MTSU Department of Physics & Astronomy

The Great Tennessee Eclipse
2017

Goal for today

Convey our excitement for the eclipse, and hope you catch it.
Why do we care so much?

• How many have witnessed a total lunar eclipse?
• How many have witnessed a total solar eclipse?
Lunar Phases

Lunar Eclipse Geometry
Solar Eclipse Geometry

The last Middle TN total solar eclipse?

- 20,000 years ago
- 65 million years ago
- 500 years ago
- 65 years ago
Last occurrence: 1478

• In 15 years Columbus will land in the Caribbean
• In 25 years Leonardo will paint Mona Lisa
• In 120 years Shakespeare will write “Romeo and Juliet”

Next opportunity: 2566
Total Solar Eclipse Frequency

- Average time between total solar eclipses for location on Earth = 375 years.
- Actual time between total solar eclipses can vary from 18 months to over 2000 years.

- Theoretical limit on duration is 7 min 32 s.
- On August 21, 2017, the peak duration will be 2 min 40 s at Hopkinsville, KY.

WHY are they so rare?
Geometry

• Compare relative sizes of the Sun, Earth, and the Moon.

• Put them at the proper distance for our scale.

1) The Moon’s orbit is tilted by 5°

As a result, solar eclipses occur only every 6th new moon (twice per year).
2) The Distance to the Moon Varies

As a result, the angular size varies by 14%, and total solar eclipses occur every 18 months. The moon at Apogee cannot produce totality.

3) The Lunar Shadow is narrow and fast

The shadow diameter on August 21, 2017 will average 68 miles.

Average shadow speed is over 1,600 mph.
4) The Shadow Does Not Last Long

The shadow crosses the US in about 90 minutes. Total duration is just over 3 hr.

Totality during a given solar eclipse is experienced by less than 0.2% of earth’s surface.

Syzygy – a 3-Body Alignment
Eclipse Cycles

Solar Eclipses 1996-2020

Saros Cycle
18.03 years

Eclipse Path

Total Solar Eclipse of 2017 August 21
Eclipse Path

Eclipse Path
Maps Where will you be on August 21 at 1:28 pm?
A Once-in-a-Lifetime Day

August 21, 2017 Schedule at MTSU:

11:00 am: Campus festivities begin
11:59 am: First contact! The moon begins to pass in front of the sun.

1:29:08 pm - Totality!
1:30:17 pm: Darkness falls across campus

2:55 pm: Last contact
3:00 pm: Campus festivities end

We will have solar glasses …

astronomers …
telescopes …

What’s it like?

August 21, 2017

• Changing daylight
• Diamond rings and beads
• Temperature will feel different
• Changes in nature

Credit: Rick Fienberg
You Might See …

- Mercury
- Sun
- Arcturus
- Jupiter
- Mars
- Venus
- Procyon
- Sirius
- Regulus
- Ecliptic Plane

How many stars and planets will you see?

- Arcturus
- Regulus
- Mars
- Mercury
- Venus
- Procyon
- Sirius
- Ecliptic Plane
Other Videos

Australia, 2012 (3:39)
https://www.youtube.com/watch?v=KZ2npH7zZ4A

2017 Simulation from Hopkinsville, KY (1:31)
https://www.youtube.com/watch?v=vzJqeyxye_E

2016 Solar Eclipse (3:42)
http://space.rice.edu/eclipse/solar_eclipse_2016/reiff_video/totality_253_Masked.mp4

2012 Solar Eclipse (0:31)
http://space.rice.edu/eclipse/solar_eclipse_2012/Ken_Offit/

11 July 2010 Solar Eclipse (10:12, best part is 3:00 – 4:00)
http://space.rice.edu/eclipse/solar_eclipse_2010/videos/
Safety

1. Solar Eclipse Glasses
2. Telescope with solar filter
3. Pinhole projection
4. Welders’ goggles (#14 or darker)
5. Stand under a tree

More Information

www.mtsu.edu/eclipse
https://eclipse2017.nasa.gov/