Studio Experience

Building and Using a Pinhole Camera

Pinhole cameras are one of the simplest ways to make a photographic image. The concept of making a pinhole camera is simple: Take a light-tight container and poke a single hole in it to let light in. That light enters the hole and an image is captured on photographic paper or film. The paper or film is then processed in the darkroom using chemicals that will reveal your image as a negative. Learning how to construct every part of the pinhole camera and analyze the resulting images will give you the knowledge to create your ideal pinhole camera. Start by rereading about camera obscura and pinhole on pages 9 and 14.

Fig. 1–44. **Pinhole camera variety.**

Before You Begin

You will need:

- a light-tight container
- black paint
- X-Acto knife or drill (depending on type of container used)
- aluminum can (clean)
- sewing needle (the smallest needle that you can find)
- sandpaper (the finest-grit sandpaper that you can find)
- black electrical tape (to tape up any light leaks and to use as a shutter)
- light-sensitive black-and-white photographic paper (to capture your image)
- masking tape
- black-and-white photographic darkroom chemicals

Create it

1 Make your container light-tight. If the inside is white or light in color, paint it black so that light doesn't reflect off the surface.

2 Cut (papier-mâché or thin plastic) or drill (metal or wood) a sub-hole on the side of your container where you want to place your pinhole. The sub-hole should be approximately one fourth of an inch and be measured to fit in the center of the side of the box. The sub-hole is basically a larger hole that the aluminum pinhole will be placed over later.

3 Carefully cut a 1-inch square piece of an aluminum can. Using a needle, push a tiny hole through the center of the piece of aluminum. Push only the very tip of the needle through the aluminum, which will allow for the smallest possible hole. If the needle hole creates a slight burr on the back side of the aluminum, use sandpaper to knock it off so it becomes smooth. This becomes your pinhole lens. The smaller the hole, the greater your depth of field.

Materials

Help students choose their materials: light-tight containers, black paint and brush if the interior is not already black. Light reflects off of white surfaces, so the black is needed to absorb unwanted light. Ask students to think about the structure of the container and to test the durability of the container to make sure it will last. Check thrift shops and dollar stores for metal tins, wooden boxes, or papier-mâché containers. Cardboard boxes are okay, but they tend to need more care in making and keeping them light-tight. The smallest needle is important because the needle size controls the depth of field; the smaller the needle hole, the greater the depth of field. The sandpaper will be used to sand the back side of the piece of aluminum after the hole is created.

Fig. 1–45. **Light-tight box before the interior is painted black.**

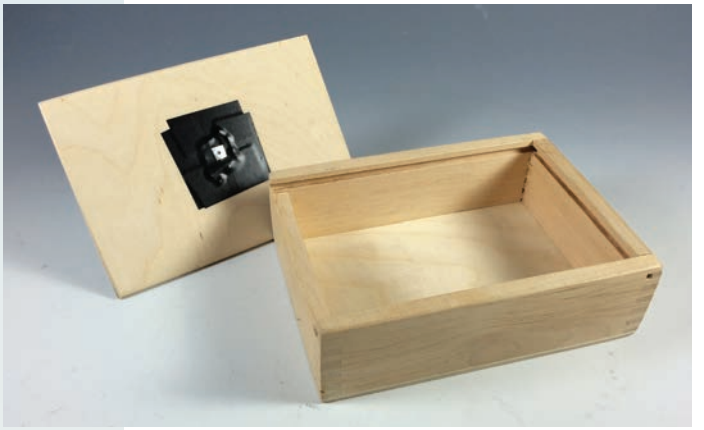

Fig. 1–46. **Aluminum pinhole is taped in place over the sub-hole.**

Teaching Tip

Explain to your students that, just like a science experiment, only one variable will be changing with each photograph, and that will be your exposure time. Remind students to keep cameras stationary when shooting to ensure a nice and sharp image.

4 Using black electrical tape, tape your pinhole lens over the sub-hole on the inside of the container. Be sure to tape the pinhole lens down on all four sides of the aluminum using a bit of pressure to avoid any light leaks below the tape.

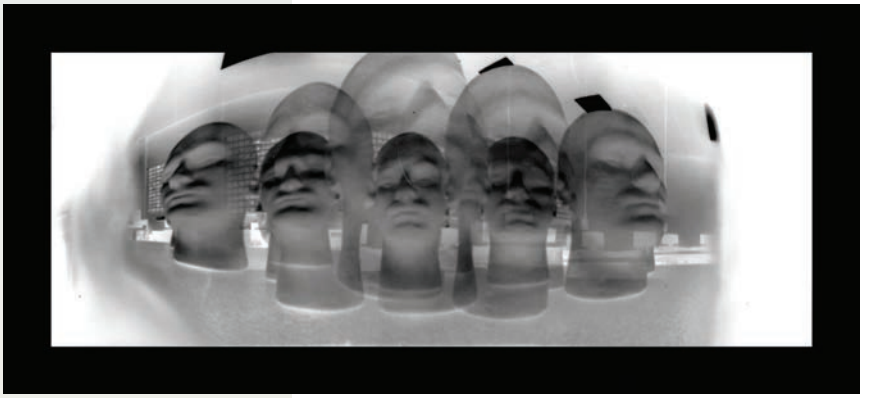

Fig. 1–47. Jaedon Croy, Negative Pinhole Image.

5 Place a piece of black electrical tape over the outside of the pinhole to act as your shutter. Once you are set up to shoot, you remove the tape for your desired exposure time, then reapply it.

6 You've created your very own pinhole camera! You are now ready to load photographic paper (start with paper before trying film...you get results fast and it's less expensive) inside of your pinhole camera.

Depth of Box	Initial Exposure Time
1 inch	1 second
3 inches	3 seconds
5 inches	6 seconds
10 inches	30 seconds

This chart gives you a starting point with exposure time. The deeper the box, the longer it takes to expose the paper.

Note It You will need lots of patience when shooting with your pinhole camera for the first few times. Your exposure will vary with the amount of light outside, the direction that you shoot, and the time of day that you shoot. Start by photographing outside on a sunny day with your initial exposure time. Make sure you photograph around that time each day until you understand your exposure times.

7 Once you make your exposure, process your photographic paper using a darkroom. Your image will be a "negative" (see page 5), which means blacks will be white, and whites will be black. At this point, you need to evaluate your exposure time. If your image is too light, then you need to add some time to your exposure. If your image is too dark, then you will need to subtract some time from your exposure.

8 Just like camera obscura, your image will be projected inside of your pinhole camera upside down and backwards. Be sure to notice how this affects text on

clothing or signs. From this point you can scan your "negative" image into the computer to invert it, meaning the blacks become white and the whites become black—a positive.

Check it

Have you eliminated all light leaks? Did you find the perfect exposure time after several attempts? Think about the composition of your photograph. With the challenge of having no viewfinder or LCD screen to check, have you followed the Rule of Thirds, which is basically placing your subject off-center (see page 109), as well as having an unusual angle to create a compelling composition?

Fig. 1–48. Jaedon Croy, Positive Pinhole Image.

Teaching Tip

Remind students not to change anything except exposure time. That means shooting in the same type of light, at about the same time of day (within an hour or so) and the camera should be set up to photograph the exact same subject, facing the same direction (shooting towards the sun or away from the sun).

Teaching Tip

The image by student photographer Jaedon Croy is of white Styrofoam heads. You can see in the negative image they appear to be black Styrofoam heads. The pinhole process can be continued in the darkroom by researching how to make a paper negative. Camera phones can also invert images through the settings to instantly see the pinhole exposure as a positive. This is the fastest way to make a positive, but the quality may be compromised.

Rubric: Studio Assessment

Advanced	Proficient	Developing	Incomplete
PLANNING • Rationale/Research • Composition • Reflection/Evaluation			
In-depth research on pinhole photography. Considers perspectives and ideas from others to use as inspiration. Thoughtfully chooses the perfect light-tight container for constructing a pinhole camera. Considers a variety of angles of view; selects perfect time of day to photograph. Composition is highly interesting; excellent use of space and Rule of Thirds.	Appropriate research on pinhole photography. Considers perspectives and ideas from others. Selects an effective light-tight container for constructing a pinhole camera. Considers several angles of view; selects appropriate time of day to photograph. Composition is interesting; good use of space and Rule of Thirds.	Little research on pinhole photography. Considers few perspectives or ideas from others. Selects an acceptable light-tight container for constructing a pinhole camera. Considers one or two angles of view; selects time of day to photograph. The composition is centered; some use of space and Rule of Thirds.	No research on the pinhole photography process. Randomly chooses container; pinhole camera has light leaks. Randomly chooses angle of view and time of day to photograph. The composition is uninteresting; no consideration of space or Rule of Thirds.
MEDIA USE • Camera • Lighting • Exposure • Props			
Great care taken to achieve the correct exposure time (shutter speed). The correct exposure was achieved. The print has a wide range of values from white to pure black.	Care taken to achieve the correct exposure time (shutter speed). The correct exposure was achieved. The print has a range of values from white to black.	Little care taken to achieve the correct exposure time (shutter speed). The correct exposure was attempted, but not achieved. The print has a small range of values	Exposure time (shutter speed) chosen randomly; exposure is incorrect—too dark or too light The print has mostly one value.
WORK PROCESS • Synthesis • Reflection/Evaluation			
Critically reflects on each image to determine the next step. Freely shares ideas, takes interest in others; eagerly participates in class discussions. Works independently and remains on-task.	Reflects on each image to determine the next step. Shares ideas, listens to others; participates in class discussions. Works independently and remains on-task.	Little reflection on images; rushes through the process. Rarely shares ideas or does not listen to others; some participation in discussions. Works somewhat independently and usually remains on-task.	No reflection on images. Rushes to get finished. Does not participate in class discussions. Does not work independently and is off-task most of the time; disruptive behavior.
INNOVATION • Risk Taking • Creativity			
Expertly demonstrates innovation by taking multiple creative risks.	Demonstrates innovation by taking creative risks.	Takes few creative risks; makes safe choices.	Avoids taking risks or copies the work of others.