THE NERVOUS SYSTEM
WHAT PARTS DO YOU KNOW THAT ARE IN THE NERVOUS SYSTEM?

- Brain
- Spinal Cord
- Peripheral Nerve
What makes up the brain, the spinal cord or your peripheral nerves?

- Neurons are “the cell”
- Cell body
- Nucleus
- Axon
- Dendrite
- What do you think surrounds the cell?
- What other organelles would be needed?
How are neurons connected?

- Synapses!!
Why are neurons connected?
More neuron connections!
Close up look at your synapse

The synapse - where the action happens

The next cell’s plasma membrane

What is this in the membrane?

Transport protein
How does the Synapse carry the signal?

1. Electrical current travels down the axon
2. Vesicles with chemicals move toward the membrane - what is that called?
3. Chemicals are released and diffuse toward the next cell’s plasma membrane
4. The chemicals open up the transport proteins and allow the signal to pass to the next cell - what type of diffusion is this?
The synapse carries a signal from cell to cell
There are lots of proteins and chemicals in your body to do the work.

Why is it important that it is an electrical current?
Are all neurons equal in size?

- Brain vs spinal cord vs peripheral nerves?

About how many neurons are in the human brain? 100 billion

About how many neurons are in the spinal cord? 1 billion

How long do you think the longest axon in the world is? around 15 feet
How many synapses are in one neuron?

1,000 to 10,000!!
This science is called Neurobiology

- Looking at the actual cells - how do they work?
- Looking at the connections - how and when do they work?
- Looking at what can change normal cells and connections
- Looking at diseases that occur in the brain
- One of the largest areas still unknown
- The you that is you is because of your neurons connecting!
What do you think can change neurons and their connections?

• Accidents
• Drugs
• Alcohol
• Disease
Accidents

• Physical injury of your neurons
Drugs and alcohol bind important receptors on neurons
Repeated binding causes the neuron to die.
The Brain’s Marijuana Receptor Sites

Cannabinoid Receptor Sites

The “Secretary”

“Fight or Flight”

Basal Ganglia

Hippocampus

Coordination

Cerebellum
Drugs = neuron death

Your Brain After Drugs

Normal

Cocaine Abuser (10 da)

Cocaine Abuser (100 da)
Alcohol damages dendrites - can repair after abstinence

Alcohol blocks receptors and slows down transmission
• Parkinson's Disease
• ALS - Lou Gehrig’s Disease
• Huntington’s Disease
• Multiple Sclerosis
• Alzheimer's
• Cerebral Palsy
• Epilepsy
• ? SIDS
100 Billion or so neurons - what’s the problem with some of them dying?

• Cells multiply all the time - will your neurons?
• Does everyone react the same way to accidents, or drugs and alcohol?
• Do all organisms react the same to all stimulus?
• Which of your activities use your neurons?
What if neurons die here? or here or here or here or here or here or here or here
Neurobiology Activities and Labs

- Pillbug behavior Lab - (http://www.udel.edu/msmith/pillbugs.html)
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