

## PINHOLE CAMERA

Duration: 2 - 5 minutes

Institution: Science Museum of Minnesota

Skill level/Age Level: K- Grey

Group size: Individual

## INTRODUCTION

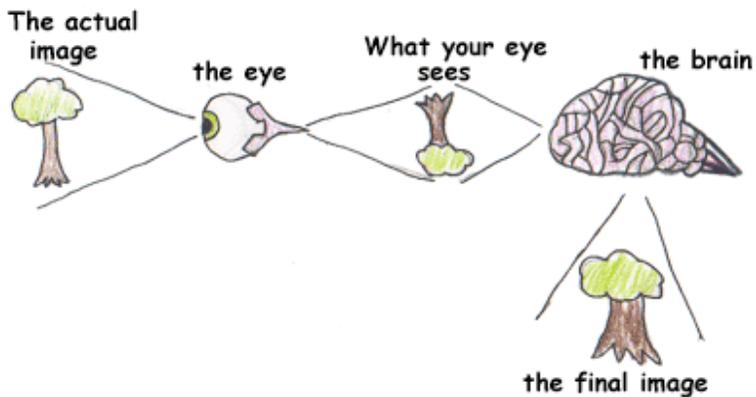
We learned about pinhole cameras when playing around with activities about light and sight. Youth were finding it hard to understand how their eyes, light, and their brain all work together to help us see. By making this simple camera the youth could get an understanding how a camera works and then possibly how their eyes work.

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**KEY CONCEPTS AND/OR SUBJECT AREA**

When teaching youth and adults about vision it has frequently been difficult to lead activities that give someone, with limited prior knowledge, an interactive hands-on experience. This activity appeared like a great way to explore how light, our eyes, and brain simultaneously works together to produce images.



This simple activity also shows some of the interesting things about how our brain takes in information and processes. You can see this best when the image that the pinhole camera shows upside down, how then do we see the world right-side up?

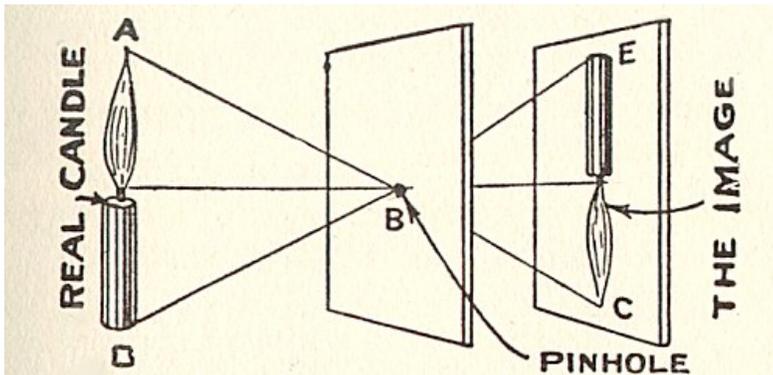


FIG. 131.—How Light and a Pinhole Form an Image.

## MATERIALS AND TOOLS



- Toilet Paper rolls:
- Either cardboard toilet or paper towel rolls will work well
- If you don't have enough tp rolls, you can roll construction paper and tape it to create the rolls



- Tape (Scotch tape or masking tape will work)



- Construction Paper (The darker the better. Use black if available)



- Rubber bands



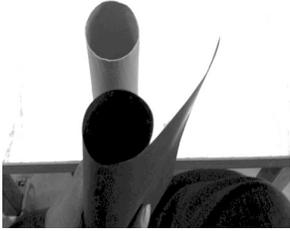
- Scissors (Kid (or adult scissors if supervised) will work)



- Wax Paper (you can also try light tissue paper or tracing paper)



- Awl or hole punching tool (you will need something that will make a pin size hole. A sharp pencil or a pen will work. For best result use a sewing needle. The smaller the hole the sharper the image, but the dimmer it looks)

**HOW TO OR STEP-BY-STEP**

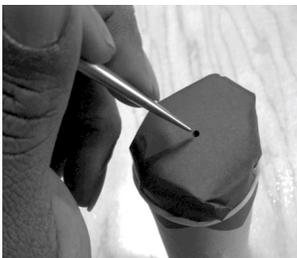
Start with either a toilet paper roll, paper towel roll, or roll up a piece of construction paper the same size.



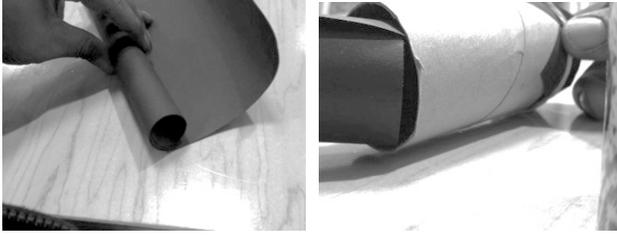
Cut out a piece of construction paper that extends at least an inch fully around the brim of the toilet paper roll. Place the piece over one end.



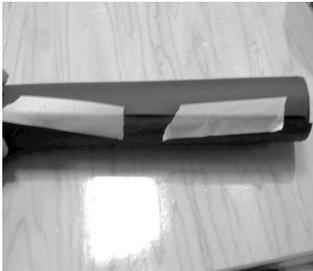
Using a rubber band secure the piece of construction paper over the end of the toilet paper roll. You can also use tape instead of the rubber band for this step.



Using the tool you have to make a hole, puncture the construction paper as close to the center as you can.



Roll up a piece of construction paper that can fit loosely inside of the toilet paper roll.



Once you have it rolled up use some tape to keep your cylinder together.



As you did earlier with the construction paper and toilet paper roll, cut out a piece of wax paper that extends at least an inch fully around the rim of the construction paper cylinder. You can figure this out by setting the roll on top the wax paper and tracing around it – then cut it an inch out from your line. Place the piece over one end.

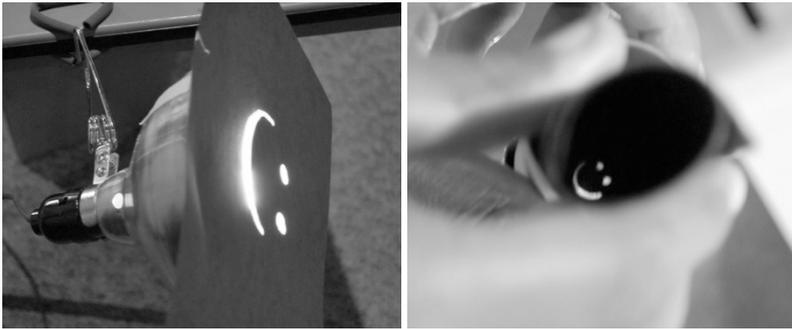


Using a rubber band secure the piece of wax paper over the end of the construction paper cylinder. (You can also use tape instead of the rubber band for this step).



Insert your construction paper cylinder into the open end of your toilet paper roll. You want to have some space between the end of your construction paper

### FACILITATION TIPS



When you look through the pinhole camera you can see the image has been reversed and flipped

### PROMPTS AND QUESTIONS

This works using a concentration of light, so the brighter the better. Sliding the construction paper cylinder forward and backwards makes the image smaller and bigger. The smaller the more concentrated the image will be.

1. What do you see?
2. How could you make your camera bigger?
3. How could you make the image bigger?
4. How is it different then when you usually look at something?
5. Why do you think the image is upside down?

### GENERAL FACILITATION TIPS

- This activity sometimes takes a delicate touch with materials – if you make the hole too big then your image is too blurry to see the details.
- Side conversations:
- Scientists often make the instruments to explore ideas this is a tool that can help you explore light.
- There are many over the counter examples – having these to supplement the conversation helps, as well as having an older film-based camera that you can open up to show how it is similar to the pinhole camera

## MATERIALS SOURCES

In design-based experiences, facilitation is about asking the learner to think about what they want to do, how they want to do it, why they want to do it, and how they might get there. Good facilitators can support this process of transfer of learning from one situation to another, a key attribute that distinguishes experts from novices.

## MORE INFORMATION

The Pinhole Gallery

<http://www.pinhole.org/>

The Pinhole Point of View

<http://rednotebook.org/pics/pinhole/index.html>

Modeling the Eye then Taking a Picture

[http://www.mrsec.psu.edu/education/nano-activities/vision/modeling\\_the\\_eye/modeling\\_the\\_eye.pdf](http://www.mrsec.psu.edu/education/nano-activities/vision/modeling_the_eye/modeling_the_eye.pdf)

## KEYWORDS

- What kinds of info would be useful here? Some ideas: outdoor, indoor, needs little/a lot of space, hand-tools, safety issues, electronics, painting, sculpture, arty, crafts?