EQUIPMENT BUILD PLAN

AIR & WATER PRESSURE

Straw Atomizer and Popcorn Launcher

Two drinking straws make a working atomizer, the same mechanism used in perfume bottles, paint sprayers and hose-end fertilizer sprayers. Scale it up with a shop vac and a rolled plastic tube and you can empty a bag of popcorn or puffed rice into the air. Both show how fast-moving air lowers pressure so the surrounding air pushes material up a tube.

> Written from Bruce's original workshop handout. Bruce's final review of this plan is in progress.

DIFFICULTY	BUILD TIME
Beginner	10-20 minutes
COST	SAFETY
Under $5	Everyday care
GOOD FOR	
Teachers, Families	

What it shows

Blow across one straw and water climbs another and sprays out as a fine mist.

Key ideas: Bernoulli's principle, air pressure, atomizer, venturi effect

Safety (Everyday care). Use plain water, and do it where spray is fine (outdoors or over a sink). Each person uses their own straws. Wear safety glasses for the popcorn launcher, and never point the air stream or the spray at anyone. If you use an air compressor instead of blowing, only an adult operates it, with eye protection.

CONSTRUCTION

Build it

Materials

- [ ] **Thin drinking straws** · 2 per person
  Narrow straws are easier to blow through
- [ ] **Cup of water** · 1
- [ ] **Two overhead transparency sheets** · 2
  Taped and rolled into a tube; a paper towel or wrapping paper tube also works
- [ ] **Popcorn, puffed rice or puffed wheat cereal** · 1 bag or bowl
  Puffed rice is Bruce's favorite; break popcorn into small bits

Tools

Scissors

Tape

Shop vac that can blow (exhaust port) for the launcher

1

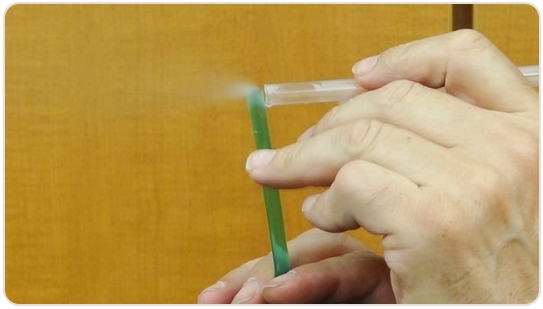
Set up the two straws

Stand one straw upright in a cup of water with its top a little above the rim. Hold the second straw level so its end sits right at the top opening of the upright straw.

2

Fine-tune the angle

Aim the blowing straw across the center of the upright straw's opening, tipped slightly upward. Bruce finds a slight upward angle works better than blowing straight across.



3

Blow hard

Blow hard and steadily through the level straw. Water climbs the upright straw, gets caught in your air stream and sprays out as a mist. Adjust the angle until you see the water rise.

4

Prepare the popcorn

For the big version, squeeze a bag of microwave popcorn a few times to break it into small bits, or use a bag of puffed rice cereal. Small pieces empty the bag fastest.

5

Roll the launch tube

Tape two overhead transparencies together and roll them into a tube that fits inside the bag. Adjust the diameter until it works well.

6

Launch

Stand the tube upright in the bag. Blow the shop vac's exhaust hose across the top of the tube, just as with the small straw. Popcorn rushes up the tube and sprays into the air.

7

Clean up

Switch the shop vac back to suction and vacuum up the mess.

THE PHYSICS

How it works

Bernoulli's principle says that the faster a fluid flows, the lower its pressure. Air rushing across the top of the upright straw lowers the pressure inside that straw.

The air pressing on the surface of the water in the cup is now greater than the pressure inside the straw, so it pushes water up the straw. Nothing pulls the water up: there is no such thing as suction, only a higher pressure pushing toward a lower one. Sipping through a straw works the same way.

When the water reaches the top, the fast air stream tears it into tiny droplets and carries them away as a mist. The popcorn launcher is the same effect on a larger scale, lifting light cereal instead of water.

Sprayers for paint, perfume, garden chemicals and soap in pressure washers use this effect. Wind blowing across a chimney top draws air up the flue the same way.

Using it

- Have every student try the two-straw atomizer with water; it gets everyone's attention quickly.
- Ask students to explain why the water moves up the straw, and listen for the word 'suction' so you can discuss what really pushes it.
- Try different straw diameters and blowing angles and record which works best.
- Have students find atomizer-type devices at home or in stores and explain how each works.
- Compare the launcher with the spool-and-card Bernoulli puzzle.

GO FURTHER

Variations

- An adult can replace blowing with an air compressor nozzle, which lifts the water much faster and sprays it much farther.
- Use a paper towel tube or wrapping paper tube for the launcher.
- Try bits of foam packing instead of cereal.

IF IT DOESN'T WORK

Troubleshooting

IF THIS HAPPENS	TRY THIS
No water comes up the straw.	Move the blowing straw so it is centered over the upright straw's opening, tilt it slightly upward, and blow harder. Lowering the upright straw so less of it sticks out above the water also helps.
The popcorn barely moves.	Break it into smaller pieces, use a narrower tube, and aim the air stream right across the tube's top opening.

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