The Sun and the Eclipse Across America
August 21, 2017

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ST13, NASA/MSFC

Image Courtesy of Dr. Alphonse Sterling, NASA/MSFC
August 1, 2008 Gansu Province, China
What IS the Sun?

The Sun is a Star
Stars are Mostly Hydrogen Gas

α-Cen-A is G2,
α-Cen-B is K1,
Proxima (α-Cen-C) is M6,

the Sun is G2
8.5 light minutes away

Betelgeuse is M2
643 ly

Bellatrix is B2
250 ly

Rigel is B8
860 ly

Saiph is B0
650 ly
Layers of the Sun

The Convection Zone
Energy continues to move toward the surface through convection currents of heated and cooled gas in the convection zone.

The Radiative Zone
Energy moves slowly outward—taking more than 170,000 years to radiate through the layer of the Sun known as the radiative zone.

Coronal Streamers
The outward-flowing plasma of the corona is shaped by magnetic field lines into tapered forms called coronal streamers, which extend millions of miles into space.

The Corona
The ionized elements within the corona glow in the X-ray and extreme ultraviolet wavelengths. NASA instruments can image the Sun’s corona at these higher energies since the photosphere is quite dim in these wavelengths.

Sun’s Core
Energy is generated by thermonuclear reactions creating extreme temperatures deep within the Sun’s core.

The Chromosphere
The relatively thin layer of the Sun called the chromosphere is sculpted by magnetic field lines that restrain the electrically charged solar plasma. Occasionally, large plasma features—called prominences—form and extend far into the very tenuous and hot corona, sometimes ejecting material away from the Sun.
What is an Eclipse?

An eclipse happens when one object blocks the light of another.

Images Used With Permission
Close to Hopkinsville, Kentucky (GE):

- Start of partial eclipse: 16:56 UT, 11:56 a.m. CDT
- Start of totality: 18:24 UT, 1:24 p.m. CDT
- Maximum eclipse: 18:25 UT, 1:25 p.m. CDT
- End of totality: 18:26 UT, 1:26 p.m. CDT
- End of partial eclipse: 19:51 UT, 2:51 p.m. CDT
What You Can See: Partial Eclipse

The entire United States will see a partial eclipse.
Use a Kitchen Colander or Trees For Partial Phases
Shadow Bands

Light shines through air, creating a wavy pattern similar to light through water in a pool.
Total Eclipse: Diamond Ring and Bailey's Beads
What You Can See: Total Eclipse

Zophia Edwards wide-angle view, from Jay Pasachoff's Eclipse 2013 page

Image Used With Permission
The Corona and Prominences

Rob Lucas, with Jay Pasachoff's 2013 Eclipse Expedition
Image Used With Permission
The Sky During Totality

Jupiter is to the east of the Meridian (left), Mercury, Mars, and Venus to the west.

Eclipsed Sun and Regulus
Safely Viewing an Eclipse
How to Safely Observe An Eclipse

No Special Rules for Lunar Eclipses

For Solar Eclipses:

- Projection
- Special Telescope Filters
- Eclipse Glasses
- Number 14 Welder's Glass
Eclipse Glasses and Welder's Glass

Number 14 or Higher!
Solar Filters for Telescopes
More Information

http://www.astrosociety.org/tov/Build_a_Sun_Funnel2.pdf

http://www.nasa.gov/offices/education/about/index.html

http://www.greatamericaneclipse.com/

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.

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.

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Sun Funnel
Make this device for your telescope with simple instructions at: www.astrosociety.org/tow/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

Photograph (below) Copyright © Elisa J. Israel

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Never look at the Sun directly without proper eye protection, except during totality of a solar eclipse.

During the partial phases of a solar eclipse you must use approved solar filters, solar glasses, solar eyewear, solar viewing glasses, or hard-hat solar viewers. Never use homemade or untested materials for direct solar viewing.

Check eclipse glasses for ISO number 12312 or European Union verification EOQ, which certifies that the product meets international standards.

**Partial Eclipse Glasses on**

The eclipse begins when the sun’s disc is partially blocked by the moon. The partial eclipse phase can last over an hour.

**Diamond Ring Glasses on**

The last of the sunlight streaming through the moon’s eclipse creates a single bright flash of light at the edge of the moon. This is known as the diamond ring effect, and it occurs the last few seconds before totality begins.

**Bailey’s Beads Glasses on**

As totality approaches, only the outer ring of the moon obscures the sunlight through, leaving tangerine spots of light called Bailey’s Beads.

**Totality**

Once the moon’s edge is completely across the sun, the moon completely reduces the amount of light. If you did not look at the eclipse before, this is the time to do so. Totality lasts for about 2 to 4 minutes.

**Final Stages Glasses on**

As a moment first begins to grow on the opposite side of the sun from where the Bailey’s Beads were at the beginning. This moment is the sun beginning to peak out from behind the moon and is your signal to stop looking directly at the sun now. Make sure you have your eclipse glasses back on.

**Safely observing the Sun!**

Warning! Never look directly at the sun without proper eye protection. You can severely injure your eyes. Check with local retailers, museums, astronomical societies, or local libraries for approved viewing glasses. You can purchase an ISO 12312-2 compliant and CE certified pair of these special glasses.

www.nasa.gov