THE SMALLER THE STRONGER

A. Question: *Can water move upwards?*

B. Materials Needed:

1. Three or four capillary tubes of different diameters.
2. A small beaker.
3. Food coloring.

C: Procedure:

1. Fill the beaker with water and place a few drops of food coloring in it.
2. Hold the three or four capillary tubes close to each other and dip them in the water; observe the water level in each of the capillary tubes.
3. When a flat cell is available, the capillaries can be projected on the screen by slanting the overhead projector slightly.

D: Anticipated Results:

Students should be able to observe the movement of water up the capillary tubes.

E: Thought Questions for Class Discussion:

1. Will the water level in the capillaries change when the tubes are either moved higher or lower in the beaker?
2. What makes the water go up in the tubes in the first place?
3. Why does the water move up higher in the narrower capillary?
4. Where do we find an application of this capillary action in daily life?
5. What is the force between unlike or like molecules of matter called?

F: Explanation:

When a capillary tube is dipped in water, the adhesive forces between the water and the glass of the tube are so large that the water is pulled upwards. The smaller the capillary, the more glass surface per unit number of water molecules exists, and thus the larger the adhesive force. Furthermore, the distance between the water molecules and the glass molecules is so much shorter in the narrower tube, that the adhesive attraction between theses unlike molecules is greatly increased.

This is how the fibers in plants and trees bring up the water from deep in the ground to high up in the leaves. Capillary action combined with osmotic pressure caused by semi-permeable walls of the fibers and the plant juices, push up the water to the tree top. Another example of adhesion is the application of paint on any surface. The paint clings to the surface because of the adhesive forces between the paint and the surface molecules.