

Activity 5

Seeing at Different Wavelengths

Purpose

One of the keys to learning about the Sun is to view it in different wavelengths of light. The views can be quite different, and so are views of objects on Earth in different wavelengths. This activity examines objects through a filter set of colored and specialized filters and illustrates how science users different wavelengths to selectively study features of the Sun.

Materials

A. Colored Acetate Filters

2 to 4" × 5" cards with pre-punched holes (about 15 mm in diameter)

(An alternative to the above card set up is to mount each of the filters separately in a 35-mm slide mount. This has the advantage of being able to use some of these with a slide projector, but the disadvantage of more individual items to use.)

tape

30-mm squares of colored acetate: 1 each of red, green, blue. Use of better quality really helps here, especially with blue. Colored cellophane is OK, but only if acetates can't be found.

B. Diffraction, Polarizing and Solar mylar Screen Filters

all of the above

30-mm square of holographic diffraction grating

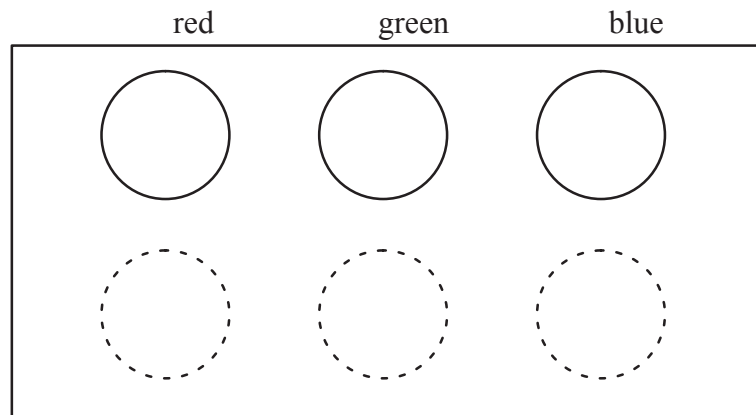
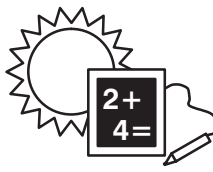
30-mm square of polarizing material

30-mm square of SolarSkreen™ or solar mylar

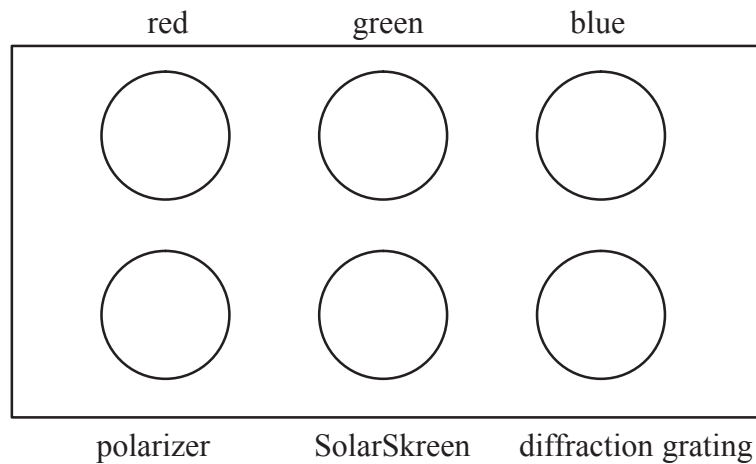
Procedures

Making the filter set:

1. If only 3 holes are necessary for the 3 colored acetate sheets, arrange them as shown:
Try to put the red and blue at positions that fit both eyes of the user at the same time. The filter card can then be used as 3-D glasses with many of the 2-color 3-D images that are available.



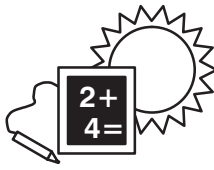
2. Tape an edge or corner into place for each color, being careful not to cover the hole.
3. If any of the other filters are to be used, place them onto the card now.



4. Place the second index card over the first with the filters sandwiched inside and tape the edges of the card closed.

Using the Colored filter set: (*Don't look directly at the sun with any of the filters except the SolarScreen filter Other filters can be used with the SolarScreen but not without it.)

1. Examining colored objects around you and compare how different things look if only one color is transmitted to the eye. Can you generalize about what you see?
2. Examine colored photos and plates in your text books, or colored photos and slides prepared by your teacher. Note carefully the position of the red color in the original, white light pictures, and then describe what happens when the red filter is used. What happens to the red colors when the green filter is used? the blue?
3. Examine the colors in the photo that are not part of the filter set, such as yellow or purple. How do these show up with each of your filters?



4. Write out a general descriptive explanation of what happens when various colored filters are used.
5. If your teacher can provide a projected spectral image from a piece of holographic diffraction grating, look at it with each of your colored filters and describe how they effect your view of the spectrum.
6. Use your colored filters in conjunction with a spectroscope (see Activity 1)
7. Brainstorm other possible uses.

Using the Polarizer Filter Set:

1. Find a spot of bright glare or reflection from a shiny surface. Automobile chrome and swimming pools are great. Rotate the polarizer as you look through it at the glare. What happens to the glare or reflections as the rotation is made?
2. Examine transparent objects such as auto window glass, plastic boxes, or cellophane by using the same rotation technique. Are there any characteristics of these material that weren't visible before?
3. Use a second piece of polarizer to examine transparent objects placed between the filters. Rotate the filters to see some spectacular effects.

Using the SolarSkreen™ filter set:

SolarSkreen is used to view the Sun directly. Larger pieces can be placed over the objective end (the end away from your eye) of a small telescope or binoculars. Be sure you know how to use this filter with these devices as permanent eye damage could result from improper use. With binoculars, be sure to cover both objective lenses, either both with SolarSkreen, or one with SolarSkreen and the other with a tight fitting lens cap.

1. Use the SolarSkreen to look for large sunspots or groups. Small spots will not be visible without some type of magnification, and if the Sun is at or near a sunspot minimum, this could be a disappointing activity.
2. If spots are visible, does the addition of any of the colored filters make it easier or harder to see them?
3. Add the diffraction grating or polarizer to the SolarSkreen. Explain what happens.