Polarity of Water Activities or Demonstrations

Jumping paper: To show the attractive force between water molecules.

Materials:
- Clear plastic cup filled half-way with water
- Newspaper

Procedure: Cut a thin, long strip of paper, 0.25” wide and 17” long or longer. Newspaper works well. Use the edge of a blade of a pair of scissors to curl the strip of paper and make a 90 degrees fold a ½ inch from the end. You can also fold the entire strip of paper accordion style. Fill a clear plastic cup half way with water. Soak the folded end of the strip in cup of water. Take the strip out of the water. Slowly bring the wet end of the curled paper near the water and watch it “jump” towards the water. Gently pull it out of the water – you can see it hold on and then release with a jump. Ask students to explain this observation. Water is strongly attracted to itself. Why? Water is a polar molecule. It has a net negative charge on the oxygen and a net positive charge on the hydrgen.

The oxygen atoms of water molecules are attracted to hydrogen atoms of other water molecules because negative and positive charges attract.

Bending Water: Static electricity can be a problem when the humidity is low. It causes shocks and makes dust stick to surfaces, and it can literally make your hair stand on end. In this experiment, you will see that it also can move things around. This experiment will not work if the humidity is high.

Materials:
- a nylon comb or a balloon
- a water faucet

Procedure: Adjust the faucet to produce a small stream of water. The stream should be about 1.5 millimeters (1/16 inch) in diameter.

Run the comb through your hair several times. Slowly bring the teeth of the comb near the stream of water, about 8 to 10 centimeters (3 or 4 inches) below the faucet. When the teeth of the comb are about an inch or less away from the stream, the stream will bend toward the comb.
Move the comb closer to the stream. How does the distance between the stream and the comb affect how much the stream bends?

Run the comb through your hair several more times. Does the comb bend the stream more now?

Change the size of the stream by adjusting the faucet. Does the size of the stream affect how much the stream bends?

If you have other combs, you can try these to see if some bend the stream more than others. Or you can use a balloon. Rub the balloon on a piece of clothing to build up charge on the balloon.

**Static electricity** is the accumulation of an electrical charge in an object. The electrical charge develops when two objects are rubbed against one another. When the objects are rubbed together, some electrons (charged components of atoms) jump from one object to the other. The object that loses the electrons becomes positively charged, while the object that they jump to becomes negatively charged. The nature of the objects has a large effect on how many electrons move. This determines how large an electrical charge accumulates in the objects. Hair and nylon are particularly good at acquiring charge when they are rubbed together.

**Attraction between Opposite Charges (+/–):** A charged object attracts small particles, such as dust. The charge in the object causes a complementary charge to develop in something close to it. The complementary charge is attracted to the charged object. If the complementary charge forms on something tiny, such as dust particles, these tiny particles move to the charged object. This is why your television screen becomes dusty faster than the television cabinet. When a television operates, electrons fly from the back to the screen. These electrons cause the screen to become charged. The charge on the screen attracts dust.

The comb attracts the stream of water in the same way. The charge on the comb attracts the molecules of water in the stream. Because the molecules in the stream can be moved easily, the stream bends toward the comb.

When you comb your hair with a nylon comb, both the comb and your hair become charged. The comb and your hair acquire opposite charges. Because the individual hairs acquire the same charge, they repel each other. Perhaps you noticed that after running the nylon comb through your hair, the hairs on your head stood on end. This is a result of your hairs repelling each other because they are charged.

**Humidity:** Static electricity is more of a problem when humidity is low. When humidity is high, most surfaces are coated with a thin film of water. When objects coated by a film of water are rubbed together, the water prevents electrons from jumping between the objects.

**Reference:** Chemical Demonstrations, A Handbook for Teachers in Chemistry by Bassam Z. Shakashiri, VOL. 3, Page 329

http://scifun.chem.wisc.edu/HOMEEXPTS/BENDWATER.html