



## Seeing Through Alien Eyes Activity Guide

Originally developed by Dennis Schatz (Pacific Science Center), Suzanne Gurton and Dan Zevin for Family Astro

Adapted by Anna Hurst

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|-------------------|---|
| Type of Activity: | Indoor classroom or drop-in station, facilitated                        |
| Set up Time:      | 5 minutes<br>(30 minutes to make filter visors for the first time)      |
| Time to Do:       | 20 minutes in classroom OR<br>5-10 minutes as drop-in                   |
| Audience age:     | 8 years and older   |
| Group size:       | 6 – 30 in a classroom OR<br>At least two at a time at a drop-in station |

### What's This Activity About?

Astronomers often look at objects in space through filters of different colors. Although this changes how the objects look, it helps them sort out details in the structure and composition of the objects they are looking at. This activity gives participants some experience with colored filters and how astronomers use them to understand astronomical objects. They are asked to construct a realistic scene on Earth with felt figures while wearing their filter visors. In a way, this lets them see Earth as an alien with different kinds of eyes might. It is a challenging activity on two levels. First, this is a new and seemingly strange way to look at the world. Second, when you limit someone's vision with the filter, it seems like a handicap rather than a tool. It will be up to you to make the connections to how filters are useful in science.

## Materials

- One set of 9" x 12" felt sheets (one each of white, blue, fuchsia, golden-yellow, green and red) \*
- One large black felt background \*
- Master template for cutting out felt figures: trees, Suns, ponds and clouds (see page 7)
- Cosmic visors (see pages 8 - 9 for assembly instructions) for which you'll need:
  - 10" x 12" sheets of theatrical gel filters (one each of red, blue and green) \*
  - 16 manila folders
  - Paper clips for securing cosmic visors
  - Push pins to secure black felt background to the wall

*\*indicates that this material is included in the AFGU toolkit. You may need to replenish these supplies. See the list of sources on pages 5 - 6.*

## Setting Up the Activity

If you are doing this as a facilitated activity in a classroom, you will need enough **chairs** to accommodate all participants, preferably though not necessarily around tables. Ideally, you should have at least three tables. All chairs should face the part of the room where you will **hang the black felt background**.

For a drop-in station, you will need a table big enough for the felt background. Alternatively, you could hang the felt on the wall where the participants can see it and you can reach it easily. Consider how you will keep the felt shapes out of view until the participants are wearing the cosmic visors.

Before doing this activity for the first time, you will have to **cut out the felt figures**. The template for the felt figures is on page 7. Cut out the shapes on a template copy but leave the outlines intact. Then use the outlines on the template as a stencil to draw the shapes onto the felt. Next cut out all the figures drawn on the different colored felt sheets (there should be a cut-out of each shape for each color). If your scissors are sharp, you can cut 3-6 layers of felt at the same time. **Keep these figures out of sight until you are ready to use them in the activity.**

You will also need to **assemble the cosmic visors** before doing this activity for the first time. Follow the instructions on pages 8 - 9. Place enough **visors** of the same color at each table along with **paperclips** to secure them. **Give nearby tables different colored visors.**

It is best if you try this activity yourself before leading it for the first time so that you know what the different colors of felt look like through the visors. This will help you guide the participants in making their choices.

## Suggestions for Introducing the Activity

To introduce this activity, have participants first put on their visors. Both children and adults may require some assistance with this (fasten visors with paper clips). Adjust visors until they are both comfortable and functional, such that users can view objects easily through the window, but it is impossible or difficult to see around the edges of the facemask. When all visors are properly

adjusted, have a brief discussion with the participants about how different everything now looks through the visors. Have them look at each other and try to remember what color clothing their friends or family members are wearing. Review the theory behind a filter: All the colors of the rainbow may hit the filter, but only particular colors will make it through to your eyes.

Suggest that this may be how an alien from another planet might see the world. We can pretend that we are aliens who have visited the Earth and now we want to tell our friends about what we saw there. To do that, we will build a scene with some typical objects seen while on Earth (a cloud, the Sun, a pond and a tree). We want to choose the objects with the colors that they have on Earth, but the challenging part is to do that while seeing through alien eyes!

## **Doing the Activity**

Make sure all participants are wearing their visors and cannot see out of the sides. Do not let them see the felt figures until everyone has their visor secured. Tell the participants that they must keep their visors on through the entire activity or they will not be allowed to participate. No peeking!

Explain that one of the reasons we see color the way we do is because of the kind of light we get from our yellow Sun. Aliens evolving on another world, perhaps with a red sun, may have eyes that are more sensitive to different colors. So have participants put on their visors and become aliens from other worlds. Have them look around the room at objects of different colors and notice how they look different through the filters. You might want to have some familiar objects on hand that are of a known color. Try some questions like these to get them thinking:

“What colors look bright with the red filter?”(red);

“What happened to the blues and greens with the red filter?”(they turned black or dark).

Tell the participants that they are now going to build a familiar landscape with what earthlings would call a green tree, a blue pond, a golden-yellow Sun and a white cloud. The order in which they do this is important. So, to best help them gradually become more familiar with how the filters affect what they see, the activity should start with the trees and end with the clouds as follows:

### **How to help participants choose a green tree:**

- Put up the six different colored felt trees on the black felt background. Explain that they should identify which tree is green without peeking (i.e., taking off their visors). Ask those wearing red visors (the “red aliens”) which trees are dark for them. Ask if those should be eliminated or kept. (They should be kept. The darker trees contain potential green color that does not get through the red filters. The other trees, those that contain some red, should appear brighter through the red filters, and thus should be eliminated. Be sure everyone is clear on this point before going on.)
- Ask for a volunteer red alien to come identify the good choices. After he or she selects, put the trees into two different “orchards”(groups): “possibly green” and “not likely to be green.”
- Move on to the blue aliens (those wearing blue visors). Ask them if there are any clear choices for the “possibly green” orchard in our search for a green tree. It may be more ambiguous, but they should go with the same thinking as the red aliens before them (except

in this case, brighter trees will have some blue in them and should most likely be eliminated). They may want to bring back some of the choices for “possibly green” that were eliminated earlier, and that’s okay. Now, ask a volunteer blue alien to come arrange the trees into the correct orchards based on the blues’ recommendations.

- End with the green aliens. Ask which would be their top choice for a green tree (or trees). They may also want to bring back some of the choices that were eliminated earlier, and that’s okay. But be aware, just because they are wearing the green visors, they are not necessarily the green experts. Do not let their votes override the others. Try to reach an overall consensus among all the aliens by making sure the reds and blues still have a say in the final selection of a green tree (or trees). This is important since their perspectives should clearly eliminate some of the wrong trees (if any) that the greens might approve. If consensus cannot be reached, simply leave up the small orchard of “possibly green” trees.

#### How to help participants choose a blue pond:

- Go through a similar process to find a blue pond, starting with the red aliens to eliminate bad choices. If it’s bright through the red filter, it’s a bad choice.
- The green filter, since it is not a pure green and lets some blue through, may make the choice a bit more ambiguous. Some green aliens may want to bring back a pond eliminated by the reds. That’s okay, because this should be a discussion among all the aliens.
- End with the blue aliens to choose the brightest ponds. Again, some of the aliens with other colored visors may object to some of the choices made by the blues, so take their remarks into account. (For example, the white pond will look bright through all the visors, so even though it is bright through the blue visors, the reds have a valid objection because it also looks bright to them and shades of blue should not look bright through red.)

#### How to help participants choose a golden-yellow Sun:

- Since there is no yellow filter, discuss the process and have them guess the order in which the different aliens should decide on the correct Sun. The easiest way would be to start with the blue aliens and make the reds be the final deciding alien group.
- Which Suns look dark to the blue aliens? These should be eliminated.
- Move on to the green aliens. Which Sun shapes look dark through the green visors? Again, these would be eliminated.
- End with the red aliens. Which Sun shapes looks bright through the red visors? They may want to bring back something that’s been eliminated, and should voice that opinion, but they should also listen to their blue and green companions and try to come up with the best answer (or answers) together.

#### How to help participants choose a white cloud:

- End with the white cloud. The white cloud may seem the trickiest since the real white cloud will look bright through all filters. (But this also makes it the simplest since no other color will look bright through all of the filters.)

- Start by reminding them that white light contains all the colors of the rainbow. Then see if they can suggest the process of elimination.
- If they are still not confident about how to translate the information they are seeing through their alien eyes, remind them again of the rainbow and convey to them that the white cloud is bright in all filters. A good process of elimination would remove the darkest cloud shapes as seen in each filter.

When the “realistic” scene is constructed, have everyone take off their visors and see how close the group was.

If this activity will be at a drop-in station, you may want to adjust the number of objects depending on the interest level and number of the participants. For example, if just two people are at the station and only want to stay for a few minutes, you could have one wear a green filter and the other a red filter. They could then try to choose the green tree. This would be enough to have a discussion about filters. They could then experiment with the different filters to see how different colored objects look through different colored filters. It may be useful to have some images of astronomical objects on hand, so that they can look at those through the filters as well. At a station, you should also consider how to keep the felt figures hidden from participants until they are wearing their visors.

## **Wrap-up**

Come back to the fact that working with restricted (filtered) colors can be as informative as working in unfiltered light. While none of the felt figures looked their “true” color using filters, the filters helped eliminate bad choices and narrow down the field to the good choices. In astronomy filters often serve a somewhat more complex purpose, but the idea that filters help us sort information underlies their basic use as tools for astronomers. For more advanced participants, you might mention that glowing clouds of gas in space – the nebulae – glow with different colors depending on what elements (hydrogen, nitrogen, oxygen) are present and how hot they are. Filters can help astronomers sort out just which elements are in a nebula and what their temperature is. In a way, filtered light helps us sample the clouds without ever going there.

## **Complementary activities:**

- Secret Messages
- The Universe in a Different Light card sorting game
- Red Hot, Blue Hot: Mapping the Invisible Universe

## **Materials sources:**

### **Filters:**

The theatrical gel filters are available from theatrical supply dealers. The ones in the toolkit were obtained from:

DTC Grip & Electric, Inc., 1280 -- 65th St., Emeryville CA 94608  
Phone: (510) 595-3456 Fax: (510) 595-0772

The filters in the kit are:

Primary Red (LEE-106S), Primary Green (LEE-139S) and Deep Blue (LEE-120S)

**Felt:**

The felt was obtained from Central/Shippee, Inc., 46 Star Lake Rd., Bloomingdale, NJ 07403

Phone: (800) 631-8968, fax: (973) 838-8273

The colors and their item numbers are as listed below. All colors were purchased in 9" x 12" sheets, except for the black, which was purchased as a 36" x 36" sheet.

Sun Gold -- 7243

Fuchsia -- 7215

Kelly -- 7288

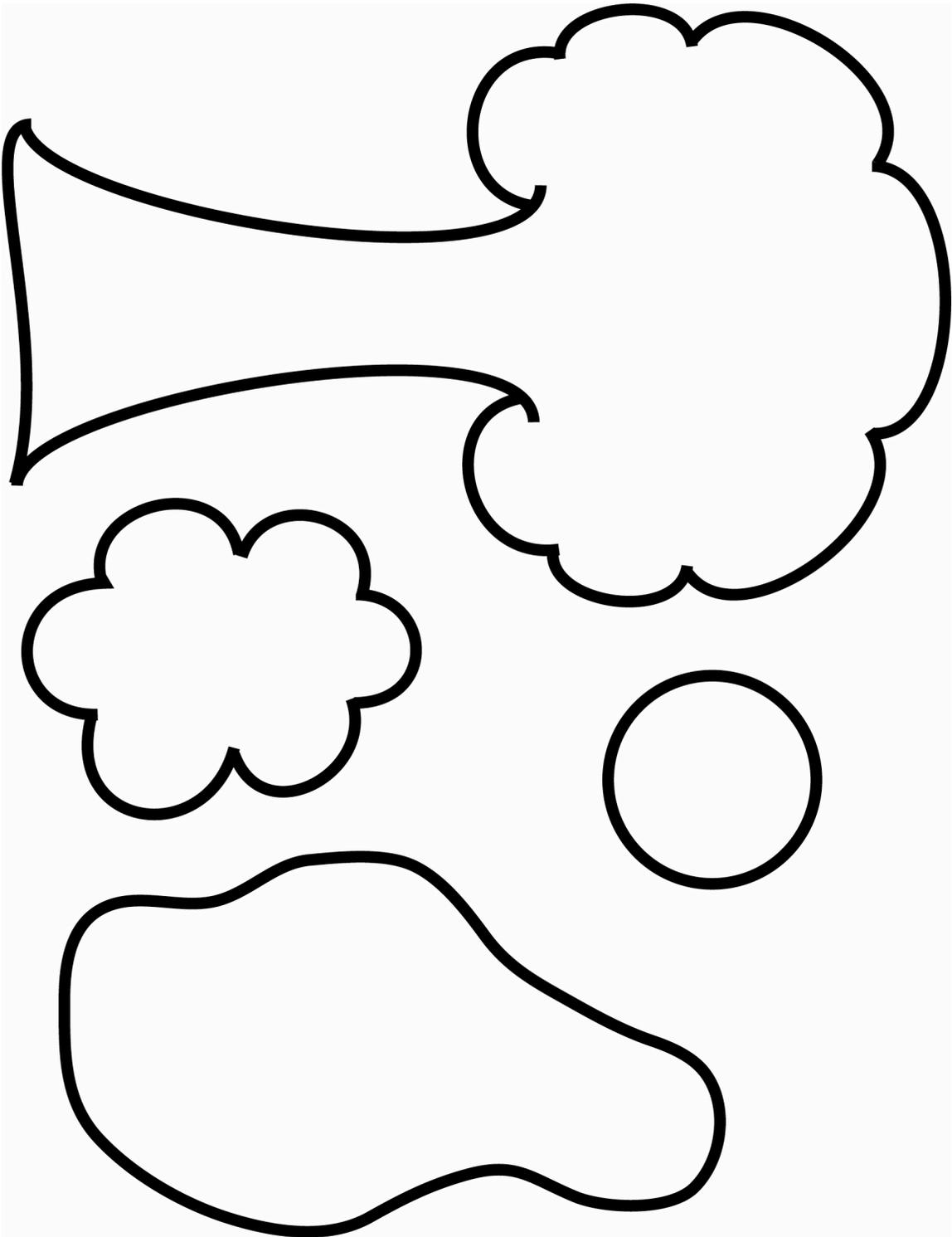
Electric Blue -- 7402

White -- 7251

Fire Red -- 7200

Black -- 367240 (36" x 36")

## Template for Felt Cut-outs



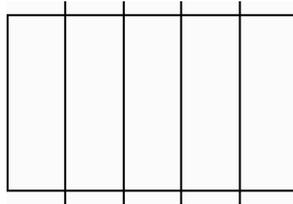
# Cosmic Visor Assembly

## Materials:

- One 10"x12" sheet each of red, blue and green theatrical gel
- 16 manila folders (This is a great way to recycle old folders!)
- Tape (masking or other)
- Scissors

## Instructions:

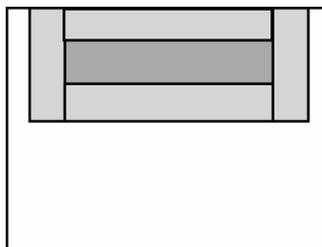
- Precut theatrical gel sheets into 6" x 2" strips. Since the sheets are 10" x 12", first cut them in half so each sheet is 6" x 10". Now cut these pieces into five 2" strips (see diagram below). You should end up with filter strips for 10 visors of each color (30 visors total).



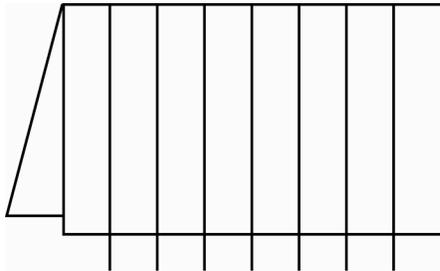
- Cut 8 manila folders at their fold; then cut these halves in half to make quarters. These will be the 30 "face masks" of the Cosmic Visors, with two pieces left over.
- Cut a 1.5" x 5.5" window in each of these quarters. Center it on the long dimension and place it approximately an inch down from one side (which will become the top.) This can easily be accomplished by folding the face mask in half and making the cuts:



- Cover the window by taping a colored gel strip over it on one side. Place tape along all 4 sides of the gel.



- Cut another set of 8 manila folders (whole, but folded) into eight strips (see diagram below). Because the folders are approximately 11.5" wide, each strip should be a little less than 1.5" wide. Measurements do not need to be precise. You should end up with eight strips per folder, and 64 strips total. You will need two strips per visor (so you'll have four left over).



- Tape one strip to each side of each visor at the top (tape heavily and on both sides to make sure strips are secure and durable). Your Cosmic Visors are now complete. They should be fastened in the back by paper clips to keep them over people's eyes and on their heads.

