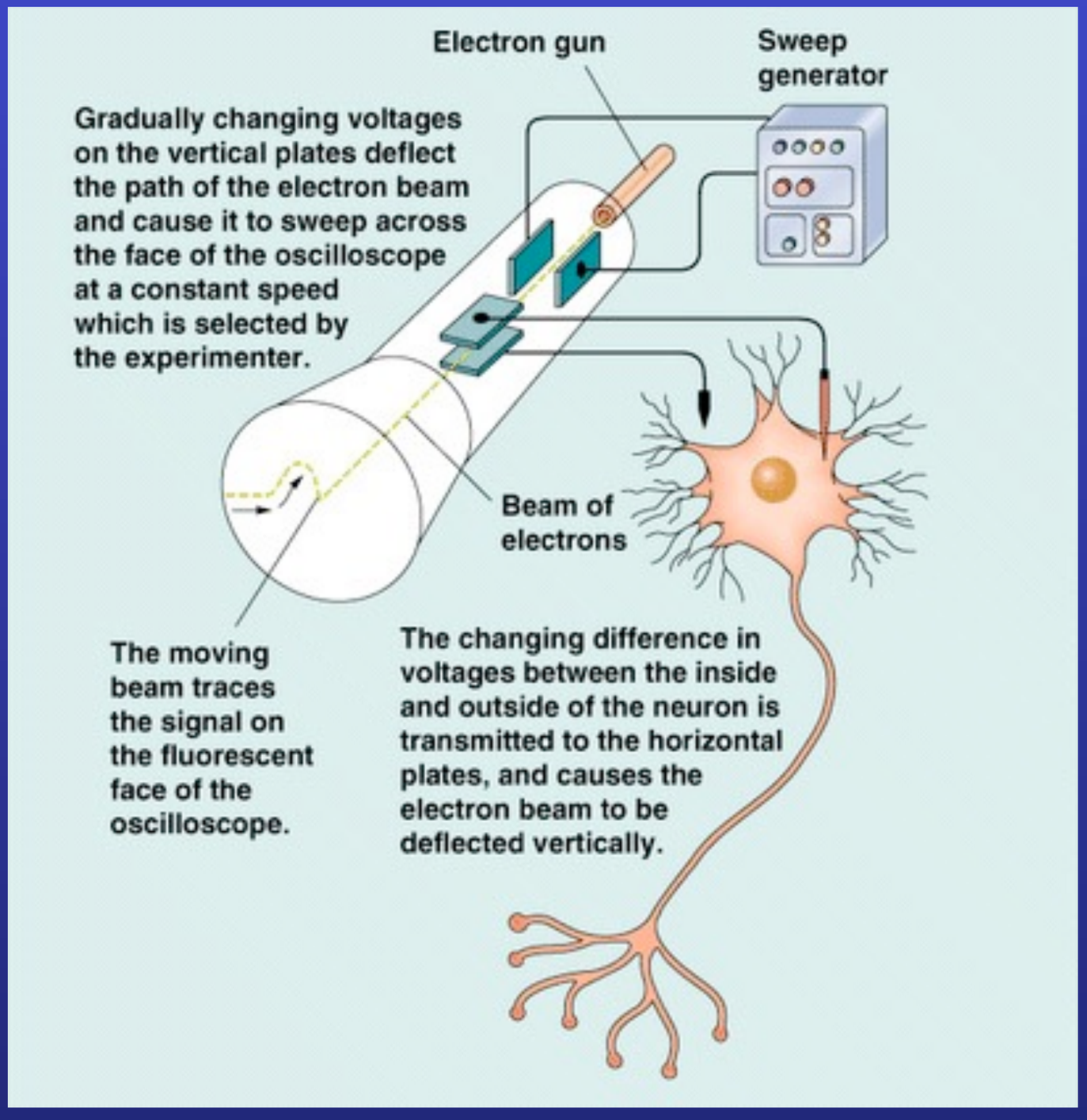
Membrane Potential

- the difference in electrical charge between the inside and outside of a cell

visualizing the resting potential

- attach microelectrodes to an oscilloscope
- one electrode goes inside cell
- one outside cell
- difference in voltage between the two electrodes is the resting membrane potential
- = -70mV



Action Potentials

- APs are produced and conducted along axons by voltage-gated ion channels
- ion channels that open or close in response to changes in the voltage of the membrane potential

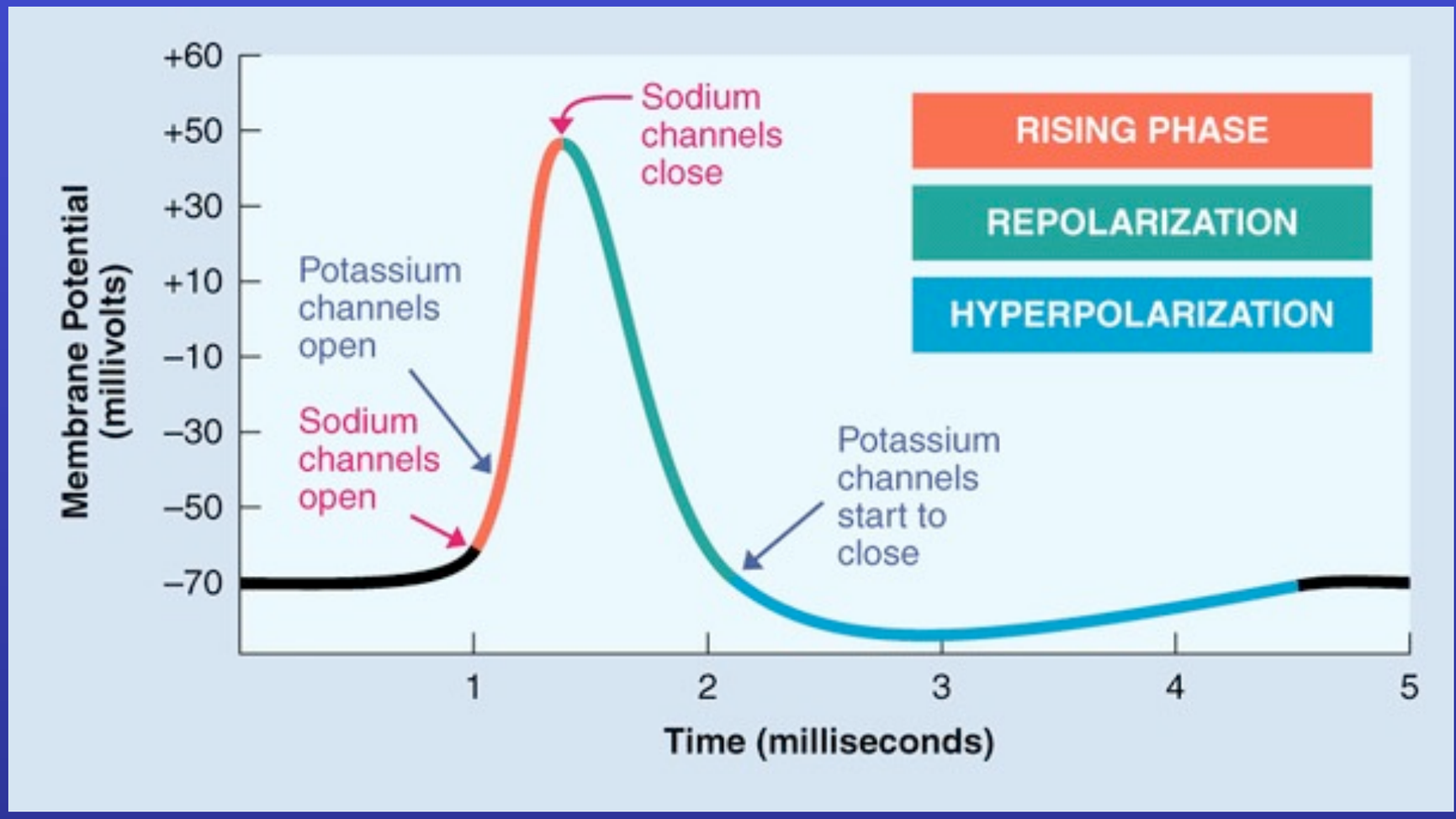
- When a nerve cell is depolarized from the resting membrane potential, different types of voltage gated ion channels will open, provided that the membrane potential reaches a threshold value.

- Such voltage dependent channels give rise to the action potential, during which sodium channels initially open to bring the membrane potential towards the equilibrium potential for Na + ions (around + 50 mV).

- With some delay, voltage dependent potassium channels open, which pulls the membrane potential towards the equilibrium potential for K + ions (around - 9 0 mY). The sodium channels have the additional property of closing after a period of depolarization, i.e. they are inactivated, whereas the potassium channels are not (Hodgkin and Huxley 1952; Hille 1984).

- The potassium channels open slower than sodium channels and are not fast enough to disturb the fast depolarization of the spike. They are, however, faster than the inactivation of sodium channels and therefore constitute the primary factor involved in the rapid repolarization of the spike.

Action Potential



- Na+ channels open wide allowing Na+ to rush in
- K+ channels open wide as well driving K+ out
- Na+ channels close after about 1 millisecond
- marks end of the rising phase