Animal cells originated in the Pre-Cambrian seas

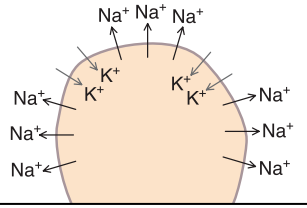
Their survival depended on Na-K ATPase pumps in the cell membrane

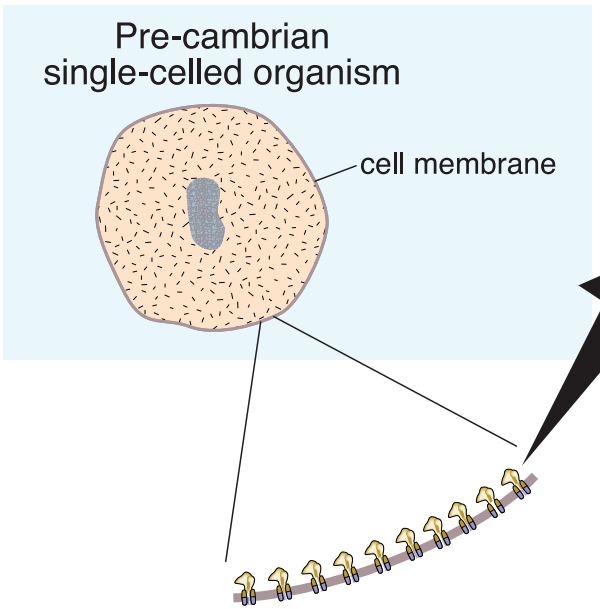
Single-celled animals in the Pre-Cambrian seas had Na-K ATPase pumps in the cell membrane:

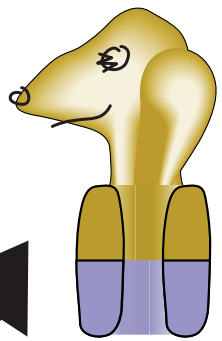
- ***to pump Na^+ ions out of the cell.***
- ***to pump K^+ ions into the cell.***

The intracellular "head" of the Na-K ATPase pump looks like the Snoopy-dog cartoon character. Hey Mom… can I keep him? Please?

The Na-K ATPase pumps force 3 Na^+ ions out of the cell for every 2 K^+ ions forced into the cell.







Na-K ATPase pump

Note: the black nose, mouth, and eyes were scribbled on this pump by a mischievous child.

Na-K ATPase pumps continuously metabolize ATP in order to pump Na^+ ions out of the cell and K^+ ions into the cell, to maintain the cell's inward Na^+ gradient and outward K^+ gradient.

And, since more Na^+ ions are ejected from the cell than K^+ ions forced in, the Na-K ATPase pumps maintain the intracellular negativity relative to the outside.

Animal life originated as single cells in the salty Pre-Cambrian seas, some 600 million years ago.[18] These primordial animal cells evolved with cell membrane pumps that used ATP for energy[50] to create an inward Na^+ gradient and an outward K^+ gradient. These "ATPase pumps" forced Na^+ ions out of the cell and pumped K^+ ions into the cell from the surrounding salt water environment to create and maintain those gradients. So vital are the *sodium-potassium* (Na-K) *ATPase pumps* that evolution has preserved them to this day in animal cells, where they continuously metabolize ATP for the life of the cell. Due to the non-stop work of the Na-K ATPase pumps, animal cells maintain fewer Na^+ ions inside the cell than outside, and more K^+ ions inside the cell than outside. At rest there is a gradient across the cell membrane for Na^+ ions to enter the cell, and a gradient for K^+ ions to leave the cell, and the Na-K ATPase pumps also help maintain the intracellular negativity.