



JUNIOR RANGER ECLIPSE EXPLORER



This book belongs to



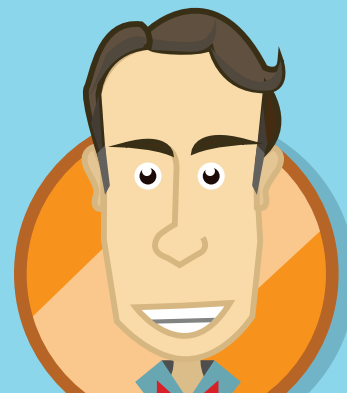
Become an Eclipse Explorer

Hello Junior Rangers! Welcome to the 2017 North American Eclipse Explorer activity book. Inside we will learn about what an eclipse is and how experiencing this natural event first-hand can make your visit to a national park or public land extra special.

Here are two special guests to help you along your ecliptic path. This is Junior Ranger CaLisa and Bill Nye from The Planetary Society. They know a lot about solar eclipses and other cool things happening in space!



JUNIOR RANGER CALISA



BILL NYE

In this book you will **EXPLORE** the Sun and Moon in the sky above you and observe how they interact with the Earth you're standing on. **LEARN** about the 2017 North American Total Solar Eclipse and other kinds of arrangements of objects in the sky. **PROTECT** your eyes from the Sun while still being able to enjoy the wonder of an eclipse.

To earn your Junior Ranger Eclipse Explorer badge, complete the activities in your age group.



When you have completed the activities, return your book to a park ranger. Be prepared to tell them three things you have learned about eclipses and how to safely view them.

1.

2.

3.



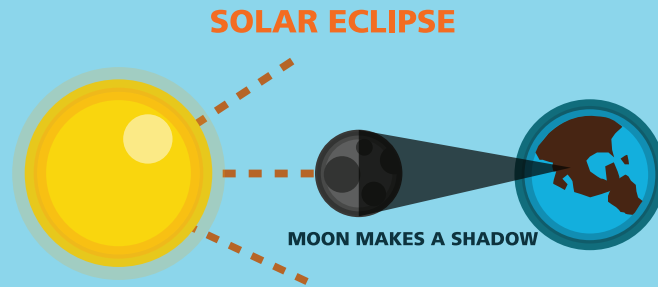


What is a Total Solar Eclipse?

A solar eclipse happens when the Moon passes directly between the Sun and the Earth. The Moon will then make a shadow on Earth. If you happen to be inside of that shadow, then you will be able to see a solar eclipse!

Total Solar Eclipse

We see this when the Moon is just the right distance from Earth and perfectly aligned to hide the entire Sun from view.



Annular Solar Eclipse

As the Moon orbits Earth, sometimes it's closer and sometimes it's farther away. If a solar eclipse happens when the Moon is far from Earth, an annular eclipse happens and we see what looks like a ring of fire in the sky! The word "annular" comes from the Latin word for "ring."

Partial Eclipse

Sometimes objects in space line up, but not quite perfectly. Partial solar eclipses will look like someone took a bite out of the Sun! For this eclipse in 2017, most of North America will see a partial eclipse. Only people in certain places will be able to see perfect **TOTALITY**.

Here are views of different solar eclipses.

Draw lines to match the orange words below to the different types of eclipses.

PARTIAL

TOTAL

ANNULAR



SUN HIDDEN
BEHIND MOON



SUN HIDDEN
BEHIND MOON

RING OF
FIRE VISIBLE



SUN PARTIALLY
COVERED



Bill's Questions

1. A solar eclipse happens when the _____ blocks the light of the _____.
2. The ring of fire can be seen during an _____.



Protect Your Eyes



Looking at the Sun without special eclipse safety glasses can seriously damage your eyes. During an eclipse, people often forget this and look right at it. Remember, regular sunglasses, tinted car windows, cameras, candy wrappers, 3-D movie glasses, and glass bottles are NOT safe to use when looking at the Sun.



Don't use anything to look at the Sun other than the special Sun viewing glasses.

Now that we're safe and sound, let's test out your special solar glasses! Put them on and find the Sun in the sky. Does it look bigger or smaller than you expected?



Syzygy (*Sih-Zih-Gee*)

Eclipses come with a lot of fun new words! Try to match these eclipse words to their definitions below.

Totality Corona Syzygy

This is a funny word that is used when any three objects line up in space. You can always remember it because it has three Y's lined up inside of it.

The moment when the Sun is completely and totally hidden by the Moon.

A bright halo shaped light around the edge of the Sun that can best be seen during a solar eclipse.



Start of Eclipse



Partial Eclipse



Diamond Ring



Totality and Corona



Diamond Ring



Partial Eclipse



End of Eclipse

The images to the left show a timeline of a total solar eclipse in action. At first, very little of the Sun is covered, then the Moon slowly moves in. Eventually the entire Sun is blocked and for a few minutes we can see the bright halo shape around the edge of the Sun called the corona. The Moon then continues to move, revealing the Sun once again.

Ssssyzygy!



Ancient Cultures and Eclipses



Many ancient cultures have observed and recorded eclipses. Ancient cultures tried to understand why the Sun vanished from the sky, so they came up with various reasons and stories for what caused a solar eclipse. Many of the stories involved mythical figures eating or stealing the Sun. Others interpreted the event as a sign of angry or quarreling gods.

The image below is from Chaco Culture National Historical Park in New Mexico. It's a very old drawing carved into a rock wall that scientists call a petroglyph. It was made by the ancestral Puebloan peoples in that area. Many people believe this ancient artwork represents a total solar eclipse that happened over 900 years ago!

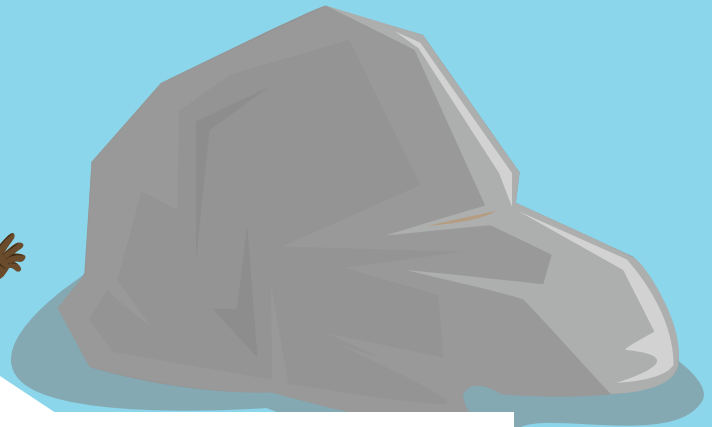
What do you think?
Does it look like an eclipse to you?



Photo by Tyler Nordgren.



Draw your own eclipse petroglyph
in this rock.



Ancient people around the world have been observing and recording eclipses for years.
How are you recording your observations?

Tell Your Own Story



Some ancient cultures wrote stories to explain what they saw in the sky during an eclipse. The Pomo are an indigenous tribe in Northern California. Their ancestors told a story of a Bear walking along the Milky Way. As Bear was walking she had to stop because the Sun was blocking her path. To get by, Bear took a great, big bite out of the Sun!

Write your own short, mystical story about eclipses. Try to use some of the local animals from the park you are in!



The Path of TOTALITY!



The moment of TOTALITY is the few minutes when the Sun is completely blocked by the Moon. As the eclipse sweeps across the continental United States, people along the path of totality will be able to see this. The Sun will appear to turn black in the sky and many stars will even come out!

During totality you will be able to temporarily remove your eclipse safety glasses and see the solar corona. Totality will last for about 2-3 minutes.

✓ Check the map to see if you are in the path of totality.

National parks and other public lands provide great opportunities to experience dark night skies and celestial events like the total solar eclipse. In which national park or state will you experience the eclipse?

How many national parks, national monuments, national historic sites and national battlefields are on the path of totality?

(Count the  to find the answer).



On the map, draw a star at the location where you will be watching the eclipse.



Future Eclipses



This eclipse is happening on August 21, 2017. It will be many years until the next total solar eclipse comes through the United States again. Can you figure out how old will you be for these upcoming U.S. total solar eclipses?

Your age in 2017

Your age in 2024

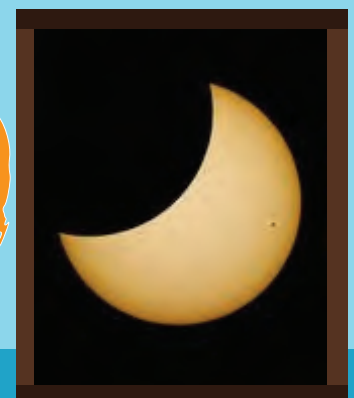
Your age in 2033

Your age in 2044

Next U.S. total solar eclipse coming in 2024!



Even if you are not in the path of totality during the eclipse, you will be able to see a partial eclipse. The farther away you are from the path of totality, the less of the Sun will be covered by the Moon.



LOOK • LISTEN • FEEL



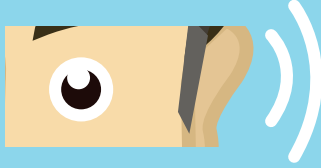
Since the daylight is completely blocked, a lot of strange things happen during a total solar eclipse. The sudden change in the amount of sunlight can have some bizarre effects on nature and on you.

Think about what kinds of changes you might notice with your senses.



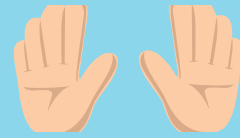
LOOK

Since the light changes, the colors of the land will change, too. And in the sky you may see stars shining in the middle of the day! Why do you think this happens?



LISTEN

During totality, birds will stop singing and frogs start croaking. After all, they think it's night time! Can you think of any other animals that might make noises because of an eclipse?



FEEL

Does it get warmer or colder during totality? Do you think you'll get goosebumps?



Make Your Way through the Solar Corona Maze



START

The corona of the Sun is the swirly, bright glow that surrounds it. Scientists study the corona to learn more about what the Sun is made of. The only time you can see the corona with the naked eye is during a total solar eclipse.

FINISH

Shadows and Light



If it is a sunny day, go outside! Then open your fingers wide and place one hand across the other like this.



Photo by Bruce Betts



There should be little window spaces between some of your fingers where sunlight can pass through. Now hold your hands out to make a shadow on the ground. Those little windows are only letting a small amount of light through.

Move your hands up and down a bit and move your fingers in closer together until you see little, round shapes of light on the ground.



ROUND SHAPES IN THE SHADOW



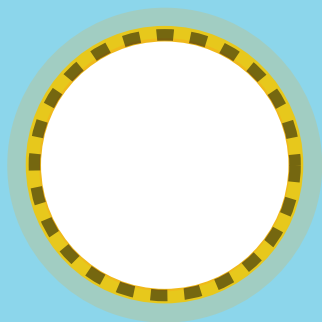
ECLIPSE SHAPES IN THE SHADOW

The finger windows you made are also called pinholes. The lights on the ground appear round because the Sun itself is round! The round shape you are seeing is a mirror projection of the Sun on the ground. During a partial eclipse, you can try this cool trick and the shapes will look just like the shape of the eclipse. Pretty neat!

Stamp Out the Sun!



Find the cancellation stamp in the visitor center of your park and use it to eclipse the Sun here. The stamp should fit right inside the center of the Sun.

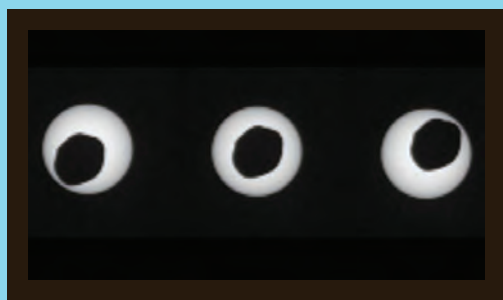


If you are not near a visitor center, color the center of the Sun in with your pencil, crayon, or marker to make a total solar eclipse.



Did You Know?

You can view a solar eclipse with your safety glasses, but you can also look through a telescope as long as it has a special solar filter. This can give you an up-close view of the solar corona!



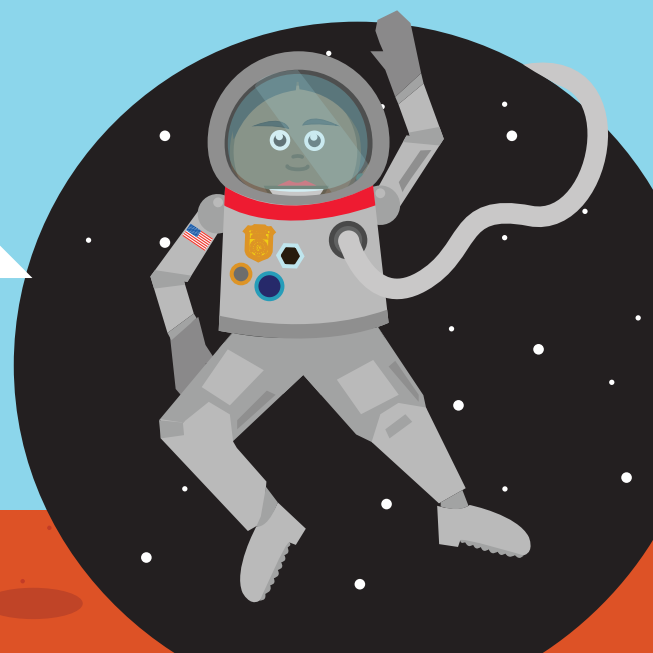
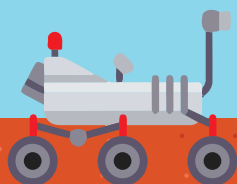
An eclipse on Mars? That's right! NASA's Curiosity Rover on Mars took these photos of a moon eclipsing the Sun. This moon is called Phobos and is smaller than our moon.

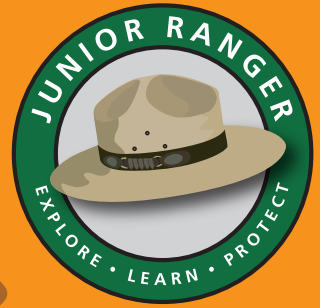
What kind of an eclipse is this?

Can you name another planet besides Earth and Mars that can have an eclipse?
(Hint: All planets in our solar system except Mercury and Venus have moons.)

Did You Know?

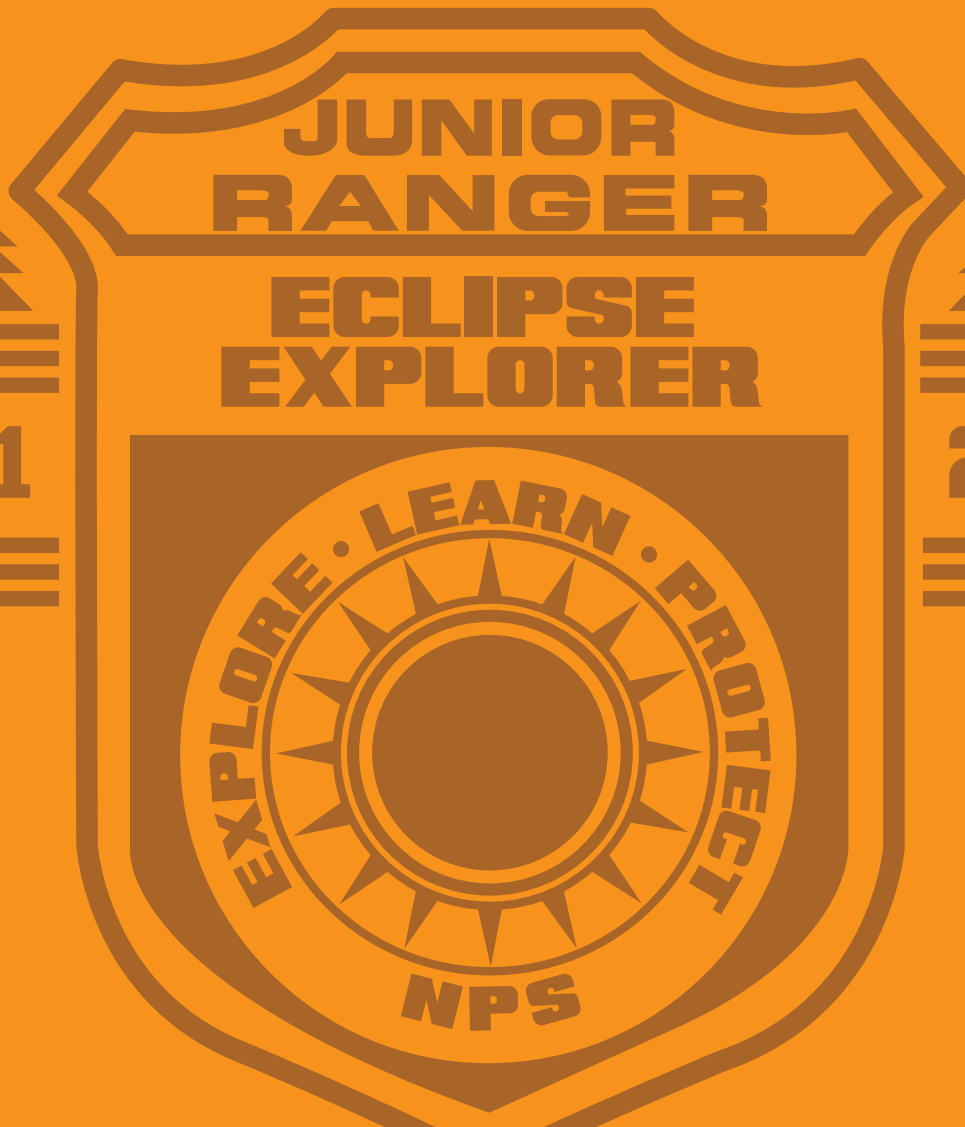
Earth is in space and you are on Earth, so you are in space too. A solar eclipse is the alignment of the Sun, Moon, and You!





08-21

2017



ECLIPSE EXPLORER PLEDGE

I _____,
promise to only view solar eclipses with the proper eye
protection, to show others how to view an eclipse safely,
and to teach others what I have learned about different
kinds of eclipses.

I also will continue to explore my national parks and the
wonders of space by looking up to the skies, both day
and night.

Congratulations!

You are now officially a Junior Ranger Eclipse Explorer.

Park Ranger Signature

Date

Come for the Eclipse, Stay for the Stars

A total solar eclipse during the day means there will be no Moon in the sky later that night. Without the bright Moon in our night sky, there will be a wonderful opportunity to see the stars. If you are in a national park with dark skies, you will even see the Milky Way!



The National Park Service and The Planetary Society agree that stargazing is a perfect way to get inspired about the wonders of our cosmos. Visit nps.gov/nightskies and earn your Junior Ranger Night Explorer badge!

Learn more about eclipses at
planetary.org/eclipse
nps.gov/subjects/naturalphenomena
[#Eclipse2017](https://twitter.com/Eclipse2017)

This activity book was made as a partnership between the U.S. National Park Service and The Planetary Society.

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Supervised by the WASO Office of Interpretation, Education, and Volunteers.



National Park Service
U.S. Department of the Interior

