Solar eclipses occur when the moon comes between the sun and the Earth and casts the darkest part of its shadow, the umbra, on Earth. In August 2017, there will be a total solar eclipse, which is only visible from a small area on Earth (see the map above). The people who see the total eclipse are in the center of the moon’s shadow when it hits Earth. The sky becomes very dark, as if it were night. For a total eclipse to take place, the sun, moon and Earth must be in a direct line.

Total solar eclipses occur when the dark silhouette of the moon completely obscures the bright light of the sun, allowing the much fainter solar corona to be visible. They are rare events. Even though they occur somewhere on Earth every 18 months, they recur only once every 360 to 410 years, on average, at any given place. There are between two and five solar eclipses every year and they tend can last for a maximum of 7 minutes, 32 seconds. On average, there are about 240 solar eclipses in a century.

You can use the resources on the next pages to learn more about this phenomenon.
The Books

Use these books to create a wonderful shared reading experience for kids and adults to learn about autumn and the Earth!

For Younger Readers


This volume is a complete, authoritative account of comets, eclipses, and meteor showers. The author has spent much of his career observing, studying, and photographing these three phenomena, and his expertise with each is well documented here. His objective is to inspire those who have never witnessed a great comet, the spectacular fireworks of a meteor shower, or the incredible sight of a total eclipse of the sun to go out and view these extraordinary objects and events. Two of the enticements he offers are an exquisite variety of outstanding photographs illustrating every aspect of these three exciting celestial phenomena and thorough explanations of the causes and manifestations of each. He also offers a historical perspective and his own observations made over his long career. However, his greatest enticement is the advice he gives on how to best observe comets, eclipses, and meteor showers and how to photograph them successfully. Since the book was originally published in Italy, it has an Italian geographic bias, but that does not distract from its value. This is excellent reference work and a fine coffee-table showpiece for anyone interested in these periodic events in the night sky.


This book looks at solar and lunar eclipses, providing background information about the sun, the moon, and our planet. The book uses brightly colored sky and space photos/illustrations along with clear, matter-of-fact descriptions to cover what an eclipse is, what eclipses can look like, how
they happen, the effects on wildlife, what people thought of eclipses in the past, how they are studied today, and about eclipses on other planets. The author also covers what stars and comets are made of, what causes both solar and lunar eclipses and auroras, and what our ancestors thought of these wonders. A fun activity is provided along with advice on viewing eclipses.


This is a book about the moon, specifically designed for young children. It has a simple sentence on one page followed by a more detailed description on the next page. This pattern continues throughout the book, allowing beginning readers to read the easy sentences and having an older person go through the harder pages. The book is written in an easy to understand language and is beautifully illustrated with engaging artwork. Topics covered include the rotation of the moon, eclipses, tides, phases of the moon, reflected sunlight, meteorite impacts, nocturnal animals using the moon and even music and art. A small glossary is included in the back of the book as well as suggestions for further reading. Astronomy is an exciting topic, but it is difficult to explain these concepts in terms that young people can understand, but this book does a good job of not only conveying information but also of awakening a sense of wonder in the nighttime sky.


Unless you have been hiding under some rock, you probably are aware that there will be a total eclipse of the sun visible in the USA on 21 August 2017. Use this event to get students interested in all aspects of the sun. Teachers looking for resources to help in this endeavor should get their hands on this book. The two authors represent the best in education and astronomy. The authors use the 5E instructional model. Each of the four major chapters is broken up into the learning cycle of engage, explore, explain, elaborate, and evaluate. The authors also encourage teachers to use the think-pair-share learning strategy. Each chapter addresses disciplinary core ideas from the NGSS. There are even connections to the Common Core State Standards. The book also comes with a copy of An Observer’s Guide to Viewing the Eclipse. To top it
off, there is a pair of solar observing “glasses.” Although the book focuses on grades 5-8, I can tell you that these activities can be used at even the freshman college level. (I know. I’ve used some of them myself.) If you’re convinced you should get this book, as you teach students about the sun, but you simply don’t have the money to obtain a copy yourself, don’t fret.


This illustrated book is a fun way to get young astronomers ready for August 2017, when millions of North Americans will have the rare chance to witness a total solar eclipse. The book tells how two curious children and their grandparents re-create eclipses in their living room using a lamp, a tennis ball, two Hula Hoops, and table tennis balls. Later, in the backyard and around the house, the family explores safe ways to view a solar eclipse and ponder phenomena from sunspots to phases of the moon. Written by the authors of NSTA’s award-winning book _Solar Science_, this book gives children and adults hands-on techniques for learning the science behind eclipses of the sun and moon.

**For Teen and Adult Readers**


Richly illustrated and meticulously researched, _American Eclipse_ follows three scientists, Maria Mitchell, Thomas Edison, and James Craig Watson, as they braved the wild frontier in a grueling race to the Rocky Mountains to witness the full solar eclipse. Each of these scientists was going for their own reasons. At a time when women did not have the right to vote and their education came under fierce attack, astronomer Maria Mitchell led a group of women to Denver to record the eclipse and make visible the role of women in professional science. Edison, 31, had not yet invented the electric light bulb. His contribution was the invention of a tasimeter, a sensitive device that he intended to point at the solar corona in the hopes of detecting its heat. Watson, a celebrated asteroid hunter, sought to discover evidence of the planet Vulcan, a celestial body that scientists hypothesized was responsible for Mercury’s unusual orbit. While none
of these expeditions succeeded in winning the “glory of the world,” they did achieve some things. Mitchell’s expedition was a political achievement, Edison founded the magazine *Science* shortly after the eclipse, and Watson left his considerable wealth to the National Academy of Sciences for the establishment of an award for scientific achievement that is still given today. The book succeeds in detailing the scientists’ adventures and makes us wonder at the nation we were in 1878 and the nation we are now.


Adults

This book provides the reader with a very comprehensive look at the mysterious phenomena known as eclipses. The volume includes numerous detailed, interesting accounts of eclipses throughout history. It is fascinating to learn that predictions of eclipses can be used to date historical events that occurred thousands of years ago and even to measure the distance across the Atlantic Ocean. This scholarly work contains much information on lunar and solar eclipses, as well as stellar and planetary eclipses and transits of the sun by Mercury and Venus. My only criticism is that sometimes the author seems to get lost in the details. Overall, this is a good book, but readers should be prepared for a wealth of details, some welcome and some not, as they make their way through the pages.


Astronomer and anthropologist Anthony Aveni explains the history and culture surrounding solar eclipses, from prehistoric Stonehenge to Babylonian creation myths to future eclipses that will capture human imaginations. In one accessible and engaging read, Aveni explains the science behind the phenomenon, tracks eclipses across the ancient world, and examines the roles of solar eclipses in modern times to reveal the profound effects these cosmic events have had on human history. Colored by his own experiences—Aveni has witnessed eight total solar eclipses in his lifetime—his account of
astronomy’s most storied phenomenon will enthrall anyone who has looked up at the sky with wonder.


Both entertaining and authoritative, Mask of the Sun reveals the humanism behind the science of both lunar and solar eclipses. With insightful detail and vividly accessible prose, Dvorak provides explanations as to how and why eclipses occur—as well as insight into the forthcoming eclipse of 2017 that will be visible across North America. Dvorak explains complex scientific ideas succinctly and clearly without resorting to formula or jargon. Furthermore, he does an excellent job of conveying the wonder of eclipses, describing both their historical-cultural value and the inspirational effect they have on people. A splendid introduction to all aspects of eclipses; for all readers interested in science.


Tyler Nordgren describes his excitement viewing solar eclipses, from his first on television in 1979 to his plans for the August 2017 eclipse. He traces human responses to eclipses, originally believed to be omens of doom, describing how Christopher Columbus used an almanac to predict a lunar eclipse convincing the Arawak chief in Jamaica that he angered the gods by not providing food for Columbus’ crew. Now he portrays eclipses as moments of awe with tourist expeditions, frequently to remote locations, allowing lucky groups to experience the brief but spectacular show of totality. In 1973 a Concorde supersonic aircraft raced the sun's shadow, extending totality to 74 minutes. But this book is not just a history of eclipses. Nordgren traces the development of astronomy and illustrates the scientific method. His most dramatic example is how observation during total solar eclipses in 1919 and 1922 confirmed Albert Einstein's newly proposed theory of general relativity, verifying Einstein's prediction of the deflection of starlight passing near the Sun. Much earlier, in 478 BCE, he describes Anaxagoras questioning sailors about the extent of visibility of an annular eclipse allowing determination of the moon’s diameter. By 150 BCE, he explains, Hipparchus proposed determining longitude from precise starting times of lunar eclipses. The book is informative and easily readable, with clear illustrations, but not error free. For example, describing an attempt to charter the Concorde for the 2001 eclipse, he indicates Concordes never flew after a 2000 crash, although commercial flights resumed continuing through mid-2003.

Questions

What is an eclipse? What is a solar eclipse?
What causes a total solar eclipse?
Can you see a solar eclipse from anywhere?
What do you think is the safest way to view a solar eclipse?

How long do solar eclipses last?

Why do you think we have solar eclipses?

Web Resources

Total Solar Eclipse 2017
https://eclipse2017.nasa.gov/
This site from NASA provides a lot of information about the total solar eclipse in August 2017.

Total Solar Eclipse 2017: When and Where to See It
At this resource, you can find information about when and where to view the solar eclipse—safely.

NASA Recommends Safety Tips to View the August Solar Eclipse
This resource provides recommendations for safely viewing a total solar eclipse.

Total Solar Eclipse 2017: Educator Resources
http://guides.statelibrary.sc.gov/total-solar-eclipse/educational-resources
From the South Carolina State Library, this site provides a guide with links to resources about eclipses.

What Is an Eclipse?
https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-an-eclipse-58
NASA provides this resource that explains both lunar and solar eclipses.

What is a Solar Eclipse?
https://www.exploratorium.edu/eclipse/video/what-is-solar-eclipse
Join Exploratorium astronomer Isabel Hawkins and Exploratorium educator Liliana Blanco as they explain the celestial mechanics of a total solar eclipse.

Solar Eclipse Facts

- Each year, there are between two and five solar eclipses.
- There are two types of eclipses on Earth: an eclipse of the moon and an eclipse of the sun.
- The total solar eclipse, when the moon completely obscures the sun and leaves only the faint solar corona, is known as a Totality.
- Total solar eclipses are rare, happening only once every 18 months.
- A total solar eclipse can only happen during a full moon.
- The speed of the moon as it moves across the sun is approximately 2,250 km (1,398 miles) per hour.
- From either the North or South Pole, only a partial solar eclipse is able to be viewed.
- A total solar eclipse can last a maximum of 7 minutes and 30 seconds.
- 269 km is the maximum width of the path of totality.
- Almost identical eclipses occur after 18 years and 11 days – known as the Saros Cycle.
- A total solar eclipse is not noticeable until the sun is more than 90 percent covered by the moon. At 99 percent coverage, daytime lighting resembles local twilight.

Adapted from the NASA Sun Earth Day and from Space Facts for Kids.