Week 8: Let it Flow

There's nothing better than cooling off in water on a hot summer day, like running through a sprinkler or playing in a fountain. Learn how water moves by experimenting with pressure, then get creative and make water move—even uphill!—by building a water wall.

Experiment

WATER WALL

outside fun!

## Materials

Two pails

Three or more 20-ounce plastic bottles

25 feet of clear aquarium airline flexible tubing (available at pet stores)

Food coloring (optional)

Duct tape

Scissors

Pipe cleaners

Zip ties

Pegboard

Instructions

First, understand how pressure helps water move with a quick challenge. Fill one pail with water and set the two pails on a flat surface, like a table. Cut a 61-centimeter piece of aquarium tubing and try to get the water to move through the tube into the empty pail. Stumped? Make a siphon—submerge the tubing in the pail of water so that no air is left in the tube, put your finger over one end of the tube and place that end of the tube into the empty pail. Get the water flowing by moving the empty pail to a lower spot, creating a longer slope in the tube. The water will flow through the tubing into the empty pail as long as the "receiving" pail is lower than the "source" pail. See what happens to the water flow as you change the position of the pails.
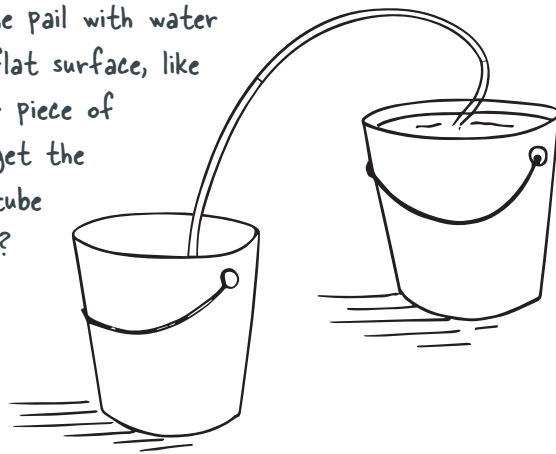
Now get creative, making water move by building a water wall. Use what you've learned about height and pressure to design a system where water moves through three (or more!) plastic bottles connected by tubing. Use scissors to poke a small hole about the diameter of the tubing in the side of a plastic bottle, very close to the bottom. Insert one end of the tubing and tape all around the opening with duct tape, trying to stop water from dripping out. Repeat with the other bottles so they all have a length of tubing coming from the bottom.

Attach the plastic bottles to a pegboard with zip ties. Place the first bottle at the top of the board and drape the tubing so that the other end is inside the open top of the next bottle. Position each bottle at a lower level than the one before. Experiment with the position of the tubing; try making hills or loops, holding the tubing in place with pipe cleaners.
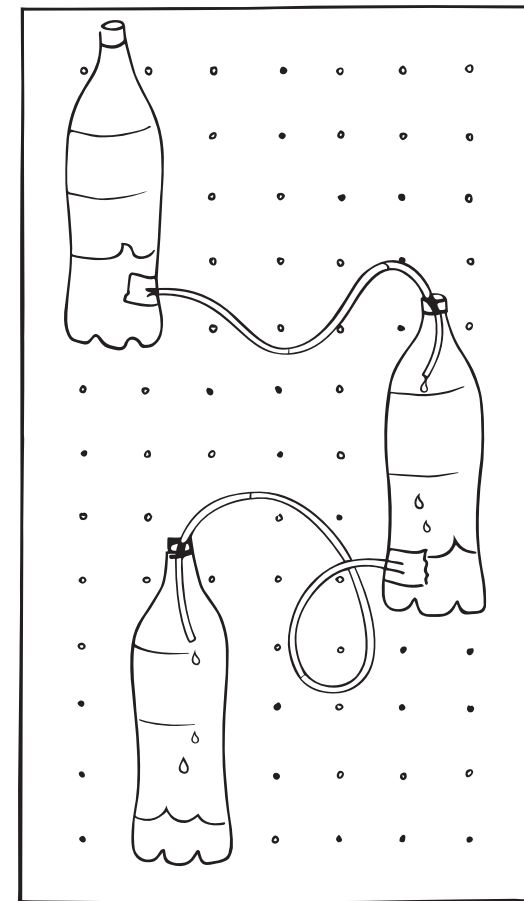
Test your design by pouring water into the first bottle; pressure will build up and push the water through the tubing into the next bottle. It may not work the first time, so just adjust the placement of your bottles and tubes until the water starts flowing!

What's happening?

Siphons are often used to move a liquid over an obstruction without pumping, like directing water from a canal over a dike to irrigate a field. Siphons operate by atmospheric pressure. When the tube is filled with water, atmospheric pressure on the source container will force water through the tube and into the receiving container. A liquid always flows from an area of higher pressure to one with lower pressure. Elevating the source container creates a difference in pressure (called a pressure gradient), with a higher pressure in the source container and a lower pressure in the receiving container. Once the flow of water has started, it will continue as long as the end of the tube is below the surface of the water.

Game on!

Get a better view of the moving water—and learn about color mixing—by adding a few drops of food coloring in each bottle. Or try one of these design challenges:

• Use at least five bottles.

• Add a water wheel (or similar water toy).

• Make water flow uphill.

Tips

Add tape anywhere you see water dripping.

Instead of a pegboard, tape the bottles to a piece of wood or a wall, set them on stairs, or ask people to hold them at different levels.

More Ways to Play With Water

Visit a fountain or water playground to cool off in a big siphon system.

Play with moving water in MSI's *Idea Factory*.

Tackle water-moving challenges in the Where's My Water? app or online game at http://disney.go.com/wheresMyWater/

Like this activity? You could be a ...

• Civil Engineer

• Water Park Designer

• Hydrologist

• Water Filtration Technician