



Trace the paths of information flow from one neuron to the next in the circuit.

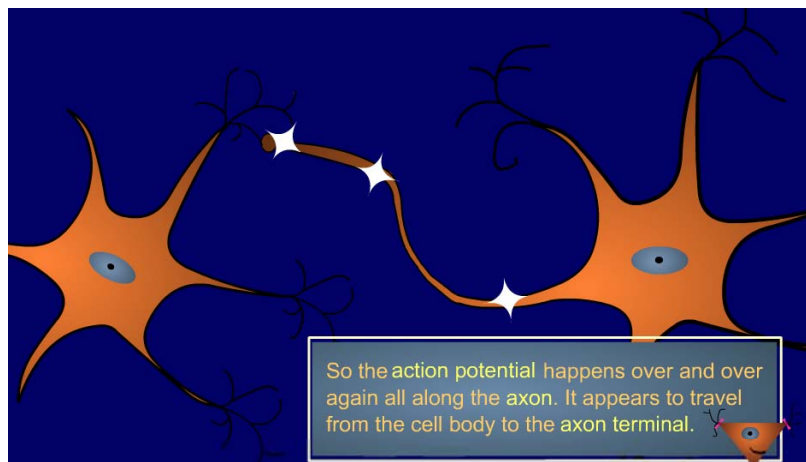
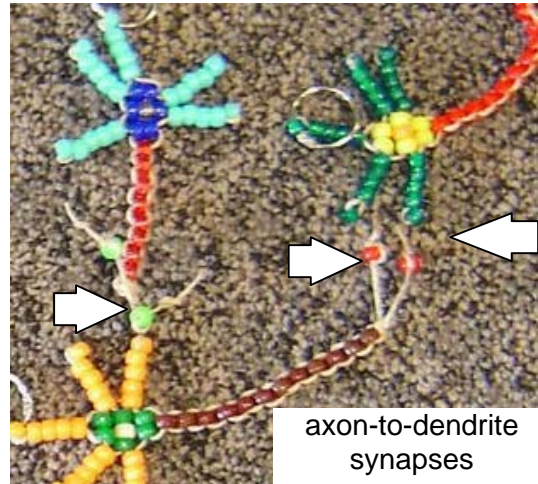
Reinforce the idea of axon-to-dendrite synaptic connections. These are the most common kind.

Where are there synapses? What kinds of synapses might these be?

Synapses occur at all axon terminal endings.

In this model, we can't tell if the synapses are excitatory or inhibitory. We cannot tell which neurotransmitters are being used just by looking at the anatomy.

Synapses can also occur at multiple points along axons as they cross multiple dendrites. These are called "en passant" or synapses in passing. These are unlikely to be illustrated by the beady neurons since the directions call for short axons in this model.



So the action potential happens over and over again all along the axon. It appears to travel from the cell body to the axon terminal.

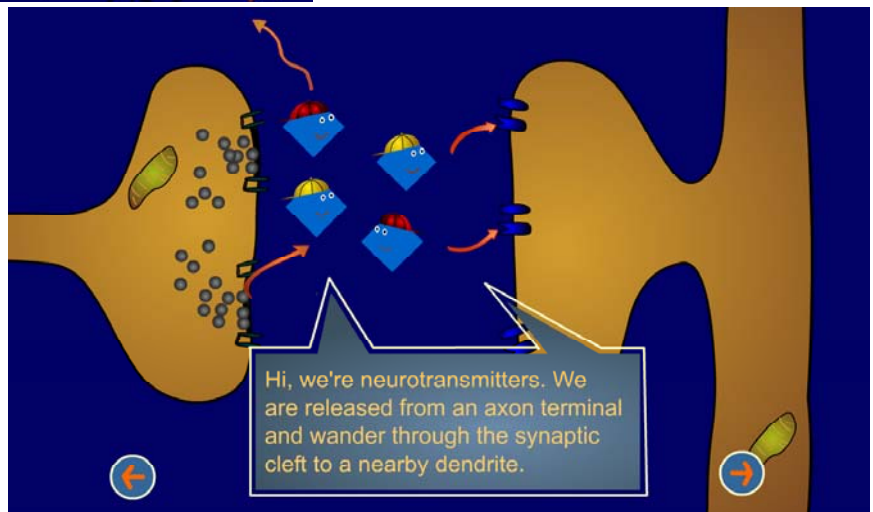
Where is information flow faster?

Information flows faster in the electrical signals inside of cells than in the chemical signals formed at synapses between cells.

Releasing the small synaptic vesicles filled with neurotransmitter may take longer than the time required for the electrical signal to travel down an axon. This will of course depend on the length of the axon.

Where is information flow more reliable? Inside neurons or across synapses?

The electrical information flowing inside neurons from dendrites to axon terminals is more reliable than the chemical communication at a synapse because the released neurotransmitters move randomly and may not always reach the dendrites to generate new signals in the postsynaptic neuron.

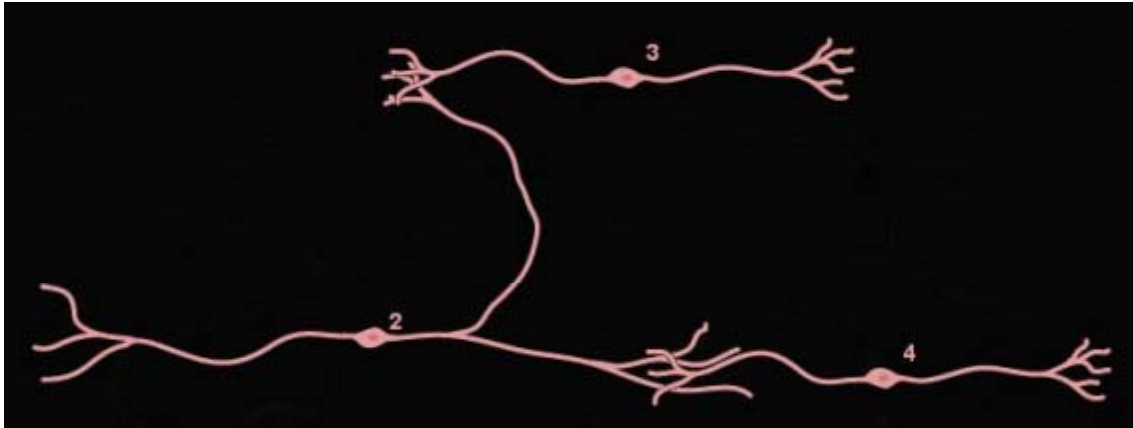


Hi, we're neurotransmitters. We are released from an axon terminal and wander through the synaptic cleft to a nearby dendrite.



What happens when one neuron synapses on two or more other neurons?

The signal is transmitted in more than one direction or to more than one target. This is called divergent output.



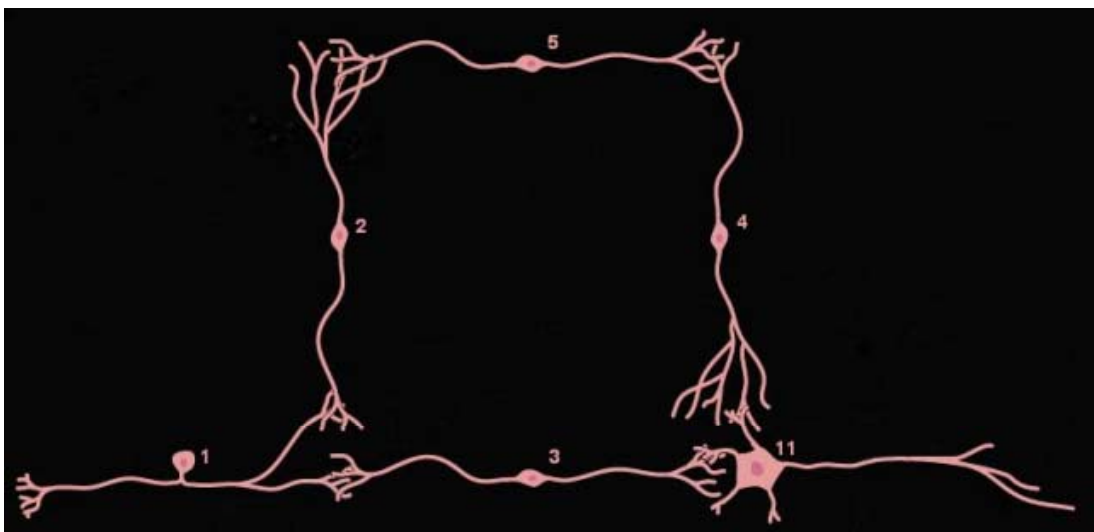
What happens if a neuron receives input from more than one other neuron?

The incoming signals add up in the receiving neuron to bring it to threshold. This is called convergent input.



If a circuit contains a point where information branches and flows into two pathways that later converge on a single neuron, which pathway will carry information faster? Why?

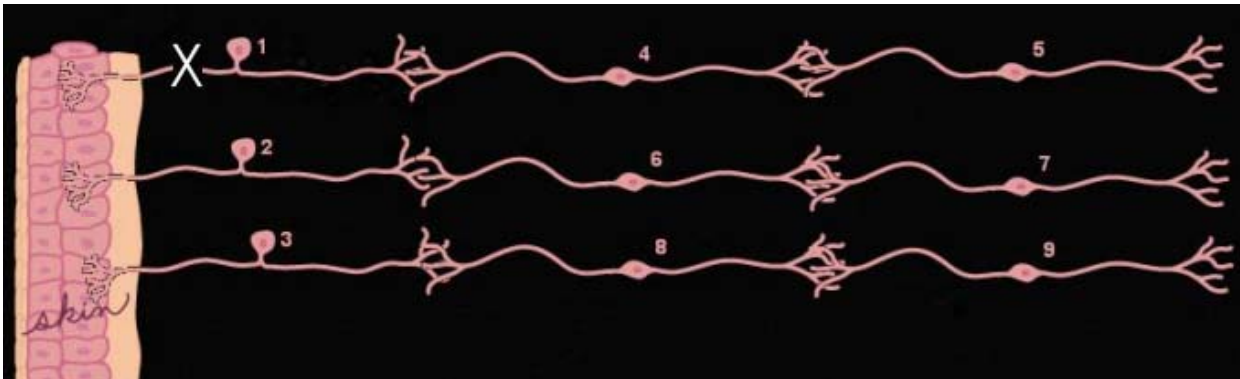
The pathway with the shortest number of synapses will be faster and is called a feed-forward circuit.





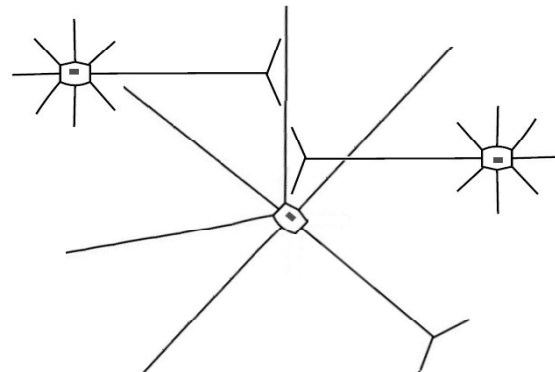
Are there places in the circuit where information flows in parallel pathways? Can the same information be carried in many neurons running in parallel? Is this an advantage or disadvantage for the nervous system? Why?

All circuits in the nervous system have many neurons and axons running in parallel carrying the same information. If one or more of these neurons or axons are damaged, then the remaining neurons or axons can still get the message across and function is preserved.



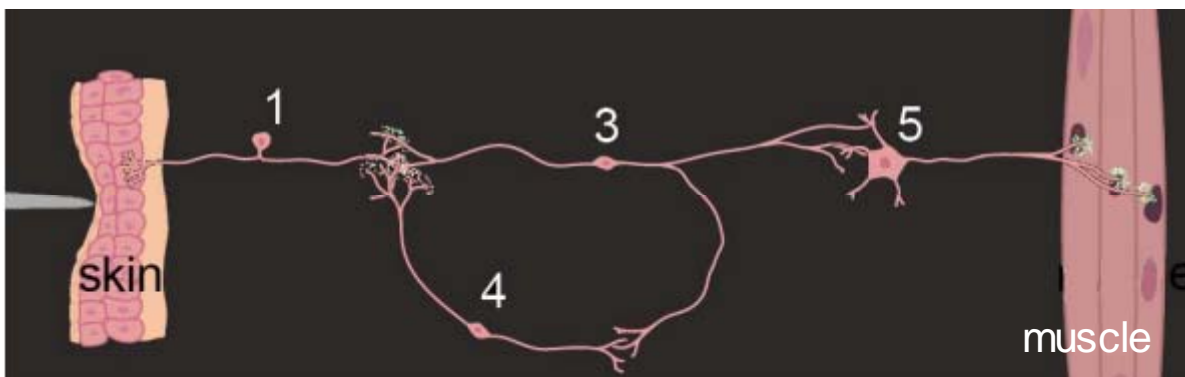
Which type of synapses might be strongest: those that occur on the dendrites or those that occur on the cell body?

Cell body. These will have a greater influence when adding up with all the incoming synaptic information from further out on the dendrites. Synaptic strength is greater closer to the cell body.



What happens if information comes back to the neuron that started a signal or pathway?

This information will change the rate of firing in the loop. If the information coming back is excitatory, this is called positive feedback. What will positive feedback do to the circuit? Neuron 5 will fire at a faster rate. If the information coming back is inhibitory, it is called negative feedback. What will negative feedback do to the circuit? Neuron 5 will fire at a slower rate.

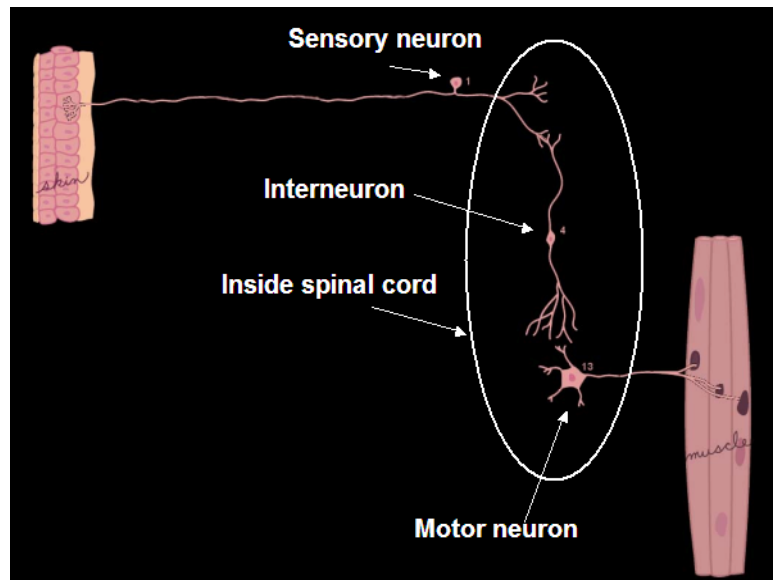




If you have a DRG sensory neuron, add it to the circuit. Why don't DRG sensory neurons have dendrites?

Sensory information in the skin (or muscles) is sensed by specialized nerve endings in the skin (or muscle) and becomes a full action potential at that nerve ending.

This electrical signal flows along the peripheral branch of the DRG axon right past the DRG cell body and into the CNS on the central branch of the DRG axon. No integration of information is necessary until the first synapse inside the spinal cord.



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But if there happen to be axon-to-cell body or axon-to-axon terminal connections, these are ok as well. What might happen at an axo-axonic synapse?

The CNS has axo-axonal connections which can modify how much neurotransmitter is released from axon 2 (postsynaptic) when axon 1 (presynaptic) sends its signal.

