

Activity 4

Star Power

CREATE A STAR SHOW AND LEARN HOW YOU CAN PREVENT LIGHT POLLUTION.

The stars in the night sky have fascinated humans since we first walked the Earth. But today, electric outdoor lighting threatens our ability to see the stars. Light pollution is a real problem, and not just for astronomers. Animals become disoriented from the excess light, which can disrupt their mating, migration, and predation behaviors. For example, sea turtle hatchlings follow light from the moon to find their way to the ocean, but coastline lighting can lure them toward roads and predators.

Part 1 Design a Constellation Box

Here's how:

- 1. Introduce constellations.** Ask girls to name their favorite constellations. (Use books or the Internet for help.) Do they know what each constellation represents and the myths associated with it? (Constellation myths are stories that explain how stars and their positions in the sky came to be.) Share the myth about your own favorite constellation with your girls.²
- 2. Prep the constellation box.** Break into small groups.¹ Each group gets one box, which must be completely enclosed. If using a shoe box, they should tape the lid on tightly. If using a rectangular tissue box, they should cut a piece of paperboard (e.g., from a cereal

You'll Need:

- ◆ room that can be darkened
- ◆ 1 desk lamp with lamp shade removed

Part 1 (for each small group):

- ◆ shoe box (the narrow, skinny kind is best), or rectangular tissue box and extra paperboard (e.g., cereal box)
- ◆ 3"x5" index card
- ◆ tape (duct or masking)
- ◆ scissors
- ◆ pushpin
- ◆ single-bulb LED keychain light (search "Energizer LED Keychain Light" at sears.com or amazon.com)
- ◆ optional: book or website that contains drawings of constellations, construction paper, glue, markers, crayons, colored pencils

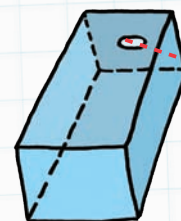
Part 2 (for each small group):

- ◆ aluminum foil
- ◆ paperboard (e.g., cereal box)
- ◆ tape (duct or masking)
- ◆ scissors

2 hours



box) and tape it over the opening. Then girls should cut a hole—just big enough to fit the LED flashlight—in the center of one of the small ends of the box.



hole for
LED flashlight

Visit pbs.org/teachers/scigirls for more activities!

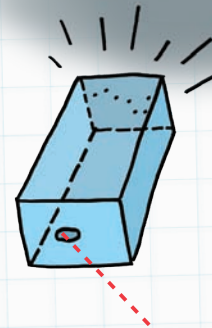
Star Power continued



3. Choose a constellation. Ask each group to choose one constellation to display with their constellation box. Guide each group to choose a different constellation so you have a variety to display.

4. Make a constellation template. Have groups sketch their constellation on an index card, and then use a pushpin to poke the stars of the constellation in the card. Now, flip the card over, so girls are looking at the **mirror image** of the constellation.

5. Use the template to poke holes in the constellation box. Have girls tape the card over the other small end of the box and use a pushpin to poke the stars of the **mirror image** of the constellation in the box. Otherwise, it will project backward! (See right.) Groups can now remove the card. Girls who finish early can decorate their constellation box with images depicting their myth.



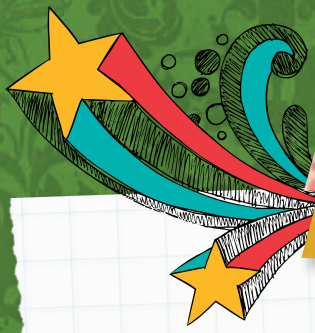
insert LED flashlight here

6. Display constellations. Hand out an LED flashlight to each group. Remind girls not to shine the light in anyone's eyes! One girl in each group should insert the flashlight into the hole at the end of the box. Then turn out the lights in the room, and tell the girls to aim the constellations at the ceiling or a wall. They can experiment with holding the box at different distances. Have each group shine its constellation one at a time and share what it represents and its myth.⁴

Watch girls learn how to monitor light pollution by becoming citizen scientists on the *SciGirls Go Green* DVD. (Select Going Green: Mentor Moment.)⁷



Mentor Moment Gurtina Besla is working on her PhD in astrophysics at Harvard. For the past several years, she has been a mentor for the Science Club for Girls in Boston, MA, guiding girls from elementary through middle school on various STEM-ventures! She is excited to pursue a career in which she gets to study how galaxies evolve and teach students about space science.



Star Power continued

Part 2 Prevent Light Pollution

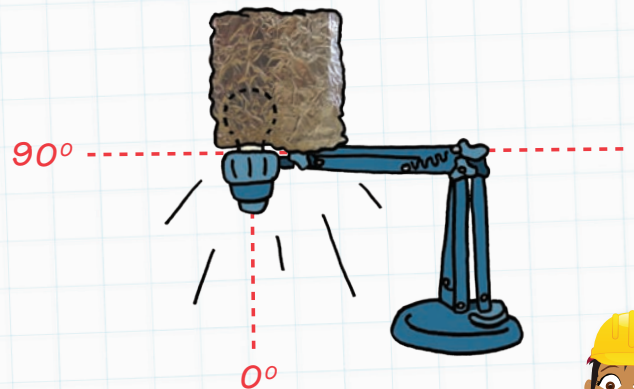
7. Introduce light pollution. Light pollution is light that is not doing what, or directed where, it should be. Can girls think of situations in which light would be considered a pollutant? (light preventing the viewing of stars, shining into a window and on a property, or creating an uncomfortable glare) Ask how this light might be harmful. (wastes energy and money, makes nighttime environments less safe, interrupts sleep, interferes with behavior of nocturnal animals) ²

8. Demonstrate light pollution. Place a desk lamp on a table in the center of the room and aim the bulb toward the ceiling. Before you turn on the lamp, spread out the constellation boxes, having some girls stand near the lamp and some far away. Tell kids the lamp represents city light. (Areas close represent the city and areas farther away represent suburban and rural areas.) Turn on the lamp. What happened to the constellations? Can you see the constellations in each of the areas? Why or why not?

To see SciGirls identify good and bad lighting in their community, watch the *SciGirls Go Green* DVD. (Select Star Power: Observe.)

9. Experiment with light direction. Ask girls to consider the direction the light is shining. What effect does this have on the ground? Have a few girls sit underneath the lamp, and ask the others how well can they see their friends. How shadowy do they look? Would this kind of lighting make the night more or less safe? How might it affect nocturnal animals?


10. Build a light shield. Deliver the **SciGirls Challenge**: How can you shield a light to reduce light pollution and increase visibility of constellations? Pass out the supplies for Part 2 and let each group brainstorm and sketch ways to redirect the light coming from this streetlight in the "city" to where it would be most useful. ³ Guide them toward building a shield for the light bulb. (Shielded light should not extend past a 90° angle.)



Use aluminum foil to cover the paperboard light shield before placing it over the lamp bulb.



Star Power continued



POINTER: If girls are struggling, encourage everyone to share their creations. Then, point out the unique features of each group's design. Emphasize that even working scientists and engineers struggle when designing something new! ⁶



Watch SciGirls build a light shield on the *SciGirls Go Green DVD*. (Select Star Power: Design.) ⁷

11. Demonstrate a light shield. Shine the constellations on the ceiling, and hold each group's shield over the lamp. What do the "stars" look like now? Have a few girls sit underneath the lamp again. How visible are they now? Ask girls to come up with other ideas to reduce light pollution (timers, dimmers, motion sensors). ⁶

12. Keep going. Take a walk around your building or neighborhood to examine the light fixtures. ² (Look at the type of bulb, how long they are left on, and if they are shielded.)

Take pictures and post them on your SciGirls project page at pbskids.org/scigirls/



Your group can also become citizen scientists, just like the SciGirls! For more information on participating in the Great World Wide Star Count, visit windows2universe.org/citizen_science/starcount.

This activity was adapted from the Dark Skies Awareness Rangers Program. For more investigations to try with your girls, check out darkskiesawareness.org/DarkSkiesRangers.

Standards Correlation

The activities in this book align to national education standards including: Standards for Technological Literacy, National Science Education Standards and the National Council of Teachers of Mathematics Standards. To download the complete and most current alignments, please visit pbs.org/teachers/scigirls.

