

# TOTAL SOLAR ECLIPSE



Credit: S. Habbal, M. Druckmuller and P. Aniol

## Pack 295 Eclipse Day Addendum for Boy Scout Participants

Monday, August 21, 2017

### **Basic Event Details**

- When: Monday, August 21, 2017, 11:45 to 4:15 pm
- Where: Camp K.T. Wallace
- Meals: Lunch and snacks will be provided

### **Advancement/Awards**

- Boy Scouts may work towards requirements for the NOVA Shoot! Award and Astronomy merit badge.
- Boy Scouts will complete all requirements to earn the BSA Eclipse Patch.

### **Activities**

- NASA Live Feed
- Independent Reading
- Build a Solar Oven
- Shoebox Pinhole Viewer
- Digital Photography
- Design a Moon Rover
- Drawings
- Journal Pages

## **Materials Needed**

### Safety

- Solar eclipse glasses
- Sunscreen
- Water bottle

### Food Items

- Hershey's Chocolate bars
- Graham Crackers
- Large marshmallows

### Live Feed

- Projector
- Screen
- Computer
- Wifi

### Activities

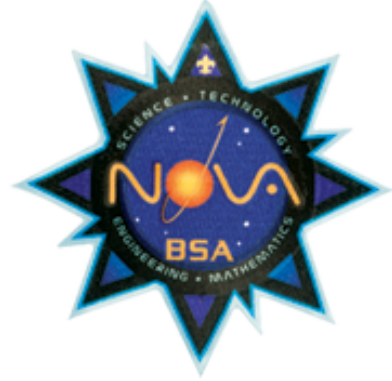
- Pizza box
- Black construction paper
- Telescope and/or binoculars
- Books about space - sun, moon, constellations, planets, astronomy, astronauts
- Drawing (white) paper
- White chalk, colored pencils, and/or markers
- Legos
- Shoe boxes (1 per Scout)
- Aluminium foil
- Push pin
- Scissors
- Box cutter
- Duct tape
- Printables
- Folders (for taking journal pages and drawings home)

## Advancement/Awards Requirements

### Boy Scout Nova Award - Shoot!

1. C. Do a combination of reading and watching (about three hours total) of science-related shows or documentaries/books and articles that involve projectiles, aviation, weather, astronomy, or space technology. Then do the following:
  1. Make a list of at least two questions or ideas from each article or show.
  2. Discuss two of the questions or ideas with your counselor.

*Additional items will need to be completed on your own and reviewed with your NOVA counselor for completion of this award. See <http://www.scouting.org/stem/Awards/BoyScouts.aspx> for more information.*



### Astronomy Merit Badge

1. Do the following:
  - a. Explain to your counselor the most likely hazards you may encounter while participating in astronomy activities, and what you should do to anticipate, help prevent, mitigate, and respond to these hazards.
  - b. Explain first aid for injuries or illnesses such as heat and cold reactions, dehydration, bites and stings, and damage to your eyes that could occur during observation.
  - c. Describe the proper clothing and other precautions for safely making observations at night and in cold weather. Then explain how to safely observe the Sun, objects near the Sun, and the Moon.
3. With the aid of diagrams (or real telescopes if available), do each of the following:
  - a. Explain why binoculars and telescopes are important astronomical tools. Demonstrate or explain how these tools are used.
  - d. Describe the proper care and storage of telescopes and binoculars both at home and in the field.
4. Do the following:
  - a. Identify in the sky at least 10 constellations, at least four of which are in the zodiac.
  - b. Identify in the sky at least eight conspicuous stars, five of which are of magnitude 1 or brighter.
5. Do the following:
  - a. List the names of the five most visible planets. Explain which ones can appear in phases similar to lunar phases and which ones cannot, and explain why.
  - d. Observe a planet and describe what you saw.



6. Do the following:

- a. Sketch the face of the Moon and indicate at least five seas and five craters. Label these landmarks.
- c. List the factors that keep the Moon in orbit around Earth.
- d. With the aid of diagrams, explain the relative positions of the Sun, Earth, and the Moon at the times of lunar and solar eclipses, and at the times of new, first-quarter, full, and last-quarter phases of the Moon.

7. Do the following:

- a. Describe the composition of the Sun, its relationship to other stars, and some effects of its radiation on Earth's weather and communications.

8. With your counselor's approval and guidance, do ONE of the following:

- e. Personally take a series of photographs or digital images of the movement of the Moon, a planet, an asteroid, meteor, or a comet. In your visual display, label each image and include the date and time it was taken. Show all positions on a star chart or map. Show your display at school or at a troop meeting. Explain the changes you observed.

*Additional requirements must be done by the Scout outside of the Eclipse STEM day for completion of this merit badge. See [http://www.scouting.org/filestore/Merit\\_Badge\\_ReqandRes/Astronomy.pdf](http://www.scouting.org/filestore/Merit_Badge_ReqandRes/Astronomy.pdf) for more information.*

### BSA Eclipse Patch – All Participating Scouts

1. Locate a site suitable for viewing either the total eclipse or the partial eclipse.
2. Describe how to safely view the eclipse.
3. Discuss with your group what you saw and felt during the eclipse. If you can, post your comments and eclipse photos on social media with the hashtag #BSAEclipse2017.



\$. Boy Scouts and Varsity Scouts — Draw a diagram of the positions of the moon, earth, and sun to show how the solar eclipse happens.

*This completes all requirements for the BSA Eclipse Patch.*

## Activities

### NASA Live Feed

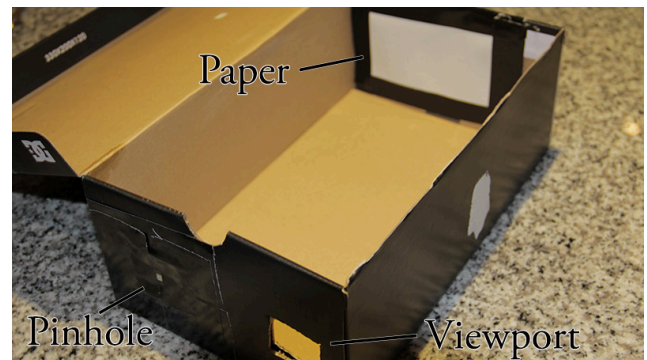
Beginning at 11:45 a.m. Eastern on August 21, 2017, NASA will offer a free live webcast of all things eclipse from Carbondale, Illinois, the spot in North America where the moon will block out the sun for the longest amount of time: 2 minutes and 40 seconds. NASA will show the eclipse in three wavelengths of light, provide insight from experts, and show the launch of an eclipse-seeking weather balloon from a stadium in Carbondale.

- <https://eclipse2017.nasa.gov/planning-your-eclipse-party>
- <https://youtu.be/is8OLhGgLAE>

### Shoebox Pinhole Viewer

#### Materials

- Shoebox
- Small piece of aluminum foil
- White sheet of paper
- Tape
- Pushpin
- Box cutter



Step 1. Cut a small hole (about 1 inch across) in one end of the shoe box, near an edge.

Step 2. Tape a piece of tinfoil over the hole.

Step 3. Using a pin or needle, punch a hole in the center of the foil.

Step 4. Tape a small piece of white paper to the inside of the box, at the opposite end from the foil-covered hole. The paper should be positioned so that light entering the box through the pin hole will hit it. This is where you'll look for the sun.

Step 5. Cut a 1 inch-diameter hole in the box near the image screen (the white piece of paper), but on a different side of the box — the side adjacent to the screen. This is your viewing hole; it must be positioned such that you can look through it at an angle and see the image screen.

Hold the shoe box so that it lines up with its own shadow, demonstrating that it is aligned with light from the sun. Stand so that when you look through the viewing hole, you can see a tiny bead of light on the image screen; that's the sun. During the eclipse, you'll see the shadow of the moon pass in front of the sun.

*Steps taken from <https://www.livescience.com/33906-solar-eclipse-viewer.html>  
Image from <https://d2t2wfirfyzjhs.cloudfront.net/images/blog/shadowbox-design.jpg>*

### Construct a Solar Oven

#### Materials:

- Pizza Box
- 2 Clear Sheet Protectors
- Black Construction Paper
- Tape (Clear & Duct)
- Utility Blade
- Thermometer (optional)
- BBQ Skewer
- Glue
- Tin Foil
- Ruler
- Pen

#### Ingredients for S'mores:

- Marshmallows
- Chocolate
- Graham Crackers

See full instructions here:

<http://lemonlimeadventures.com/wp-content/uploads/2016/06/Summer-Solar-Oven-Guide.pdf>



### Design and Test a Moon Rover

Set a 20 minute time limit for building.

#### Criteria:

1. Must be able to go down a four-foot board at a 45 degree angle and not break as it came down.
2. Must be able to move at least two feet when someone (adult) pushes the moon rover.
3. Must be able to hold two figures.
4. Must be able to hold cargo in it, and the cargo cannot fall out during any of the tests.
5. Must stay in one piece for the crash test.



Have Boy Scout set up rover obstacles for Rovers made by Cubs.

#### Reference

- <http://adventuresinmommydom.org/design-a-moon-rover/>

## Drawing Station

### Materials

- Blue or Black construction paper
- Yellow or white colored pencils, crayons, markers or chalk
- Gold star stickers (optional)

### Astronomy Merit Badge Requirements

- Sketch the face of the Moon and indicate at least five seas and five craters. Label these landmarks.
- With the aid of diagrams, explain the relative positions of the Sun, Earth, and the Moon at the times of lunar and solar eclipses, and at the times of new, first-quarter, full, and last-quarter phases of the Moon.
- With the aid of diagrams, explain the relative positions of the Sun, Earth, and the Moon at the times of lunar and solar eclipses, and at the times of new, first-quarter, full, and last-quarter phases of the Moon.

## Digital Photography

Take a series of images during the eclipse. Track the date and time (you may want to double check your camera's metadata to do this for you). Create a display of the images shot and share with your Troop. (Astronomy merit badge requirement.)

### Materials:

- Personal digital camera
- Solar eclipse lens filter
- Tripod
- Remote shutter release

### Gear recommendations:

<https://www.bhphotovideo.com/explora/photography/tips-and-solutions/how-photograph-solar-eclipse>

<https://www.bhphotovideo.com/c/buy/solar-photography-filters/ci/34576/N/3537148334>

### Tip Sheets:

<http://www.eclipse2017.org/2017/photographing.HTM>



### Telescope Station

Set up telescope for viewing the “night sky” during the eclipse blackout. Aid younger Cubs in how to focus to complete their requirements.

#### Astronomy Merit Badge Requirements:

- Explain why binoculars and telescopes are important astronomical tools. Demonstrate or explain how these tools are used.
- Describe the proper care and storage of telescopes and binoculars both at home and in the field.
- Observe a planet and describe what you saw. (Jupiter, Mercury, Mars and Venus should be visible.)
- Identify in the sky at least 10 constellations, at least four of which are in the zodiac. (You may not get all 10 at this viewing, but a good start.)
- Identify in the sky at least eight conspicuous stars, five of which are of magnitude 1 or brighter. (You may not get all 8 at this viewing, but a good start.)

#### Resources to aid in location during the eclipse:

- <http://earthsky.org/astronomy-essentials/august-21-2017-solar-eclipse-4-planets-bright-stars> for more information.
- <https://www.space.com/36721-stars-planets-visible-during-solar-eclipse.html>

NOVA Award Journal (Boy Scout)



Scout Name: \_\_\_\_\_

Make a list of at least two questions or ideas from what you read and watched about the eclipse today. Make a list of at least two questions or ideas from each article or show.

Title: \_\_\_\_\_

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Title: \_\_\_\_\_

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



Other Resources

- [https://eclipse2017.nasa.gov/sites/default/files/NASA\\_Eclipse\\_Activity\\_Guide.pdf](https://eclipse2017.nasa.gov/sites/default/files/NASA_Eclipse_Activity_Guide.pdf)
- <http://www.scouting.org/eclipse2017.aspx>
- 25 facts you should know about the August 21, 2017, total solar eclipse  
<http://cs.astronomy.com/asy/b/astronomy/archive/2014/08/05/25-facts-you-should-know-about-the-august-21-2017-total-solar-eclipse.aspx>
- <https://triviaquestionsworld.com/space-trivia-questions/>