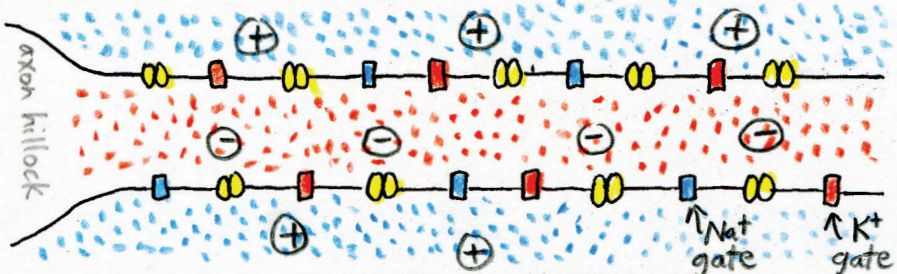
THE ACTION POTENTIAL and THE SYNAPSE

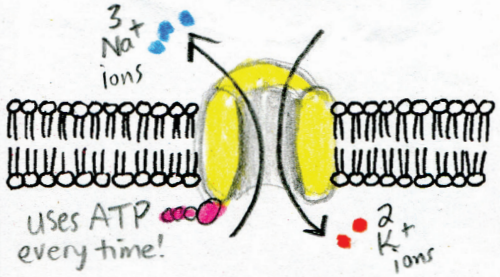
Electrical signals start in the hillock, travel down the axon, and end up in the axon terminals.

BEFORE ("RESTING POTENTIAL") ● Na^+ ● K^+

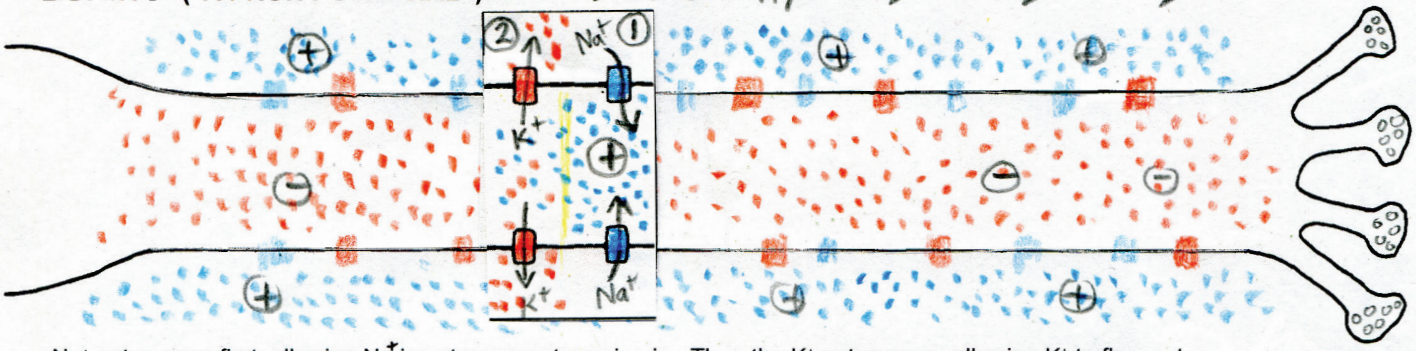


Electrical charge inside the axon is negative ***in comparison to*** the outside.

The resting potential is maintained by the ***sodium-potassium pump*** in the membrane.

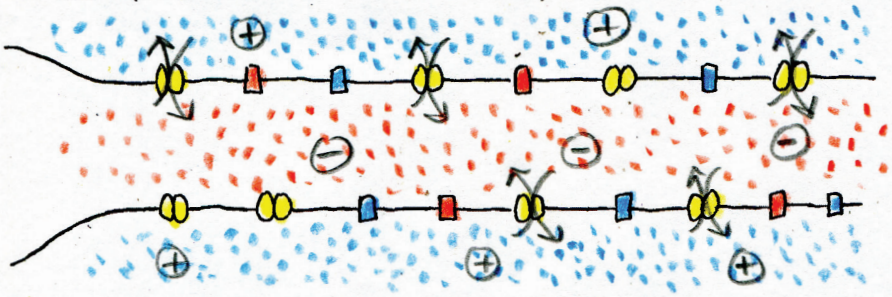


DURING ("ACTION POTENTIAL") → ONE WAY →



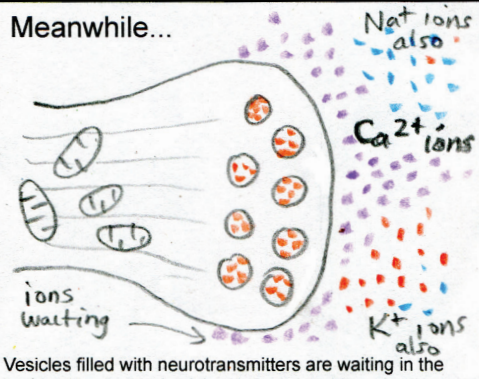
Na^+ gates open first, allowing Na^+ ions to come streaming in. Then the K^+ gates open, allowing K^+ to flow out.

AFTER (BACK TO RESTING POTENTIAL)



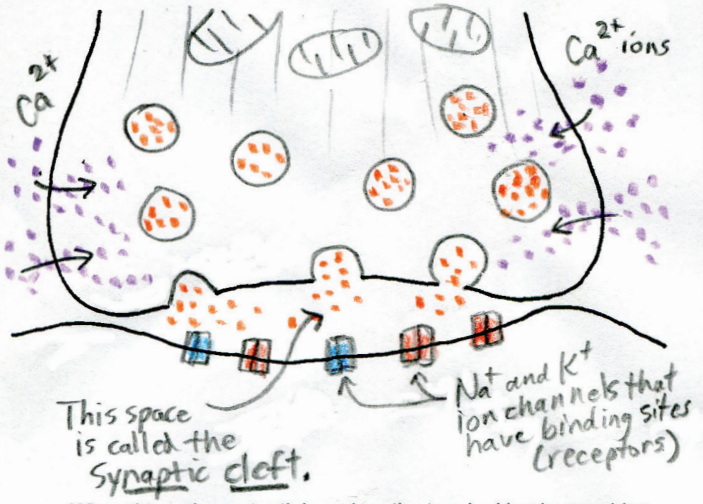
Na/K pumps go back to work, restoring the original resting potential.

Meanwhile...

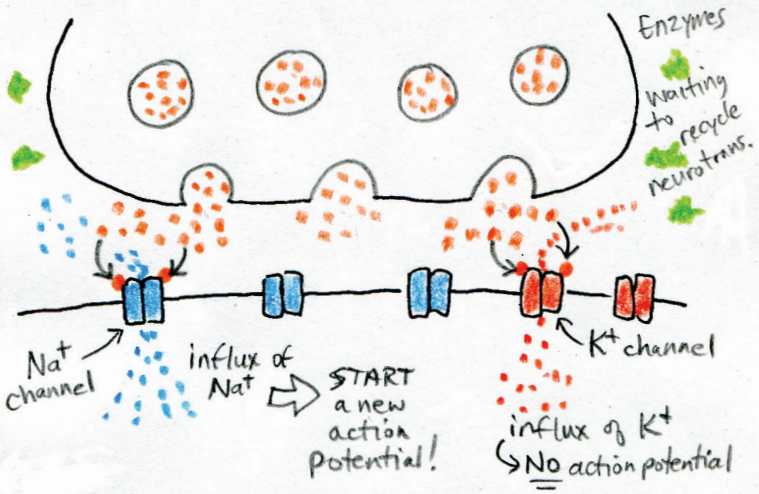


Vesicles filled with neurotransmitters are waiting in the terminal knobs, and calcium ions are waiting outside.

THE SYNAPSE -- jumping the gap



When the action potential reaches the terminal knob, a sudden influx of Ca^{2+} ions causes the vesicles to do exocytosis.



The neurotransmitters cross the synaptic cleft and bind to receptor sites on ion channels. Some neurotransmitters are "excitatory" and will start a new electrical signal by opening Na^+ channels. Other neurotransmitters are "inhibitory" and will prevent a new signal from starting by opening K^+ channels.