

Activity #2: Telescopic Eye

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You may not know it, but your eye is constantly doing work. Any time that you look at something, small muscles in your eye adjust the size and shape of your lens so that you can focus on it - making sure it's not blurry. You're going to make a telescope that also brings things in and out of focus!

Materials:

- Wax paper square
- Rubber band
- Two different diameter cardboard tubes
- CONVEX 50x500 lens

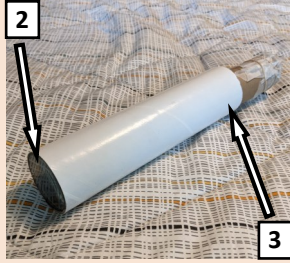
Optional materials:

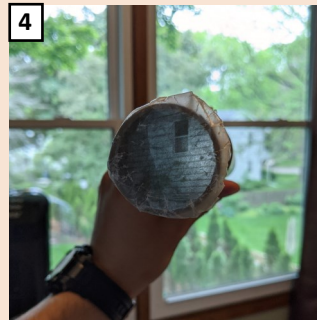
- Super glue/hot glue (ask an adult to help with this!)

Instructions:

1. Take the skinny tube, wax paper, and rubber band. Cover one end of the tube with the wax paper, and hold it in place with the rubber band. Note that the wax paper is smooth and flat across the opening of the tube.
2. Take the wider tube and the lens. Place the lens in the tube, flat across the opening of the

tube. The lens should fit tight in the tube. If an adult is around, you can ask them to help you use glue to secure the lens even more.

3. Place one tube in the other, so they make a telescope, and your telescopic eye is done!
4. Now it's time to "focus" on something. Go outside or to a window and point your telescope to a tree (something about 30 feet away). Slowly slide the inner tube out from the outer tube (not all the way!)



until a few inches stick out. You should start to see an image form on the wax paper (it will be upside down!). You may need to adjust how far the inner tube is in the outer tube to focus onto something.

5. To look at something closer, pull the inner tube out further, and to look at something farther away, push the inner tube in

further.

Exploration:

1. When the image of what you're looking at becomes clear on your wax paper, that means your telescope is "focused" on your object. Can you focus on something closer? What about something farther away?
2. With your telescope, your lens is acting like the lens in your eye, and the wax paper is acting like the retina - or the back of your eye. We see that the image on the wax paper is upside down, do you think the same thing happens on your retina?

Our eyes work a little differently than this telescope, but many octopuses and squids actually have telescopic-like eyes that work in this exact way!

Anna Morandi (1714 - 1774) Anatomist and sculptor

Over her life, Anna Morandi worked with her husband, Giovanni Manzolini, in Bologna, Italy to dissect hundreds of human bodies and study them. Specifically, they made wax sculptures of organs so that others could study them. The two taught hundreds of lessons on anatomy using her sculptures and her scientific notebook. Morandi was specifically interested in the anatomy of our senses, like our eyes, ears, and nose.



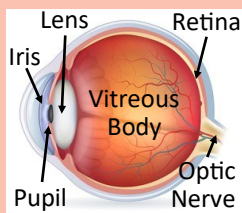
In the eye of the beholder

activities about the anatomy of the eye



Activity #1: Eye Anatomy Model

The eye is a masterpiece of anatomy, one that is millions of years of evolution in the making. With a system so intricate, there are many common health issues that arise. Let's learn about the various parts of the eyes and some common eye conditions.



Pupil and Iris—Light enters your eye through the pupil, a small hole or aperture in your eye. If you've ever used a camera, you might have had to adjust the size of the aperture to let less or more light in. Your eye does the same thing by using your iris - the colorful disk around your pupil - to constrict or open your pupil.

Optical Condition: Anisocoria. Anisocoria (an-ih-suh-kawr-ee-uh) occurs when one pupil is larger than the other. About 1 in 5 people have this condition. It is often due to some head injury or trauma, so it's important to protect your head by wearing a helmet when biking or seatbelt when in the car.

Lens—The light enters through your pupil, and is focused onto the back of your eye by a soft lens, made of transparent proteins, that allows you to see objects clearly. There are muscles that squeeze or stretch the lens so that you can focus on objects closer or farther away.

Optical Condition: Cataracts. Naturally occurring due to old age, cataracts are when the lens becomes cloudy and impacts your vision. People often have surgeries to remove their cloudy lens and replace it with an artificial one.

Vitreous Body—The majority of your eye is filled with the vitreous. It is a clear gel-like fluid and contains many tiny fibers that attach to your retina. It maintains the round shape of the eye and protects your eye from shock if your head is hit.

Optical Condition: Vitreous detachment. As you age, your vitreous becomes more liquidy, and parts

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- Interviews with artists and scientists who study perception!
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detach from your retina. This usually causes "floaters" in your vision - or small disruptions in the visual field such as spots, web-like lines, or rings.

Retina—The back of your eye is the retina, and it contains two types of light-sensitive - photoreceptor - cells that allow you to see: rods and cones. Cells that allow us to see: rods and cones. Rods work at low levels of light and allow us to see at night, but aren't sensitive to color. Cones work in high levels of light and allow us to see color. Humans have three types of cones - red, green, and blue - that each activate with each specific color.

Optical Condition: Color blindness. Usually a hereditary condition, color blindness occurs when the cones in your retina aren't working properly. The most common color blindness causes people to have difficulty distinguishing between green and red colors.

Optic Nerve—Your retina processes the image in your eye, and the optic nerve brings that information to the brain. The optic nerve is located at the very back of your eye, and transports the electrical impulses from your rods and cones right to your brain. There are almost one million nerves in your optic nerve bundle.

Health Condition: Glaucoma. Glaucoma is caused when there is too much pressure from the vitreous, which pushes into the cells of your optic nerve and causes some of the cells to die. If left untreated, this can lead to blindness. That's why going to regular eye exams, where they can test the pressure of your eyes, is important!

Now let's build a model of the eye with all these parts!

Materials Provided in Kit:

- Eye Anatomy Model Cutout
- Plastic magnifying lens
- Clear plastic bag (containing the materials)
- Pom-poms
- Red twine

Materials You'll Have to Find:

- Color pencils/markers
- Sharp pencil or pen
- Scissors
- Glue and tape

Instructions:

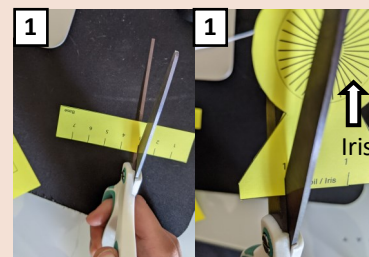
1. Cut out the pieces on the cardstock. Cut along all the solid lines. Cut out the grey circles, and cut the slits along the flat edge of each piece.
2. Poke a hole in the center of the piece labeled "Lens/Iris"

Have a cool project to show?
Learn something new from these activities you want to share?
Tell us about it here →

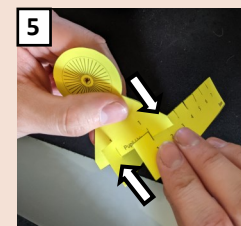


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You can also color the iris (the circle with radial lines), maybe color it the same color as your iris!



3. Take the magnifying lens and tape it to the part labeled "Lens".
4. Cut the plastic bag into three circles, about 3" across. Then tape/glue each one over the opening of each of the three "Vitreous Body" parts.
5. Take your pom-poms and glue them to the "Retina" piece.



6. Take your red twine and glue it to the center of the "Optic Nerve" piece. Try to glue them in a bundle.
7. Once all the glue is dry, we'll put all the pieces onto the base. Start with the "Pupil/Iris" piece. Take one of the base pieces, and slide slit 1 of the Pupil/Iris part into the slit 1 of the base. Do the same to the other base as well.
8. Carefully repeat this with each of the other parts, sliding each numbered slit into its corresponding slit on the base.

Exploration:

1. Have you seen your own pupil change size? You can see this if you go to a mirror in a dark room. If you turn on the lights quickly and look at your pupil in the mirror, you'll see it shrink.
2. What would the medical condition be called if some of your plastic bag is coming off of your eye model?
3. In what other way might our eyes use a "lens"? (You might be wearing a pair of them right now...)
4. What kind of photoreceptor cells do each of the pom-poms on the retina correspond to?

Patricia Bath (1942 - 2019) Ophthalmologist

Dr. Bath was an ophthalmologist - an eye doctor. She was the first African American to complete a residency in ophthalmology. She invented the Laserphaco Probe, which made cataract surgeries more precise and painless. She received a patent for her invention in 1988, becoming the first African American female doctor to receive a medical patent. Dr. Bath also strongly advocated for accessible and affordable eye care, and helped establish the idea that eyesight is a basic human right.

