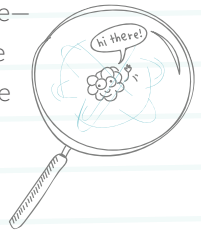
electrons on the MOVE

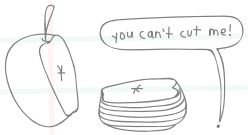
It's 7am and your alarm clock buzzes. You open one eye. It's cold and dark outside, but you can hear the hum of the heater warming up the house. You hop out of bed and flick on the light to get dressed.

You've only been awake for 2 seconds and you've already used electricity for light, warmth, and to get you to school on time! **We all depend on electricity in countless ways every day.** A lot of people find electricity mysterious and maybe a bit scary, but it's no mystery—it's science!

To understand electricity, you have to look close—really, really close. Electrical circuits like the one in your alarm clock or light switch work because of the **way electrons behave**. And to look at electrons, first we have to look at **atoms**.

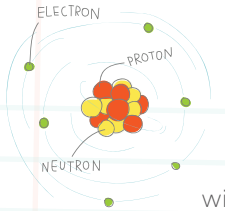


You can think of atoms as the smallest piece of any material. Take anything you can think of—say, an apple. Start cutting it up into smaller and smaller pieces. Keep cutting and cutting and cutting, and you'll reach a point where it can't be divided any more. That's an atom!

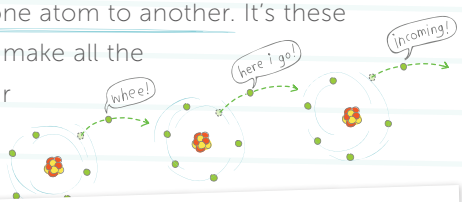


the word "ATOM" comes from the ancient Greek word for "UNCUTTABLE"

Atoms are almost unimaginably small. Look closely at a single strand of your hair. It's about 1,000,000 atoms wide!



Atoms are made up of three different teeny-tiny particles. The protons and neutrons are clumped in the center of the atom, with the **electrons** buzzing around in a sort of cloud. In some materials, the electrons can escape and go hopping from one atom to another. It's these hopping electrons that make all the electrical gadgets in our life possible!

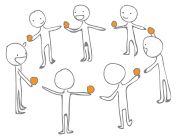


Since electrons are way, way too tiny to see, it's hard to picture exactly what this looks like. Here's one way to think about how this works in an electric circuit.

Imagine a bunch of your friends are standing in a circle, and you give each of them an orange.

your friends = **wire**
oranges = **electrons**
you = **battery**

NOTE: real electrons are nothing like oranges



First, you hand your orange to the friend next to you. Then they hand their orange to the friend next to them, who hands their orange to the friend next to them, and so on around and around the circle.

Moving electrons power everything from calculators to cell phones to microwave ovens. Take a look around your house and imagine all the wires full of **hopping electrons**, whizzing by all around you!

Electric Charge

Each electron and proton has a teeny-tiny **electric charge**. Protons have a positive charge, and electrons have a negative charge.

If the two particles have opposite charges, they will **attract** each other.

If the two particles have the same charge, they will **repel** each other.

PUT ON AN

Electric Magic Show

Have you ever rubbed a balloon on your hair to make it stand on end?

Or gotten zapped by a doorknob after scuffing your feet along a carpet?

If so, you've experienced a type of electricity called **static electricity**. Harness that power to put on a magic show and wow your friends!

From home you'll need

ELECTRIC MAGIC KIT

wool cloth

Look for a wool sock, sweater, or blanket. Your own hair will work as well—just make sure it's clean!

magic wand

Try a plastic straw, a plastic ruler, a plastic comb, or a piece of PVC pipe.

or

magic balloon

Look for a regular rubber balloon, not the mylar kind. Blow it up, and you're ready to make some magic!

MAGIC SUPPLIES

plastic water bottle or disposable plastic cup

pin or needle

empty soda can

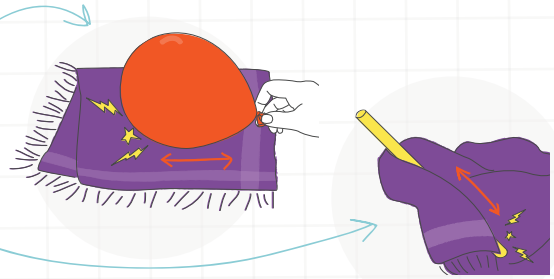
tissue paper

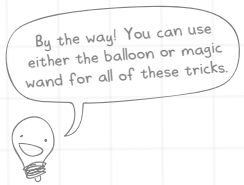
water

pepper

Get ready for magic

To put on an electric magic show, first you need to load up your magic wand or balloon with some electrons. Rub the wand or balloon on the cloth for at least 1 minute for best results. The longer you rub, the greater the charge.





TOP SECRET

Amazing Magic Tricks

CONFIDENTIAL

Flying Tissue Paper

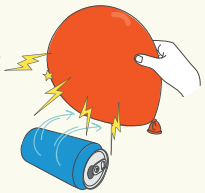
1. Spread a handful of tissue paper squares on the table.
2. Charge up your magic wand.
3. Bring the magic wand close to the tissue squares to make them jump up and stick to the wand.

tip: You can also cut out tissue paper birds or other animals, then use your wand to make them fly.

Rolling Can Trick

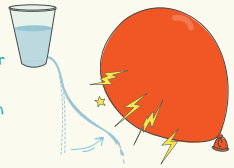
1. Lay an empty soda can on its side on a smooth surface.
2. Charge up your balloon.
3. Bring the balloon close to the soda can to make the can roll towards the balloon.

tip: Keep moving the balloon back to keep the can rolling forward.



Bending Water Trick

tip: The water should come out in a thin stream.



1. Poke a tiny hole near the bottom of a water bottle or plastic cup.
2. Charge up your balloon and fill the cup or bottle with water.
3. Bring the balloon close to bend the stream of water towards the balloon.

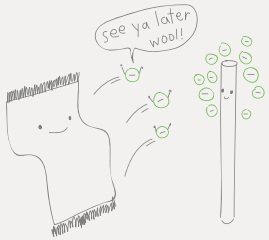
Jumping Pepper Trick

1. Sprinkle some pepper onto a plate.
2. Charge up your magic wand.
3. Bring the wand close to the plate to make the pepper jump up and stick to the wand.

tip: To make it extra-dramatic, toss some uncooked rice on the plate as well. Make a bet with your audience that you can separate the pepper from the rice.

what's going on?

Some materials, like wool, very easily "**donate**" electrons. When you rubbed the magic wand on the wool, a bunch of electrons moved from the wool to the wand. This created a **negative charge** on the wand.



When you bring your charged-up wand close to a piece of tissue paper, the electrons repel each other and a bunch of the tissue's electrons move away from the wand. That leaves more positive charges close to the negatively charged magic wand. Opposite charges attract, and that attraction pulls the tissue paper up to stick to the wand.

see pg. 1 for more about electrons