

Photo Credit: NASA/Kurtz/Gemignani



Solar Eclipses

Myths, History, and Science

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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.



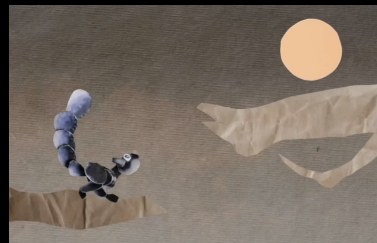
19th Century court robe, Metropolitan Museum of Art

<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".



Funeral Stela, Louvre

Taparet Stela 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

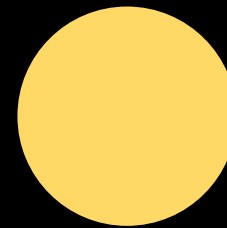
Part of the Chandrayaan (Lunar Vehicle) program from the Indian Space Research Organization

Source: ISRO

How do Solar Eclipses Work?

Let's build a Solar Eclipse

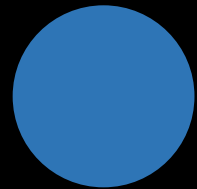
**Not to scale*



Sun

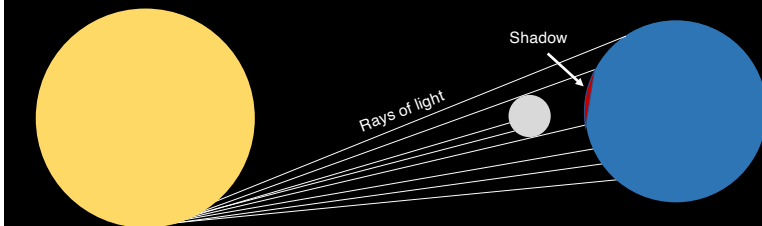


Moon

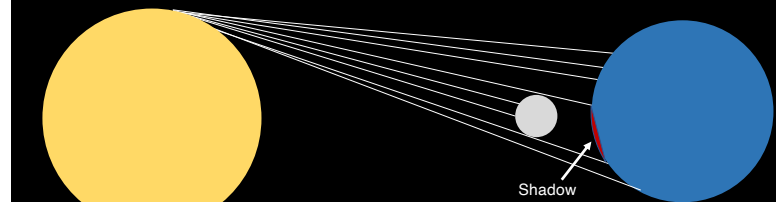


Earth

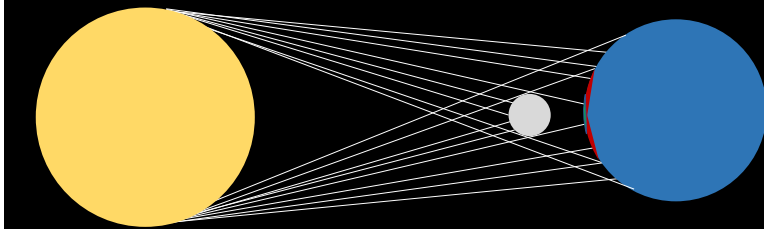
Light from different areas of the sun cast shadows on different areas of the Earth



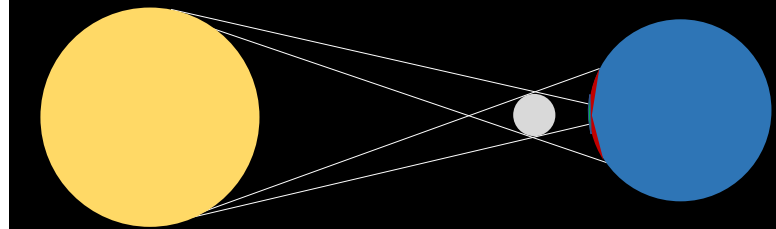
Light from different areas of the sun cast shadows on different areas of the Earth



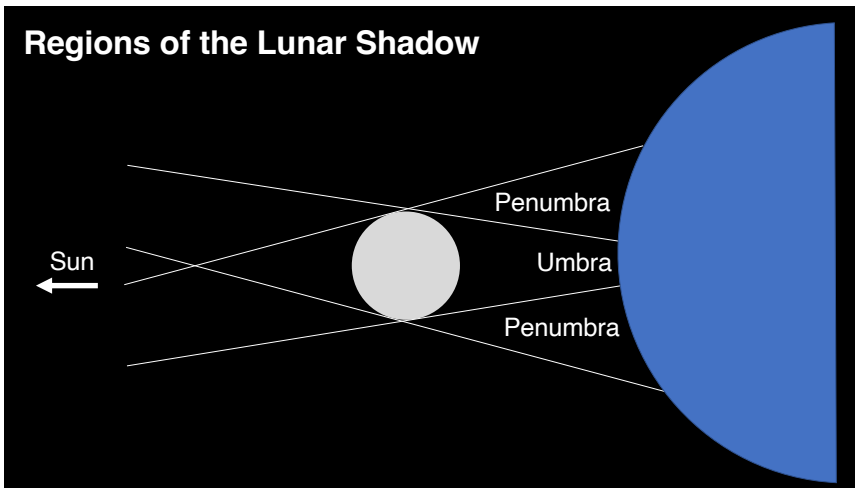
Light from different areas of the sun cast shadows on different areas of the Earth



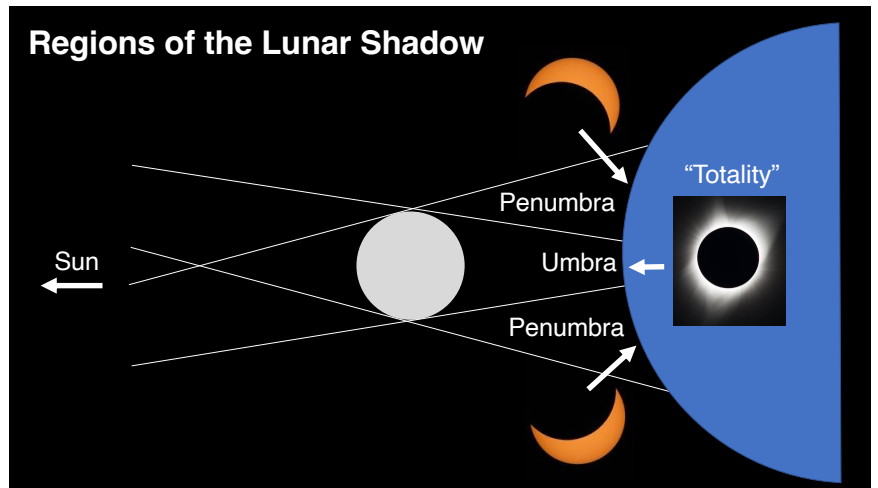
Shadows from different parts of the Sun Overlap at some places on Earth



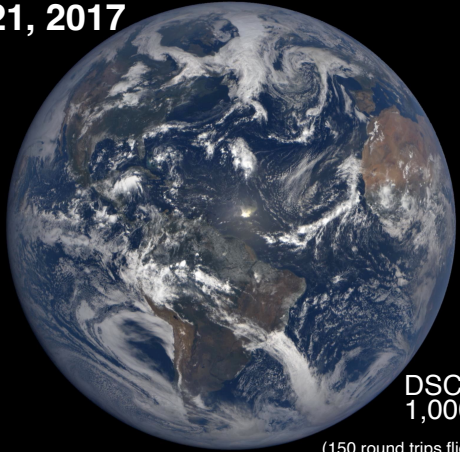
Regions of the Lunar Shadow



Regions of the Lunar Shadow

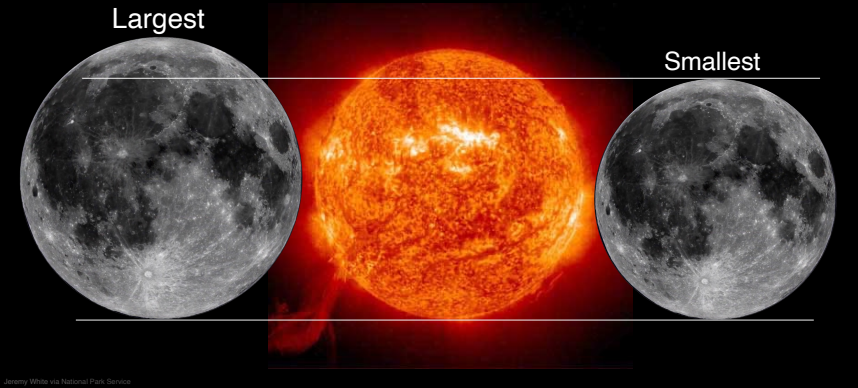


August 21, 2017

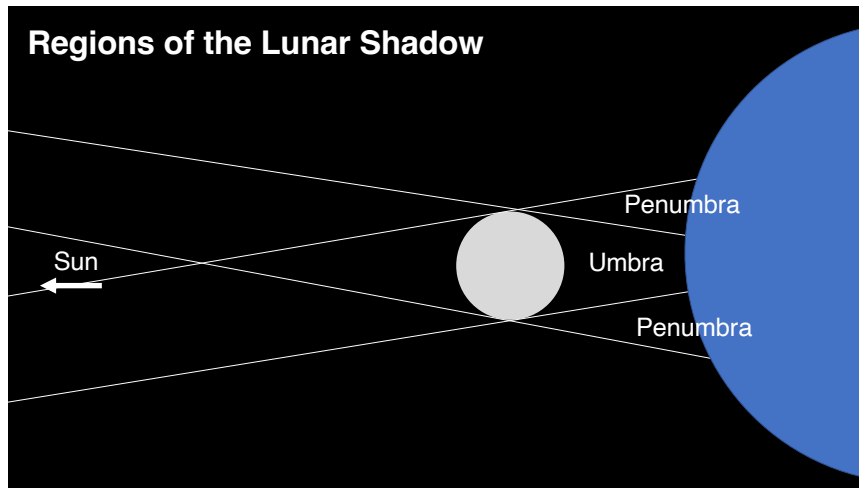


DSCOVR Satellite
1,000,000 miles away
(150 round trips flight from New York to London)

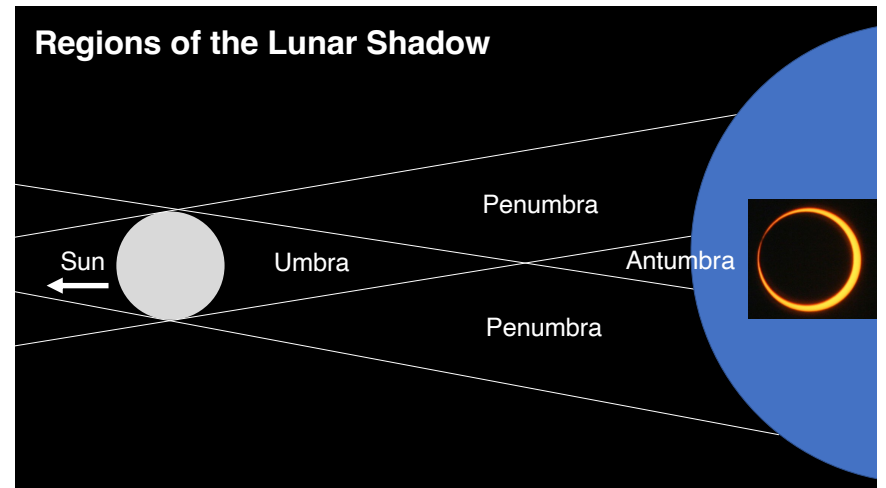
The Moon doesn't always appear the same size

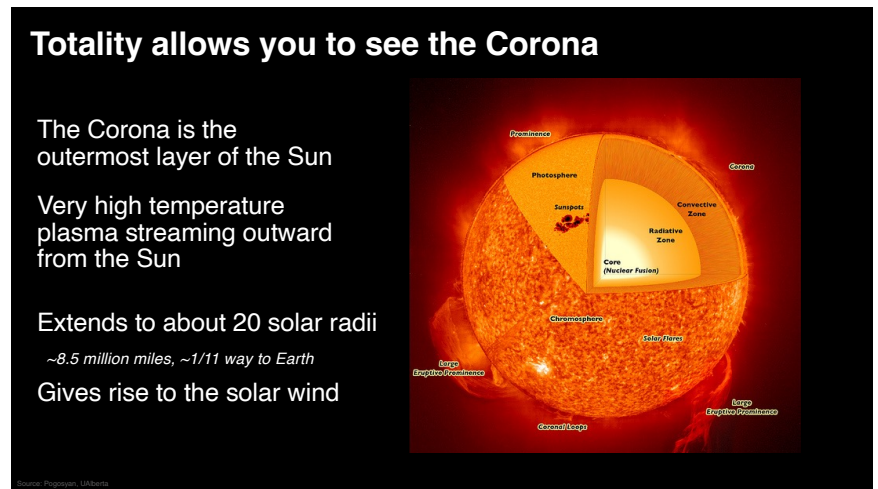
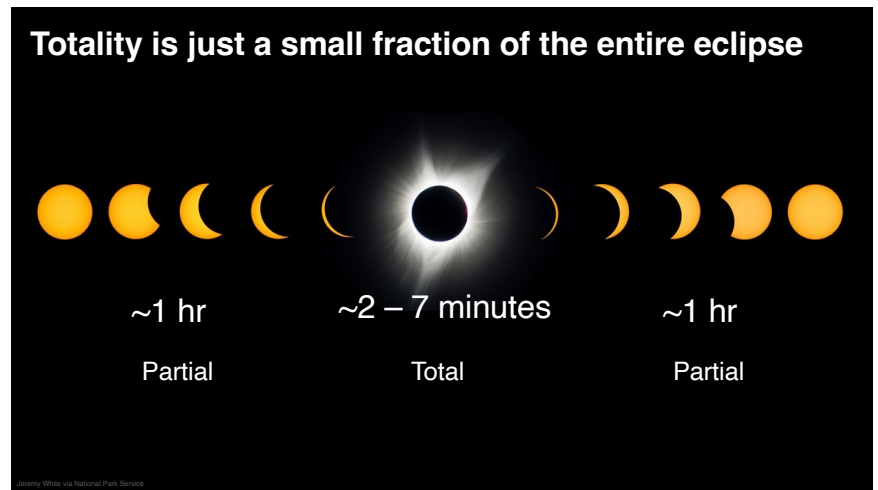
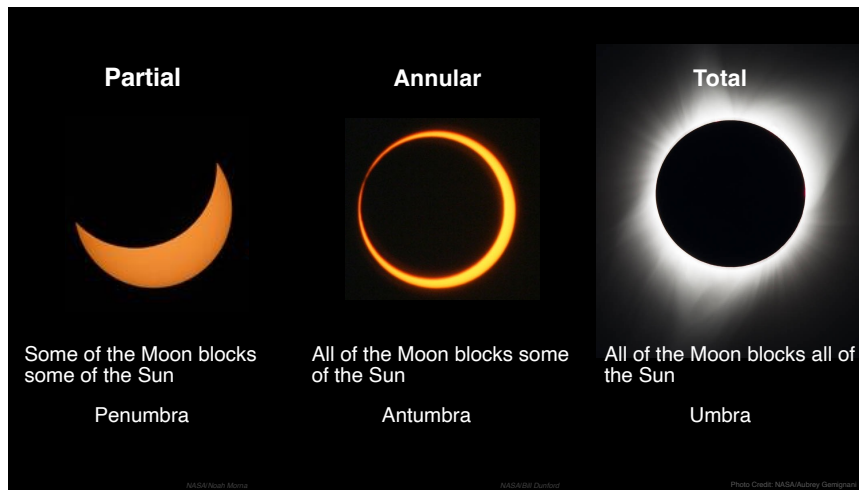


Regions of the Lunar Shadow



Regions of the Lunar Shadow





Solar eclipses occur on other planets

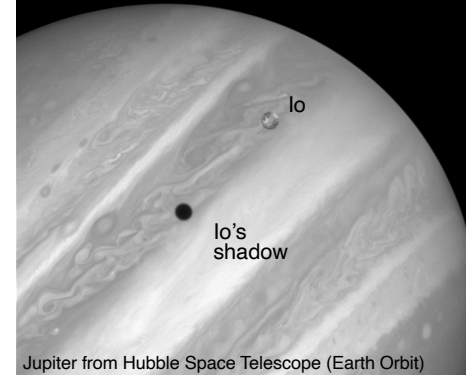


Martian moon Phobos

Phobos passing in the front of the Sun as viewed by a rover on the surface of Mars

Source: NASA

Solar eclipses occur on other planets



Jupiter from Hubble Space Telescope (Earth Orbit)



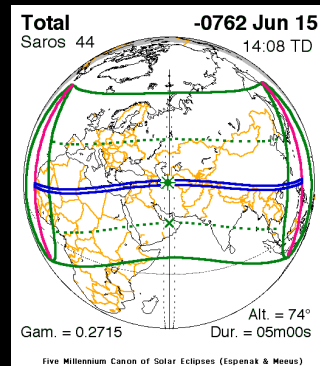
Jupiter from Juno spacecraft (Jupiter Orbit)

Source: NASA

We can accurately calculate historical eclipses

Assyrian Eclipse June 15, 763 BCE

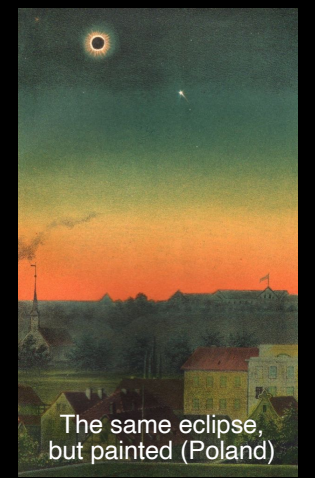
"Bur-Sagale of Guzana [person's name], revolt in the city of Ashur. In the month Simanu [May/June] an eclipse of the sun took place."



Famous Solar Eclipses in History: July 28, 1851



First photographed solar eclipse (Russia)



The same eclipse, but painted (Poland)

Famous Solar Eclipses in History: May 29, 1919

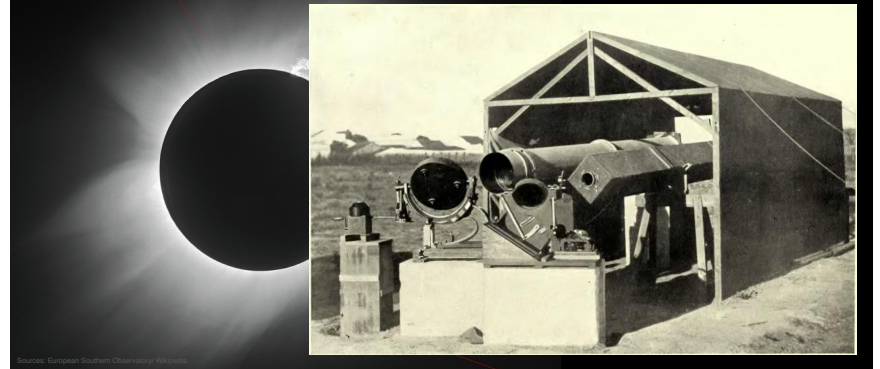


The Eddington Experiment:
Observational confirmation that
gravity bends spacetime

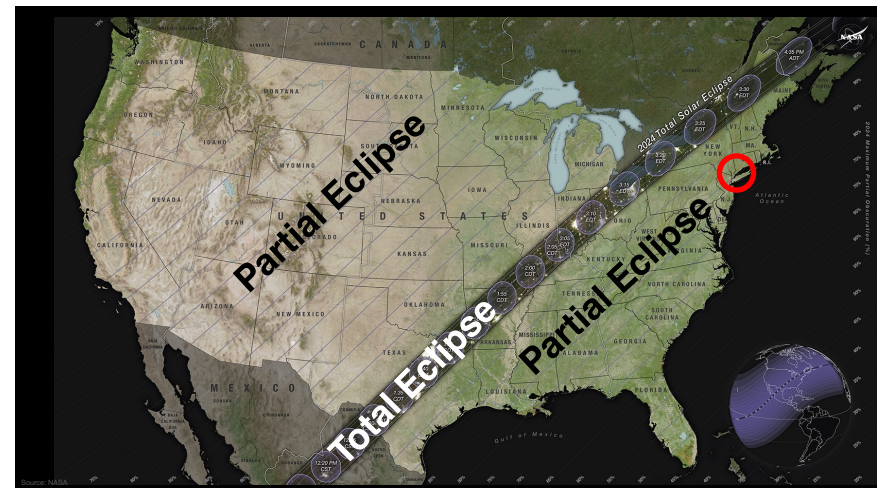
Stars that were very close to
the Sun appeared to be in a
slightly different position.

The light was bent by the Sun's
high gravity.

Famous Solar Eclipses in History: May 29, 1919



What to Expect for the April 8 Eclipse and How to Prepare

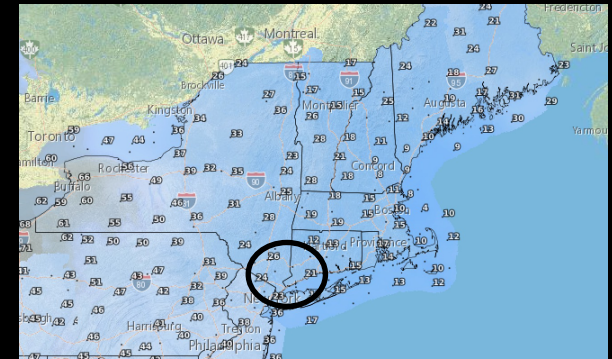


Simulation of April 8 Eclipse



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



Source: National Weather Service

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:

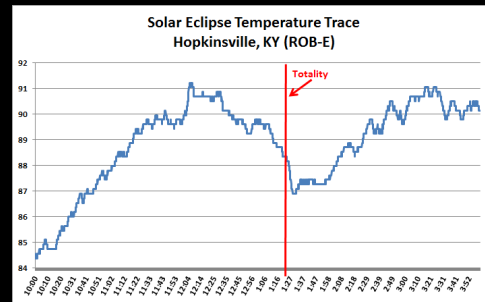
It gets darker.

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.

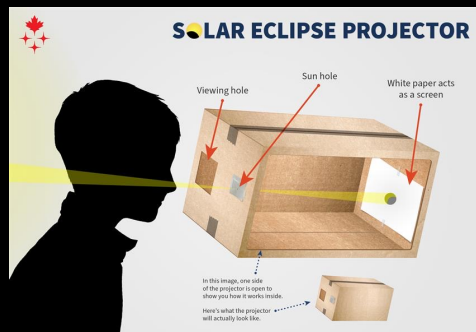


Source: Autodesk/Dr. Jay Kumar Singh/Digitalminds

Observing Methods

At no point will Westchester experience totality!

Always use a safe viewing aid.

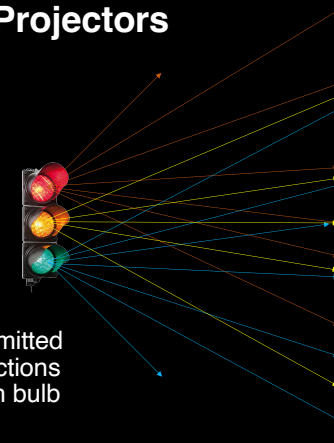


Canada

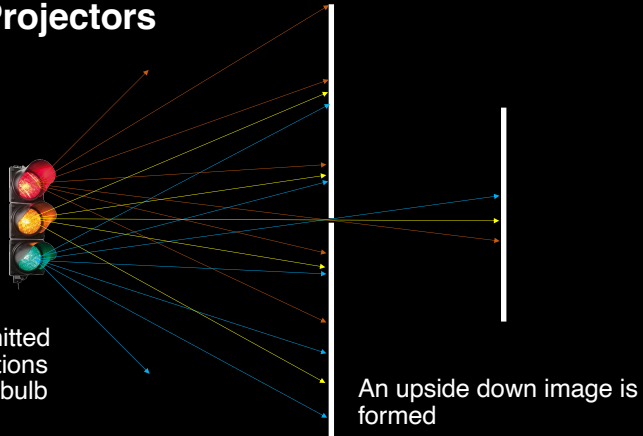
Pinhole Projectors

No image is formed.

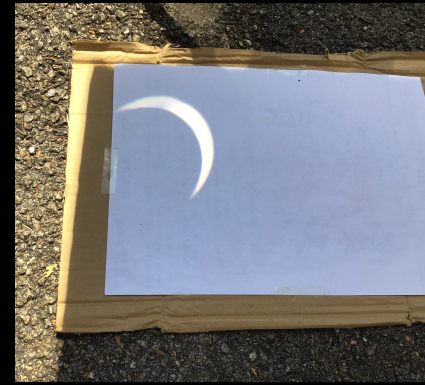
Light is emitted in all directions from each bulb



Pinhole Projectors



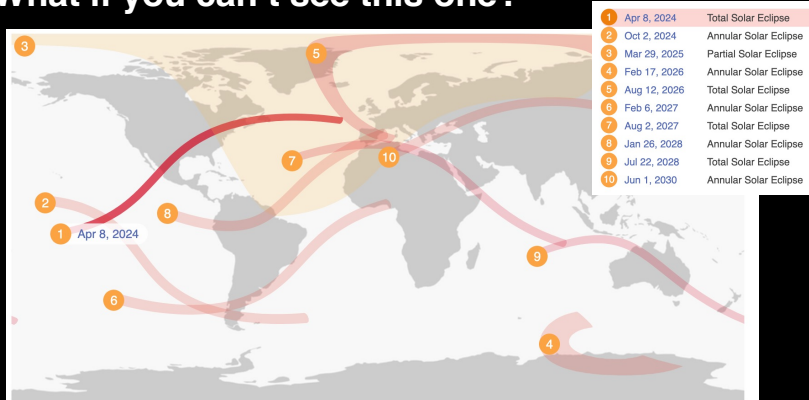
Pinhole Projectors



Source: NASA



What if you can't see this one?



Source: TimeandData.com

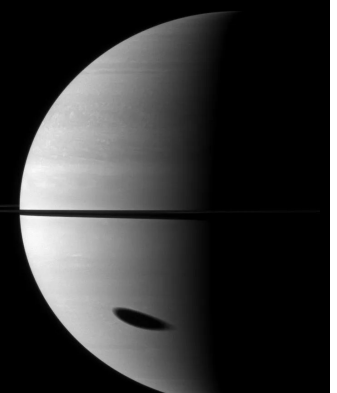
Stick around to try using a pinhole viewer!

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