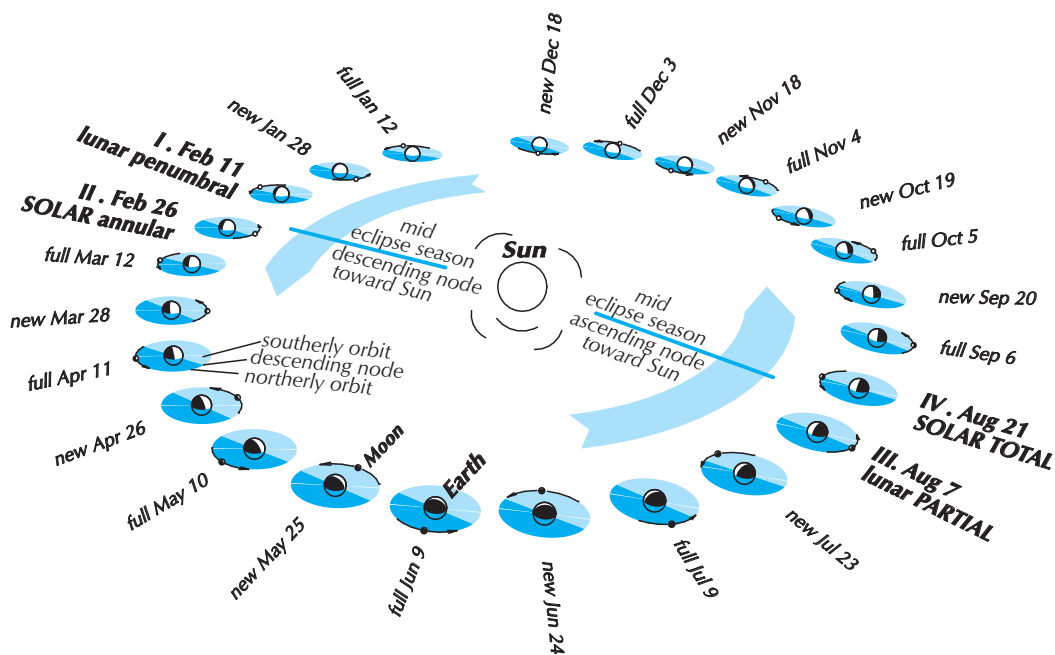


ECLIPSES

For full information, especially on the total solar eclipse of August 21 which will cross the U.S.A., see the 10-page section on "Eclipses of 2017" in the latest edition of our book *The Under-Standing of Eclipses* (www.universalworkshop.com).



SCHEMATIC VIEW summarizing the year's eclipses. At each date of New or Full Moon, the Earth is shown with the Moon inward of it at New Moon, outward at Full. The plane of the Moon's orbit at the time is shown in blue, paler for the half lying south of the ecliptic. This plane gradually rotates backward. There is an eclipse if the Moon is Full or New when it is in the ecliptic plane, that is, close to the time it crosses the ascending node of its orbit or the opposite descending node. The black arrow is the Moon's course over 7 days. The view is from ecliptic longitude 270°, latitude 30°. Relative to the Earth's orbit, the Sun's size is exaggerated by 15, Earth and Moon by 600, and the Earth-Moon distance by 40; the inclination of the Moon's orbit is exaggerated from 5° to 10°.

Timetables of the two eclipse seasons of 2017

All times are in Universal Time (UT).

Feb 6 14:15—Moon at perigee.

Penumbral eclipse of the Moon, February (10-)11
Number 59 of the 71 in lunar saros series 114 (971 to 2233 AD).

Feb 10 22:32—penumbral eclipse begins: first contact of Moon with Earth's shadow.

Feb 11 00:33—Full Moon (Moon at opposition to Sun in ecliptic longitude). Moon's center is exactly south of the center of Earth's shadow, as measured perpendicularly to the ecliptic.

00:44—middle of eclipse: Moon nearest to center of Earth's shadow. The penumbral magnitude of the eclipse is 1.014; that is, the penumbra reaches across the Moon and another 0.014 of its diameter.

01:11—Moon at opposition to Sun in right ascension; its center is exactly south of the center of Earth's shadow, as measured perpendicularly to the equator.

02:56—penumbral eclipse ends: last contact of Moon with Earth's shadow.

Feb 11 19:50—Moon at ascending node.

Feb 18 21:16—Moon at apogee.

Feb 21 22—Middle of eclipse season: Sun at same longitude as Moon's ascending node.

Feb 26 6:30—Moon at descending node.

Annular eclipse of the Sun, February 26

Number 29 of the 71 in solar saros series 140 (1512 to 2774 AD).

Feb 26 12:11—partial eclipse begins: first contact of Moon's penumbral cone with Earth, at local sunrise.

13:16—annular eclipse begins: first contact of Moon's antumbra (prolongation of umbral cone) with Earth, at local sunrise.

14:39—conjunction of Moon and Sun in right ascension: Moon's center exactly north of Sun's as measured perpendicularly to Earth's equator. Center of eclipse takes place at local apparent noon, with Sun and Moon on the meridian.

14:53—greatest eclipse: axis of shadow passes nearest ($\gamma = -0.462$ Earth-radius) south of the center of Earth. As seen from the point of greatest eclipse, the magnitude is 0.992; that is, the Moon covers this fraction of the Sun's diameter. Duration on centerline is 0m 44s.

14:58—New Moon (conjunction of Moon with Sun in ecliptic longitude): Moon's center is exactly north of Sun's as measured perpendicularly to the ecliptic.

16:31—annular eclipse ends: last contact of Moon's antumbra with Earth, at local sunset.

17:36—partial eclipse ends: last contact of penumbra with Earth, at local sunset.

Partial eclipse of the Moon, August 7

Number 61 of the 82 in lunar saros series 119 (935 to 2396 AD).

Aug 7 15:48—penumbral eclipse begins: first contact of Moon with Earth's shadow.

17:22—partial eclipse begins: first contact of Moon with Earth's umbra.

18:11—Full Moon (Moon at opposition to Sun in ecliptic longitude). Moon's center is exactly north of the center of Earth's shadow, as measured perpendicularly to the ecliptic.

18:21—**middle of eclipse**: Moon nearest to center of Earth's shadow. The umbral magnitude of the eclipse is 0.252; that is, the umbra reaches across this fraction of the Moon's diameter.

18:41—Moon at opposition to Sun in right ascension; its center is exactly north of the center of Earth's shadow, as measured perpendicularly to the equator.

19:19—partial eclipse ends: last contact of Moon with Earth's umbra.

20:53—penumbral eclipse ends: last contact of Moon with Earth's shadow.

Aug 8 10:56—Moon at descending node.

Aug 16 20—Middle of eclipse season: Sun at same longitude as Moon's ascending node.

Aug 18 13:16—Moon at perigee.

Aug 21 10:34—Moon at ascending node.

Total eclipse of the Sun, August 21

Number 22 of the 77 in solar saros series 145 (1639 to 3009 AD).

Aug 21 15:47—partial eclipse begins: first contact of Moon's penumbral cone with Earth, at local sunrise.

16:49—total eclipse begins: first contact of Moon's umbra with Earth, at local sunrise.

18:13—conjunction of Moon and Sun in right ascension: Moon's center exactly north of Sun's as measured perpendicularly to Earth's equator. Center of eclipse takes place at local apparent noon, with Sun and Moon on the meridian.

18:25—greatest eclipse: axis of shadow passes nearest ($\gamma = 0.437$ Earth-radius) north of the center of Earth. As seen from the point of greatest eclipse, the magnitude is 1.031; that is, the Moon covers the Sun and 0.031 of a Sun-width more. Duration on centerline is 2m 45s.

18:30—New Moon (conjunction of Moon with Sun in ecliptic longitude): Moon's center is exactly north of Sun's as measured perpendicularly to the ecliptic.

20:02—total eclipse ends: last contact of Moon's umbra with Earth, at local sunset.

21:04—partial eclipse ends: last contact of penumbra with Earth, at local sunset.

Aug 30 11:32—Moon at apogee.

Path of totality on August 21.

