

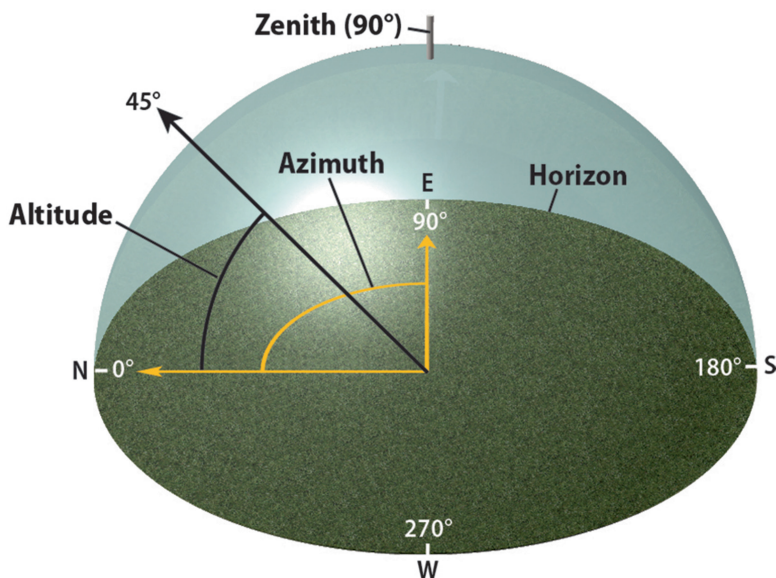
## Chapter 2



### An Illustrated Eclipse Glossary

So that we're all speaking the same language about solar eclipses, this chapter will provide a brief list of the most popular terms you'll encounter, many of them with illustrations. You should get familiar with them because you will see them again.

**Altitude**—the height, in degrees, of a point or celestial object above the horizon. We measure altitude from  $0^\circ$  (on the horizon) to  $90^\circ$  (at the zenith, which is the overhead point). Consider the following sentence as an eclipse-related example: At Rosecrans Memorial Airport in St. Joseph, Missouri, on August 21, 2017, the Sun will stand  $61.9^\circ$  high in the south at mid-eclipse.

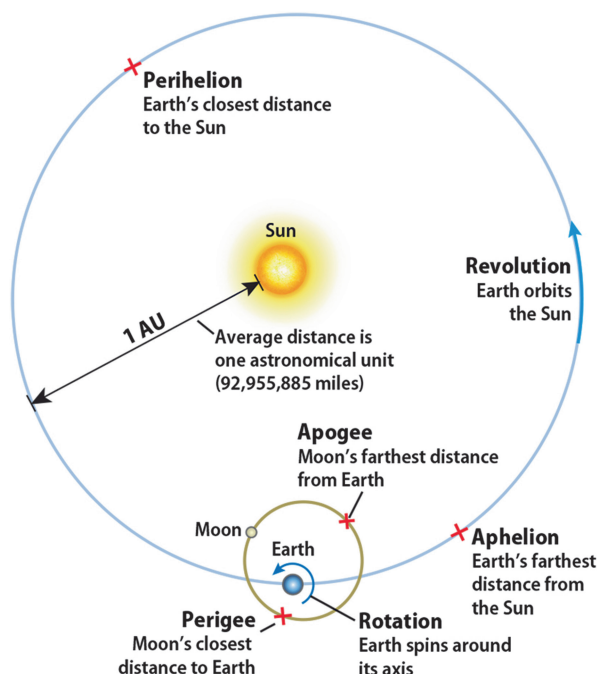


**Fig. 2.1** Altitude and azimuth. (Courtesy of *Astronomy* magazine: Roen Kelly)

**Angular diameter**—the apparent size of a celestial object, measured in degrees, minutes, and/or seconds, as seen from Earth. OK, let's define the three words in that sentence. A degree is  $1/360$  of a circle. Said another way, a circle contains  $360^\circ$ . A minute (short for minute of arc or arcminute) is  $1/60$  of  $1^\circ$ . A second (short for second of arc or arcsecond) is  $1/60$  of 1 minute of arc. So,  $1^\circ$  contains 3,600 arcseconds. An example of use might be something like, "The average angular size of the Sun or the Moon, as seen from Earth, is 31 arcminutes, or  $0.52^\circ$ ."

**Angular distance**—this is the same thing as angular diameter except that we're measuring the distance between two objects, not the size of a single object; so the definition would be the distance between two celestial bodies expressed in degrees, minutes, and/or seconds of arc.

**Aphelion**—the position of an object in solar orbit when it lies farthest from the Sun. Similarly, **apogee** is the position of the Moon or other object in Earth orbit when it lies farthest from our planet. Aphelion has two approved pronunciations: a FEEL ee on and ap HEEL ee on.



**Fig. 2.2** Aphelion and perihelion. (Courtesy of *Astronomy* magazine: Richard Talcott and Roen Kelly)

**Azimuth**—the angular distance (from  $0^\circ$  to  $360^\circ$ ) to an object measured eastward along the horizon starting from north; so the azimuth of an object due north is  $0^\circ$ ; due east would be  $90^\circ$ ; south would be  $180^\circ$ ; and a due-west azimuth equals  $270^\circ$ . Well, that's if the object is on the ground; for a celestial object, the measurement is to a line that passes through the object and makes a right angle to the horizon.

**Baily's beads**—during a total solar eclipse, the effect often seen just before and just after totality when only a few points of sunlight are visible at the edge of the Moon. This effect is caused by the irregularity of the lunar surface. At our satellite's edge, mountains block out the Sun's disk, but valleys permit it to shine through. Scientists named this phenomenon after English astronomer Francis Baily, who first explained it in 1836.

**Center line**—the midpoint of the width of the Moon’s shadow on Earth; the centerline is the location for the maximum duration of totality. You’ll hear the cry throughout this book: “Get to the center line!”

**Chromosphere**—the region of the Sun’s atmosphere between its visible surface and its corona; sometimes briefly visible just before or after totality as an intense red glow at the Moon’s edge.

**Conjunction**—a point on the sky where two celestial bodies appear to line up; the lineup may be an exact one, as in the case of a total eclipse, or it may be a near one, as in the case of New Moon (when our satellite is “in line” with the Sun).

**Corona**—the shell of thin gas that extends out some distance from the Sun’s surface normally visible only during totality; “corona” is the Latin word for “crown.” Well put.



**Fig. 2.3** The Sun’s corona becomes visible during totality. (Courtesy of Mike Reynolds)



**Fig. 2.4** The diamond ring is visible just before and just after totality. (Courtesy of Mike Reynolds)

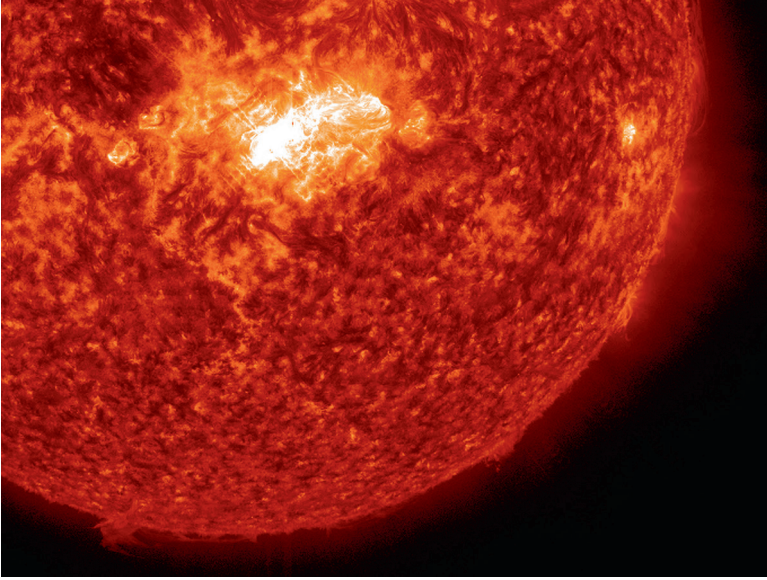
**Diamond ring**—the effect just prior to or just after totality of a solar eclipse when a small portion of the Sun's disk plus its corona produce an effect similar to a ring with a brilliant diamond.

**Disk**—the visible surface of any heavenly body.

**Ecliptic**—the circle described by the Sun's apparent annual path through the stars; the plane of Earth's orbit around the Sun. You may not know it by this name, but the ecliptic traces the Sun's path through the constellations of the zodiac.

**First contact**—during a solar eclipse, the moment that the Moon makes contact with the Sun; this moment marks the beginning of the eclipse.

**Flare**—a sudden burst of particles and energy from the Sun's photosphere; through a Hydrogen-alpha filter, flares often appear brighter than the surrounding area.



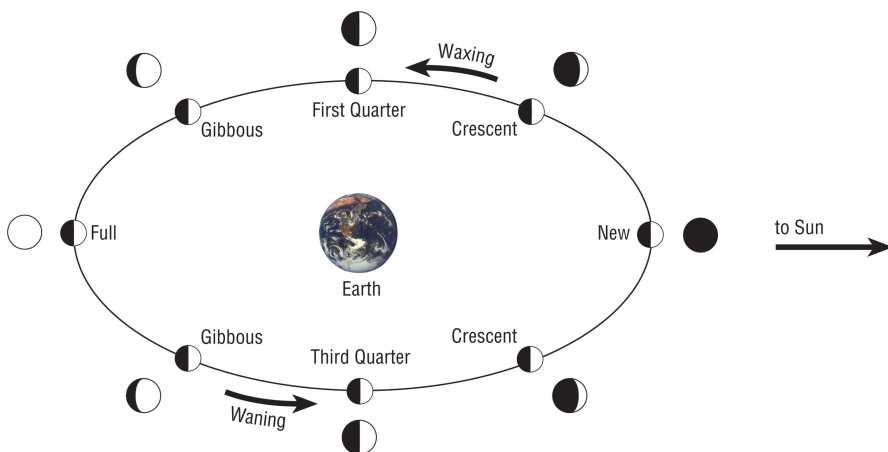
**Fig.2.5** Solar flares are huge explosions on the Sun's surface. (Courtesy of NASA/SDO)

**Fourth contact**—during a solar eclipse, the moment that the disk of the Moon breaks contact with the Sun; this moment marks the end of the eclipse.

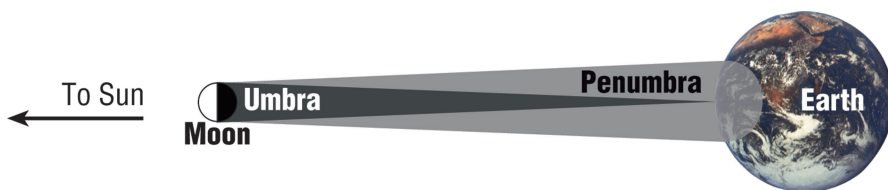
**Hydrogen-alpha filter**—a filter that passes only light with a wavelength of 656.28 nanometers (or 6,562.8 Angstroms); a simpler definition is a filter that allows you to observe the Sun's chromosphere, flares, prominences, and more; abbreviated H-alpha filters, these accessories are expensive but impressive.

**Magnitude**—the amount of the Sun's diameter the Moon covers during an eclipse; this is not the same as “obscuration.”

**New Moon**—the phase where the Moon seems completely unlit from our perspective on Earth; the phase where the Moon is between Earth and the Sun; solar eclipses can occur only at New Moon.



**Fig. 2.6** Lunar phases. Solar eclipses occur only at New Moon. (Courtesy of Holley Y. Bakich)



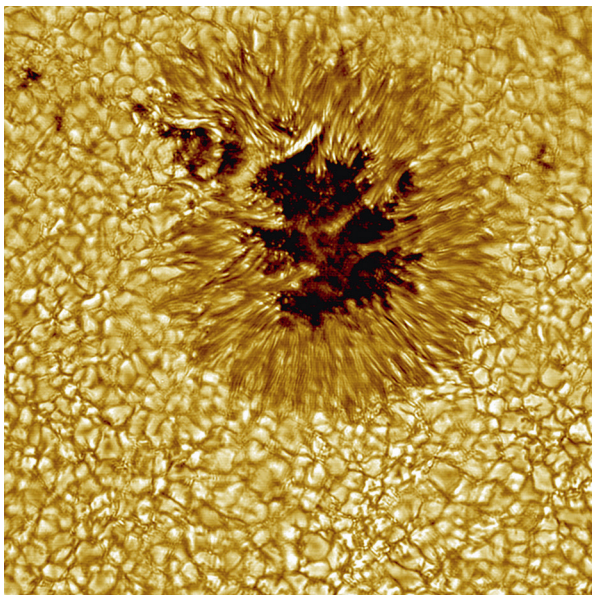
**Fig. 2.7** The Moon's umbra is its dark inner shadow; its penumbra is the lighter outer shadow. (Courtesy of Holley Y. Bakich)

**Nodes**—with regard to solar eclipses, the two points at which the Moon's orbital plane intersects the plane of the ecliptic; in other words, the two places the plane of the Moon's orbit crosses the plane of Earth's orbit; eclipses can occur only near nodes.

**Obscuration**—the amount of the Sun's area the Moon covers during an eclipse; this is not the same as “magnitude.”

**Orbit**—the path of one celestial body around another; examples: Earth orbits the Sun, and the Moon orbits Earth.

**Penumbra**—the less dark outer region of the Moon's shadow; an observer under the penumbra sees a partial solar eclipse.



**Fig. 2.8** Close-up view of a sunspot. (Courtesy of Vacuum Tower Telescope/NSO/NOAO)

**Perigee**—the position of the Moon or other object in Earth orbit when it lies closest to our planet.

**Perihelion**—the position of an object in solar orbit when it lies closest to the Sun.

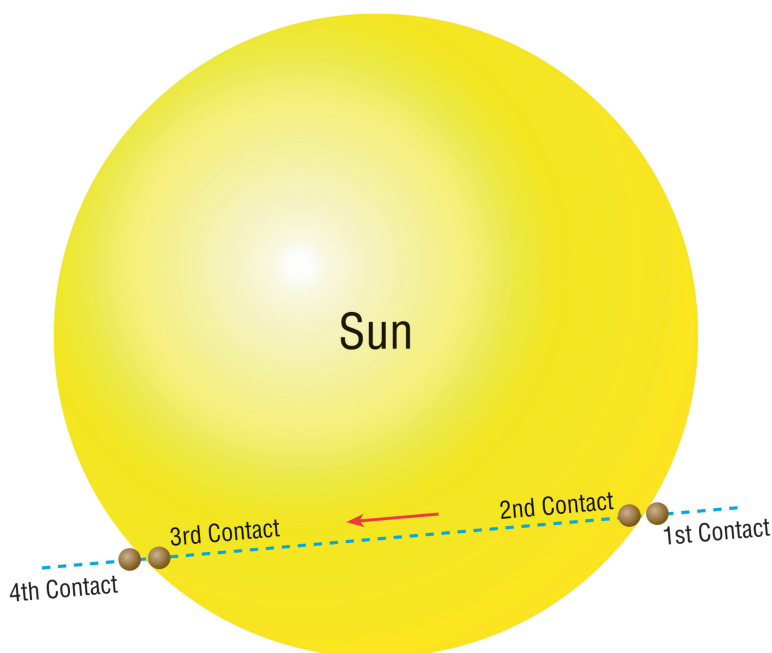
**Photosphere**—the visible surface of the Sun; where our star emits visible light; the Sun's disk.

**Prominence**—a large-scale, gaseous formation above the surface of the Sun usually occurring over regions of solar activity such as sunspot groups; during totality observers often see prominences seeming to erupt from the Moon's dark edge.

**Revolution**—in astronomy, the orbiting of one body around another; the Moon revolves around Earth.

**Rotation**—the spinning of a celestial body on its axis; Earth rotates once a day.





**Fig. 2.9** First, second, third, and fourth contacts during a total solar eclipse have the same geometries as the planet pictured crossing the Sun in this illustration. (Courtesy of *Astronomy* magazine: Roen Kelly)

**Saros cycle**—a time period equal to 6,585.3 days between which similar eclipses occur.

**Second contact**—during a total solar eclipse, the moment the Moon covers 100 percent of the Sun's disk; the instant totality begins.

**Shadow bands**—faint ripples of light occasionally seen on flat, light-colored surfaces just before and just after totality.

**Solar telescope**—a telescope whose design lets you safely observe the Sun.

**Sunspot**—a temporarily cooler (and therefore darker) region on the Sun's visible disk caused by magnetic field variations.

**Syzygy**—the lineup of three celestial bodies; for a solar eclipse, the lineup is the Sun, the Moon, and Earth.

**Third contact**—during a total solar eclipse, the instant totality ends.

**Umbra**—the dark inner region of the Moon's shadow; anyone under the Moon's umbra will experience a total solar eclipse.

**Universal Time (UT)**—also known as Greenwich Mean Time (GMT); standard time kept on the Greenwich meridian (longitude=0°); astronomers use UT to coordinate observations of celestial events.

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