



INDIRECT OBSERVATION OF AN ECLIPSE

Brief description

Students create an eclipse pinhole projector for the observing the solar eclipse indirectly.

Level: All grades

Preparation time: 5-20 minutes to create your projector. We recommend doing this before the day of the eclipse.

Duration: 5-30 minutes

Keywords: solar eclipse, Sun, observation, safety, eyes, pinhole

Educational Goals

- ★ Observe the Sun and the eclipse safely using the projection method.

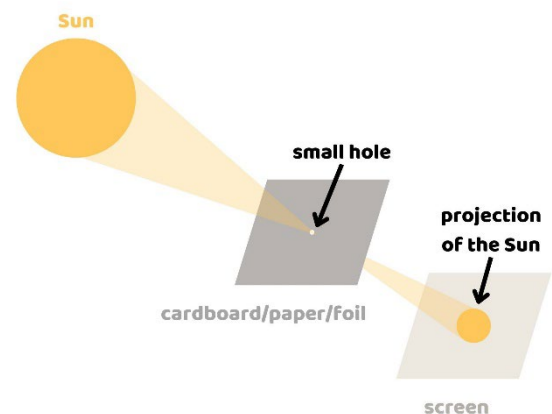
Materials

- ☐ We recommend using two sheets of white cardstock: one to make the holes and the other as a screen to project upon. Any other medium you can make holes in will also work (paper, aluminum foil in a cardboard frame to hold it, etc.).
- ☐ To make the holes: bamboo skewers, lead pencils or other pointed objects.
- ☐ Any object with holes: spatula, pasta strainer, etc.

Introduction

It is possible to observe an eclipse indirectly using the pinhole method. All you have to do is make a hole in a piece of cardboard and put this cardboard in front of the Sun. Sunlight then passes through the hole and forms the image of the Sun on a screen placed behind it. During the eclipse, the shape of the Sun is no longer a perfect circle and we can see the progress of the eclipse as the Moon covers it.

It is completely safe to observe the eclipse this way, since we are not looking at the Sun, but at a projection of its image!



Preparation

A basic pinhole camera consists of a single hole. But it is possible to have fun and create interesting designs in cardboard. Each of the holes will create an image of the Sun on the screen.

We recommend preparing the designs before the eclipse so that you are ready to use them when the time comes.

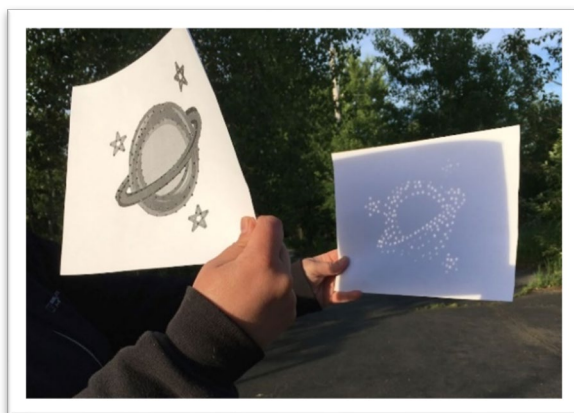
1. Write your name

A great memory for a young student would be to have a photo of their own name written in reflections of the crescent Sun!

On a piece of cardboard, invite students to write their name in large letters. Next they must punch holes along the letters. Depending on their age, adult supervision may be necessary.



By holding the sheet with the holes above the screen, you can see the words written in crescents.



*The Discover the Universe logo in pinholes!
Notice the distance between the sheet with the holes and the screen.*



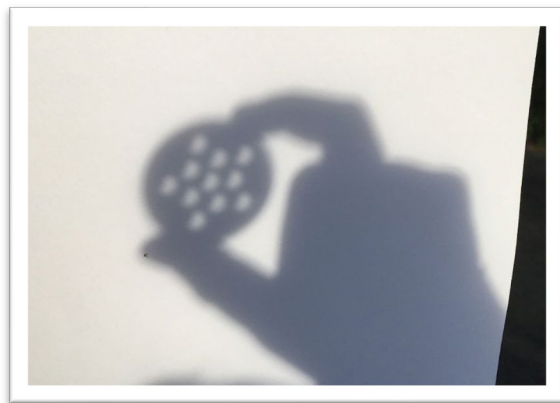
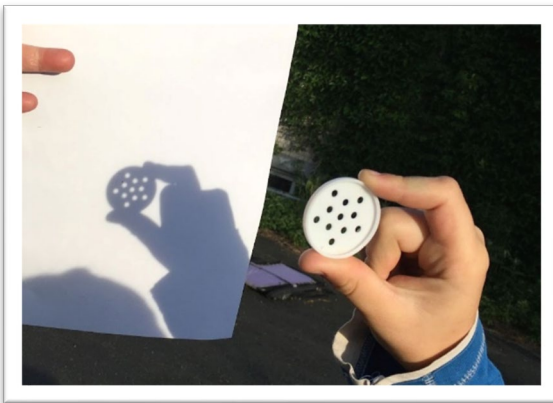
*A drawing of the Mont-Mégantic Observatory
reflected in the crescent Sun!
Credit: Frédérique Baron*

2. Make a drawing

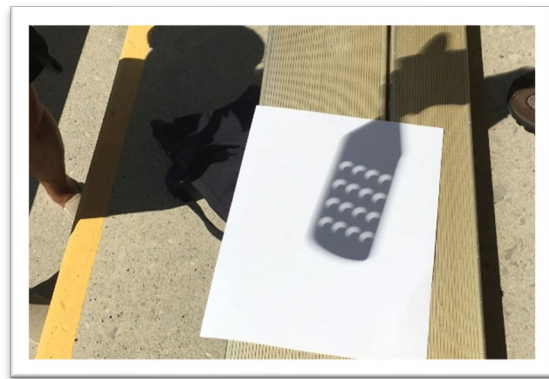
Instead of writing their name, students could draw a picture and make holes in various places to obtain a beautiful result. Let them use their imagination!

3. Any object with holes

Ask students to find objects in their homes that have holes and that could provide beautiful images of the eclipse. Several kitchen utensils work well, such as spatulas or pasta strainers.



Any object with holes can be used as a pinhole camera! We can clearly see that the holes project an image of the Sun, which is no longer a perfect circle during the eclipse.



Our director Julie Bolduc-Duval and astronomer Rosa Doran brought kitchen utensils for the 2017 solar eclipse in the United States. We can clearly see the crescents of the Sun through Rosa's spatula.

Process

Warning: do not look at the Sun through the holes! The goal of this activity is to observe the Sun indirectly. You must therefore let the sunlight pass through the holes and observe its image on your screen.

During the eclipse, hold the pinhole projector so the Sun filters through it onto the screen, your back should be to the Sun. You will see an image of the Sun appear on the screen. The smaller the holes, the closer the screen should be to the pinhole. The image of the Sun will then be very small.

Have fun with the projectors you have created and with objects with holes! Take photos of the results.

Other ideas:

- ★ Cross your fingers to create small holes and observe the result.
- ★ Look at the shadows created by the leaves of the trees. Since the trees won't have leaves yet in April, this won't be possible. But you can keep it in mind for future partial eclipses!

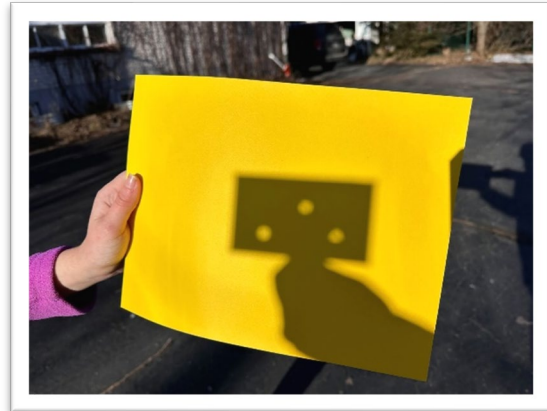
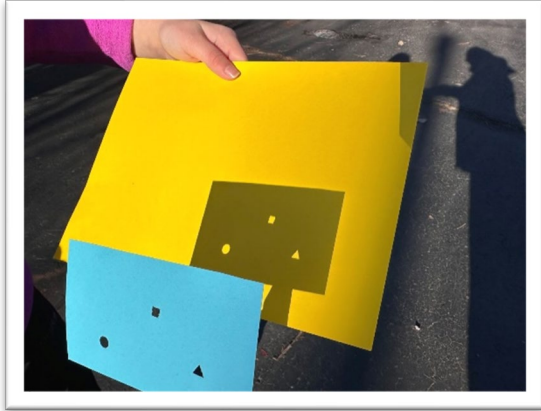
This activity works best when the Sun is a crescent, at least 30 minutes after the start of the partial eclipse.



Pasta strainers give great results! Credit: NPS-Mary O'Neill

Taking it Further

If you place the screen too close to the pinhole, you will see the image of the hole and not an image of the light source (Sun). This can be proven by using holes of different shapes. This example was created using square and triangular shaped holes, in addition to the usual circular holes.



If the screen is placed too close to the holes, you can see the shape of the holes. By moving the screen back, we then see the shape of the light source: the circle of the Sun. Note that there was no eclipse at that time, so the image of the Sun is a circle!

Note

Do you happen to remember eclipse boxes used during a solar eclipse in your childhood? We do not recommend using these devices since it's actually difficult to obtain a good image. You need to have the right hole size for the length of the box. It is much easier to have a screen that moves to adjust the distance!

Inspiration

We thank NASA Punch for the inspiration for the activity with the different shaped holes. You can see their more detailed explanations on:

https://punch.space.swri.edu/punch_outreach_pinholeprojector.php