TURNING DAY INTO NIGHT









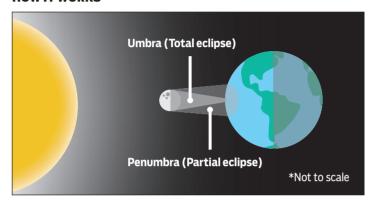


THE ASSOCIATED PRESS

This combination picture shows five stages of the solar eclipse over Germany in 1999. The chronological order begins at the left, and the center image shows the total eclipse.

TOTAL SOLAR ECLIPSES

HOW IT WORKS



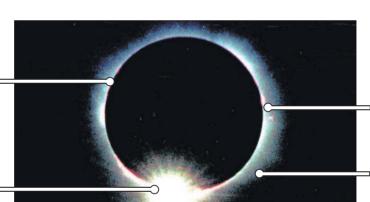
Solar eclipses happen when the moon moves between the Earth and the sun and casts a shadow. A total solar eclipse occurs when the moon completely covers the sun, as seen from Earth. Totality can be seen only from a limited area where the darkest part of the moon's shadow is cast. This part of the shadow is called the umbra and is almost as dark as night. The area that sees totality changes during the course of the eclipse because the moon and Earth are in constant motion. Areas outside the umbra may be able to see a partial eclipse because of the penumbra. This is the outer part of the moon's shadow that is faint.

TOTALITY PHENOMENA

Some unique sights can been seen only during a total solar eclipse.

Chromosphere: This is the lower atmosphere of the sun that appears as a thin reddish glow around the edge of the sun during a total solar eclipse.

Diamond ring: This effect is seen about 10 to 15 seconds before and after totality when there is a single point of sunlight shining through a valley on the edge of the moon.



TIMING

Solar eclipses can happen only around a new moon because of the alignment of the sun, moon and Earth during that time. However, this doesn't mean that eclipses happen every new moon. The orbital path of the moon around Earth has to meet the orbital path of the Earth around the sun. The two points where these planes cross are called the lunar nodes. This can happen because the moon's path around Earth is inclined at an angle of approximately five degrees to the Earth's path around the sun. When the moon passes through a node during a new moon, solar eclipses occur.

FREQUENCY

Most calendar years have two solar eclipses, but may only have one total eclipse. The maximum number of eclipses that can take place in the same year is five, but it is rare. According to NASA, only about 25 years in the past 5,000 years have had five solar eclipses. The last time this happened was in 1935, and the next time will be 2206.

Even though solar eclipses take place every year, they are considered a rare sight compared with a lunar eclipse. This is because a solar eclipse is only visible from a limited path on Earth, while a lunar eclipse can been seen anywhere Earth is facing the moon. Lunar eclipses also tend to last longer.

Solar and lunar eclipses come in pairs. A solar eclipse always takes place about two weeks before or after a lunar eclipse. There was a partial lunar eclipse preceding Monday's solar eclipse, which took place on August 7-8.

Shadow bands: These are faint ripples of light that are sometimes seen on flat, light-colored surfaces on the ground and along walls about one minute before and after totality.

Baily's beads: This effect is seen right before and after totality when only a few points of sunlight are visible through valleys on the moon.

• Corona: This is the upper atmosphere of the sun. It appears as a halo around the sun during a total solar eclipse.

PAST AND FUTURE ECLIPSES

Ancient Chinese documents date one of the first recorded eclipses to over 4,000 years ago. Since then, this phenomena has been widely observed and studied. Eclipses have even lead to important scientific discoveries. Some notable eclipses in history are shown below.

Oct. 22, 2134 BC: This was the oldest solar eclipse ever recorded. Chinese legend says two astrologers were executed for failing to predict it. **Dec. 22, 968:** This total solar eclipse over Europe resulted in the first clear description of the corona.

July 20, 1506: This was the most recent total solar eclipse visible from Richmond's location.

July 28, 1851: The first photograph of the Sun's corona was taken by a Prussian photographer during this eclipse.

May 29, 1919: Einstein's Theory of Relativity was verified by observing the bending of starlight near the sun during this eclipse.

2100 BC 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000

July 19, 418: First report of a comet seen during a solar eclipse **Jan. 27, 632:** This eclipse coincided with the death of Prophet Mohammed's son. Mohammed dismissed rumors that it was a miracle.

Aug. 2, 1133: King Henry I died two years after this eclipse, thus spreading the belief that eclipses are bad omens for rulers.

May 15, 1836: Baily's beads were first discovered during this eclipse.

Aug. 16, 1868: French astronomer Jules Jannsen discovered helium during this total solar eclipse.

July 21, 2009: This was the longest total solar eclipse of the 21st century, lasting 6 minutes, 39 seconds.

SUPERSTITIONS

In ancient times, eclipses were feared, being associated with myths and superstitions to explain the temporary darkening of the sun. Even today, solar eclipses are considered a bad omen in many cultures.

Creatures eat the sun

In Vietnam, people believed that an eclipse was caused by a giant frog eating the sun. Norse cultures blamed wolves. In ancient China, it was thought to be a celestial dragon that devoured it.

Angry gods, quarreling sun and moon

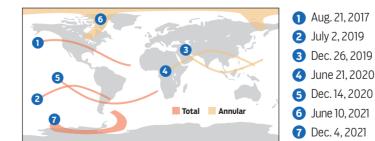
The ancient Greeks believed an eclipse was a sign of angry gods and that it was the beginning of disasters and destruction. But according to Batammaliba legends, the sun and moon were fighting and the only way to stop them was for people on earth to resolve all conflicts with each other.

Modern day superstitions

In many cultures today, people believe that eclipses can be a danger to pregnant women, so they stay indoors. In parts of India, people fast because they believe that any food cooked during an eclipse is poisonous.

FUTURE SOLAR ECLIPSES

Worldwide: The map below shows the total or annular solar eclipses that will happen across the globe in the next five years.



In Richmond

After Monday, the next partial eclipse covering over 50 percent of the sun and visible from Richmond will be on April 8, 2024. As for a total eclipse, it won't happen in Richmond until Sept. 14, 2099. The next annular solar eclipse visible from either Richmond or Virginia will be Aug. 4, 2111.

OTHER TYPES OF ECLIPSES

Annular solar eclipse



This occurs when the moon appears to be smaller than the sun and a bright ring of sunlight remains visible during the eclipse. This happens when the moon is near its farthest point from Earth.

Partial solar eclipse



This happens when the moon only partially covers the sun. Both total and annular solar eclipses are seen as partial from the areas on Earth outside the moon's inner shadow.

Hybrid solar eclipse

This rare type of solar eclipse changes from an annular to a total eclipse, and vice versa, along its path.

Total lunar eclipse



Sometimes called a blood moon, this occurs during a full moon when the dark part of Earth's shadow obscures all of the moon's surface.

Partial lunar eclipse



This can be observed when only a portion of the moon's surface is obscured by the dark part of Earth's shadow.

Penumbral lunar eclipse



This happens when the moon moves through the faint, outer portion of the Earth's shadow. It is often mistaken for a normal full moon.

Planet transit

This happens when Venus or Mercury, the only planets inside Earth's orbit, comes between Earth and the sun, appearing as a small dot only visible with filtered telescopes.

SOURCES: TIMEANDDATE.COM, NASA, LIVE SCIENCE