

## Make a Pinhole Viewer

The first type of camera ever invented was called a camera obscura, which is Latin for "dark room." At first, that's exactly what it was - a dark room with a tiny hole that allowed a narrow beam of light to enter. This beam produced a "real image" of outside objects on the wall opposite the hole (it didn't take pictures, though - light-sensitive materials like film weren't invented until much later). A pinhole camera is just a portable version of this ancient camera obscura. (It's a bit inconvenient to carry a room with you to take pictures of your family vacation!)

In a modern camera, a lens is used to bend light waves into a narrow beam that produces an image on the film. In a pinhole camera, the hole acts like a lens by only allowing a narrow beam of light to enter. It forms the same type of upside-down, reversed image as a regular camera, so you can see how a camera works by making a pinhole viewer.

With photographic paper and the right developing materials, you can make a pinhole camera that will actually produce photographs. In this project, though, you'll make a pinhole camera viewer that allows you to see a real image, but not record it.

### Materials:

- \*Empty paper towel or paper roll
- \* Aluminum foil
- \* Waxed paper
- \* 1 sheet black construction paper
- \* Tape (masking or electrical)
- \* Straight pin
- \* Ruler
- \* Marker
- \* Xacto knife, utility knife, or box cutter

### Procedure:

1. Pick up a cardboard tube or make one from black paper.
2. Place a piece of aluminum foil between two index cards and gently turn the pin through the layers. Then tape the aluminum foil to the end of the tube, with the hole in the center.)
3. Cut a circle out of waxed paper and tape it over the top of the tube. This will be your viewing screen, or "film."
4. Tape another piece of tube to the one you have been working on -so they form one tube.

5. For a pinhole camera to work, the only light must come in through the pinhole. Make your camera "light-tight" by wrapping it in aluminum foil. Take a 1.5-foot-long piece of foil and tape the edge to the can (have the foil line up even with the metal bottom of the can). Then wrap the foil around the can as many times as it will go, closing the end with tape. Some foil will probably extend over the open end of the tube; just tuck this excess inside the tube.

6. Roll the piece of black construction paper into a tube and insert it part-way into the open end of the can. This will act as a light-shielding eyepiece for your camera.

Now you are ready to use your camera! Place an object such as a flower or pencil (or even your hand!) under a bright lamp so it is well lit. Point the pinhole end of the camera at it and look through the black paper eyepiece. (You may need to cup your hand around the eyepiece to help keep the inside of the can dark. This will be easier if the room is dark except for the lamp.) You should see a color image of the object on the waxed paper screen; move your camera in and out until the object is in focus. Don't get confused when trying to center the object in your viewer! The image is upside-down and reversed, so you will have to move the camera in the opposite direction from what you expect. Remember, practice makes perfect!

Think about what you could do to improve your pinhole camera, then try some of your ideas. What would happen if the screen were farther away from the pinhole? What other kinds of materials would work for the screen? Would a bigger hole make a better image? If you want, you can get a book from the library or research on the web to learn how to make a pinhole camera that really takes pictures. This pinhole camera website is a good place to start: it has step-by-step instructions, plus a gallery of photos taken with pinhole cameras!