

Andy Bumstead (abums1@u.brockport.edu)

Anthony Raymond (araym3@u.brockport.edu)

Purpose of model (Osmosis and Plasmolysis):

This model simulates the processes of diffusion and osmosis in a plant cell

- **Osmosis is the movement of water molecules from an area of high water concentration to an area of low water concentration.**
- **Diffusion is the spontaneous movement of molecules from an area of high concentration to an area of low concentration.**

Our model portrays an elodea plant cell with a cell wall, cell membrane and other organelles (green chloroplasts). It gives the user a sense of how initial water content, and the interaction between water and solute (salt) affects the cell membrane. The addition of salt water to the plant cell causes its cell membrane to shrink away from the cell wall.

Initial setup requires the user to select a beginning “water content”, using a slider adjusts the amount of water molecules present in the cell. Note how, depending on the initial cell water content, the cell membrane will either collapse away from the cell wall or be fully pressed against it. Pressing the “Setup” button prepares the simulation.

Pressing the “Go” button will continuously simulate the random movement of water molecules inside the cell. Pressing the “Go Once” button will simulate this process one movement at a time.

This model also gives the user a sense of the cytoplasmic streaming activity that occurs within plant cells. This can be observed by the green chloroplasts moving, but remaining within the constraints of the cell membrane.

Pressing the “Add 5% Salt Solution” button simulates the addition of salt solution to the outside of the plant cell. Note the salt molecules will start from the corners and quickly fill the entire cell, moving randomly.

By adding increasing amounts of salt, the plant cell membrane will progressively shrink in response. This will simulate the process of osmosis where adding a high solute concentration to the outside of a cell will cause water to be drawn out. As the cell membrane shrinks the organelles (green) will become compacted. All of this takes place as the plant cell strives to achieve equilibrium.