two very different types of glial cells, which accounts for their difference in their regenerative ability.

The PNS contains Schwann cells, which do not inhibit axon regeneration. Their only function is to produce myelin. The CNS contains two types of glial cells, oligodendrocytes and astrocytes. Oligodendrocytes and astrocytes are proteins that help stabilize the complex CNS. They provide a "scaffold" so that neurons only sprout to where they are intended and they also lock the connections into place. Without these proteins, the CNS may not be able to organize itself and work properly.

There are four main approaches that scientists are exploring to try to regenerate nerves. They are: gene therapy, stem cell therapy, guidance channels, and neurotrophic growth factors. These approaches will be discussed in the next presentation.