
Eclipse

July 20, 1969

On 10:56pm - July 20, 1969 Neil Armstrong steped onto the Moon.

On December 19, 1972 Eugene Cernan stepped off the Moon.

Since then no human has gone to the Moon or even left low earth orbit

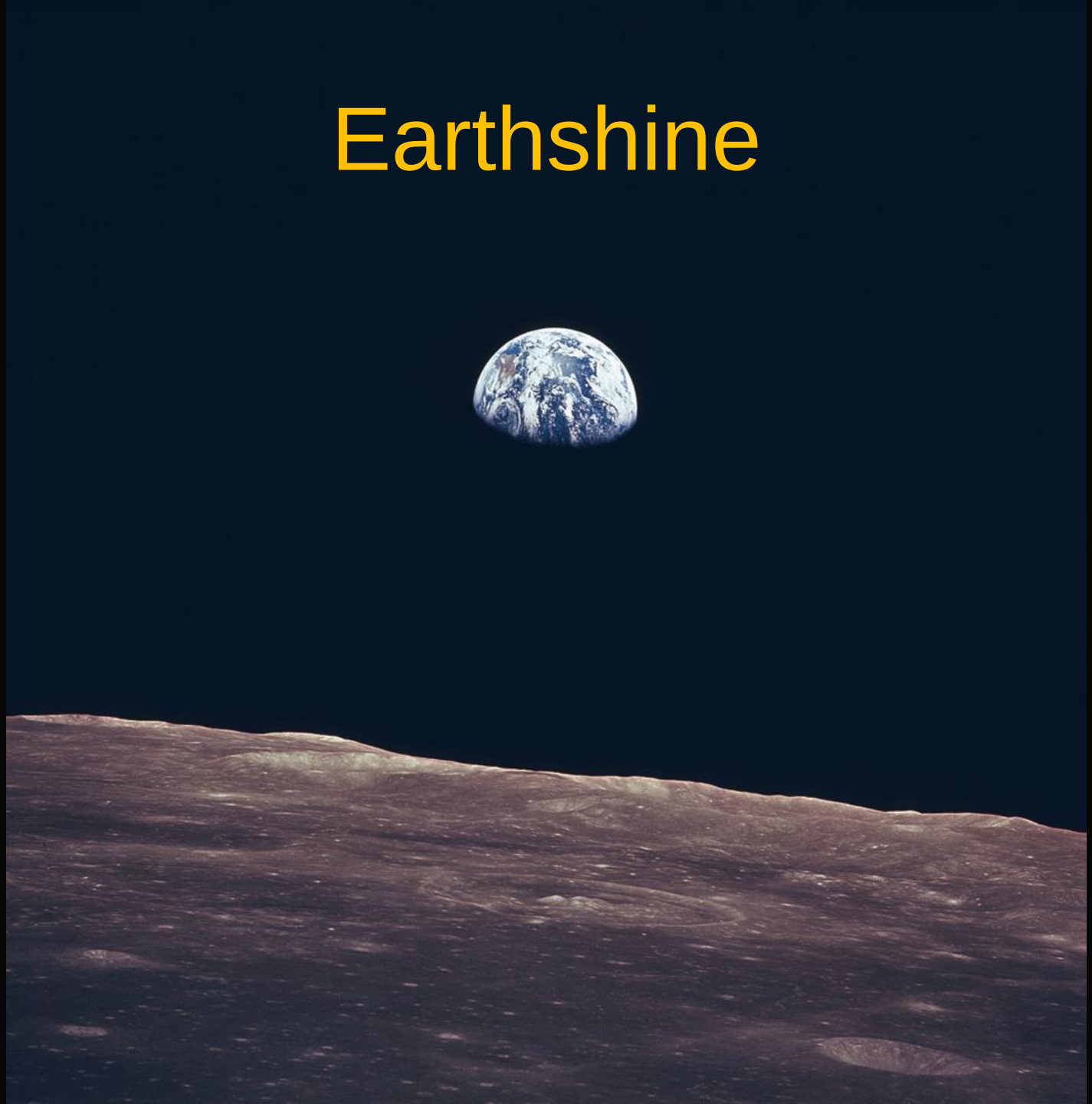
Moon Phases Review

Moon Phase Timing

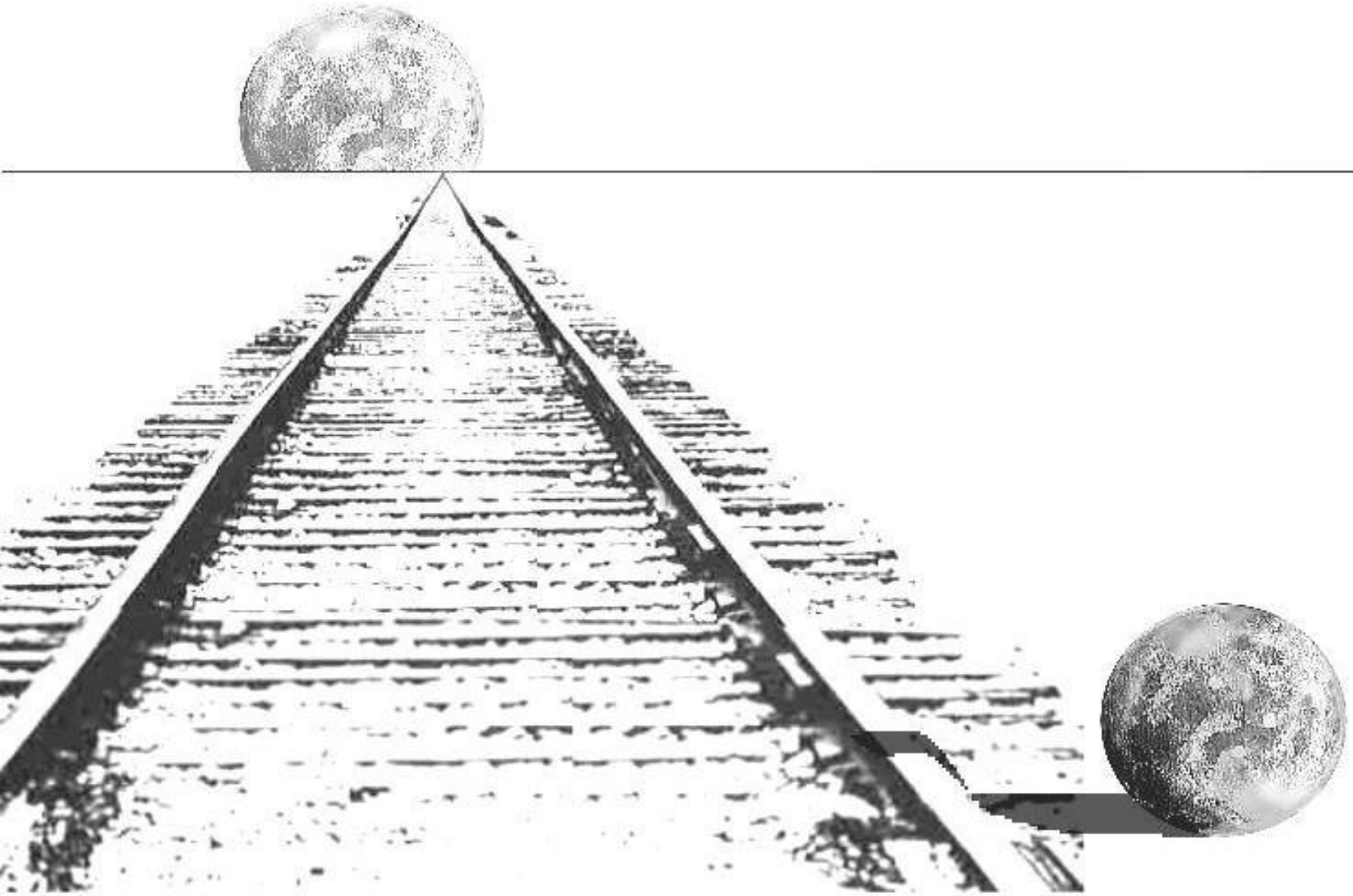
- The Moon orbits the Earth every 27.3 days.
- The full phase Cycle takes 29.5 days.

Earthshine

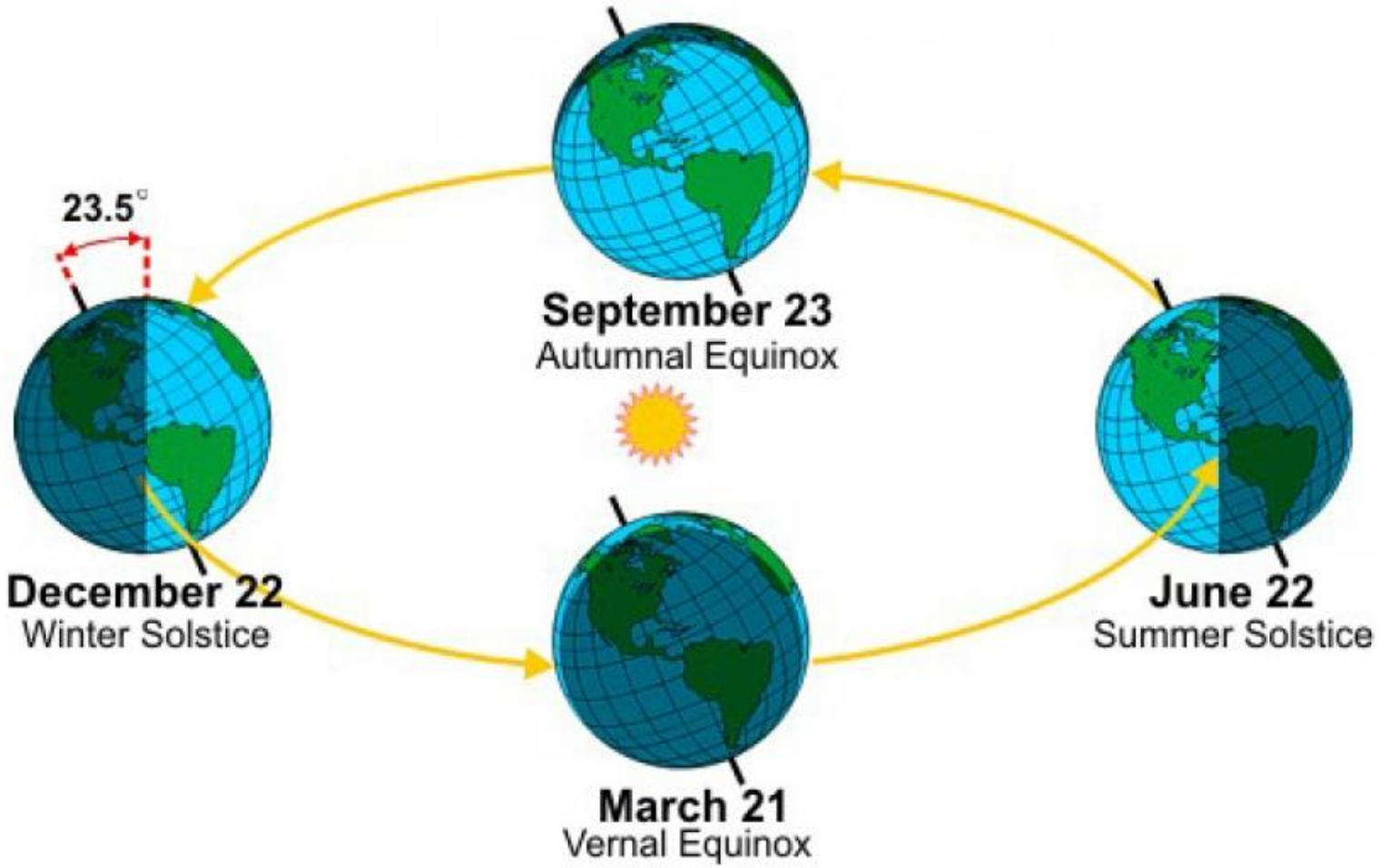
Earthshine



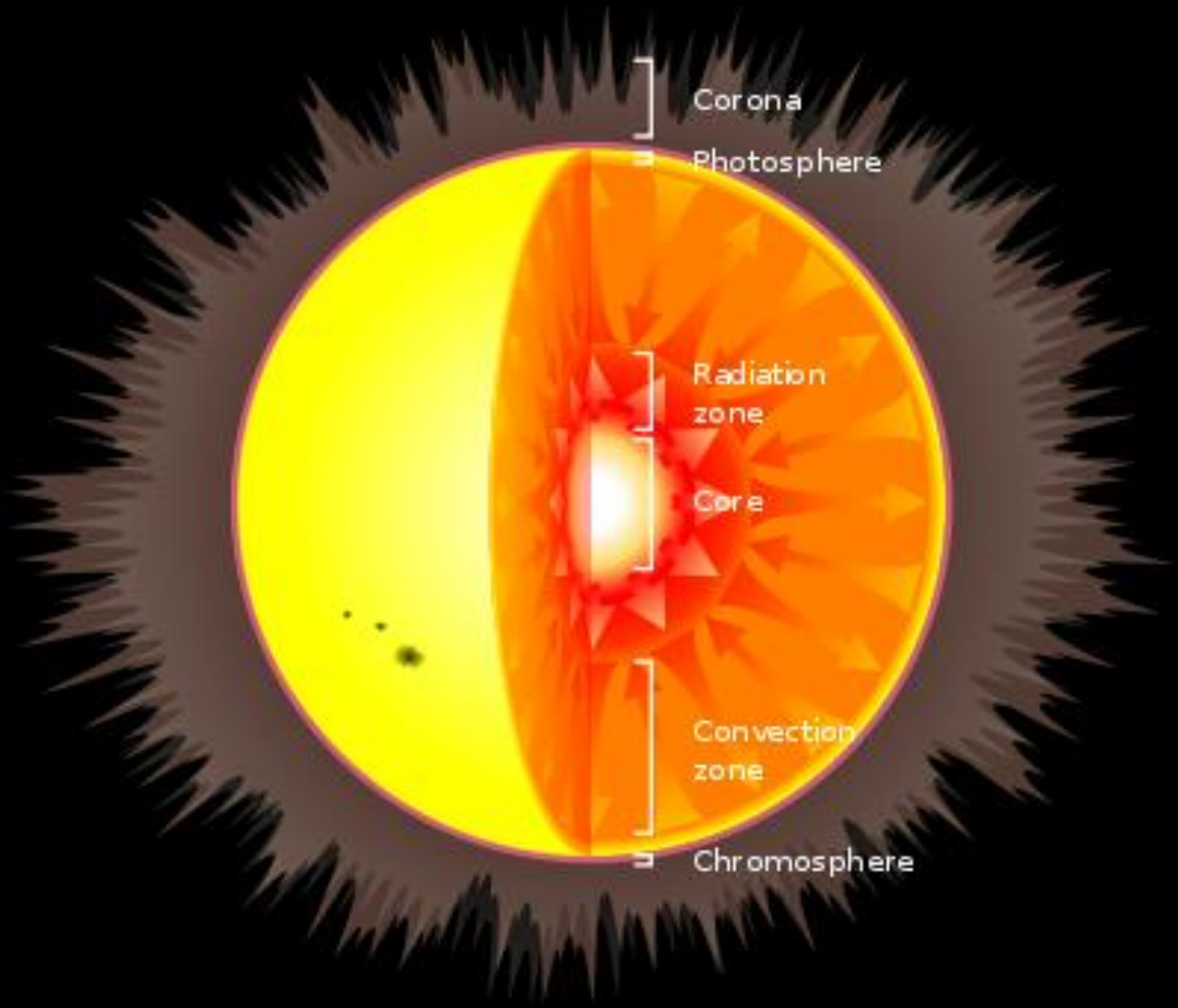
Moon Illusion



Seasons Review



The Sun


Corona
Photosphere
Radiation zone
Core
Convection zone
Chromosphere

LUNAR ECLIPSE


Next Total Lunar Eclipses
January 21, 2018 Early Morning
January 21 2019 Early Evening.


©2001 F. Espenak
www.MrEclipse.com

Moon's shadow on Earth taken by French cosmonaut Jean-Pierre Haigneré aboard the Mir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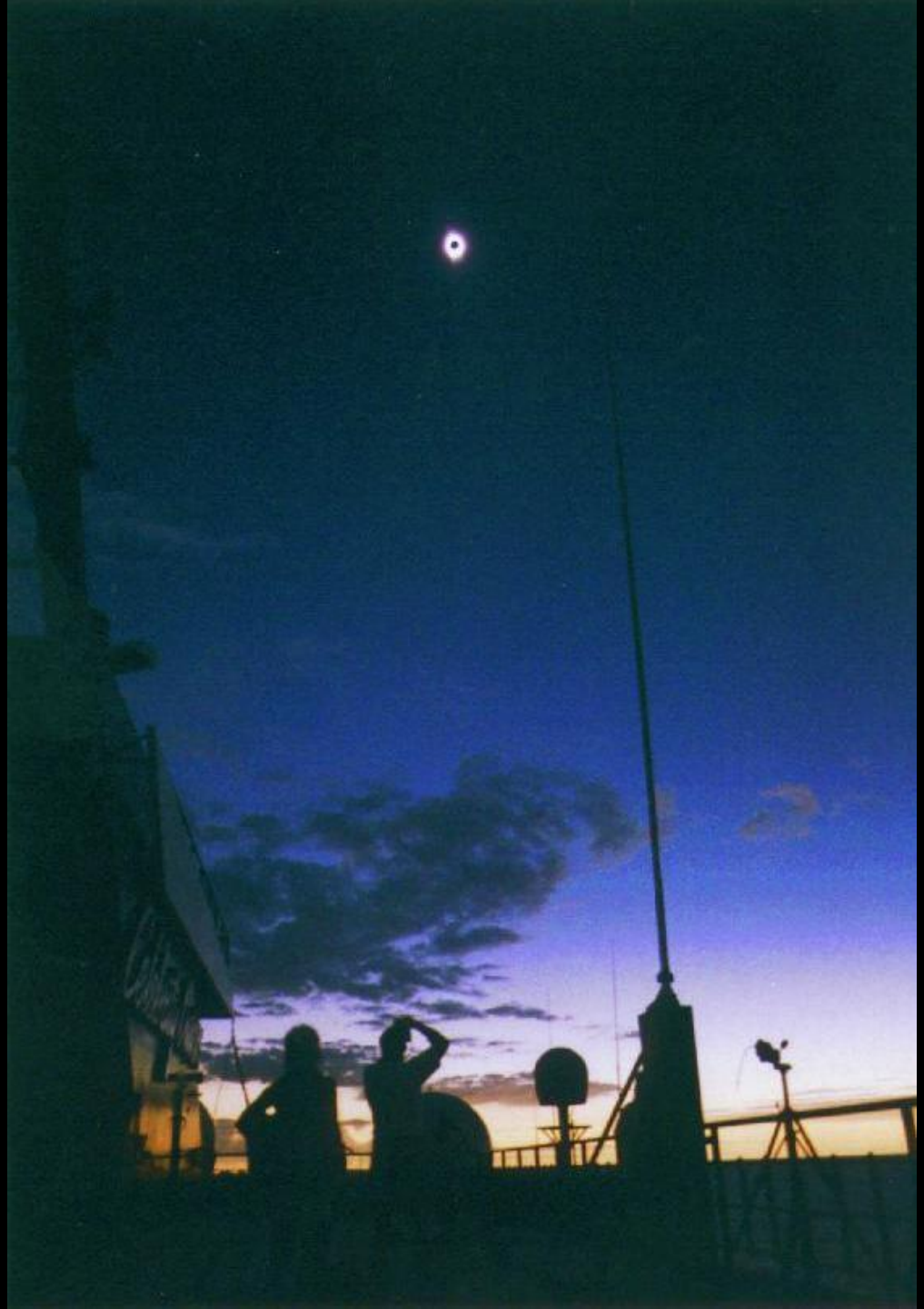
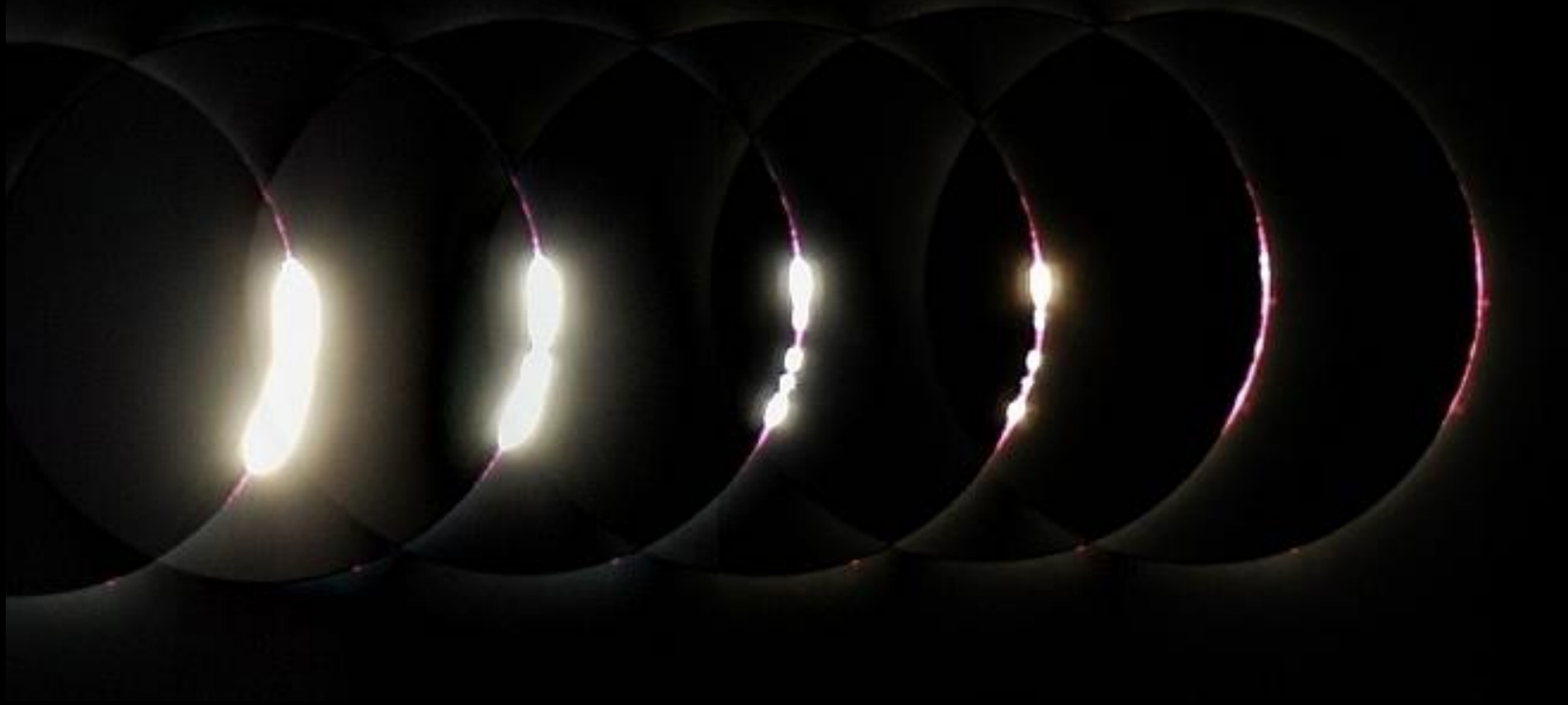


What do you see in a Solar Eclipse

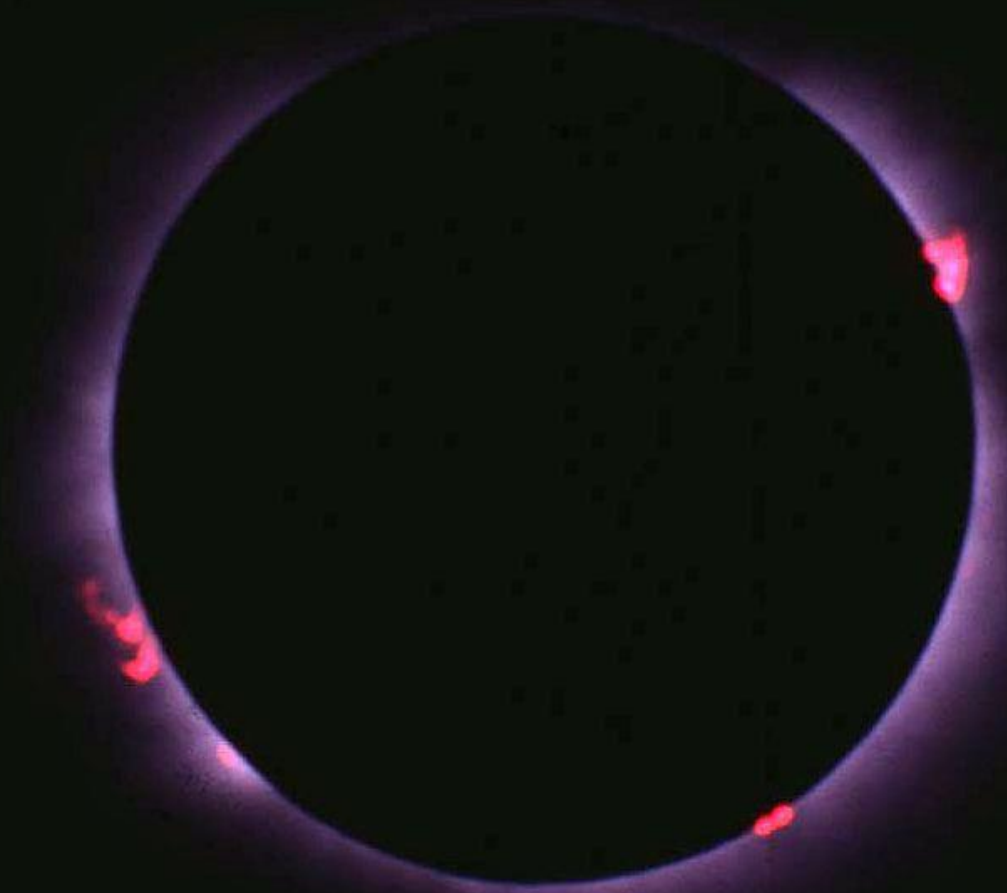
Moons Shadow

Baily's Beads



Diamond Ring

Solar Prominences



The Corona

Great American Eclipse August 21 2017
Independence Oregon, Images by Chanan Greenberg
Composite Image

Eclipse Questions

Regarding the map of future eclipses…

- Why do the eclipse paths run in different directions (in 2024 the path runs from southwest to northeast but this past August it ran northwest to southeast)?
- Why are the bands of totality thick when they are near the poles?
- Why is totality in a different place every time?
- What are the aspects of the moon's orbit (shape and plane?) that affect eclipse location, duration, etc.?

Why do the eclipse paths run in different directions (in 2024 the path runs from southwest to northeast but this past August it ran northwest to southeast)?

Why are the bands of totality thick when they are near the poles?

- The Earth is a sphere so strait paths appear curved on a flat map.
- The tilt of the Earth causes seasons. The tilt also causes the ecliptic (the plane of the orbit of the Earth, Moon and other planets) to trace a slanted path across the Earth.
- This slanted path is the most extreme at the Equinoxes.
- The Earth's curve also means that the Moon's shadow is wider near the poles.

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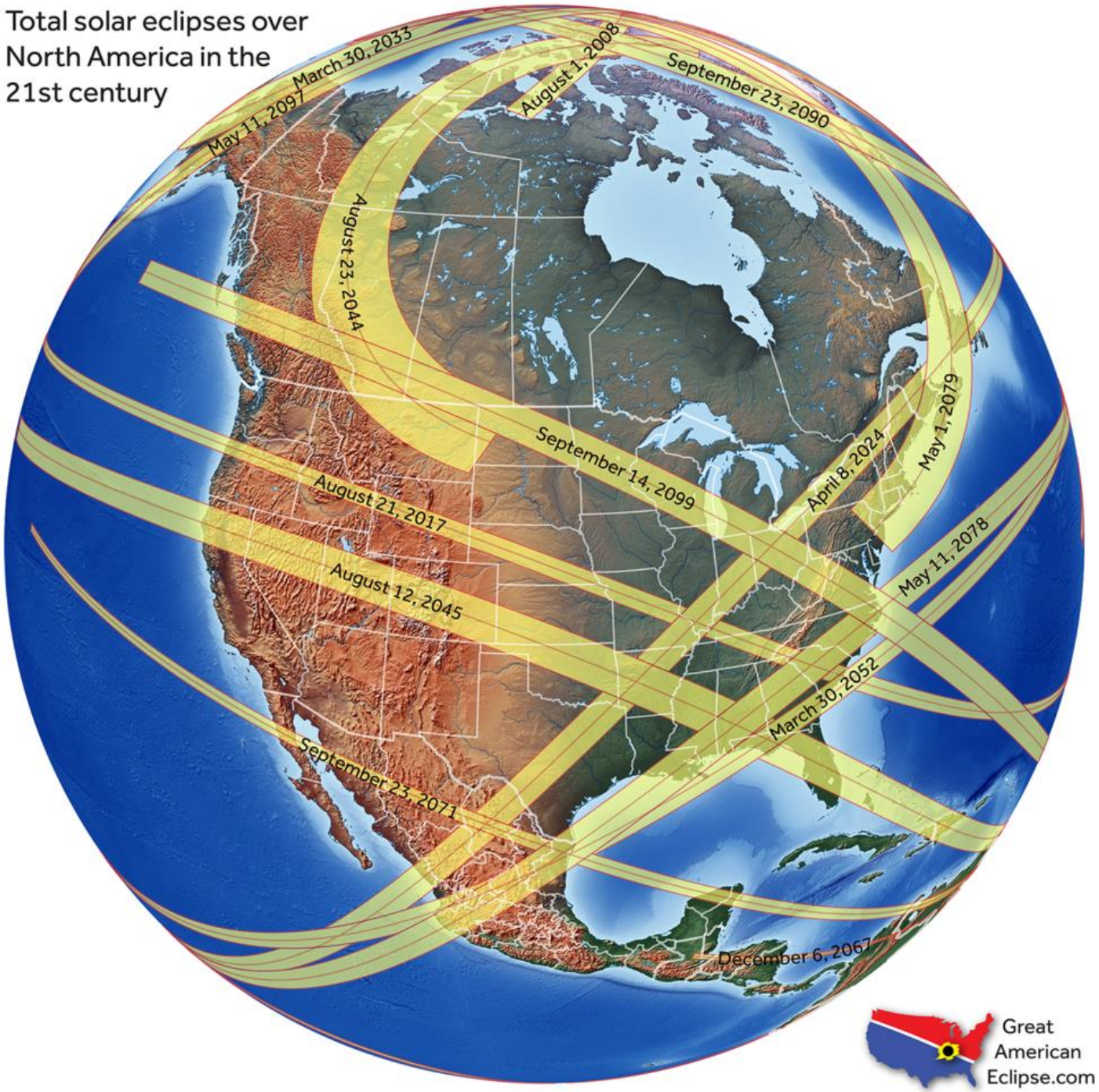
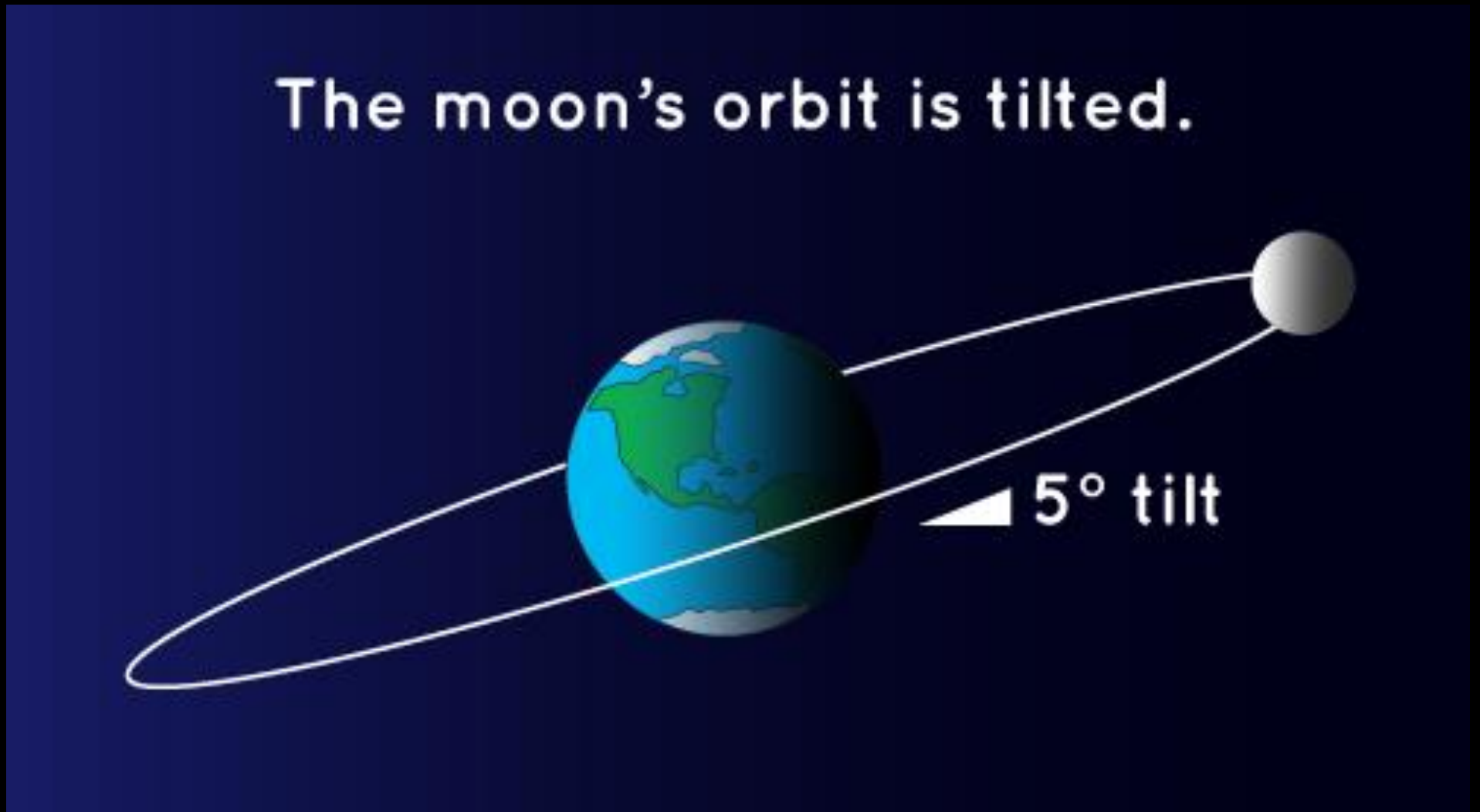

Total solar eclipses over North America in the 21st century
March 30, 2033
May 11, 2097
August 1, 2008
September 23, 2090
August 23, 2044
September 14, 2099
August 21, 2017
August 12, 2045
April 8, 2024
May 1, 2079
May 11, 2078
March 30, 2052
September 23, 2071
December 6, 2067
Great American Eclipse.com

Why is totality in a different place every time?

Earth and Moon Orbit Timing

- The Moon orbits the Earth every 27 1/3 days.
- Earth orbits the sun every 365 ¼ Days.
- The same spot gets a total solar eclipse about every 375 years!
- There is a total solar eclipse about every 18 months.

- What are the aspects of the moon's orbit (shape and plane?) that affect eclipse location, duration, etc.?



Eclipse Questions

Regarding the eclipse paths and what you see…

- What do you see at the edge of totality compared to the center line? We heard something about it being more colorful?
- Is there a clearly defined edge of totality? Could you step from out to in within the two minutes of darkness? In other words, what distance would you have to travel to move from outside totality to completely inside it?
- Why do some areas see partial eclipses and others total?
- What is the bright part of the sun that you can still see during a solar eclipse? Why can we see it even when the sun is entirely blocked by the moon?
- At the eclipse on Aug. 21, somebody talked to me about watching the approaching shadow instead of watching the sun get covered? In the moment, however, I forgot to look behind me. What does the approaching shadow look like?
- What are typical animal reactions to a total eclipse?

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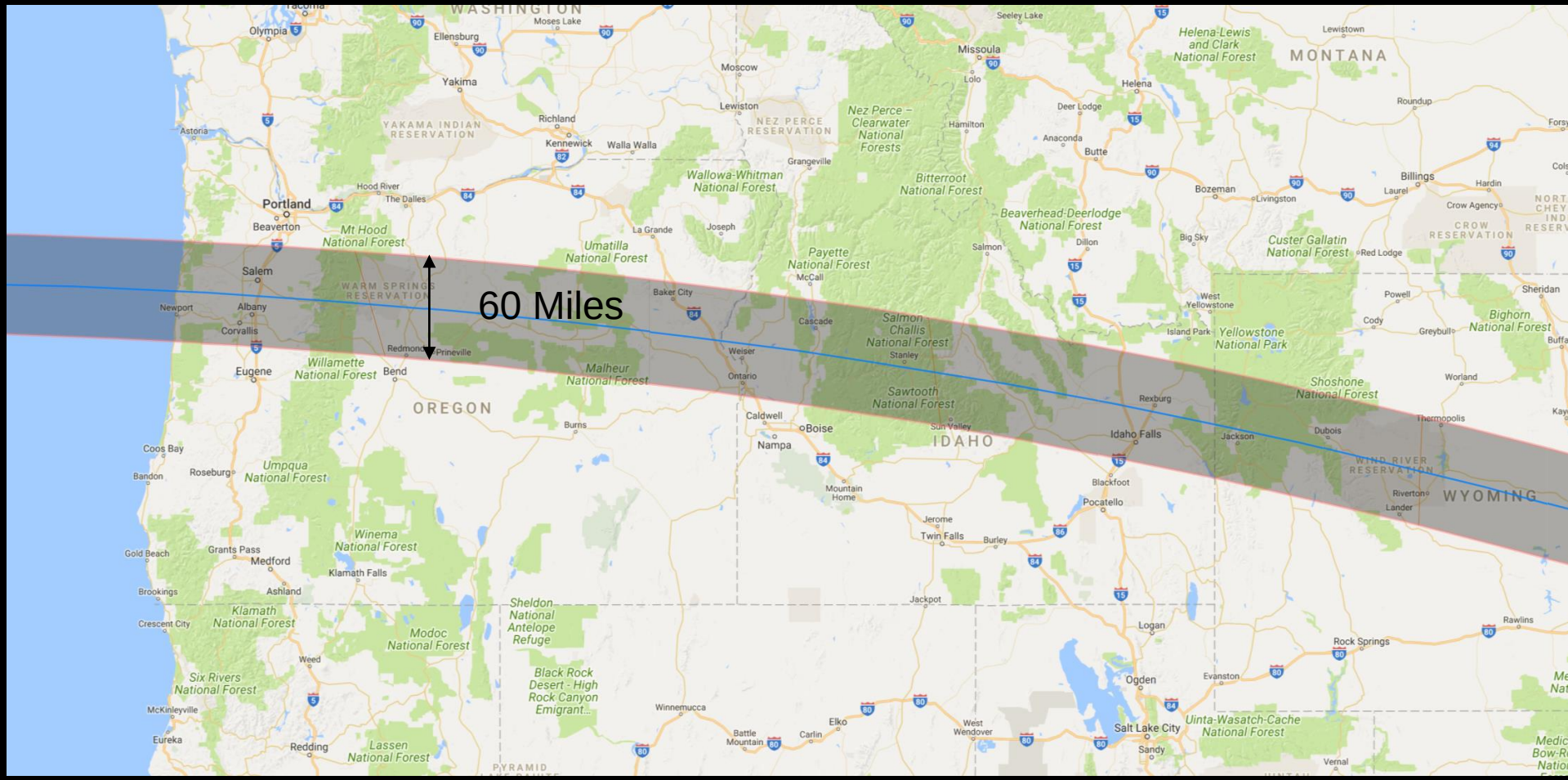

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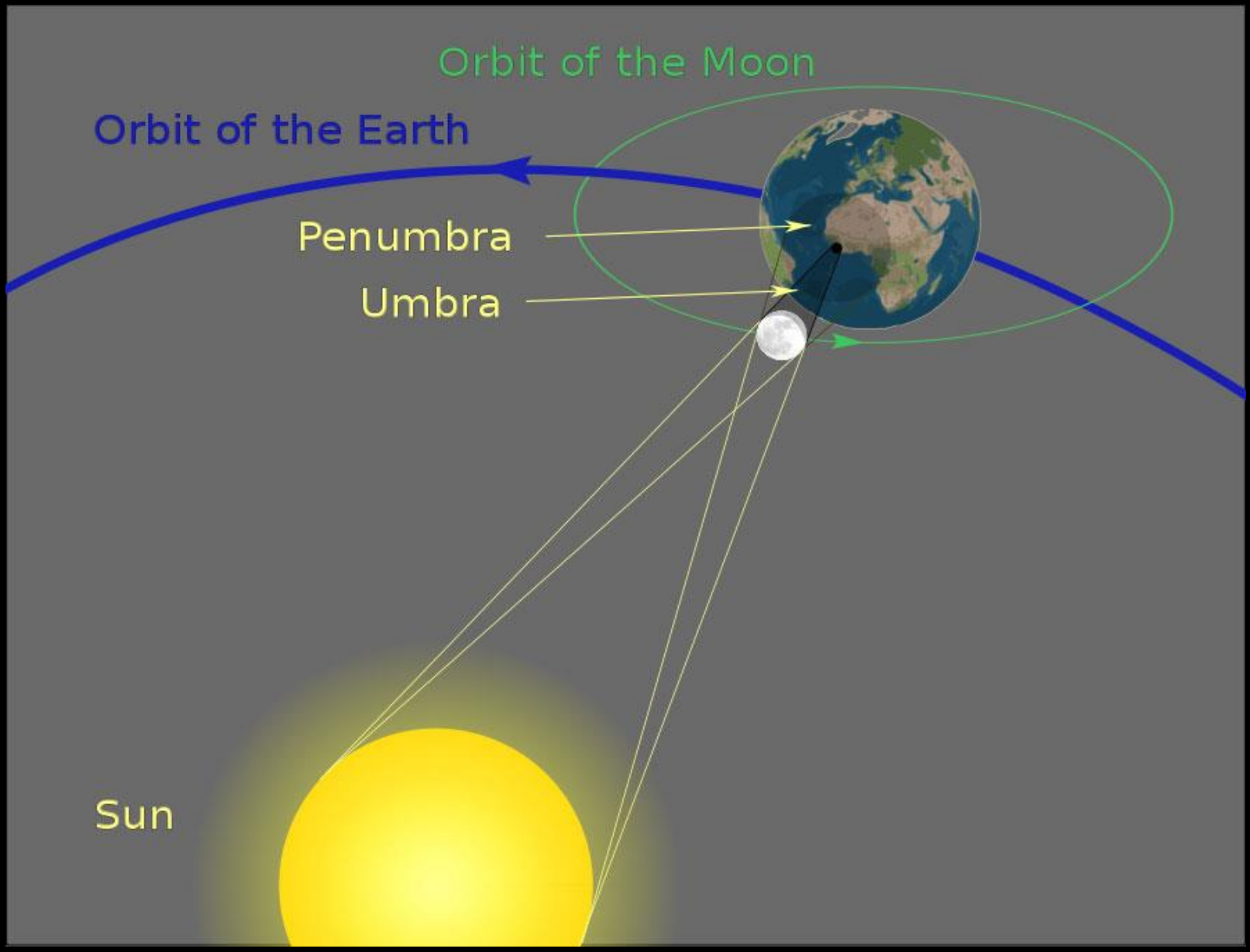


At the eclipse on Aug. 21, somebody talked to me about watching the approaching shadow instead of watching the sun get covered? In the moment, however, I forgot to look behind me. What does the approaching shadow look like?

Answer:

- During an eclipse the Moon’s shadow's speed can be anywhere from 1,100 mph at the equator to 5,000 mph at the poles.
- The Shadow was moving at 2,293MPH in central Oregon.
- You can sometimes see the shadow approach if you are in a position to see distant objects.
- The final shadow approach can only be seen as a brief impression, like a bullet in flight,

What are typical animal reactions to a total eclipse?

Eclipse Questions

Regarding eyes and eclipse glasses

- Would a welding helmet work as eclipse glasses?
- Why does the sun look orange through the glasses?
- How long can your eyes tolerate looking at the sun without damage? One second? Tenths of a second?
- How does looking at the sun during an eclipse (or not during an eclipse) burn your eyes?
- What are the glasses made of? How do they work?

Other…

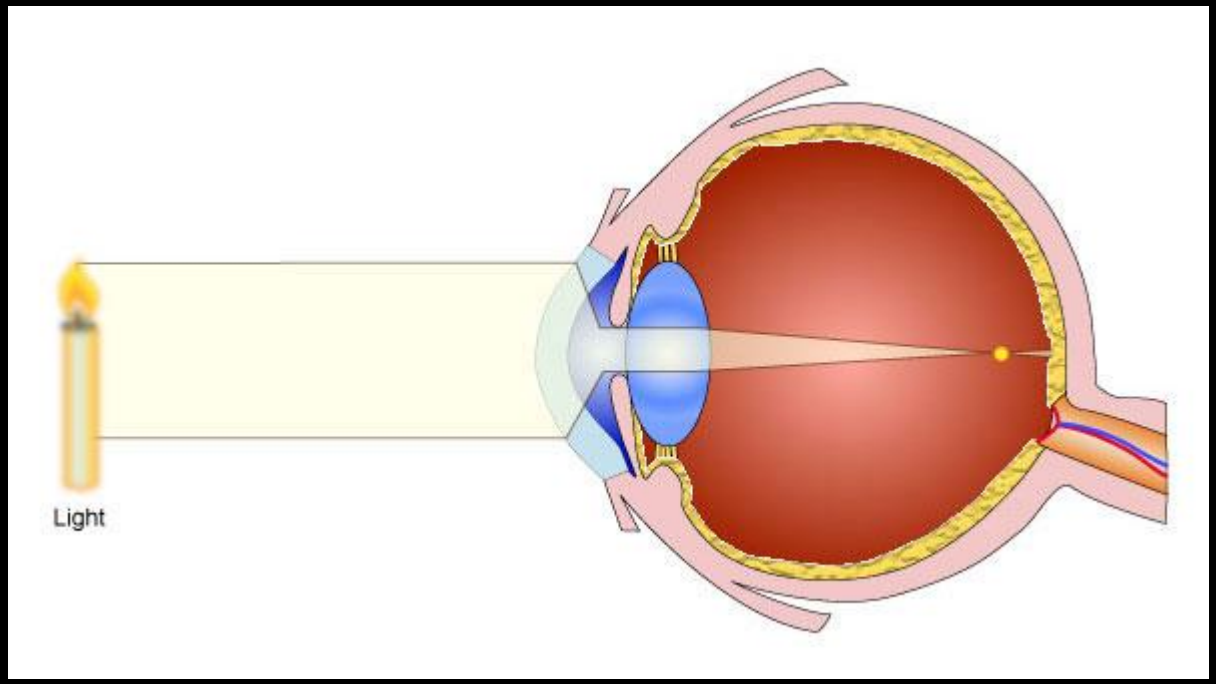
- How many total solar eclipses have you seen? Where were they and when?
- How many lunar eclipses have you seen?
- Where should the students and I meet if we want the best show possible in 2024?

Would a welding helmet work as eclipse glasses?
Why does the sun look orange through the glasses?
What are the glasses made of? How do they work?

A welders helmet is only safe if it has at least shade 14 glass (most don't)

Reputable eclipse glasses are safe

How long can your eyes tolerate looking at the sun without damage?
One second? Tenths of a second?
How does looking at the sun during an eclipse (or not during an eclipse) burn your eyes?



Never look at the Sun through an unprotected Telescope. Binoculars, Spotting Scope etc.

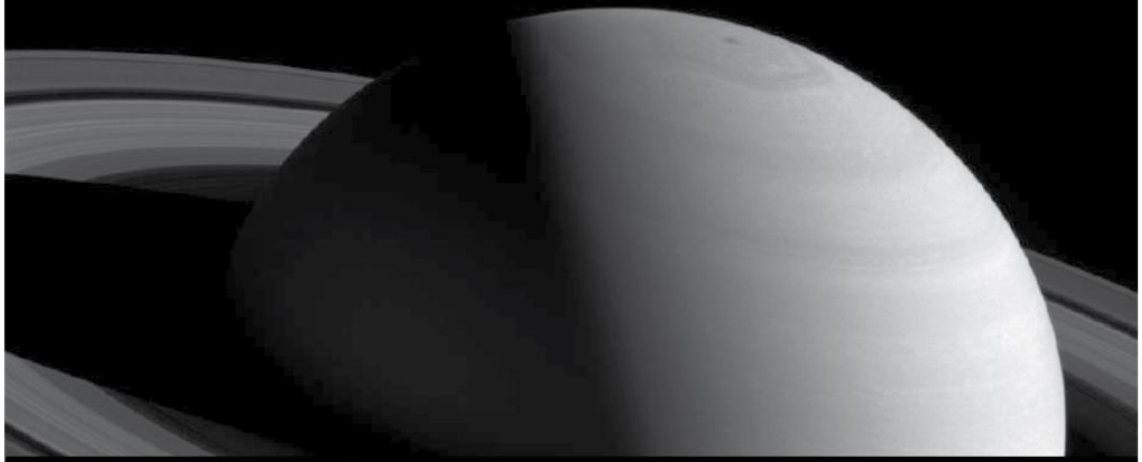
Last Quuestions

- How many total solar eclipses have you seen? Where were they and when?
- How many lunar eclipses have you seen?
- Where should the students and I meet if we want the best show possible in 2024?

The April 8, 2024 Eclipse will be visible from:

Dallas
Austin
Indianapolis
Cleveland
Buffalo
Syracuse
Rochester
Montreal
And many smaller towns.

Family Science & Astronomy Festival + Makerspace



Saturday, September 30, 2017 • 2–11 pm (workshops 2–6 pm)

College of San Mateo

Family Science & Astronomy Festival + Makerspace Program

EVENT	PRESENTED BY	TIME	LOCATION
Planetarium Show ●	Darryl Stanford	2 pm	Planetarium
When Anatomy Students Make Cookies ●	Carlene Tonini-Boutacoff	2 pm	36-217
A Bone to Pick	Lakshmikanta Sengupta Michele Titus		
Sun and Moon ●	SMCAS	2–3:30 pm*	36-Outdoors
Secrets of the Living World ●	Kathy Diamond Ellen Young Rachel Cunningham	2–5:30 pm	36-200
Color Awesome! ●	John Dao, STEM Club	2–5:30 pm*	36-223
Tooth Sleuth ●	Linda Hand	2–6 pm*	36 Sandbox
Dinosaur Name Matching Contest ●	Linda Hand	2–6 pm*	36-First Floor Lobby
Physics for Everyone! ●	David Locke, John Atkins	2-6 pm*	36-114
Coloring Station ●	CSM Library Makerspace	2–6 pm*	CSM Library
Cyanotype: The Art of Sun Printing ●	CSM Library Makerspace	2–6 pm*	CSM Library
Make Stitch Art Cards ●	Cassandra King (CSM Library)	2–6 pm*	CSM Library
Yarn Arts: God's Eye, Looms, Needles ●	Cassandra King (CSM Library)	2–6 pm*	CSM Library
Robotics: Programmable Pumpkin Lights ●	CSM Robotics Club	2–6 pm*	CSM Library
Build and Create with Legos *(ages 3+)* ●	CSM Library Makerspace	2–6 pm*	CSM Library
Build and Create with Keva Planks *(ages 6+)* ●	CSM Library Makerspace	2–6 pm*	CSM Library
Make Paper Helicopters *(ages 6+)* ●	CSM Library Makerspace	2–6 pm*	CSM Library
3-D Printing Demonstration ●	Kalina Tabatt (CSM Library)	2–6 pm*	CSM Library
Make Your Own Buttons *(While supplies last. Recommended for ages 8+)* ●	Bryan Gerbig (CSM Library)	2–6 pm*	CSM Library
Face Painting & Make Up Station *(ages 3+)* ●	Cosmetology Dept. Students	2–6 pm*	CSM Library
Cosmos Video ●	SMCAS	2–6 pm*	36-125
SMCAS Information/membership table ●	San Mateo County Astronomical Society (SMCAS)	2–6 pm*	36-first floor lobby
Comet Chef (making comets)	SMCAS	2–6 pm*	Planetarium Patio
The Sun-Solar Observing ●	SMCAS	2–6 pm*	Bridge
Construct Planispheres ●	SMCAS	2–6 pm*	36-112
Learn About the Nature of the Universe! ● ●	KIPAC astrophysicists will answer questions about near-space to the edges of the known Universe and beyond.	2–6 pm*	36-109

● *Astronomy Event* ● *Science Event* ● *Makerspace Event* **Asterisk by event time signifies a drop-in event*

Family Science & Astronomy Festival + Makerspace Program

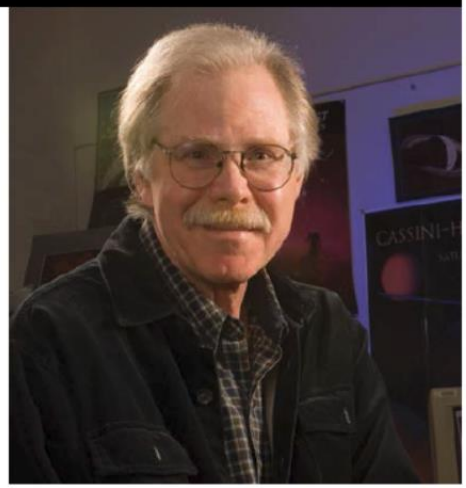
EVENT		PRESENTED BY	TIME	LOCATION
Planetarium Show	●	Darryl Stanford	3 pm	Planetarium
When Anatomy Students Make Cookies **A Bone to Pick**	●	Carlene Tonini-Boutacoff Lakshmikanta Sengupta Michele Titus	3 pm	36-217
Planetarium Show	●	Darryl Stanford	4 pm	Planetarium
When Anatomy Students Make Cookies **A Bone to Pick**	●	Carlene Tonini-Boutacoff Lakshmikanta Sengupta Michele Titus	4 pm	36-217
How a Telescope Works	●	SMCAS	4–6 pm*	36-first floor lobby
Planetarium Show	●	Darryl Stanford	5 pm	Planetarium
When Anatomy Students Make Cookies **A Bone to Pick**	●	Carlene Tonini-Boutacoff Lakshmikanta Sengupta Michele Titus	5 pm	36-217
Planetarium Show	●	Darryl Stanford	6 pm	Planetarium
Lecture				
Keynote Speaker + Reception: **Dr. Jeffrey N. Cuzzi** *(see below)*	●	Math Science Division	7:30–9 pm	CSM Theatre
Star Gazing				
CSM Observatory - Jazz Under the Stars *(weather permitting)*	●	Justin Stevick & Darryl Stanford	9:15–11 pm	CSM Observatory

Cassini: Thirteen Years at Saturn

Dr. Jeffrey N. Cuzzi • 7:30 pm • CSM Theatre

The NASA-ESA Cassini-Huygens mission to the Saturn system has just completed its spectacularly successful thirteen-year data-taking phase, with the orbiter plunging into the planet's atmosphere on September 15. This talk will review the scope and results of the Cassini orbiter mission. Emphasis will be on studies of Saturn's Rings, but there will be some discussion of results on the moons and the planet itself.

Dr. Jeffrey N. Cuzzi is the Interdisciplinary Scientist for Rings and Dust on the Cassini Mission. He has studied Saturn's Rings for over 40 years, and was invited to join the Voyager Imaging team to lead the design and analysis of Voyager image of the rings of Saturn, Uranus, and Neptune.



Front cover Saturn image and Cassini rendering courtesy of NASA.

Questions?

THE END