



Optics



Be a physicist today! In this activity, you are going to explore how you can use water to change how things look. First, you'll use it to bend light. Then, use water as a magnifying glass!

Why are we doing this activity?

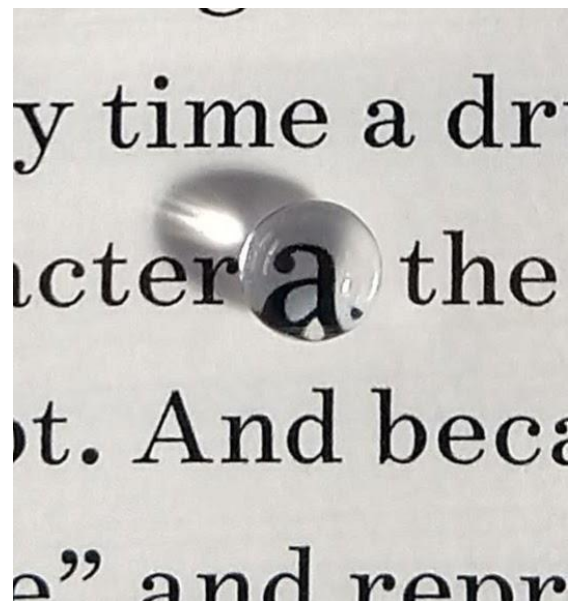
Have you ever used a magnifying glass, a microscope, or binoculars? These all use curved pieces of glass (or mirrors) to make things look bigger (or closer) than they actually are. But you can use water and other liquids to make things look different, too! Today, you'll explore what happens when water bends ("refracts") light. Refraction is the secret behind how your glasses help you see better, and how microscopes and binoculars make things look bigger than they are.

Reflection is another way that light can be bent, this time, by bouncing it off a reflective surface, like when you see yourself in a mirror or darkened window. You can also see your reflection in curved mirrors, but it will look different because the curve of the mirror changes the direction that light is reflected.

In this activity, you'll do a couple of quick tests to see what happens when light is refracted and reflected, and then you'll try some magnification without a magnifying lens! Exploring how light behaves is a branch of physics called optics.

Supplies Needed

- Drinking glass
- Water
- Spoon
- Pencil and paper
- Towel
- Newspaper, magazine, or other paper with small type
- Sheet of plastic, such as a notebook sleeve protector or zip-top plastic bag
- Water dropper (such as a clean medicine dropper or kitchen baster)





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What to do

1. Look closely at your spoon. How big is it? What is its overall shape? Is it curved, or bent, or does it make a straight line? Draw what you see.
2. Fill the glass about halfway with water. What do you think will happen when you put the spoon into the water? Try it, and look closely at the line where the water meets the air. What do you see? This is the effect of refraction, light bending as it travels through air and then water.
3. Take the spoon out of the water, dry it off, and look at your reflection in the back of the spoon. How does this reflection compare to your usual mirror reflection? Flip the spoon over and look at your reflection on the spoon bowl. How about that reflection? Draw what you see.
4. Now it's time to try some magnification. Lay out your newspaper and place the plastic bag on top of it. Use the dropper or baster to carefully drop one drop of water on the plastic sheet. Look at the letters underneath the drop; they should look larger. You might need to close or cover one eye.
5. Try to make the letters look as large as you can! Use a bigger or smaller drop of water. Try lifting the plastic sheet above the page. You can use a ruler to measure the size difference. What combination works best to enlarge the letters?

Want to go further?

- It looked like the spoon bent at the surface of the water. Draw this carefully and measure the angle. Try it again with other objects (pencil, plastic spoon), and with other liquids. Does the angle vary depending on materials? How? Can you predict the angle of refraction?
- These activities are part of the field of optics, but there are many more ways to study how light behaves. Find a source (family, friends, documentaries, books, reliable internet sources) to read about diffraction, polarization, quantum optics, and more.
- Rainbows are formed when white light splits apart into its component colors. Learn more here <https://ssec.si.edu/stemvisions-blog/science-rainbows>