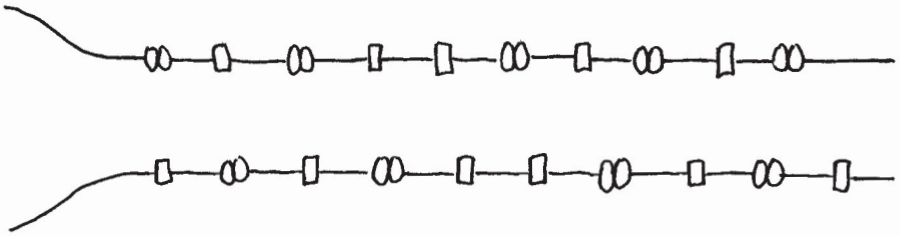
THE ACTION POTENTIAL and THE SYNAPSE

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

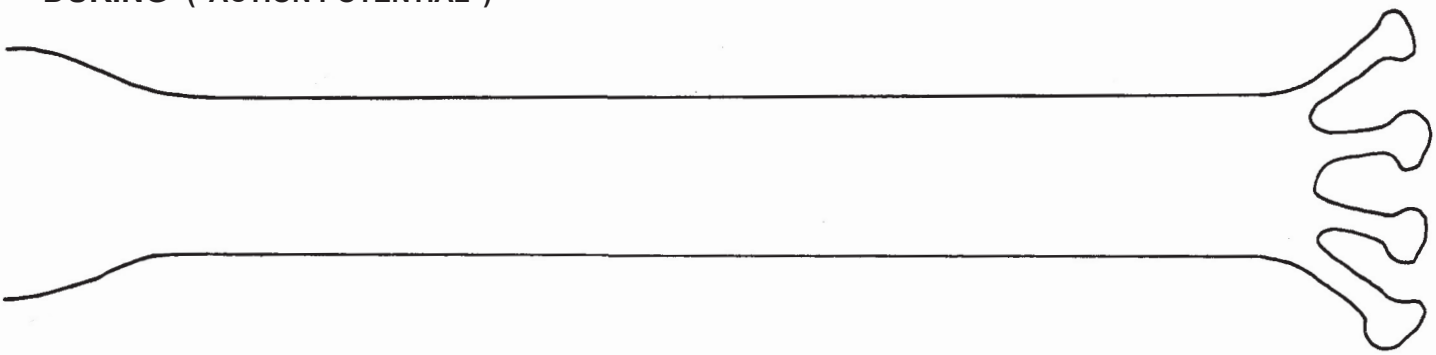
BEFORE ("RESTING POTENTIAL")



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

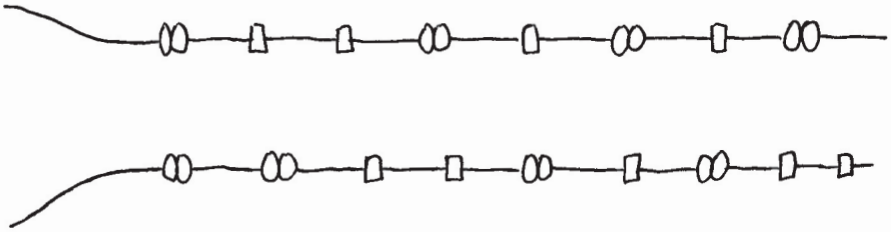
The resting potential is maintained by the ***sodium-potassium pump*** in the membrane.

DURING ("ACTION POTENTIAL")



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)



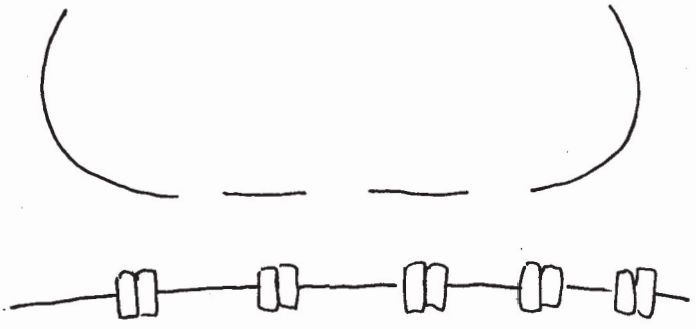
Na/K pumps go back to work, restoring the original resting potential.

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 open Na^+ channels in order to start a new action potential. Other neurotransmitters are "inhibitory" and will open K^+ channels, preventing a new action potential. Enzymes are present, also, for immediate removal of neurotransmitters.