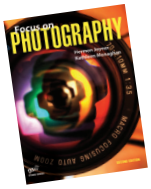
MAKING A PINHOLE CAMERA

Experience the art of pinhole cameras! Create a one-of-a-kind long exposure pinhole camera that requires no darkroom processing. Easily adaptable for kindergarten through college and beyond, this project uses readily available materials.



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DIRECTIONS FOR MAKING
A PINHOLE CAMERA

Making a Long-Exposure Pinhole Camera

1. Locate a light-tight metal or hard plastic container. Paint the inside black to keep any and all light from reflecting. Drill (or cut) a ¼"-square sub-hole that you will eventually tape your pinhole over.

2. Using the smallest size needle that you can find, gently push a hole through a ½"-square piece of aluminum can You may need to sand the bur on the backside of the aluminum if it is rough where the needle poked through.

3. Tape the piece of aluminum over the sub-hole of your light-tight container. Make sure the pinhole is in the center of your sub-hole. Use electric tape so light does not get through. Use a small piece of electrical tape as the shutter/lens cap over the pinhole.

4. Now you are ready to load your camera with photo graphic paper. Cut a piece that fits nicely inside your camera. To ensure that your paper doesn't fall forward, use a small piece of tape rolled up behind your photo paper to keep it in place.

5. I would suggest that you use electrical tape to hold down the lid on your container.

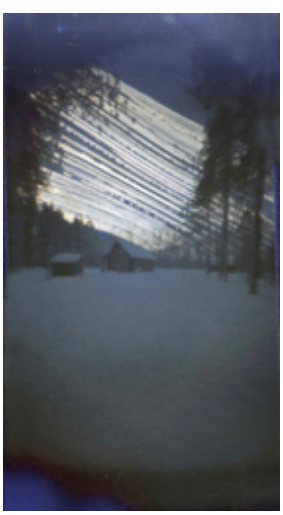
6. You are now ready to make your long exposure. I suggest that you tape your pinhole camera into its location so it doesn't move. The camera must remain stationary for the duration of the exposure.

7. Working in subdued light, scan your pinhole image into the computer. You basically have one shot at this due to the intensity of the light of the scanner (which will start to alter to image immediately). Scan at a high resolution such as 1200 dpi.

8. Once your image is scanned, your image needs to be inverted and flipped horizontal. You can alter color/ contrast/levels as you see fit.

This is what your Pinhole Camera should look like once complete. The larger hole is the sub hole that was drilled. The center is a needle hole punched into a piece of aluminum pop can with a needle hole!

This is how the photographic paper should look when you open your little tin camera. The image is seen as a negative (whites are black, and blacks are white).



This is how the finished piece should look once it is scanned, inverted, and flipped the correct way. No other editing was done.

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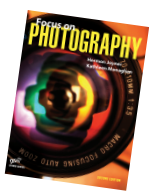


THE **CAMERA OBSCURA** & **PINHOLE PHOTOGRAPHY**

Nicole Croy

One of the most interesting facts about photography is that cameras and lenses were invented hundreds of years before an image was ever recorded. The first camera was called the "camera obscura." This device was used in astronomy and, when a lens was added, as a drawing tool. It works because light travels in a straight line, and when light rays are reflected from a subject through a small hole in thin material, these rays cross and are projected upside-down.

Camera Concepts

The simple pinhole camera doesn't use a lens. Instead it has a thin sheet of metal with a tiny hole in it that projects an image as a glass lens would. The images made by a pinhole camera aren't as sharp as those made by a glass lens, but they have a special look all their own that is quite beautiful. Pinhole cameras have a nearly universal depth of field; virtually everything is in focus all the time.

Making a pinhole camera is simple: Take a light-tight container and poke a small hole in it to let light through.

> Pinhole cameras have a nearly universal depth of field; virtually everything is in focus all the time.

That light enters the hole and an image is captured on photographic paper or film. The film is then processed in a darkroom using chemicals that reveal the image as a negative.

The Pinhole Process

Learning how to construct every part of the pinhole camera and analyzing the resulting images will give your students an in-depth knowledge of the history of photography.

1. Make sure that the chosen container is light-tight. If the inside is bright in color, paint it black so that light doesn't reflect off the surface.
2. Cut (for papier-mâché or plastic) or drill (for metal or wood) a sub-hole on the side of the container where you want to place the pinhole. The sub-hole should be ¼" and centered on the side of the box.
3. Carefully cut a 1" square of aluminum from a can. Using a needle, push a tiny hole through the center of the aluminum. Push only the tip of the needle through, which will allow for the smallest possible hole.

The smaller the hole, the greater the depth of field. If the hole creates a slight burr on the back side of the aluminum, use sandpaper to smooth it away. This becomes the lens.

4. Using black electrical tape, tape the pinhole lens over the sub-hole on the inside of the container. Be sure to tape the aluminum down on all four sides, using slight pressure to avoid light leaks below the tape.
5. Place another piece of electrical tape over the outside of the pinhole to act as your shutter. Once you are ready to shoot, remove the tape for your desired exposure time and then reapply it.

After students have successfully created their own pinhole cameras, they can begin loading photographic paper into them (start with paper before trying film—you get results fast and it's less expensive).

Processing Photographic Paper

Once an exposure is made, students will need to process their photographic paper in a darkroom. The images will be "negatives," which means that values will be reversed—blacks will be white and whites will be black. At this point, they'll need to evaluate their exposure time. If their images are too light, they need to add time to their exposures. If their images are too dark, they need to subtract time from their exposures.

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

Depth of Box	Exposure Time
1"	1 second
3"	3 seconds
5"	6 seconds
10"	30 seconds

Exposure Time

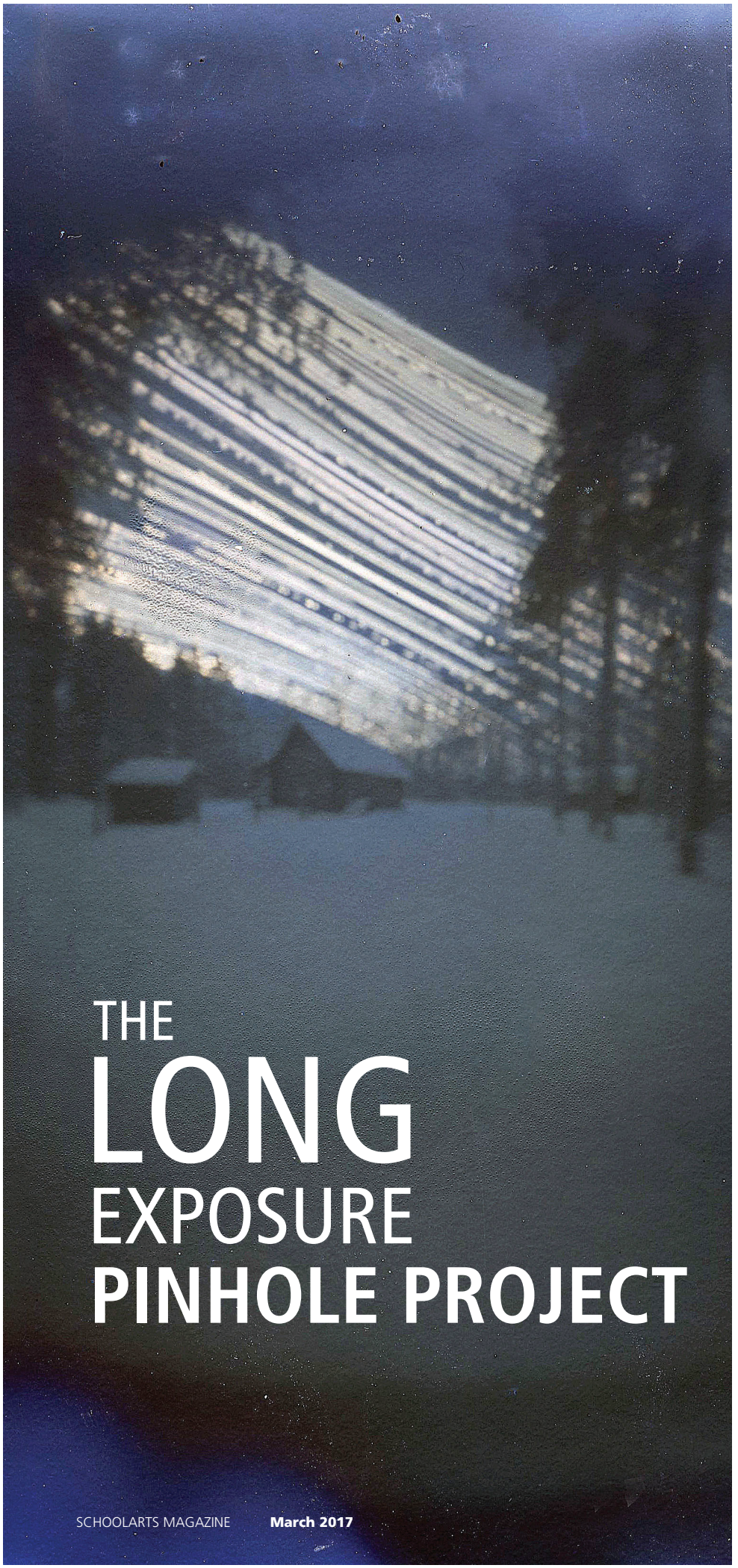
The images will be projected inside of students' pinhole cameras upside-down and backwards. Point out how this affects the text on clothing or signs. Once students have processed their negatives, they can scan their images into a computer to invert them; blacks become white and the whites become black—"positives."

Patience—Practice!

Students will need lots of patience when first shooting with pinhole cameras. Their exposures will vary with the amount of light outside, the direction in which they shoot, and the time of day. They should start by photographing outside on a sunny day with the initial exposure time. Make sure they photograph around the same time each day until they understand their exposure times.

Nicole Croy teaches high-school photography at Carroll High School in Fort Wayne, Indiana.

This lesson is adapted from the textbook Focus on Photography *(available from Davis Publications) by Hermon Joyner and Kathleen Monaghan.*



THE LONG EXPOSURE PINHOLE PROJECT

Nicole Croy

Pinhole cameras are my obsession. I am elated by the fact that I can build my very own working camera with just a few common supplies from my artroom. I began by making the basic pinhole camera from a cardboard box (see "The Camera Obscura and Pinhole Photography" from last month's issue), and then progressed to metal containers. I've explored cylindrical (as well as half cylindrical) containers, and then was inspired to build cameras that could shoot 360 degrees with a multiple lens.

I progressed by building a camera made from a real box truck, and have recently landed in the extreme long exposure category. In the past year I have created more than 300 long exposure pinhole cameras that allow me to record the sun's light trails across the sky for months at a time.

Beyond the Basic Pinhole

This long-exposure pinhole project allows for your students to take the basic pinhole camera a step further than a few second's exposure and record for a longer amount of time. This is the next step in making your "standard" pinhole images or pinhole assignment into something completely mind-blowing.

For this project, the basic pinhole camera is constructed. Black-and-white darkroom photographic paper is placed inside of the camera. It is important that whatever location you choose, the camera remain stationary

> This is the next step in making your "standard" pinhole assignment into something completely mind-blowing.

and taped to an object for the duration of the exposure (I tend to tape my pinhole cameras to metal posts and trees, out of by passers' view). The cameras should be left to expose from anywhere between two days and 240 days! The longer the exposure, the

more light trails from the sun you will record. Due to this extremely long exposure, moving objects such as cars and people become obsolete, and water becomes very still and flattens out.

Scanning the Image

This is where you ask, "Isn't the paper completely over-exposed?" My answer is "Yes, you are right!" Your paper is completely over-exposed and if you were to place it in a tray of developer it would turn completely black. Once the pinhole lens is closed and the camera is taken down, the image will need to be scanned into a computer and will essentially become your original file, no darkroom required.

The brand of photographic paper, the type of paper (fiber-based or resin-coated), the age of the paper, the surface finish of the paper, as well as the weather all play into the color of your image once removed from the pinhole camera. Mysterious colors including reds, greens, blues, etc., appear from the black-and-white photo paper.

Your image on the photo paper will be a "negative," so you will need to invert it to make it a positive image. Scan your photo paper in subdued light so that the paper gets minimal additional exposure to light. Once the light of the scanner bed hits your photo paper, it alters the papers color (so no pressure, you essentially have *one* shot at this).

Making a Long Exposure Pinhole Camera

1. Locate a light-tight metal or hard plastic container. Paint the inside black to keep any and all light from reflecting. Drill (or cut) a ¼ x ¼" sub hole that you will eventually tape your pinhole over.
2. Using the smallest size needle that you can find, gently push the needle through a ½ x ½" piece of aluminum can. You may need to sand the bur on the backside of the aluminum if it is rough where the needle poked through.
3. Tape the piece of aluminum over the sub hole of your light-tight container. Make sure the pinhole is in the center of your sub hole. Use electric tape so light does not get through. Use a small piece of electrical tape as the shutter/lens cap over the pinhole.

Now you are ready to load your camera with photographic paper. Cut a piece that fits nicely inside of your camera. To ensure that your paper doesn't fall forward, use a small piece of tape rolled up behind your photo paper to keep it in place. I would suggest that you use electrical tape to hold down the lid down on your container.

You are now ready to make your long exposure. I suggest that you tape your pinhole camera into its location so it doesn't move. The camera must remain stationary for the duration of the exposure.

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