

# Sun Funnel

Adult Supervision

Prep Time: 1 hour

Activity Time: 10 min

Build a rear-projector telescope adapter for viewing the Sun

## Summary

We've all heard the sage, parental advice: Don't look at the Sun!! This is a good rule of thumb since protecting your vision is really important, but it turns out that there are some cool ways to observe the Sun without hurting your eyes. This activity shows you how to make your own rear-projection telescope adaptor so that you can observe a partial solar eclipse or surface features like sunspots. This should be assembled by an adult, but people of all ages can enjoy the results with adult supervision.

*Credit: Activity created by the American Astronomical Society  
[https://www.astrosociety.org/tov/Build\\_a\\_Sun\\_Funnel2.pdf](https://www.astrosociety.org/tov/Build_a_Sun_Funnel2.pdf)*

## Objectives

- Create an inexpensive rear-projection telescope adapter.
- Observe celestial events like a solar eclipse or planets in transit.
- Observe and learn about features of the Sun: sunspots, limb darkening, solar rotation.

## Materials

- Large automotive funnel
- Large hose clamp
- Small hose clamp
- Piece of rear-surface projection screen, white shower curtain material or vellum paper.
- Inexpensive **all-metal-and-glass** telescope eyepiece
- Telescope
- Flat-head screwdriver
- Small hacksaw
- Medium to fine grit sandpaper
- Ruler
- Rubber Band

\*\* See our extensive buying guide on page xxxx for more information \*\*

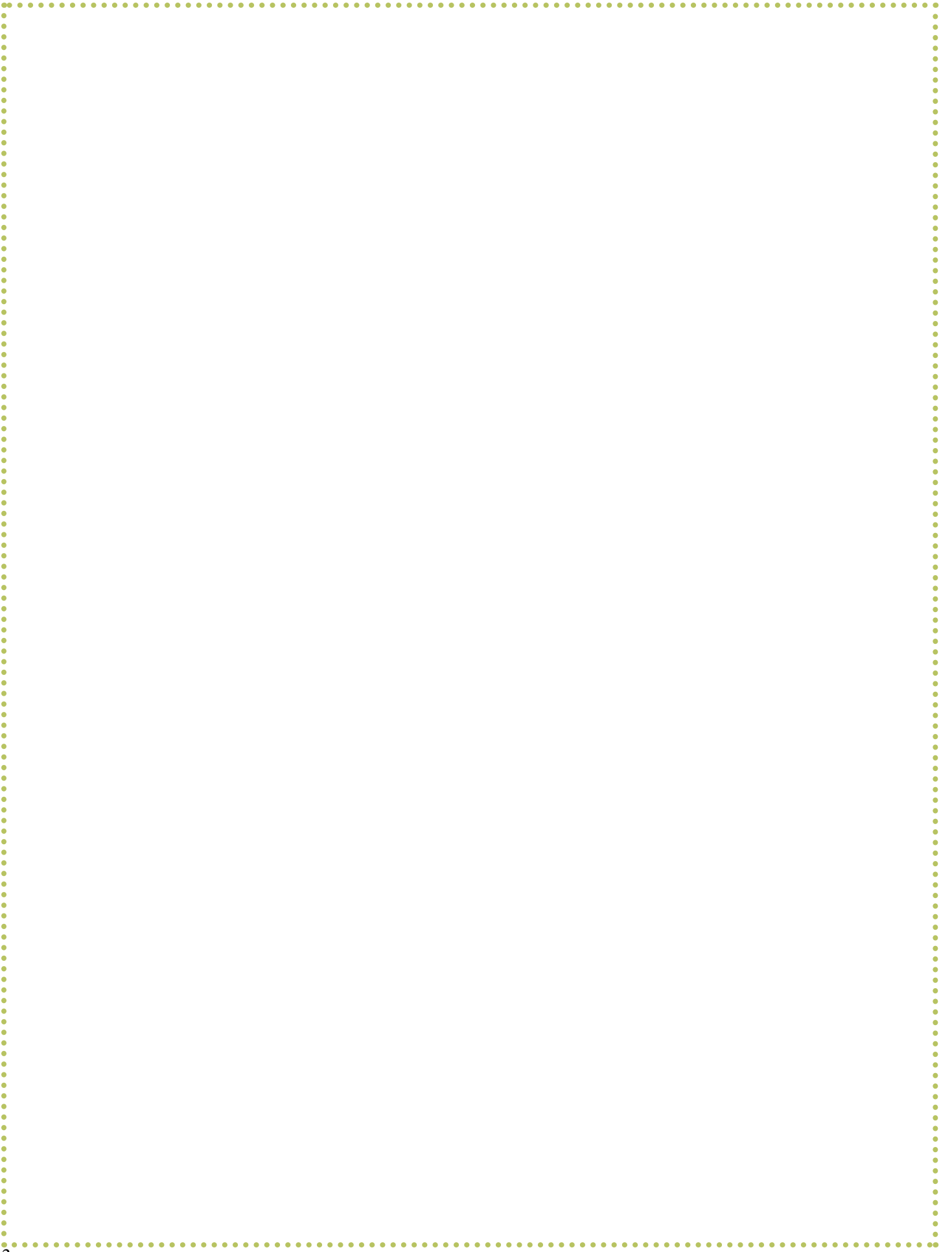


**WARNING:** This activity poses risk of bodily injury, vision impairment and damage to equipment. To avoid harm, the Sun Funnel should be constructed by a capable adult and always used with adult supervision. Follow all safety warnings.

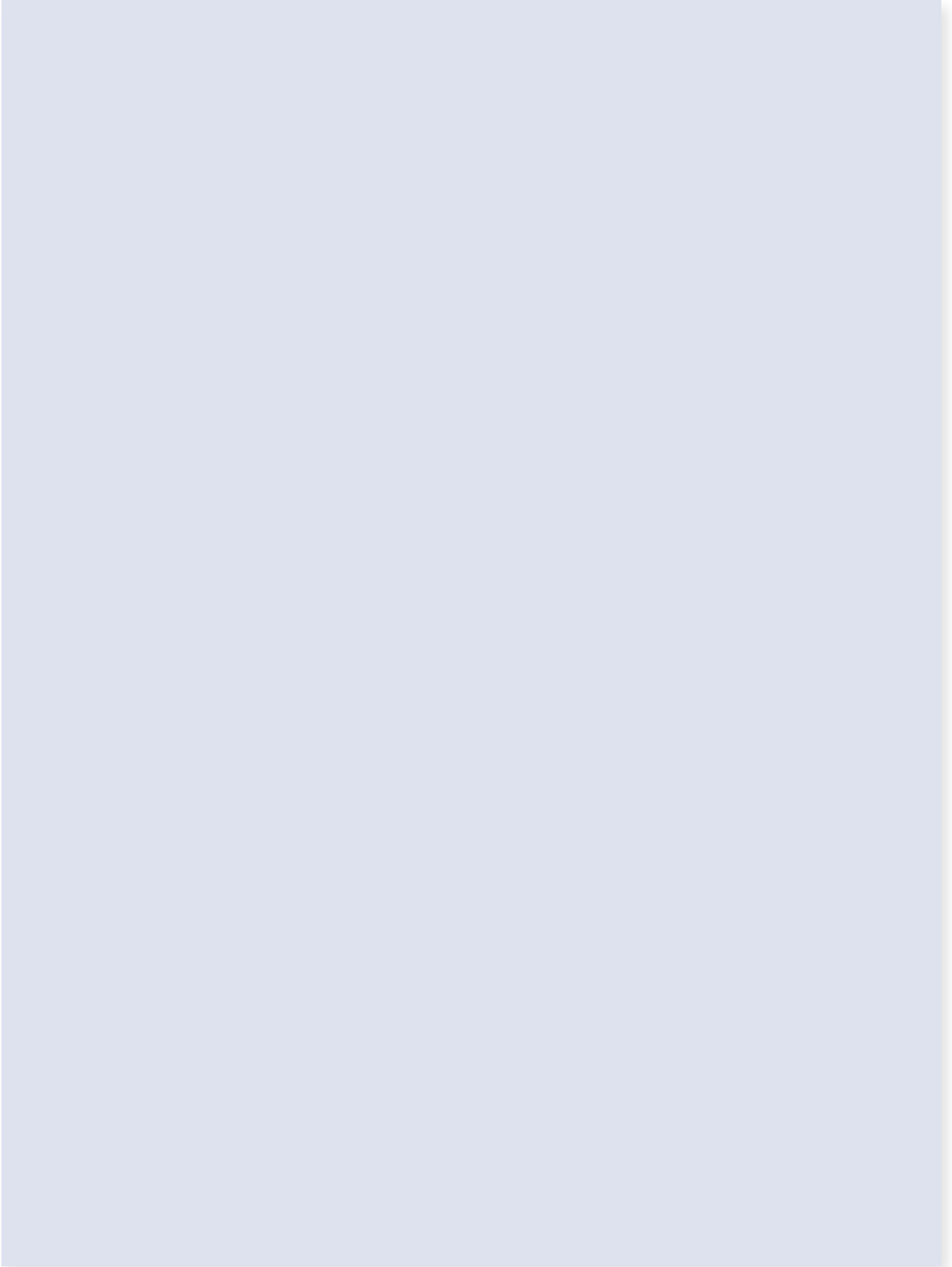
## BUYING GUIDE

1. The ideal funnel will have a large opening and long body to project a large image of the Sun and will need to just accommodate your eyepiece once cut. A 7.75" x 5" x 5" round top funnel is perfect. We recommend the Blitz/Hopkins Super Funnel #05034 for around \$5 at your local hardware, auto-parts store or online (<http://amzn.to/1VzVYNP>)
2. Large hose clamp, 2.5" x 5.5". We recommend the Breeze #62080 for \$1 to \$2 at your local hardware store or online (<http://bit.ly/qBbvRK>). A rubber band can be substituted.
3. Small hose clamp, 1.3/16" x 1.5". We recommend the Breeze #62016; around \$1 at your local hardware store or online (<http://bit.ly/oTDjRR>)
4. 8-inch x 8-inch or larger piece of Da-Lite High-Contrast Da-Tex rear-surface projection screen #95774 (<http://bit.ly/1qX3yEW>, \$12 for 1 sq. ft.) or Carl's Rear Projection Film (<http://amzn.to/1SsLTRN>, 8½ x 11 inch sheet, available as part of \$3 to \$4 sample pack). If you can't or don't want to buy either material, a suitable alternative is to use two layers of a gray or white vinyl shower-curtain liner.
5. Inexpensive (e.g., Huygens, Kellner, Plössl) all-metal-and-glass telescope eyepiece, 1.25-inch barrel, focal length ~5 to ~25 mm (tips on choosing the optimum focal length follow on subsequent pages). Use one that you already have lying around, as long as it has no plastic in it, which would melt or catch fire. If you don't have one, they're available from numerous manufacturers and dealers — just type "telescope eyepieces" into any internet search engine, and you'll find many to choose from. Another good source is Surplus Shed (<http://bit.ly/1SRnm2H>).
6. Flat-head screwdriver
7. Small hacksaw
8. Medium- to fine-grit sandpaper
9. 12-inch ruler
10. Scissors

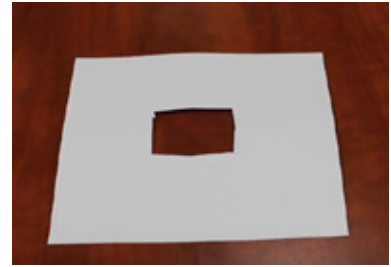




## SCIENCE BACKGROUND

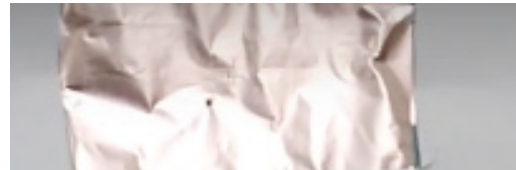


1. Starting with either a full or half-sheet of cardstock, cut a ~1 inch rectangular hole in the center. This will form the window for the aluminum foil.
2. Cut out a rectangle of aluminum foil that is a little bit larger than the window you just cut out.



3. Use four pieces of tape to secure each edge of the aluminum foil onto the cardstock. This will become the "back" of the pinhole viewer.

4. Using a pushpin or tack, make a small hole in the center of the aluminum foil. Aluminum foil is used here because it tends to form a very circular hole with smooth edges, so try not to move the pin around too much as you make the hole.



5. Go outside during bright daylight and practice lining up the Sun with the pinhole viewer. You will want to put a white piece of paper a few feet behind the viewer, or project the Sun's image onto a smooth surface like concrete. *Be sure not to look at the Sun!* When looking at the image of the Sun, the Sun will be behind you. When you use the pin hole viewer during an eclipse, you will see a crescent of the Sun like the ones below.



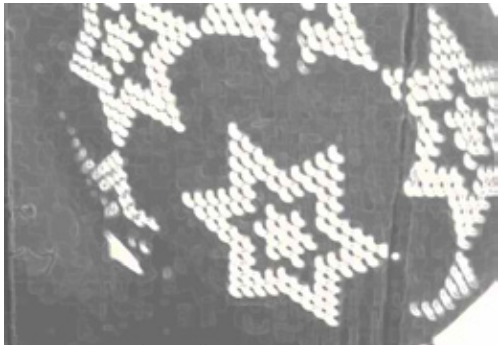
Credit: Eugene Kim



Credit: Dave Pool

More Fun Options:

One pin hole will give you one perfect projected image of the Sun, but you don't have to stop there! You are free to make more pinholes, creating a series of little Sun projections. Make a design, write your name - the possibilities are limited only by your imagination! In fact, any object with small holes can be used as a pin hole viewer. Collanders can make great pin hole viewers! In fact, the small regions of light that pass between the leaves of a deciduous tree can make a slew of solar projections - that's why those little dappled bits of light are circular (like the disk of the Sun). The next time you're lounging under a tree - see for yourself! During a partial solar eclipse, those circles turn to crescents. Finally, the ultimate DIY pinhole viewer is just your two hands overlapping so that small amounts of light pass through your fingers.



Kitchen colander pin hole viewer,  
Credit: John Louie



Leaves creating pin hole projections



Message written in pin holes  
Credit: National Astronomical Observatory of Japan

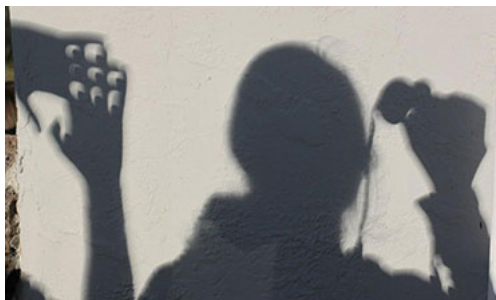


Image credit: Lisa Kunze



Making a pin hole viewer with your fingers,  
Credit: Ellie's Enormous Elevator

Watch a video tutorial of this activity on YouTube:

**<http://bit.ly/MakingAPinHoleViewer>**

Find out more by watching our eclipse webcast:

**<http://bit.ly/Webcast5-ObservingTheEclipse>**



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