Stay Curious and Keep Exploring Experiment Kit

Hello, librarians and educators! Emily here, MIT engineer turned science TV host. My book *Stay Curious and Keep Exploring* contains 50 of my favorite science experiments that use materials you probably already have on hand. Some of these experiments will POP, some will bubble over, some will GLOW in the dark, and some may be a little spooky! For each experiment, I'll tell you exactly what you need, and my little scientists and I will walk you through it step by step.

This activity kit includes three experiments that will be easy to replicate in your libraries and classrooms. I want these experiments and my book to encourage kids to stay curious about the world around them. Science is so fun and exciting because it's all about learning how the world works. So, let's get to the experiments!

Stay Curious and Keep Exploring
Written by Emily Calandrelli

chronicleprism.com

CHRONICLE PRISM

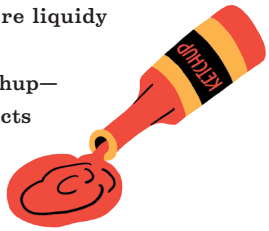
Oobleck

Why is ketchup so hard to get out of the bottle?

ABOUT THE EXPERIMENT

Shake, shake, shake! Ever wonder why you need to shake and hit a ketchup bottle to get the ketchup out? Ketchup is a special type of fluid known as a **non-Newtonian fluid**. That means it doesn't abide by normal fluid rules. Sometimes it acts like a liquid (when force is applied) and like a solid (when no force is applied). When you shake and hit the bottle, the ketchup becomes more liquidy and can escape.

Oobleck is another non-Newtonian fluid. But it's the opposite of ketchup—when you add force it acts like a solid, and when you don't add force it acts like a liquid. I used to make Oobleck as a kid with my mom, and it was always a dream of mine to fill an entire pool with Oobleck! So, when we were able to do that on *Emily's Wonder Lab*, it was a dream.



Materials

- 1 cup (140 g) cornstarch
- ½ to ¾ cup (120 to 180 ml) water
- 2 drops of food coloring (optional)
- Bowl

Warning:
Oobleck might clog your drain, so when you're done, throw it in the trash.

INSTRUCTIONS

This recipe isn't exact. If it feels too dry, add a little water. If it feels too watery, add a little cornstarch. And remember, you can make as little or as much as you like—you can fill an entire pool with this stuff, in fact!

1. **Add the cornstarch, water, and food coloring (if using) to a bowl.**
2. **Mix with your hands (this will get messy!).**

This may look a little liquidy at first, but try to squeeze it into a ball—does it feel like a solid? If not, add a little bit more cornstarch. If it doesn't feel liquidy at all, add a little bit of water. You should be able to pick it up, squeeze it into a ball, and then stop squeezing and let it fall through your fingers.

THE SCIENCE

Whoa, this feels so weird! Sometimes it's hard, but sometimes it feels like a liquid.

That's what makes Oobleck a non-Newtonian fluid. You can change what it feels like by adding or removing **pressure**. Squeeze it together and it feels like a solid, but if you stop squeezing it, it goes back to a liquid!

(Make a Hypothesis!)

MAKE A HYPOTHESIS →

If we made an entire pool filled with Oobleck, what would you need to do to get across it without sinking—walk? Crawl? Hop? Dance? Run?

Make your own guess, then flip upside down to read!

When we tried this on Emily's Wonder Lab, the kids who made it across the pool of Oobleck without sinking were the ones who applied a force to the Oobleck: like hopping, running, or even dancing. Basically, they pushed on the Oobleck in some way. Remember, Oobleck acts like a solid when force is applied—that's the key to getting across!

Magically Moving Bubble

Why do balloons make your hair stand on end?

ABOUT THE EXPERIMENT

When you rub a balloon on your hair, you're transferring electrons from your hair to the balloon. This does a couple of things. One, it makes the balloon have a **static charge**. Two, it makes your hair now have a charge that is *opposite* of the charge on the balloon, so it will become attracted to the balloon! Each hair also has the same charge, so they will repel each other—making them stand up even more!

In this experiment, we'll use static charge to actually move something. It looks like a magic trick if you don't know the science! This works best if you have a large, smooth surface like a countertop. Because you might end up getting soap on the floor, this is a great one to do in your kitchen.

Materials

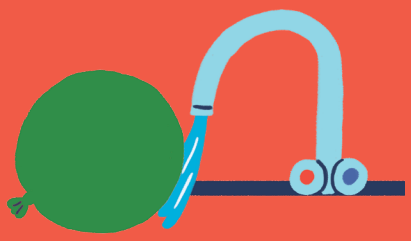
- Dish soap
- Glass of water
- Spoon
- Straw
- Balloon
- Head of hair

INSTRUCTIONS

1. Add a few squeezes of dish soap to your glass of water. Stir with a spoon.
2. Throw some water on a flat, smooth surface (about ½ cup [120 ml] should do).
3. Place the end of your straw on the surface and blow a bubble in the soapy water.
4. Blow up your balloon and tie it off.
5. Rub the balloon on your head for about 20 seconds.
6. Place the balloon in front of the bubble (about ½ inch [~1 cm]).
7. Repeat steps 5 and 6 as necessary.

You should be able to quickly move your bubble ever so slightly with your balloon. Make sure you get your balloon very close to the bubble so that it can feel the static charge.

TRY THIS



Let's try moving other forms of water. Turn on the faucet so you have a really thin stream. Rub the balloon on your head and place it next to the stream. What happened? What happens if you turn the faucet higher? Do you notice it move as much? (The heavier the water gets, the harder it is to move with the static.)

THE SCIENCE

The bubble moved! I feel like I have a superpower!

That's right! By rubbing the balloon on your head, you moved electrons from your hair to the balloon. Your balloon temporarily will have a static charge.

But how does that static charge move a bubble?

Because in a bubble, atoms are free to move around, which makes them easily affected (and moved!) by static charge.

Self-Inflating Balloon

If you accidentally let go of a balloon outside, what happens to it?

Lab Assistant (an Adult!) Required

ABOUT THE EXPERIMENT

If you let go of a helium balloon outside, it will rise and rise and eventually you won't be able to see it anymore. As the balloon gets higher in the atmosphere, the air **pressure** outside of the balloon gets lower, which means the air molecules are more spread apart. The air inside the balloon wants to match the air pressure outside the balloon, so the air molecules inside the balloon start to spread apart too. This makes your balloon stretch bigger and bigger. Eventually, the balloon can't get any bigger and it will POP, sending the balloon parts back down to the ground. Sometimes these balloons can end up in the water or in animals' habitats, so it's very important to hold on to your balloons tightly when you're outside!

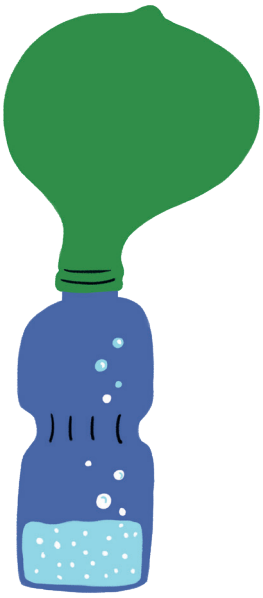
This experiment will stretch out a balloon and make it bigger too. But instead of launching it in the air, we're going to add air inside the balloon using a chemical reaction.

Materials

- Balloon
- 2 tablespoons baking soda
- Plastic bottle
- ¼ cup (60 ml) vinegar

INSTRUCTIONS

1. Blow up your balloon once and then let the air out (this will stretch out your balloon).
2. Pour the baking soda into the bottle.
3. Hold your balloon open while your friend or lab assistant (an adult) pours the vinegar inside your balloon. Try to pour in as much as you can!



4. Very carefully, trying not to spill the vinegar, place your balloon on the opening of your bottle. Make sure there is no gap between the balloon and the bottle.
5. Lift your balloon upward so that the vinegar mixes in with the baking soda.
6. Shake your bottle around so that the baking soda and vinegar fully mix.

As soon as you lift up your balloon, you should see bubbles form as the vinegar and baking soda begin to mix. Those bubbles will almost instantly make your balloon expand and stand straight up! Your balloon may not completely fill up with air—it all depends on how much is in your bottle.

THE SCIENCE

Whoa! The balloon filled with air out of NOWHERE! How'd that happen?

Let me show you. I want you to try something. Close your mouth. Now blow air into your mouth and cheeks. What happened to your cheeks?

My cheeks puff out.

Exactly! You added more air to your mouth from your lungs. That increased the air pressure inside, and that pressure pushed out on your cheeks. Something very similar is happening in your bottle. Instead of your lungs pushing out more air, the chemical reaction is doing it! The baking soda and vinegar create carbon dioxide gas. That gas is adding to the air molecules that were already in the bottle. Those air molecules don't have anywhere else to go, so they leave the bottle and fill the balloon. As more gas is created, the air pressure increases and that pushes out on the balloon, filling your balloon in the process!

TRY THIS

Try adding fewer ingredients to your bottle and balloon. How does that change how much your balloon inflates? Less vinegar and baking soda will lead to fewer carbon dioxide bubbles, meaning your balloon won't blow up as big.