

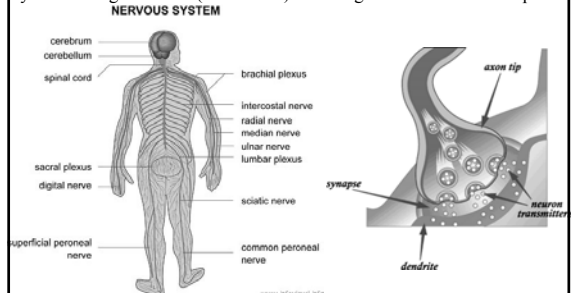
# Chapter 20 The Nervous System

The nervous system made me a little nervous as a child.



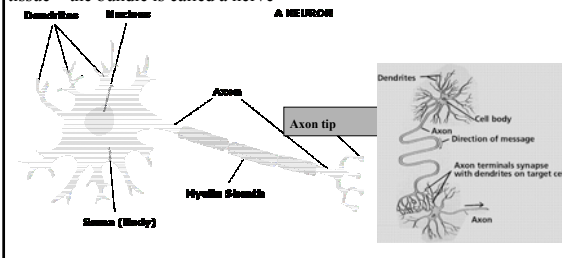
## Section 1 How The Nervous System Works

- Nervous System receives info from both inside and outside the body – directs the way your body responds to the info (called a response)– helps maintain homeostasis – information is carried through your nervous system through neurons (nerve cells) – message is called a nerve impulse

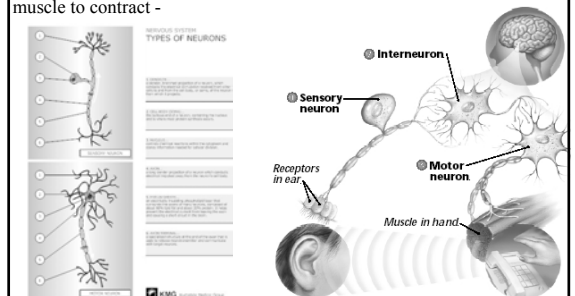


-dendrite = carries impulses toward cell body  
-axon = carries impulses away from cell body

neuron can have many dendrites but only one axon – axon can have more than one tip – axons and dendrites are sometimes called nerve fibers – nerve fibers are arranged in parallel bundles and covered by connective tissue – the bundle is called a nerve



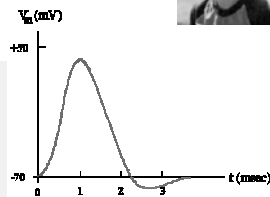
-3 kinds of neurons = sensory neurons, interneurons, and motor neurons – together they make a chain of nerve cells that can carry an impulse through the nervous system – sensory neuron pick up stimuli from internal or external environment – pulse travels to the interneuron usually in the brain or spinal cord – sends pulse to motor neuron to stimulate muscle to contract -



- nerve impulse starts in the dendrite – moves towards the cell body then down the axon to the axon tip – moves by electrical and chemical signals – can travel as fast as 120 meters per second – there are tiny spaces between axon tips and the next dendrite, muscle, gland, etc. – space is called a synapse – chemicals get released in the gap to pass the impulse across -



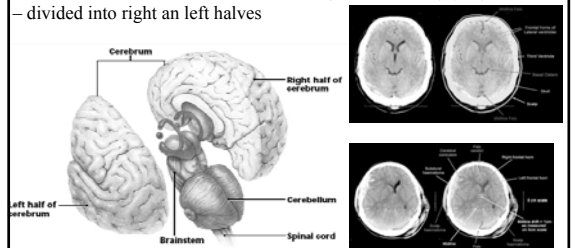
Some people say I get on their nerves.



Nervous systems, like other communication systems, use a sequence of impulses to carry message. The nature of nerve impulses, however, differs entirely from electromagnetic waves and sound waves. In every nerve cell, there is a membrane separating the cytoplasmic fluid from the extracellular solution. The transmembrane voltage (also called membrane potential) is defined as the inside potential minus the extracellular potential. When the nerve fiber is at rest, the membrane potential is about -70 mV. The nerve impulse is a sharp change of the membrane potential. Therefore, it is also known as the action potential (Fig. 1).

## Section 2 Divisions Of The Nervous System

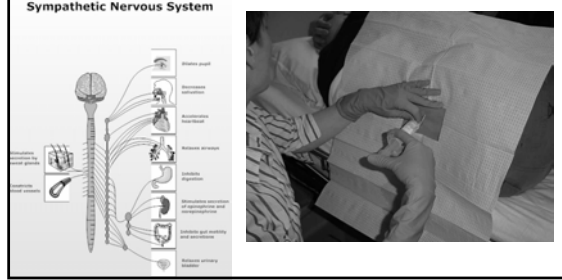
- central nervous system (CNS) = brain and spinal cord – peripheral nervous system (PNS) = all the nerves outside of the CNS – stimulus to PNS to CNS to PNS to Response – skull, connective tissue and fluid help protect your brain – brain has billions of neurons – brain has three main parts = cerebrum, cerebellum, and the brainstem – largest part is the cerebrum – carries out movement, learning, remembering, judgment, etc. – divided into right and left halves



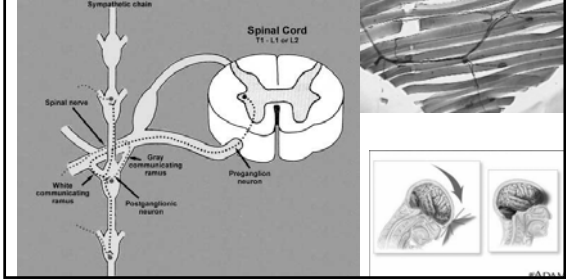
- right side controls left side of body and left side of brain controls right side of the body - right side of brain associated with artistic ability and left half with math, speech, writing and logical thinking - cerebellum is the second largest section - coordinates actions with your muscles and balance - brain stem lies between the cerebellum and spinal cord - controls the body's involuntary actions - ex. breathing



- spinal cord protected by the vertebral column, connective tissue, and watery fluid (spinal fluid) - connects to the peripheral nervous system - PNS sends nerves to the rest of the body - leave the spinal cord through spaces between vertebrae - spinal nerves are like a two way highway because impulses must be able to travel in either direction - contains axons for both motor and sensory neurons -



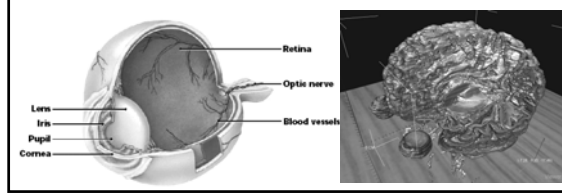
- nerves of the peripheral nervous system can be divided into two groups = somatic and autonomic nervous systems - somatic nervous system controls the voluntary actions and autonomic controls involuntary (automatic) - reflexes happen without conscious thought - nerve impulse goes to the spinal cord and never to the brain - concussion = brain bumps against the skull



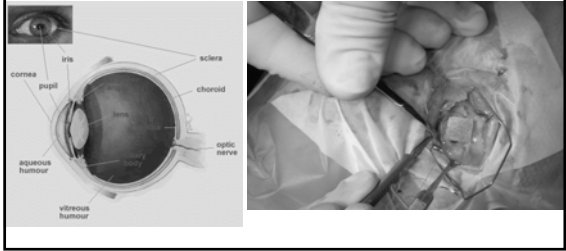
**Section 3 The Senses**

- major senses are vision, hearing, balance, smell, taste, and touch -

vision  
 - eyes respond to light - convert light to impulses that your brain interprets - cornea is the clear tissue that covers the front of the eye - pupil is the opening through which light enters the eye - iris regulates the size of the pupil and how much light enters the eye - lens bends the light and produces an image upside down onto the back of your eye - muscles attached to the eye adjusts its shape



- retina is the layer or receptor cells that line the back of the eye - rod receptors let you see black, white and gray - work well in dim light - cone receptors let you see color - work best in bright light - nearsightedness = can see images close well and far away poorly - farsightedness = can see images far away well and close poorly - concave lenses on glass are used to correct nearsightedness - convex lenses are used to correct farsightedness



Hearing  
 - ears convert sound waves into nerve impulses that your brain can interpret - ear consists of the outer ear, middle ear, and inner ear - outer ear is the part of your ear that you see - in the shape of a funnel - gathers sound waves and sends them down into the ear canal - eardrum separates the outer ear from the middle ear

