Description: First, watch the video COSI Workshop: Scope on a Rope. Were you able to guess what any of those images were? You may not have a microscope at home, but in this activity, learners will see if they can magnify images with water!

Keywords: light, magnify, water

Materials:
- Zipping plastic sandwich bag
- Testing materials (book, shampoo bottle, etc.)
- Water
- Towel
- Clear glass
- Note card

Instructions:
Part 1: Fill the sandwich bag with water. Zip it tightly as it fills (trying to eliminate as many air bubbles as possible) and check that no water escapes from the bag’s zipped top or its edges when lightly pressed.

Be careful to explain that dropping or squeezing the bag too strongly will cause it to break open, so your learner should be cautious and careful with it. You may wish to bring test materials into a wet-friendly space, like a bathroom or kitchen, just to be safe.

Ask your learner to experiment with viewing things through the bag of water – for example, the writing in a book, the ingredients on a bottle of shampoo, their hand, or a phone screen. Encourage them to look through the bag from the top, bottom, and side; to gently squeeze the bag to view how it distorts the image; to see if they can read small text when viewed through the water.

What happens if you have less water in the bag? Try filling it only about ¼ of the way, then roll it so that the bottom is cylindrical. How does this change the image you see?

Part 2: Now, in a new dry sandwich bag, place a piece of paper or flat object with small writing. It could be a piece of a magazine, a coaster, etc. Close the Ziplock bag, press out all the air, and lay it flat on a surface like a table. Now carefully drop a droplet of water on top. The water should form a spherical droplet on top (but that droplet is flat on the bottom). What does that do to the words underneath the droplet? See if you can make the droplet a little taller by adding a bit more water. Did that change anything?
You may want to close or cover one eye while you look at it.

Possible Interactive Questions:
- Can you use water to make something look larger than it really is? What about smaller than its true size?
- Where else have you seen water seem to distort the size of an object?
- How might animals who live underwater have eyes that differ from ours?
- What do you think light has to do with microscopes or magnifying glasses?

What’s Going On?
Light rays travel in straight lines. When those rays meet an *opaque* surface (like a table, an apple, or a human), some bounce off, reflecting into our eyes where an image is formed. When light rays strike a *transparent* object – like a clean window or water – some bounces off but much of the light will travel through the object. When light strikes that transparent object at an angle, the light rays will *refract*. **Refraction** is the bending of light. It occurs because light passing through the object changes speed.

Because light refracts when it travels through water or glass, it has changed direction a bit before meeting your eye. That means that what your eye actually sees could be a little different than the object itself! It can fool your brain into seeing something that is **BIGGER** or **smaller** than the object itself!

Lenses use the principle of refraction to purposely make things look bigger or smaller (or closer or further away). If you wear glasses or contact lenses, that is exactly what they are doing! Your droplet of water was *convex* on top – the surface was curved in a spherical, dome-like shape. That refracts the light rays in such a way that the object appears a little bigger, or *magnified*, to your eyes.

Additional Resources: If you have any questions or comments, reach out to COSI at sciencequestions@cosi.org.