Eclipses

Introduction & Bibliography

On Wednesday, 29 March 2006, a **total eclipse of the Sun** will be visible from within a narrow corridor which traverses half the Earth. Northwestern Egypt also lies within the umbral (total shadow) path where the central duration is 3 minutes 58 seconds. The path of the Moon's umbral shadow begins in Brazil and extends across the Atlantic, northern Africa, and central Asia where it ends at sunset in western Mongolia. A partial eclipse will be seen within the much broader path of the Moon's penumbral shadow, which includes the northern two thirds of Africa, Europe, and central Asia.[1]

What Does *Eclipse* Mean?

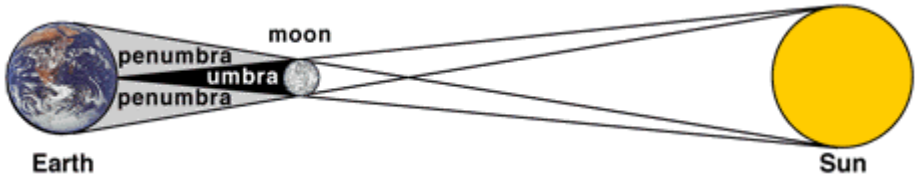
Eclipses are natural phenomena, which occur when three celestial objects become aligned, so that a celestial body is completely or partially obscured by another.

Eclipse Types

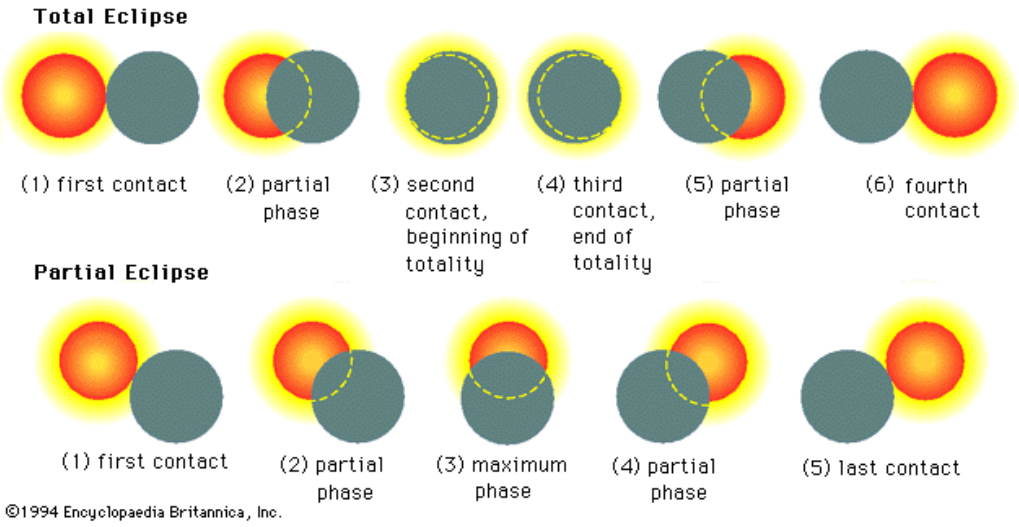
Solar eclipse happens when the Moon moves directly into the path between the Sun and the Earth, ***Lunar eclipse*** happens when the Earth moves directly into the path between the Sun and the Moon.

[1] *NASA Eclipse Home Page,* http://sunearth.gsfc.nasa.gov/eclipse/OH/OH2006.html

The following diagram shows a side view of the alignment in case of a solar eclipse: [2]



There are two types of solar eclipses: total and partial eclipses: [3]



Of these two, partial eclipses are much more common because the path of a total solar eclipse covers only a few kilometers and much of the time the shadow of the total eclipse does not even touch the Earth. In these instances we still see a partial eclipse, but we see none of the features of the total eclipse that make it a truly spectacular event.

Occasionally, when the Moon is far enough away from the Earth in its orbit and its apparent size is small enough, the Moon can pass directly in front of the Sun and not cause a total solar eclipse. This is called an ***annular eclipse***, and has the same features as a partial eclipse, except that the light from the Sun comes in the form of a ring (annular means ring in Latin) rather than part of a circle as in a partial eclipse.[4]

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[2] Hipschman, Ron, "Why Eclipses Happen," *Exploratorium: The Museum of Science, Art and Human Perception,* http://www.exploratorium.edu/eclipse/why.html

[3] *Encyclopaedia Britannica,* v.s. "Eclipse. Solar Eclipse Phenomena," http://www.search.eb.com/eb/article-11197?query=%22total%20solar%20eclipse%22&ct=eb

[4] "What Is an Eclipse," *Eclipse 2001,* http://museumeclipse.org/about/what.html

Safe Solar Eclipse Observing

The only time that the Sun can be viewed safely with the naked eye is during a total eclipse, when the Moon completely covers the disk of the Sun. **It is never safe to look** at a partial or annular eclipse, or the partial phases of a total solar eclipse, **without the proper equipment and techniques**, the result can damage the eyes.

The Sun can only be viewed directly when filters specially designed to protect the eyes are used.[5] Extreme caution should be exercised when viewing the sun. Always consult an expert!

Quick Basic Facts on:

Earth's Moon (Luna)[6]

- Distance from Earth: 384,400 km
- Equatorial Radius: 1737.4 km
- Volume: 21,970,000 km^3
- Mass: 73,483,000,000,000,000,000,000 kg

Earth[7]

- Distance from the Sun: 149,597,890 km
- Equatorial Radius: 6,378.14 km
- Volume: 1,083,200,000,000 km^3
- Mass: 5,973,700,000,000,000,000,000,000 kg

The Sun[8]

- Distance from Earth: 149,597,900 km
- Equatorial Radius: 695,500 km
- Volume: 1,142,200,000,000,000,000 km^3
- Mass: 1,989,000,000,000,000,000,000,000,000,000 kg

[5] Chou, B. Ralph, "Eye Safety during Solar Eclipses," *Nasa Eclipse Home Page*, http://sunearth.gsfc.nasa.gov/eclipse/SEhelp/safety2.html

[6] NASA, "Earth's Moon," *Solar System Exploration,* http://solarsystem.nasa.gov/planets/profile.cfm?Object=SolarSys

[7] NASA, "Earth," *Solar System Exploration,* http://solarsystem.nasa.gov/planets/profile.cfm?Object=Earth&Display=Overview

[8] NASA, "Sun," *Solar System Exploration,* http://solarsystem.nasa.gov/planets/profile.cfm?Object=Sun&Display=Overview

Solar Eclipses: 2001 - 2010[9]

The table below lists every solar eclipse from 2001 through 2010:

Geographic abbreviations: n = north, s = south, e = east, w = west, c = central

Date	Eclipse Type	Eclipse Magnitude	Central Duration	Geographic Region of Eclipse Visibility
2001 Jun 21	Total	1.050	04m57s	e S. America, Africa [Total: s Atlantic, s Africa, Madagascar]
2001 Dec 14	Annular	0.968	03m53s	N. & C. America, nw S. America [Annular: c Pacific, Costa Rica]
2002 Jun 10	Annular	0.996	00m23s	e Asia, Australia, w N. America [Annular: n Pacific, w Mexico]
2002 Dec 04	Total	1.024	02m04s	s Africa, Antarctica, Indonesia, Australia [Total: s Africa, s Indian, s Australia]
2003 May 31	Annular	0.938	03m37s	Europe, Asia, nw N. America [Annular: Iceland, Greenland]
2003 Nov 23	Total	1.038	01m57s	Australia, N. Z., Antarctica, s S. America [Total: Antarctica]
2004 Apr 19	Partial	0.736	-	Antarctica, s Africa
2004 Oct 14	Partial	0.927	-	ne Asia, Hawaii, Alaska
2005 Apr 08	Hybrid	1.007	00m42s	N. Zealand, N. & S. America [Hybrid: s Pacific, Panama, Colombia, Venezuela]
2005 Oct 03	Annular	0.958	04m32s	Europe, Africa, s Asia [Annular: Portugal, Spain, Libia, Sudan, Kenya]
2006 Mar 29	Total	1.052	04m07s	Africa, Europe, w Asia [Total: c Africa, Turkey, Russia]
2006 Sep 22	Annular	0.935	07m09s	S. America, w Africa, Antarctica [Annular: Guyana, Suriname, F. Guiana, s Atlantic]
2007 Mar 19	Partial	0.874	-	Asia, Alaska
2007 Sep 11	Partial	0.749	-	S. America, Antarctica
2008 Feb 07	Annular	0.965	02m12s	Antarctica, e Australia, N. Zealand [Annular: Antarctica]
2008 Aug 01	Total	1.039	02m27s	ne N. America, Europe, Asia [Total: n Canada, Greenland, Siberia, Mongolia, China]
2009 Jan 26	Annular	0.928	07m54s	s Africa, Antarctica, se Asia, Australia [Annular: s Indian, Sumatra, Borneo]
2009 Jul 22	Total	1.080	06m39s	e Asia, Pacific Ocean, Hawaii [Total: India, Nepal, China, c Pacific]
2010 Jan 15	Annular	0.919	11m08s	Africa, Asia [Annular: c Africa, India, Malymar, China]
2010 Jul 11	Total	1.058	05m20s	s S. America [Total: s Pacific, Easter Is., Chile, Argentina]

[9] NASA, "Solar Eclipse Page: Solar Eclipses:2001-2010," *NASA Solar Eclipse Home Page*, http://sunearth.gsfc.nasa.gov/eclipse/solar.html

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Web Resources

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This website contains a summary of the phenomenon, photographs of both solar and lunar eclipses, as well as photographs of comets, galaxies, constellations and the night sky. It also features detailed instructions on how to photograph eclipses, tips for eclipse watching and eye safety, and information about upcoming solar eclipses.

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