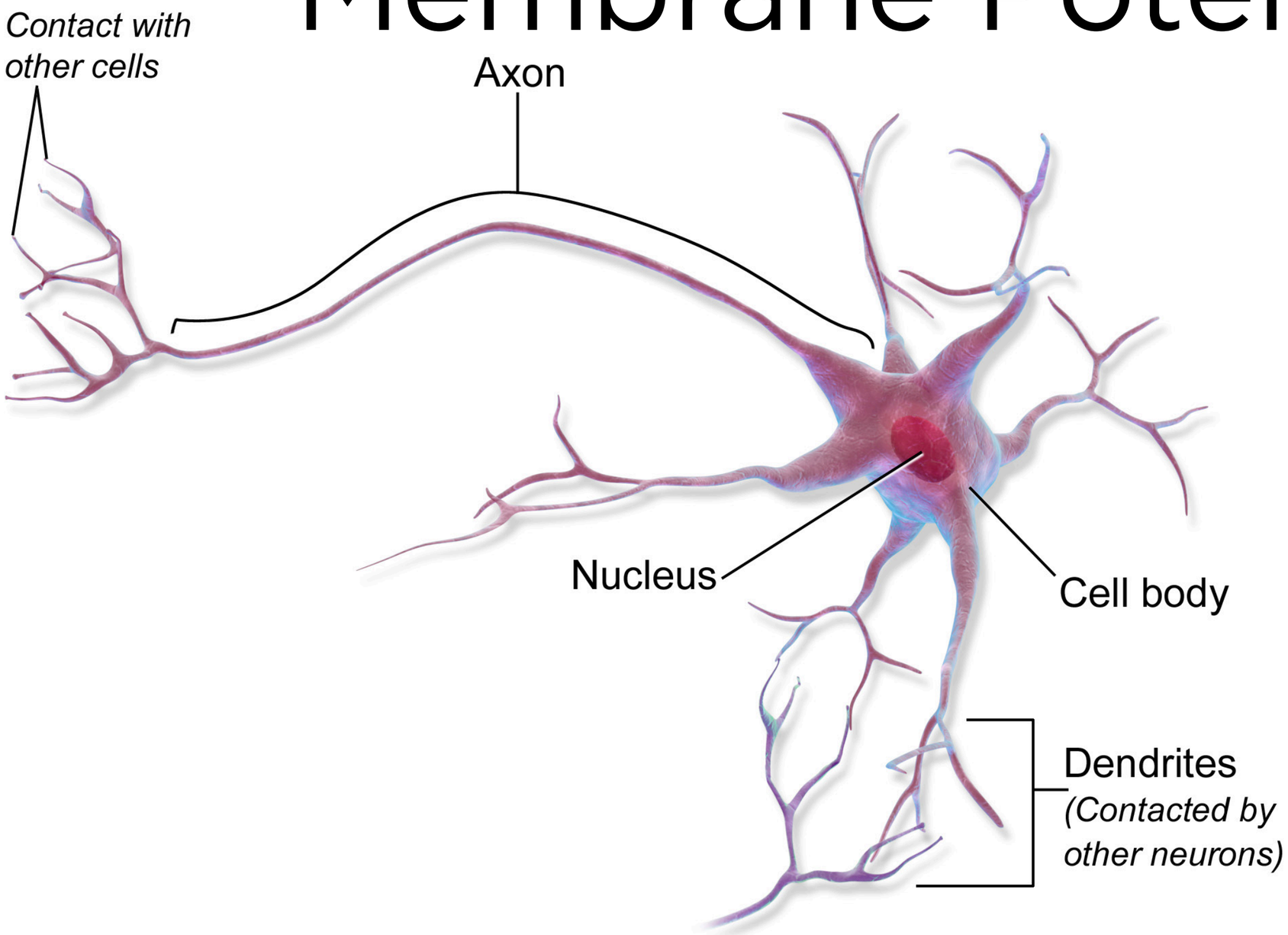
The Resting Membrane Potential

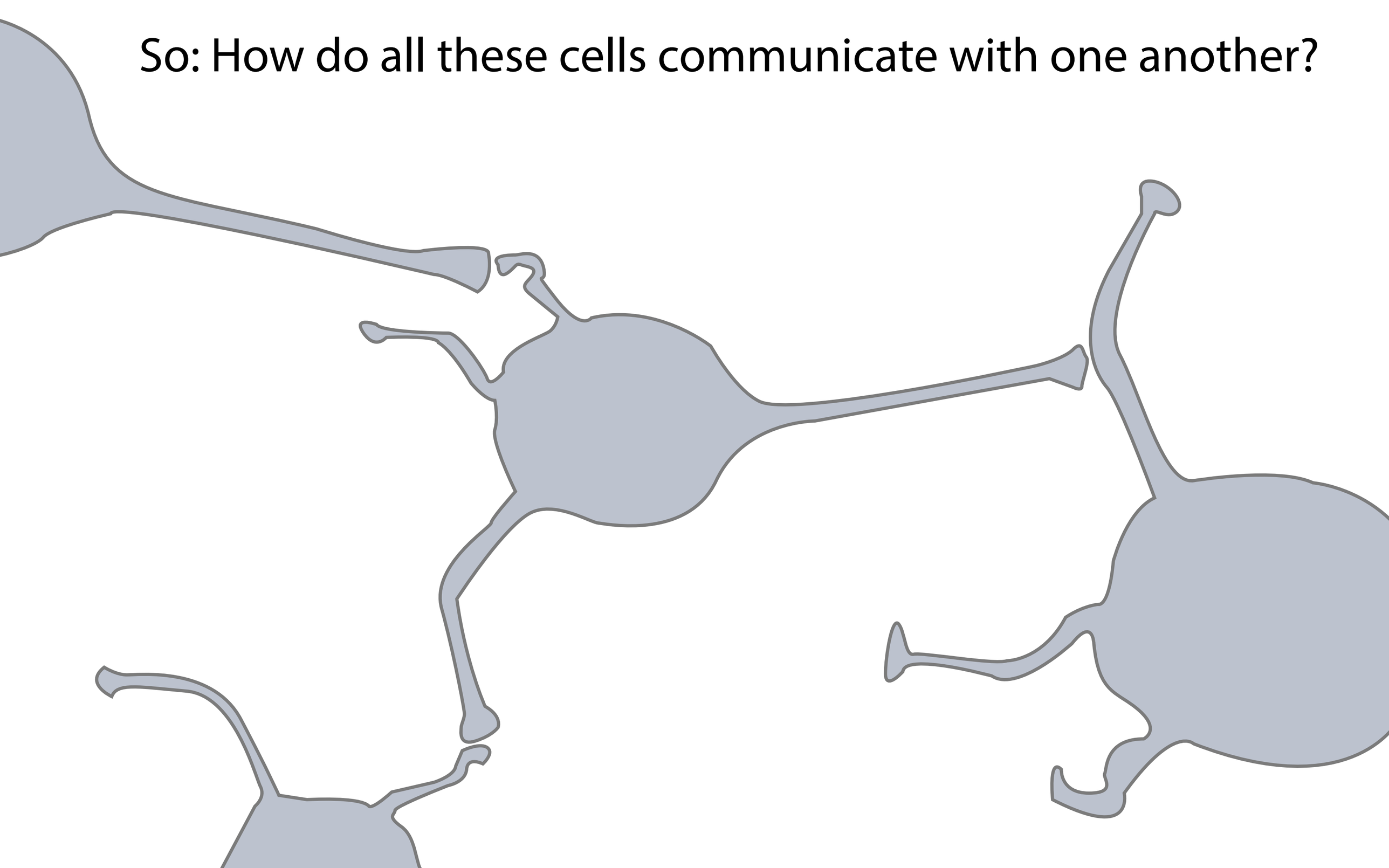


steven j. barnes

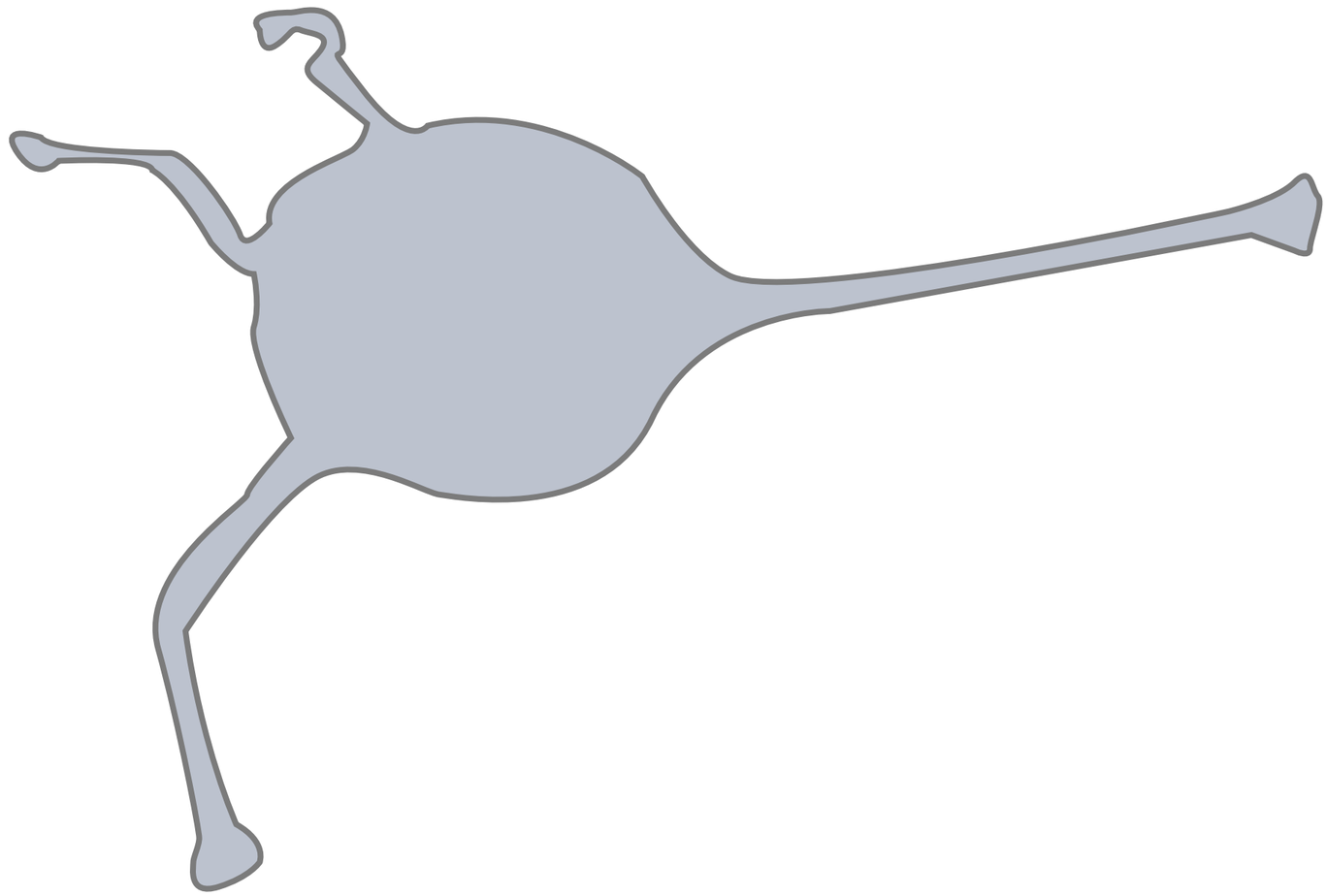
- Describe the resting membrane potential and its ionic basis.

Learning Goals

So: How do all these cells communicate with one another?

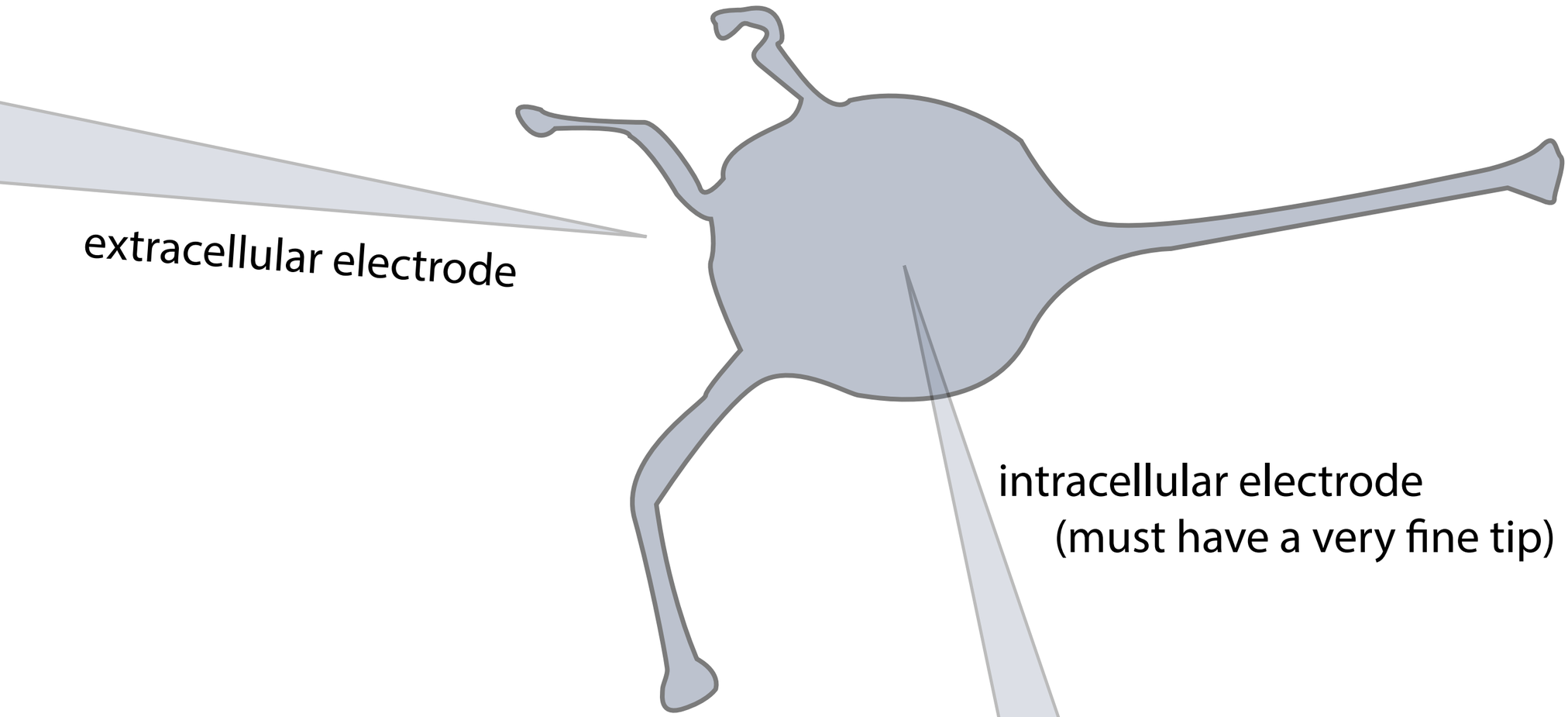


As a first step: How does communication occur within a single neuron?



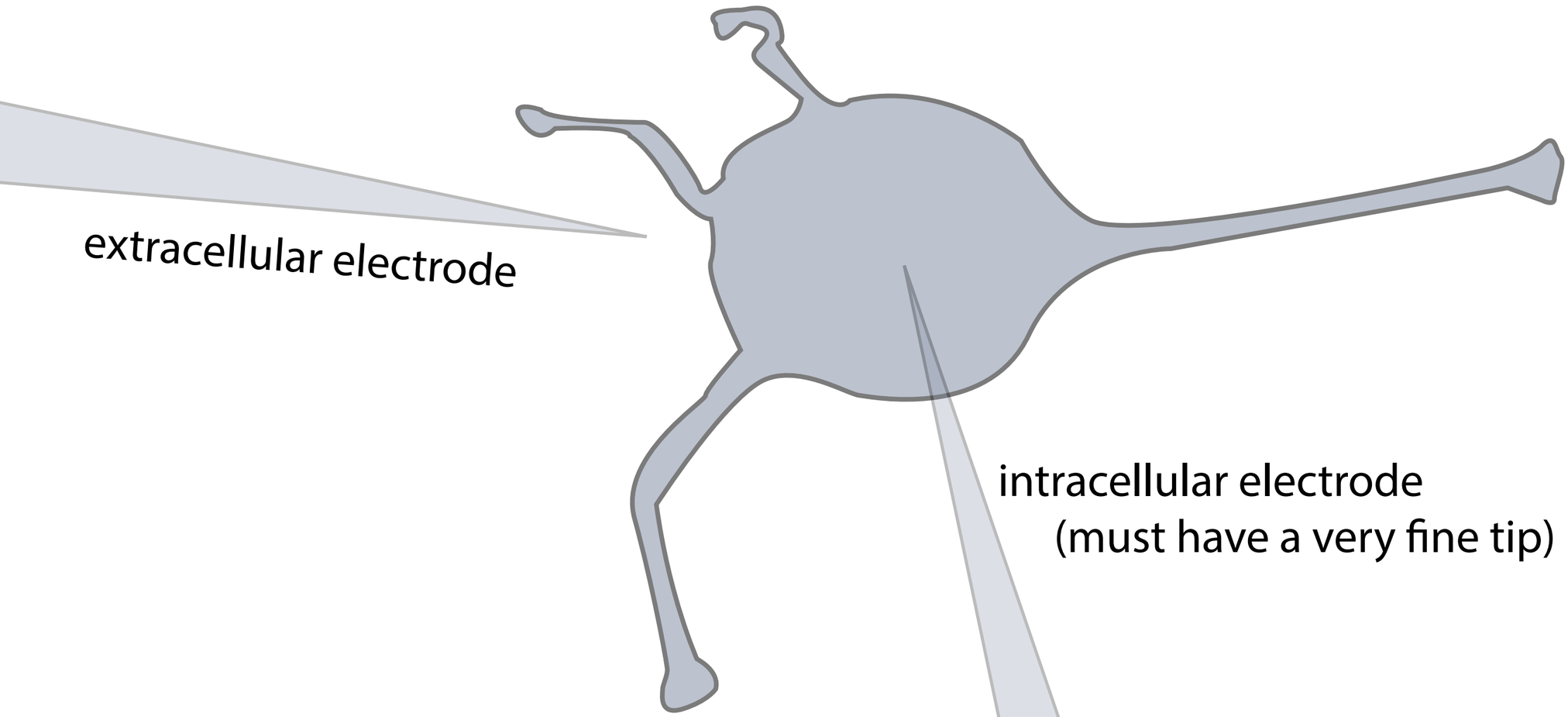
Intracellular Recording

aka: the 'sharps microelectrode' technique



Resting Membrane Potential

A healthy neuron has a resting membrane potential (or membrane voltage) of between -60 and -80 mV (the voltage inside the neuron is 60-80 mV less than outside the neuron).



Resting Membrane Potential

Why the polarization at -70mV?

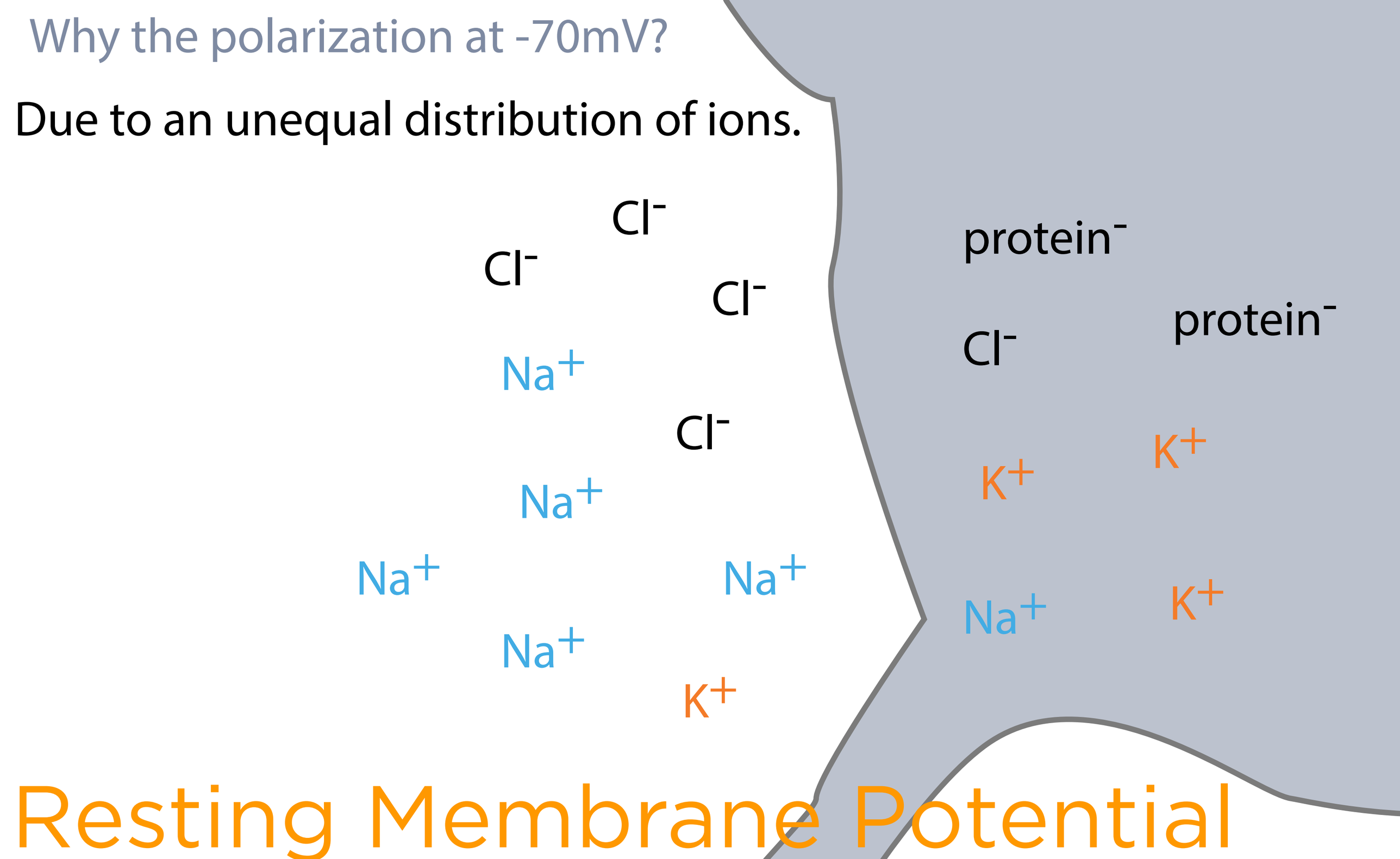
Extracellular Fluid

Cytoplasm

Resting Membrane Potential

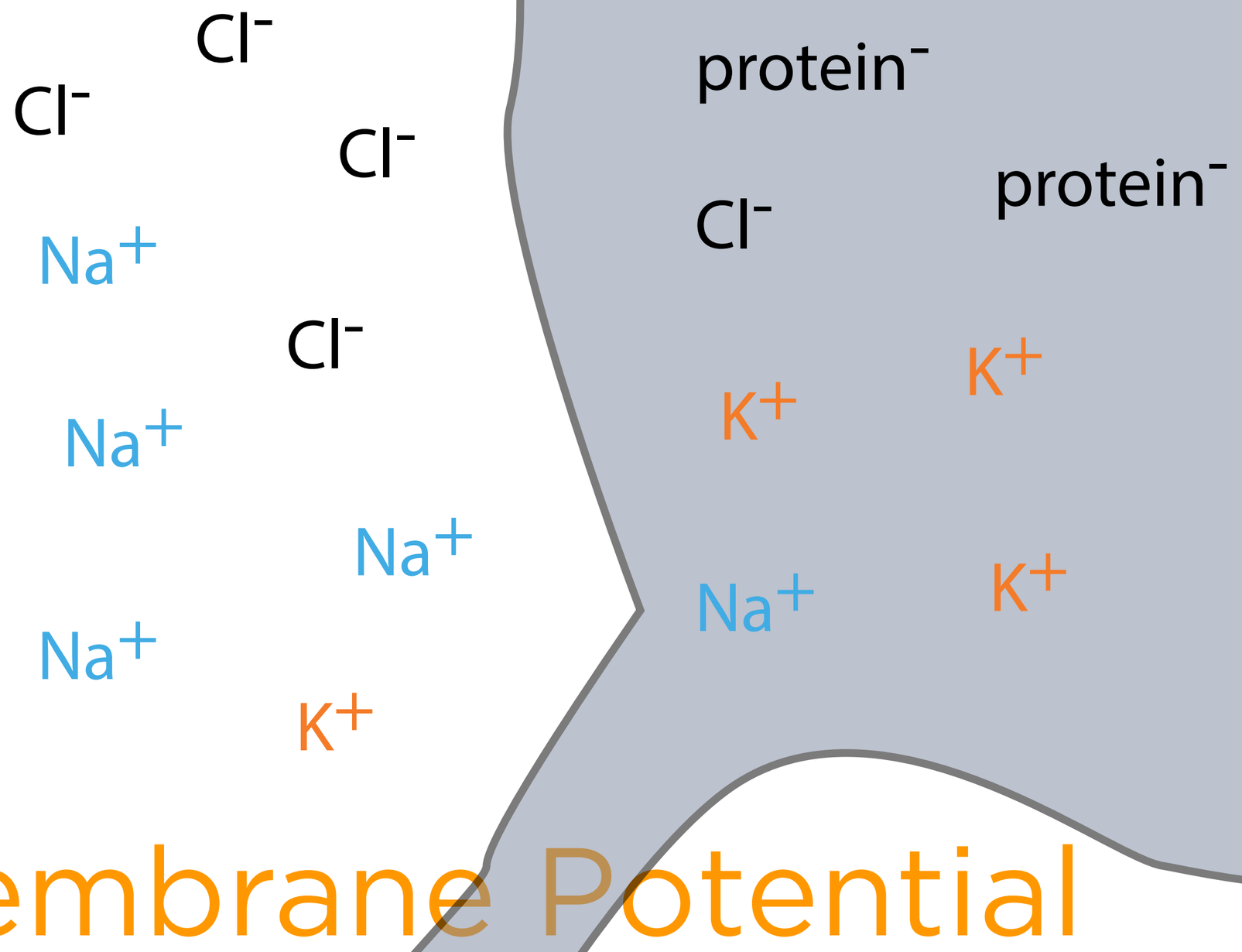
Why the polarization at -70mV?

Due to an unequal distribution of ions.



Resting Membrane Potential

Why the unequal distribution of ions?

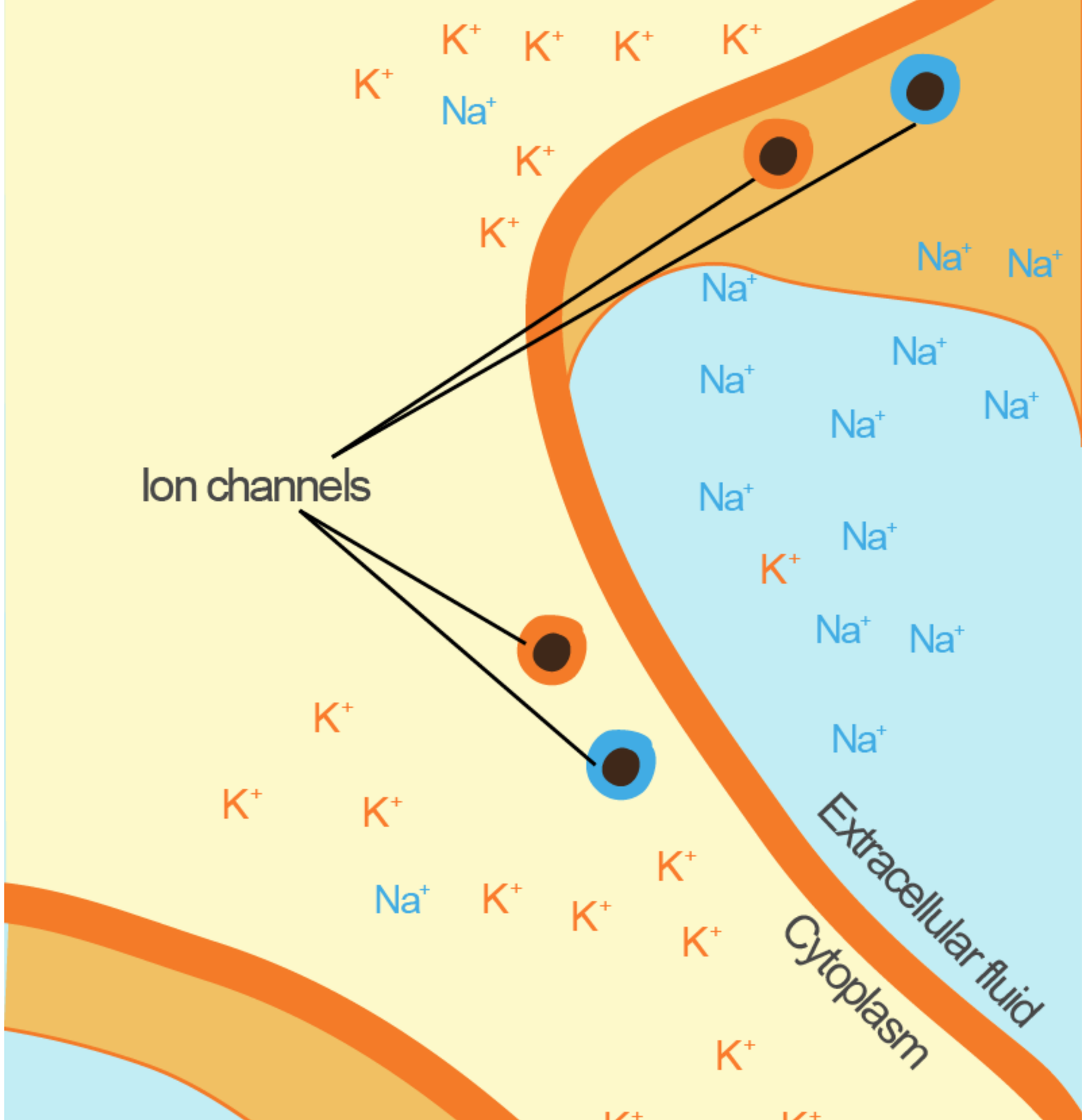


Resting Membrane Potential

Why the unequal distribution of ions?

Four Factors:

1. Differential Permeability (due to the presence of ion channels).

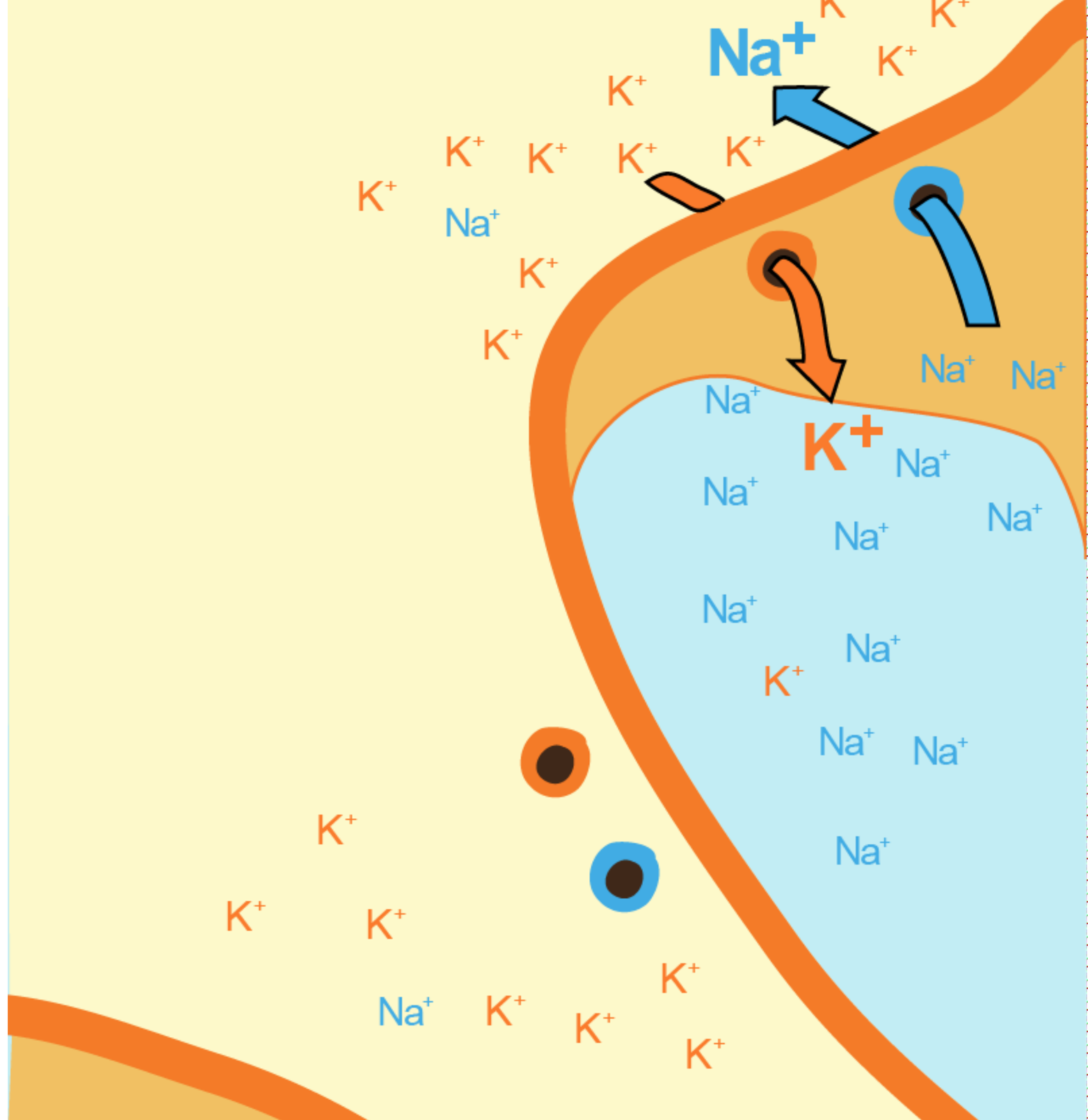


Why the unequal distribution of ions?

Four Factors:

1. Differential Permeability.
2. Ions move down their concentration gradients.

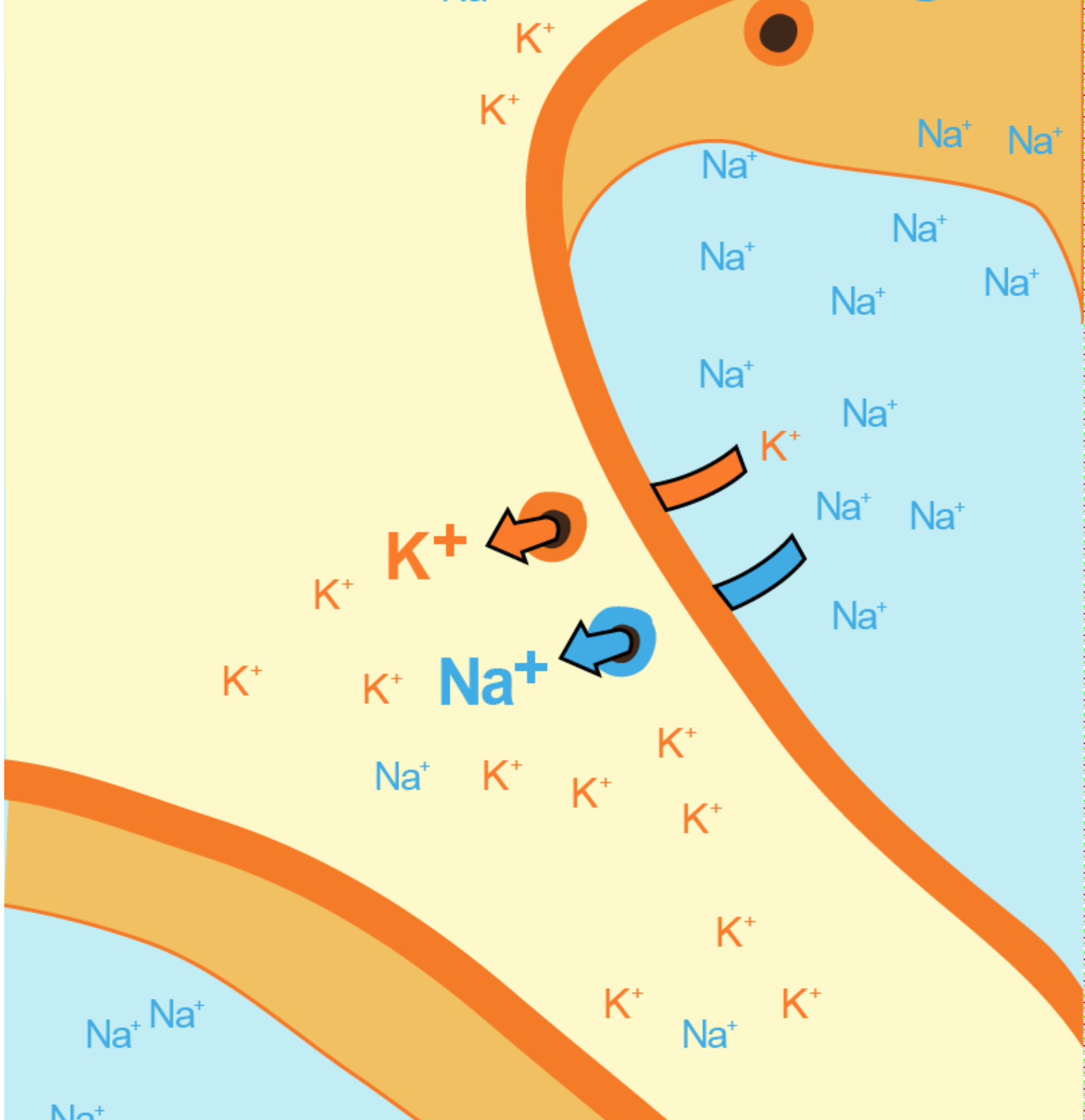
Thus, Na+ will tend to enter and K+ will tend to exit.



Why the unequal distribution of ions?

Four Factors:

1. Differential Permeability.
2. Movement down concentration gradient.
3. The negative internal charge creates pressure for both Na+ and K+ to enter the cell.



Why the unequal distribution of ions?

Four Factors:

1. Differential Permeability.
2. Movement down concentration gradient.
3. Electrostatic pressure.
4. Sodium-potassium pump transports 3 Na+ out for every 2 K+ it transports in.