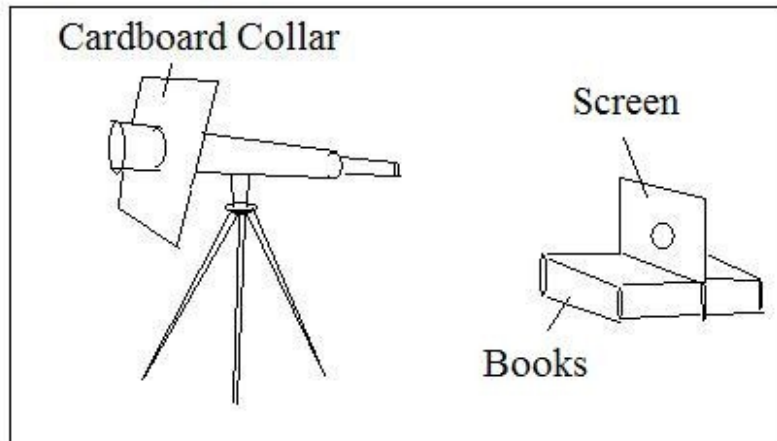


Doing Astronomy During The Day: *Sunspots Affecting Us Historically and Currently*

Similar to the Phases of the Moon sketching activity, students will have the chance to observe a projection of the Sun and watch how sunspots move across its surface over time. Extensions of this project can include the Sun's variable rotation, sunspot cycle duration, sunspot cycle max's and min's, magnetic field lines, solar flares in the news, and mini ice ages. Ideas for projects can be accessed at <http://www.geocities.com/rowleydeb/sunspots>. Ideas for class solar viewing have been gleaned from "Project ASTRO: Universe At Your Fingertips," an outreach publication from the **Astronomical Society of the Pacific** (ASP).



A good setup for observing sunspots

Viewing The Sun By Projection

Items You Will Need:

- 1 Set of Binoculars (with lenses smaller than 50 mm wide) or refracting telescope
- 1 Tripod (or something to that effect)
- 1 Piece of Cardboard for a shade (30 cm square)
- 1 "Screen" (10 cm square, or just another piece of cardboard with white paper)
- 1 Roll of Duct Tape (for securing the binocs to the tripod, and unforeseen setbacks)

1. Cut a hole in the cardboard shade that will fit snugly over the front end of the binoculars. (Only one eyepiece is needed. Darken the other one.) This shading is important to viewing the solar projection, or the projection gets "washed out" by the bright sun.
2. Focus the binocs or telescope to infinity by viewing a far away object, like a treetop (not the Sun!). Use a low magnification eyepiece in the telescope.
3. Point the binoculars or telescope at the Sun. **BUT DO NOT LOOK THROUGH THE INSTRUMENT!** It might take a minute or two of pointing to get the image just right on the screen. Watch the shadow of the binocular setup to guide the image, making the shadow as small as possible.
4. To focus the image, move the screen back and forth until the Sun is centered and fits on the screen. Tilt the screen to make the Sun's image more circular.
5. Gently jiggle the binoculars or telescope. Dots and specks that are not jiggling are dust

particles on the binoculars' lenses or smudges on the screen, but the ones that do jiggle are sunspots!

Observations:

1. You and your students may notice that the Sun is brighter near the center and darker out to its sides. This effect is called limb darkening and has to do with looking through hotter regions of the Sun's atmosphere versus the cooler regions of the Sun's atmosphere near the edges.
2. The Sun's projection will also start to float off the screen. This is because the Earth is rotating, causing the Sun to look like it is moving through the sky.
3. Sunspots will also be seen (unless a minimum in the solar cycle is being approached). Here's a website to see if there are active regions (AR) on the Sun's surface.

[Http://www.spaceweather.com](http://www.spaceweather.com)