



*International*  
OBSERVE THE  
**MOON**  
NIGHT  
2016

# October

SAVE THE DATE

8<sup>TH</sup>



#observethemoon

OBSERVETHEMOONNIGHT.ORG

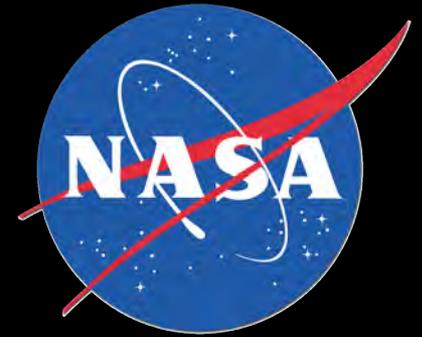
Planets, Moons and Meteorites, Oh My!

# Who We Are: Ask a Scientist!



**Heliophysics & Planetary  
Science Office**

Barbara Cohen, Lunar and Planetary Scientist  
Renee Weber, Lunar and Planetary Scientist  
Mitzi Adams, Solar Physicist



Marshall Space  
Flight Center

**Meteoroid Environment Office**

Bill Cooke, Program Manager

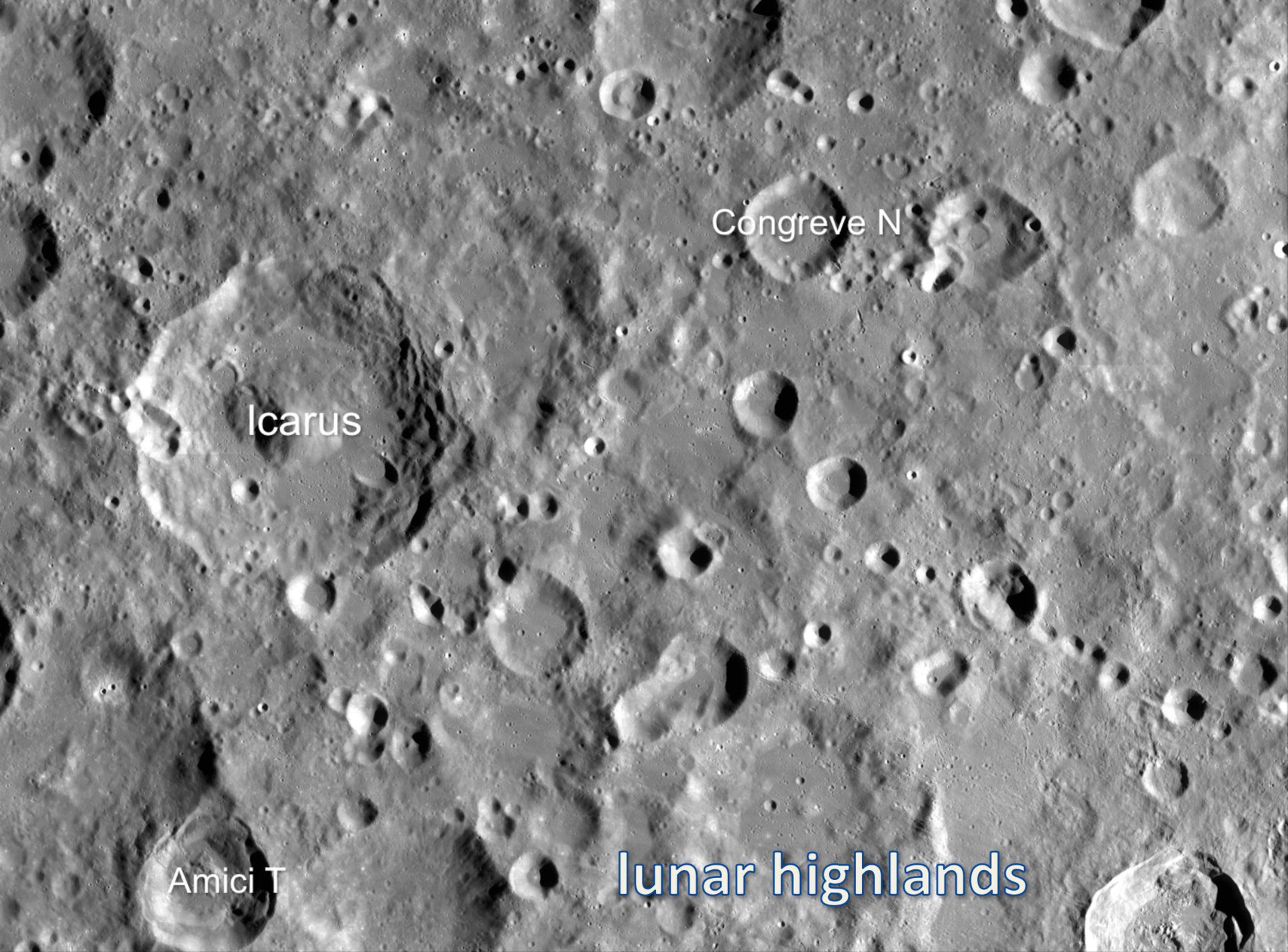


lunar mare



25 km



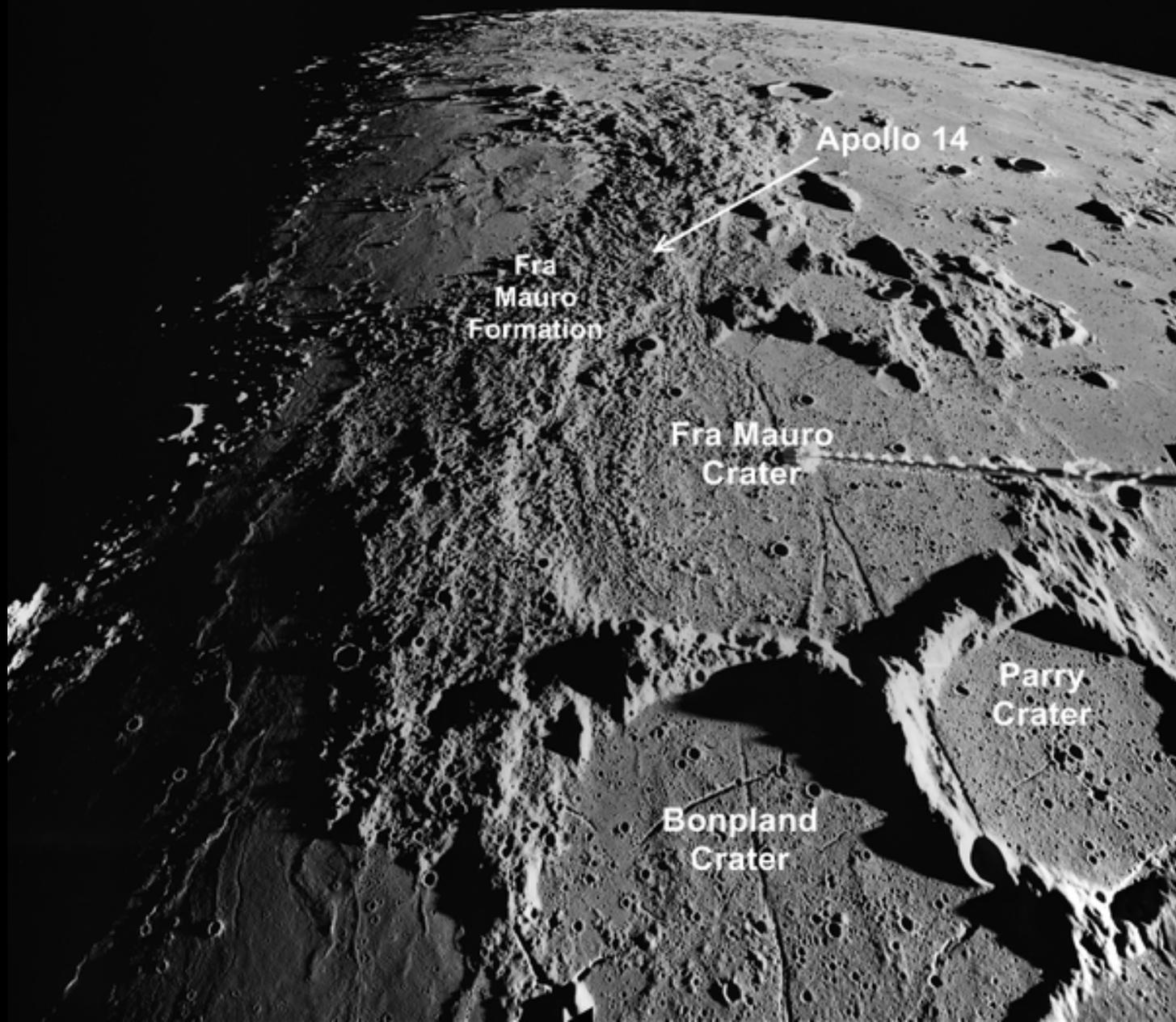


Icarus

Congreve N

Amici T

**lunar highlands**



Apollo 14

Fra  
Mauro  
Formation

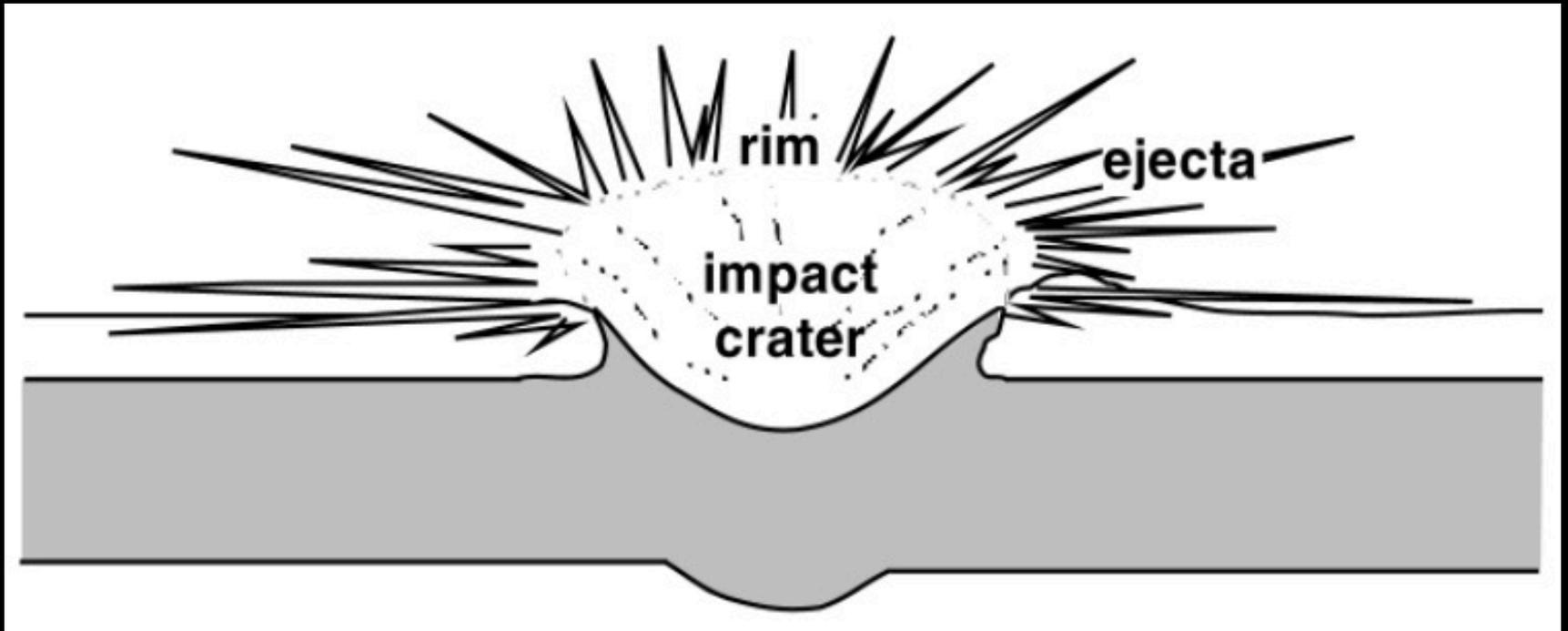
Fra Mauro  
Crater

Parry  
Crater

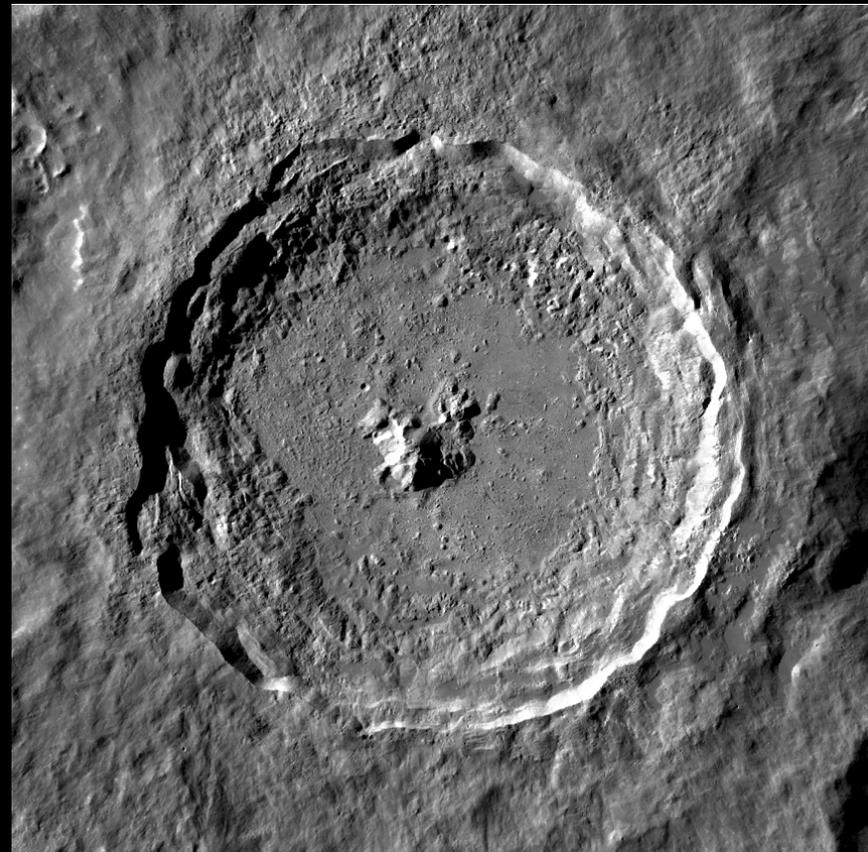
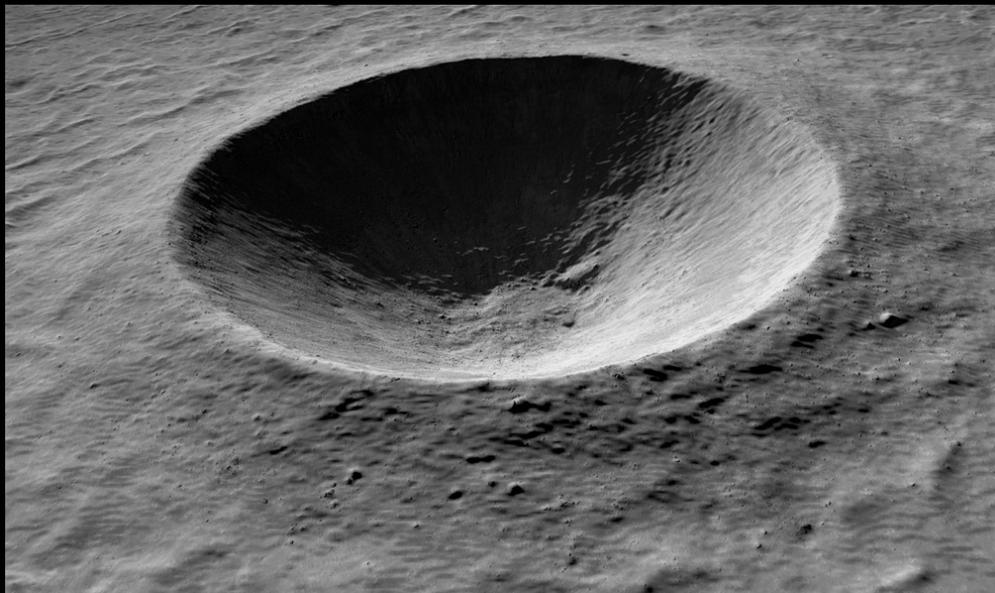
Bonpland  
Crater

impact craters





crater formation and ejecta patterns



crater types

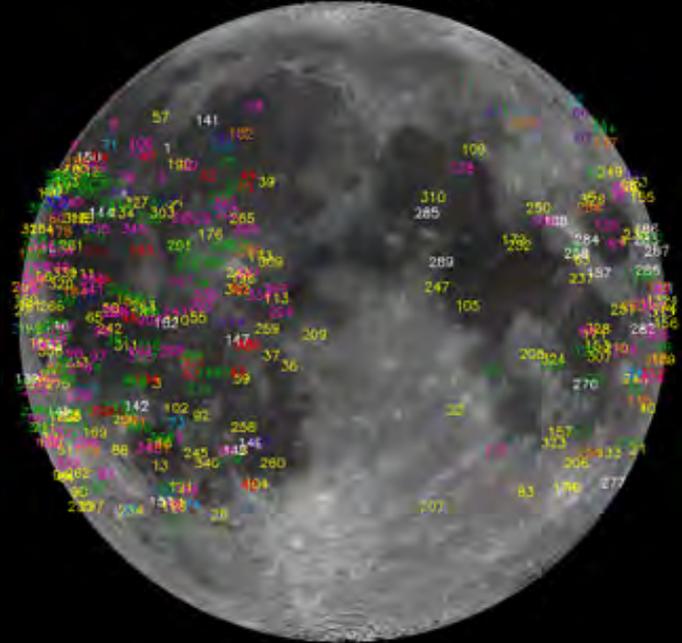
11.17.2006



impact flash monitoring



2005–2016 MEO Impact Candidates



# The Great American Solar Eclipse

August 21, 2017

National Aeronautics and  
Space Administration



## What is a Solar Eclipse?

A solar eclipse happens when the Moon, as it orbits Earth, fully or partially blocks the light of the Sun, thus **casting its shadow on Earth**.

Observers within the *path of totality* can expect to see something like the image below. Observers outside the path of totality will see the Sun partially eclipsed as a crescent Sun (with safe filters).

## Maximum Eclipse

Time	Location
10:17am PDT	Lincoln Beach, OR
	Depoe Bay, OR
11:26am MDT	Lime, ID
1:19pm CDT	Valley View, MO
	Bloomsdale, MO
1:26pm CDT	Hopkinsville, KY
1:28pm CDT	Calistia, TN
2:47pm EDT	Bethera, SC

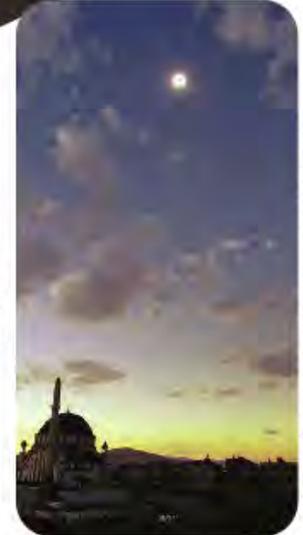
After the 2017 solar eclipse, the next total solar eclipse visible over the continental United States will be on April 8, 2024.

The last total solar eclipse to cover this much of the country was on June 8, 1918.

If the Sun is scaled to about 10 cm (3.9 in), Earth would be about 10 meters away (33 feet).



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## The predicted path of the August 21, 2017 solar eclipse

Duration of Greatest Eclipse:  
2 min 40 sec  
(18:25 UT=13:25 CDT or 1:25 p.m. CDT)

Location of Greatest Eclipse:  
36 deg 58 min N; 87 deg 40 min W  
(between Princeton, KY and Hopkinsville, KY)

Path Width: approximately 115 km

Eclipse predictions by Fred Espenak, GSFC, NASA Emeritus



**Never look directly at the Sun unless you have filters that you know are safe.**

For more information:

<http://eclipse/gsfsc.nasa.gov/SEhelp/safety.html>

For more information about solar eclipses:

<http://eclipse.gsfc.nasa.gov/solar.html>

<http://eclipsewise.com/solar>

<http://eclipse2017.org/>

[www.nasa.gov](http://www.nasa.gov)



<http://mail.colonial.net/~Halter/index.html>

The NASA image above shows the Moon's umbral shadow as seen from the International Space Station during the total solar eclipse on 29 March 2006.

Mitzi Adams • [mitzi.adams@nasa.gov](mailto:mitzi.adams@nasa.gov) • 256-961-7626

FL-2016-06-52-MSFC G-157953

# Safely Observing the Sun

**WARNING:** Never look directly at the Sun without proper eye protection. You can seriously injure your eyes.



## Mirror in an Envelope

Slide a mirror into an envelope with a ragged hole cut into the front. Point the mirror toward the Sun so that an image is reflected onto a screen at least 5 meters (about 15 feet) away. The longer the distance, the larger the image.

**Do not look at the mirror, only at the screen.**

Photograph (below) Copyright © Elisa J. Israel



## Strange Shadows!

Sunlight through trees produces projected crescents during partial phases.

## Go Stick Your Head in a Box

You can make this simple "eclipse telescope" with some cardboard, paper, tape, and foil.

The longer the distance from the pinhole to the screen, the larger the image of the Sun will be.

White paper screen taped to inside end of box

Small image of partially eclipsed Sun



## Sun Funnel

Make this device for your telescope with simple instructions at: [www.astrosociety.org/toiv/Build\\_a\\_Sun\\_Funnel.pdf](http://www.astrosociety.org/toiv/Build_a_Sun_Funnel.pdf)

## Cool in the Shades

Visit the Von Braun Astronomical Society (or your local astronomical society) and pick up a pair of these special Eclipse Sunglasses!

[www.vbas.org](http://www.vbas.org)



## Local Area Eclipse Details

Location	% Covered	Start (CDT)	Max (CDT)	End (CDT)
Nashville, TN	100.0%	11:58AM	1:28PM	2:54PM
Totality begins 1:27PM • Totality ends 1:29PM				
Brentwood, TN	100.0%	11:58AM	1:28PM	2:54PM
Totality begins 1:28PM • Totality ends 1:29PM				
Franklin, TN	99.9	11:58AM	1:28PM	2:54PM
Fayetteville, TN	98.2	11:59	1:30	2:56
Ardmore, AL/TN	97.3	11:59	1:29	2:55
Florence, AL	95.9	11:57	1:28	2:54
Athens, AL	96.7	11:59	1:29	2:56
Decatur, AL	96.1	11:59	1:30	2:56
Hartselle, AL	95.8	11:59	1:30	2:56
Madison, AL	96.7	11:59	1:30	2:56
USSRC	96.8	11:59	1:30	2:56
Huntsville, AL	97.0	11:59	1:30	2:56
VBAS	97.1	12:00PM	1:30	2:56
Arab, AL	96.0	12:00	1:31	2:57
Gurley, AL	97.1	12:00	1:31	2:57
Guntersville, AL	96.4	12:01	1:31	2:57
Scottsboro, AL	97.4	12:01	1:31	2:57
Bridgeport, AL	98.6	12:01	1:32	2:57

JAVA Script Solar Eclipse Explorer  
<http://eclipse.gsfc.nasa.gov/JSEX/JSEX-NA.html>

# Moon Phases 2016

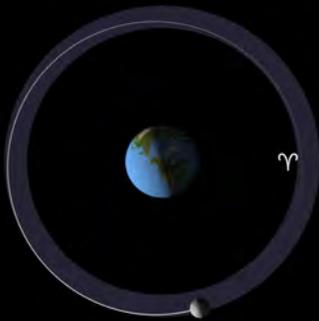
Including Libration and Position Angle



<b>Time</b>	01 Jan 2016 00:00 UT
<b>Phase</b>	61.6% (20d 13h 31m)
<b>Diameter</b>	1779.5 arcseconds
<b>Distance</b>	402771 km (31.61 Earths)
<b>Position</b>	11h 47m 20s, 01° 32' 56"N
<b>Subsolar</b>	1.502°N 74.460°W
<b>Sub-Earth</b>	0.205°S 2.095°E
<b>Pos. Angle</b>	24.955°

Phases of the Moon

**Moon Phases 2016**  
Including Libration and Position Angle



<b>Time</b>	09 Oct 2016 01:00 UT
<b>Phase</b>	48.7% (8d 00h 49m)
<b>Diameter</b>	1814.3 arcseconds
<b>Distance</b>	395037 km (31.00 Earths)
<b>Position</b>	18h 59m 54s, 18° 17' 53"S
<b>Subsolar</b>	0.869°N 85.140°E
<b>Sub-Earth</b>	5.713°S 6.317°W
<b>Pos. Angle</b>	353.233°

what you'll see tonight