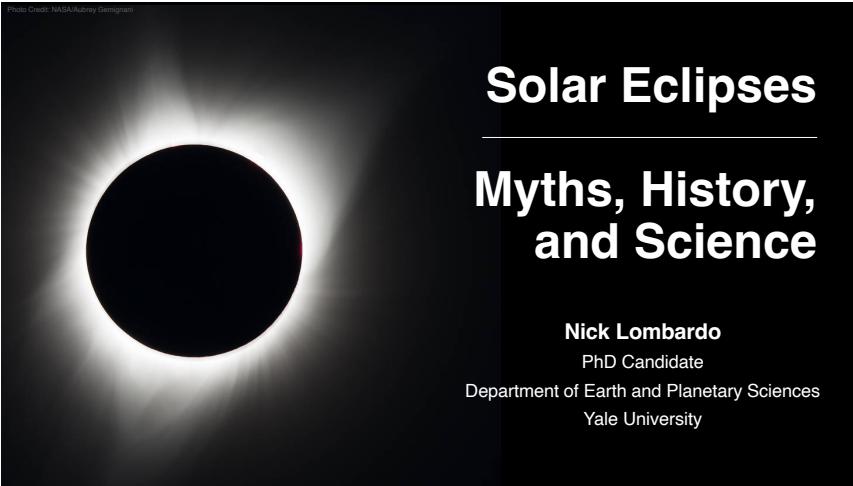


Photo Credit: NASA/Aubrey Gemignani



Solar Eclipses

Myths, History, and Science

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Department of Earth and Planetary Sciences
Yale University

Diverse Cultures had Diverse Stories

Ancient Chinese Cultures

Earliest recorded solar eclipse, 2137 BCE

"The Sun has been eaten [by a dragon]"
To frighten away the dragon and save the
Sun, people would bang drums and make
loud noises during an eclipse.



19th Century court robe, Metropolitan Museum of Art

<https://www.britannica.com/list/the-sun-was-eaten-6-ways-cultures-have-explained-eclipses>

Diverse Cultures had Diverse Stories

The Choctaw People

"When an eclipse occurred, legend has it that our ancestors believed hungry, large black squirrels would emerge and eat the sun to quell their hunger pains. The tribe would yell, throw sticks and rocks, shoot arrows, and throw spears toward the darkened sun to scare away the hungry squirrels. Every tribal member was counted on to do their part to frighten away the squirrels and save the sun from being devoured."

Chief Gary Batton



Video developed by the Choctaw Nation about the black squirrel.



Source: Choctaw Nation

Diverse Cultures had Diverse Stories

Egyptians

Egyptians were skilled astronomers, but there's no record of them observing eclipses. Some scholars have suggested that perhaps eclipses were highly distressing and were deliberately not recorded to not "endow the event with a degree of permanence".

Funerary Stele, Louvre



Taparet Stele E52, Wikipedia

<https://www.britannica.com/list/the-sun-was-eaten-6-ways-cultures-have-explained-eclipses>

Very Paraphrased Version of One Hindu Myth

"The story begins in the earliest of time, when the angels and demons sought to extract an elixir of immortality. Mohini, the female avatar of Vishnu, started distributing the elixir to the angels. However, one of the demons, Svarbhanu, sat in the row of angels and drank the elixir."

Very Paraphrased Version of One Hindu Myth

"Surya (the Sun) and Chandra (the Moon) noticed him and they informed Mohini; however, by that time, Svarbhanu had already become immortal. Vishnu, as Mohini, cut off Svarbhanu's head. Svarbhanu could not die, but his head was separated from his body; his head came to be known as Rahu, while his body came to be known as Ketu."

Very Paraphrased Version of One Hindu Myth

"Rahu and Ketu became bitter enemies with Surya and Chandra for exposing his deception and leading to his decapitation. For this, Rahu pursues them and attempts to consume the Sun and Moon. Since Rahu is the head without the body, the Sun and Moon exit from his throat when he tries to swallow them. This represents the temporary revenge of Rahu."



Chandrayaan-3 Lander on
the Surface of the Moon,
August 2023

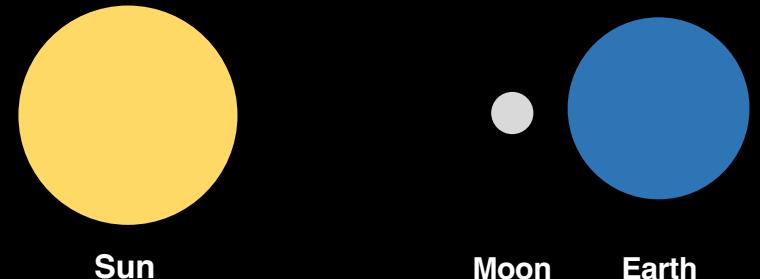
Part of the Chandrayaan (Lunar Vehicle) program from the Indian Space Research Organization

Source: ISRO

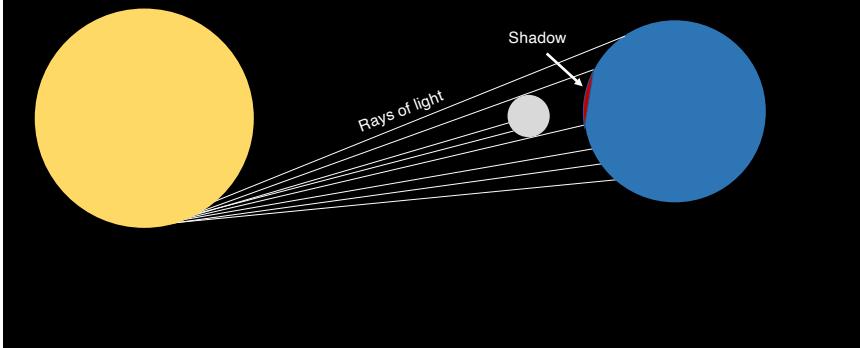
How do Solar Eclipses Work?

Let's build a Solar Eclipse

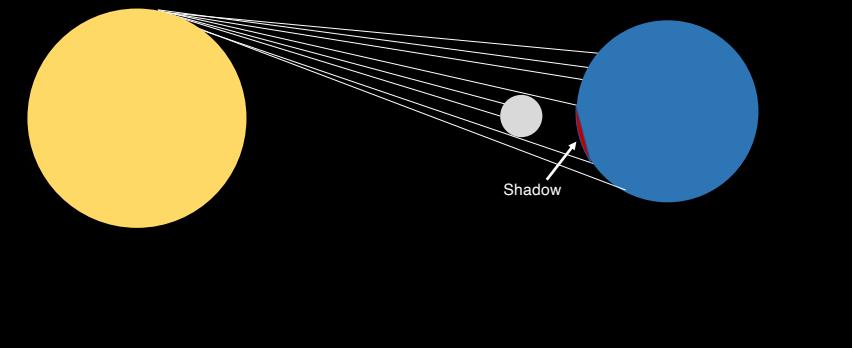
**Not to scale*



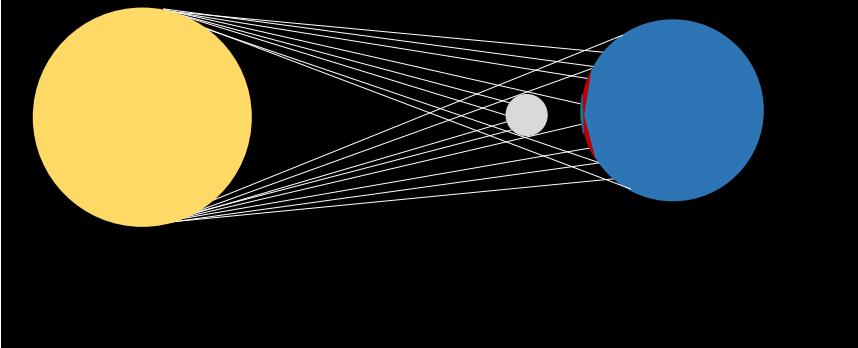
Light from different areas of the sun cast shadows on different areas of the Earth



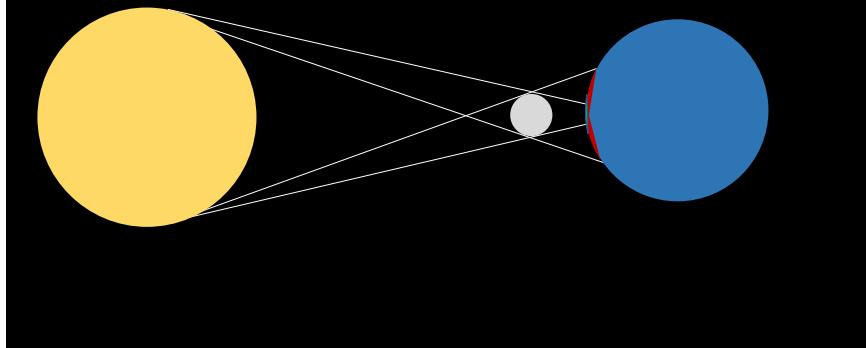
Light from different areas of the sun cast shadows on different areas of the Earth



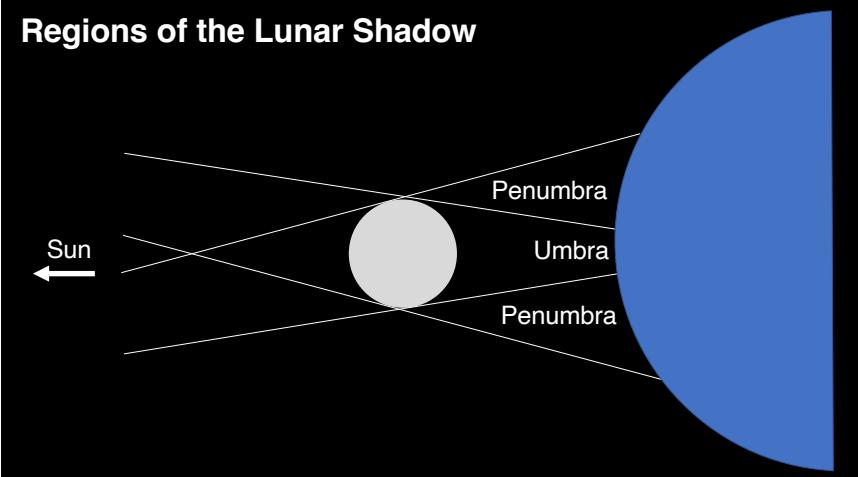
Light from different areas of the sun cast shadows on different areas of the Earth



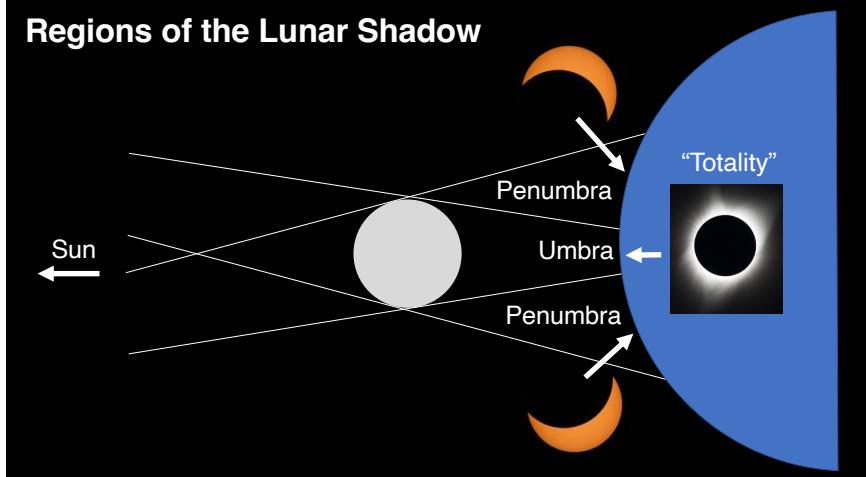
Shadows from different parts of the Sun Overlap at some places on Earth



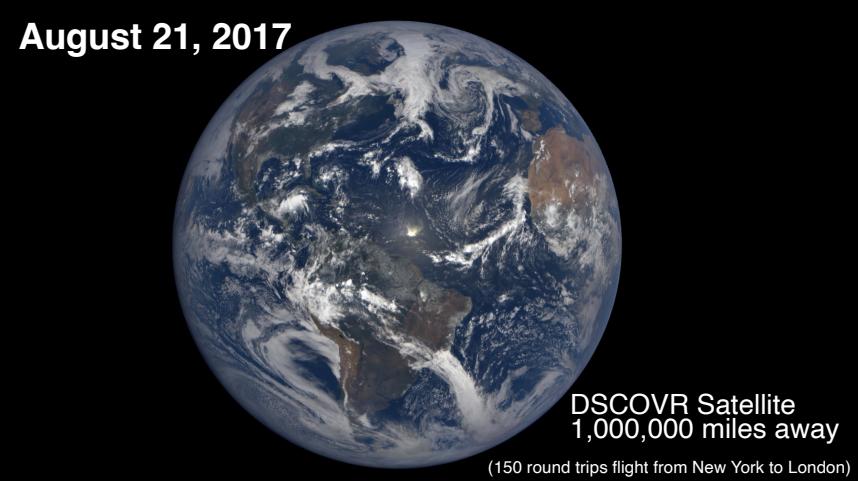
Regions of the Lunar Shadow



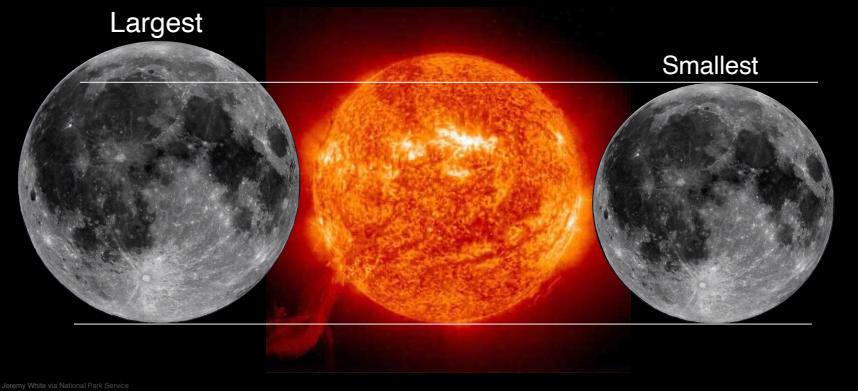
Regions of the Lunar Shadow



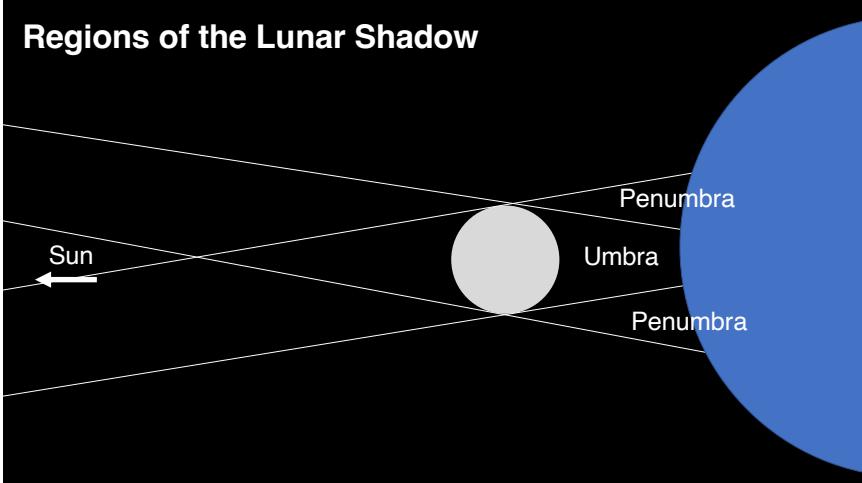
August 21, 2017



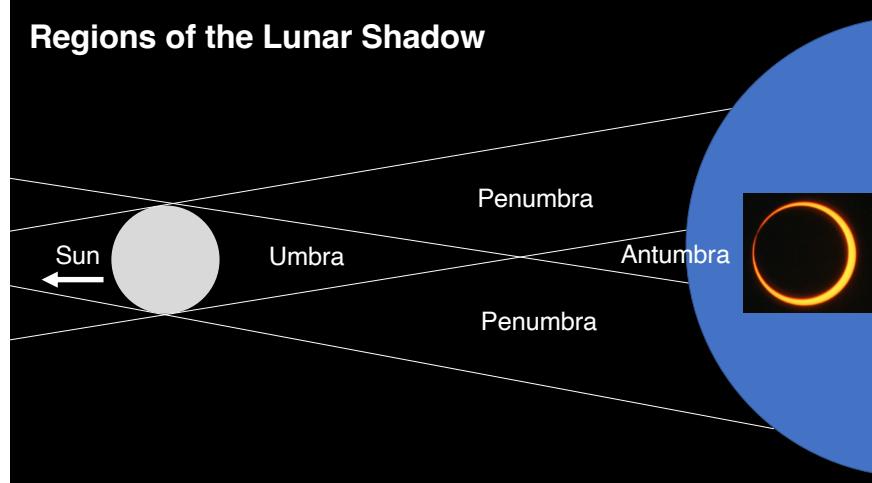
The Moon doesn't always appear the same size

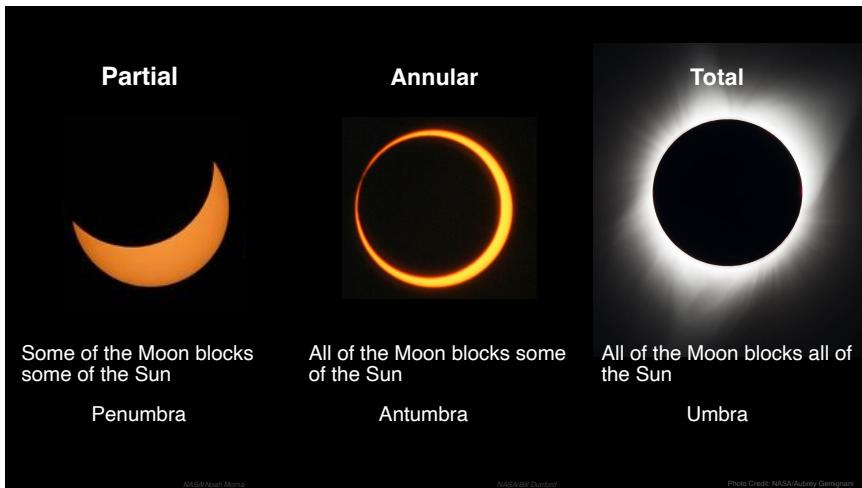


Regions of the Lunar Shadow



Regions of the Lunar Shadow





Totality is just a small fraction of the entire eclipse



Totality allows you to see the Corona

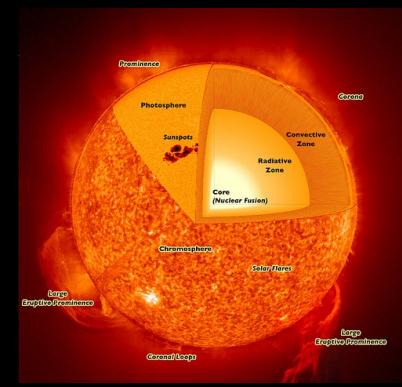
The Corona is the outermost layer of the Sun

Very high temperature plasma streaming outward from the Sun

Extends to about 20 solar radii

~8.5 million miles, ~1/11 way to Earth

Gives rise to the solar wind

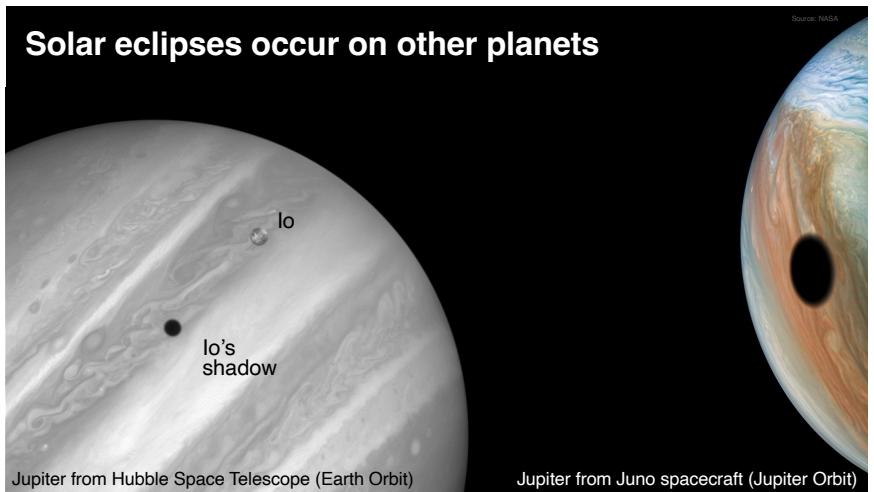


Source: Popovyan, UABESTA

Solar eclipses occur on other planets



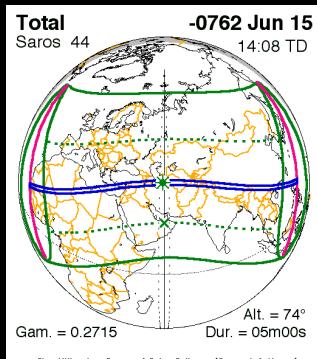
Solar eclipses occur on other planets



We can accurately calculate historical eclipses

Assyrian Eclipse June 15, 763 BCE

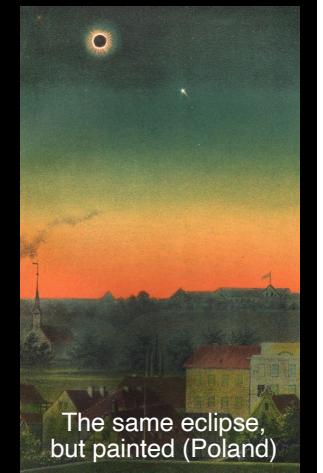
"Bur-Sagale of Guzana [person's name], revolt in the city of Ashur. In the month Simanu [May/June] an eclipse of the sun took place."



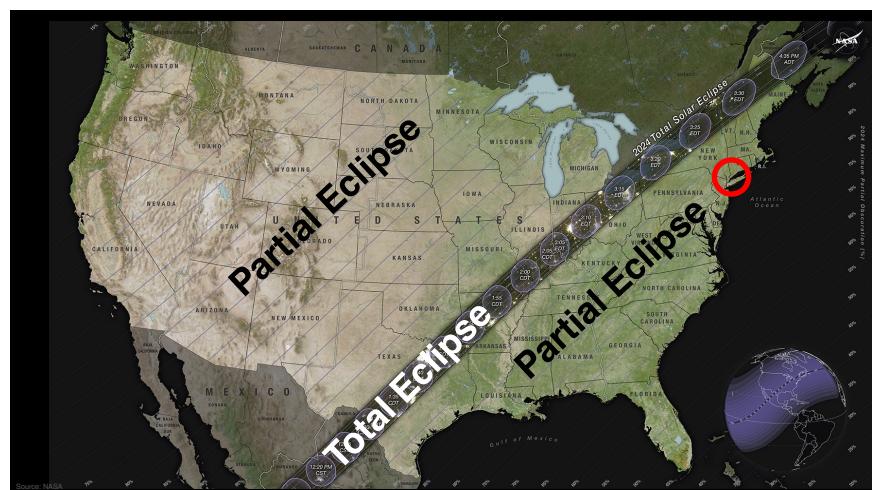
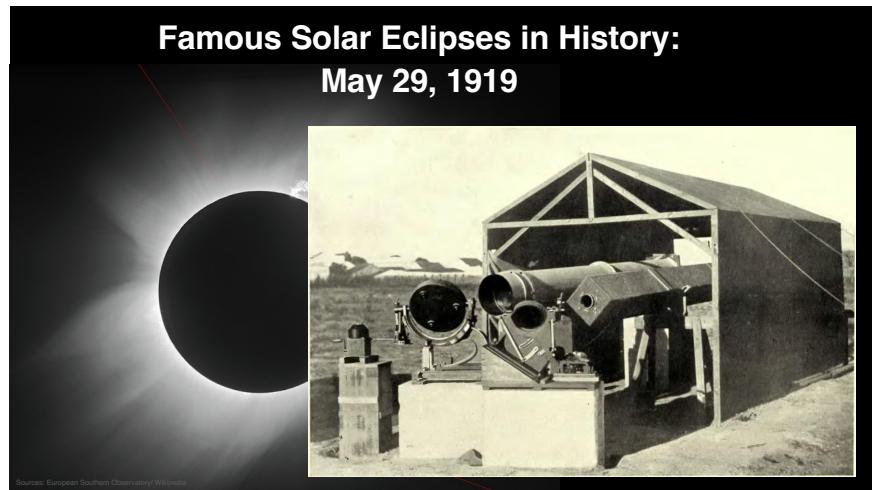
Famous Solar Eclipses in History: July 28, 1851



First photographed solar eclipse
(Russia)



The same eclipse,
but painted (Poland)

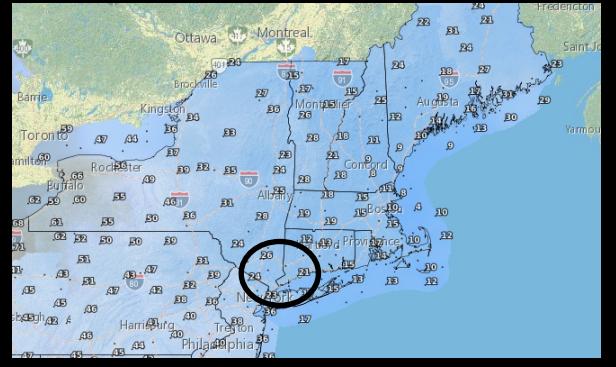


Simulation of April 8 Eclipse



Forecast looks ok, but this could change

National Weather Service expects about 25% of the sky to be covered by clouds, which shouldn't impact the partial eclipse much



What to do During the Eclipse

As the eclipse progresses, pay attention to your surroundings:

What to do During the Eclipse

As the eclipse progresses, pay attention to your surroundings:

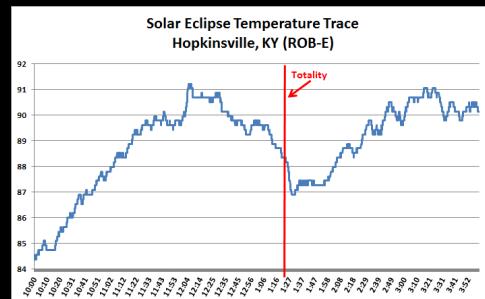
It gets darker.

What to do During the Eclipse

As the eclipse progresses, pay attention to your surroundings:

It gets darker.

Temperatures can drop a few degrees.



Source: National Weather Service

What to do During the Eclipse

As the eclipse progresses, pay attention to your surroundings:

It gets darker.

Temperatures can drop a few degrees.

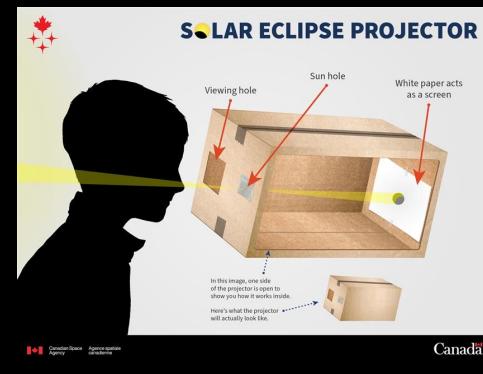
Animals may behave differently near the time of maximum eclipse (3:26).

Observe the eclipse using a safe viewing method.



source: Audubon/Dr. Ajay Kumar Singh/Shutterstock

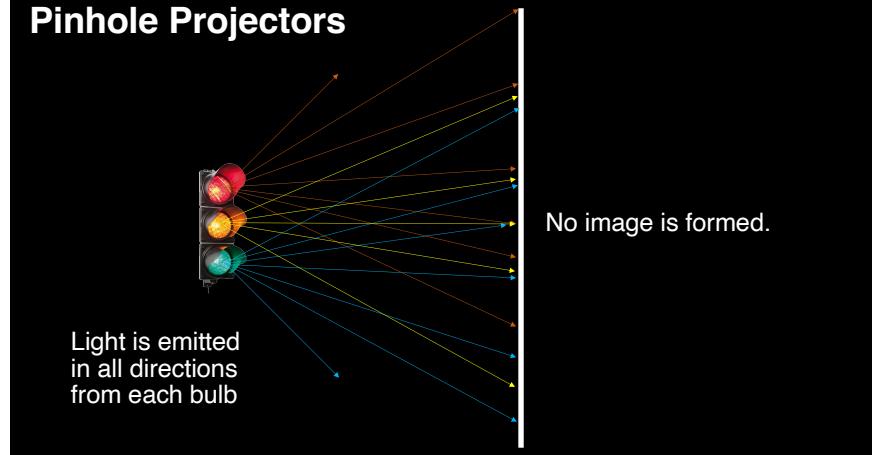
Observing Methods



At no point will Westchester experience totality!

Always use a safe viewing aid.

Pinhole Projectors



Pinhole Projectors

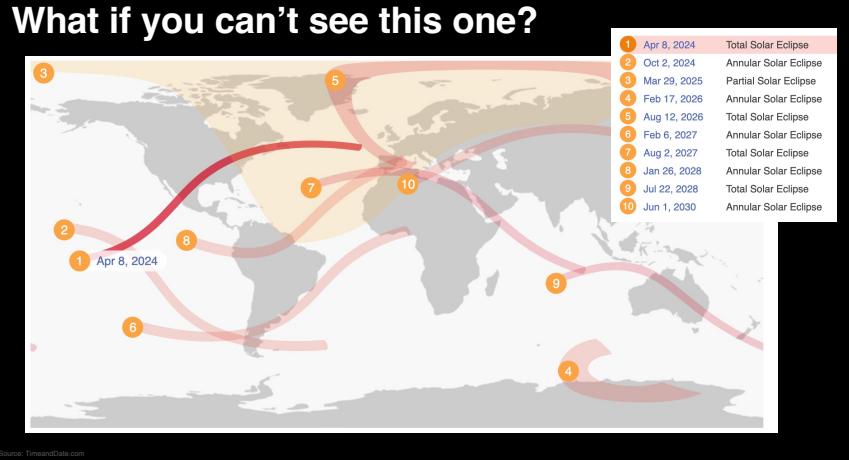
Light is emitted
in all directions
from each bulb

An upside down image is
formed

Pinhole Projectors



What if you can't see this one?



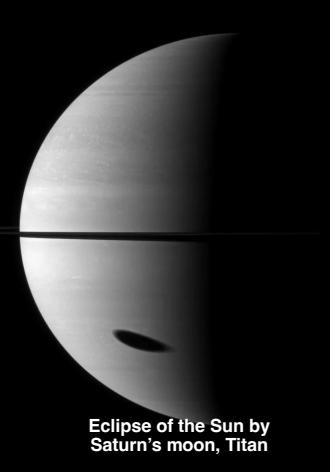
Stick around to try using a pinhole viewer!

Questions?

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Thanks to the
Friends of Trailside Nature Museum
for enabling this presentation



Eclipse of the Sun by
Saturn's moon, Titan

Source: NASA