

# Week 7: Topsy Turvy World

Don't just shield your eyes from the bright summer sun. Instead, explore the properties of light and understand how your eye works. Make a pinhole viewer to see the world in a new way ... upside down!

## Experiment

# PINHOLE VIEWER

### Materials

Box, like a tissue box or shoebox



Aluminum foil

Wax paper

Tape

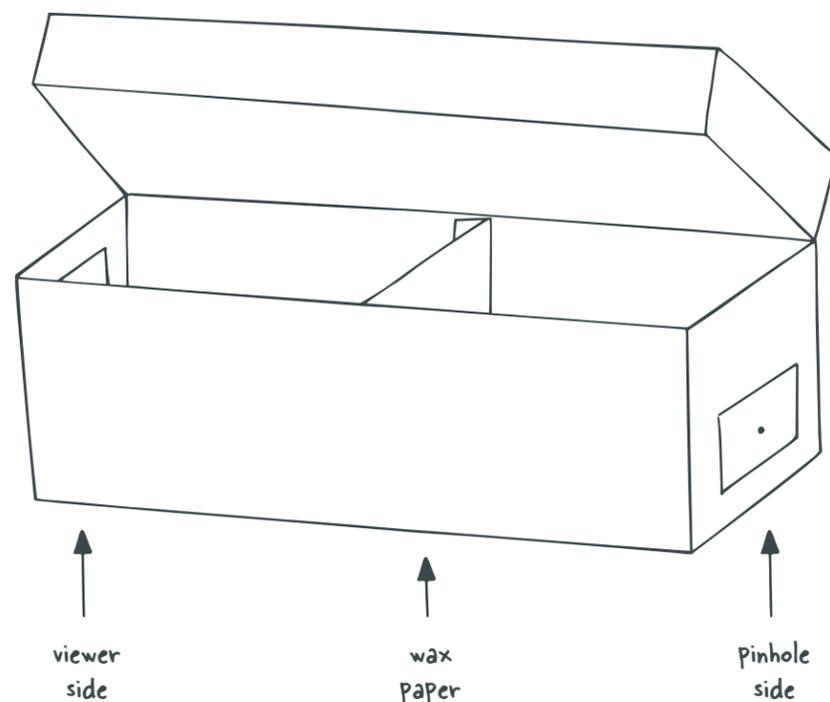
Scissors or box cutter

Pushpin

Large box (optional)

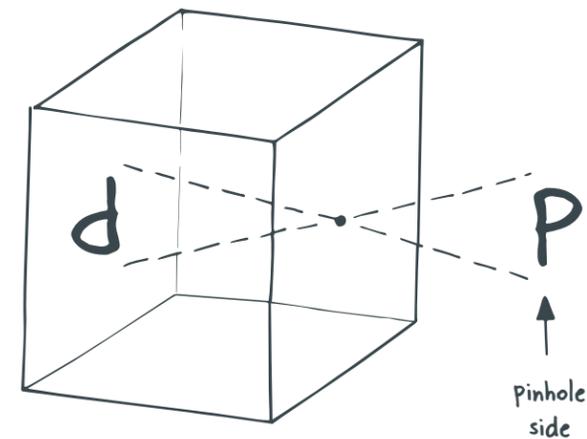
### Instructions

Cut two square holes on opposite ends of a square or rectangular box. Cover one hole with aluminum foil and the other with wax paper, taping down the edges. Make sure light doesn't get inside the box by taping off any gaps or edges. Poke a small hole in the aluminum foil square with a pin. Head outside or look out the window on a sunny day. Hold the viewer with the wax paper side facing you and look around. You'll see images reflected on the wax paper, but they're upside down!



If your box is long, like a shoebox, attach the wax paper inside in the middle of the box by taping a wax paper flap on either side. Get the wax paper as flat as possible. Hold the open side against your eye and block the sunlight with your hands as you look inside.

Make a wearable pinhole viewer out of a large box (one that fits over your head). Cut a small square on one side near the bottom of the box. Cover it with aluminum foil and poke a pinhole in the middle. Tape a piece of white paper on the inside of the box, opposite the pinhole. Block out all light by taping off gaps and holes. Decorate the outside of the box. Put the box over your head with the pinhole at the back, and look at the white paper to see what's behind you. Bring a digital camera inside the box with you and try taking a picture of what you see! Don't use a flash, and hold the camera very still to get the best shot.



### What's happening?

The pinhole in the viewer acts like a camera lens, forcing light through to create an image on the opposite side. Light only travels in straight lines. When forced through a pinhole, only light from the top of the object you're seeing reaches the bottom of the paper in the viewer and only light from the bottom of the object reaches the top of the paper. The result is an inverted picture of what you're seeing. Your eye works like this, too. Light travels through the lens and is reflected on the retina, the back of the inside of your eye. The image on the retina is also upside down ... your brain just flips it right side up so you can tell what you're seeing.

### Game on!

Turn your bedroom into a huge pinhole camera, also called a camera obscura. Darken the window with a blanket or curtains, and tape a piece of aluminum foil with a dime-sized hole in the center of the window. On the opposite wall, you should see an upside-down image of whatever is outside your window!

### Tips

Experiment with different shapes of boxes to see what works best. Boxes where the pinhole and wax paper are only a couple inches apart result in smaller images.

### More Ways to Play With Light

Learn about vision by dissecting a cow's eyeball in our Dissect an Eye at MSI program.

Make rainbows with giant prisms in *Science Storms*.

### Like this activity? You could be a ...

- Ophthalmologist
- Photographer
- Optometrist
- Surveyor