OCCULTATIONS of bright bodies by the Moon

Shown here are occultations by the Moon of major planets, the first four asteroids, and the four first-magnitude stars that lie near enough to the ecliptic: Antares, Spica, Regulus, Aldebaran. (Pollux is a little too far north.)

The Moon occults many fainter stars and asteroids, and planets and asteroids occult stars or (very rarely) each other.

In 2017 there is a large number (49) of occultations of the limited types shown here. Usually there are between 20 and 30, though in 2007 there were 57.

The Moon's path is always gradually shifting, and this determines whether a planet or star near the ecliptic actually get occulted. Antares and Spica do not lie in the Moon's way this year. Others get occulted every month——or more than 12 times, since the lunation (cycle of the Moon) is shorter than calendar months.

A series of Aldebaran occultations began on 2015 Jan. 29 and ends 2018 Sep. 3; there are 14 in 2017. A Regulus series began 2016 Dec. 18, ends 2018 Apr. 24, and there are 12 in 2017. A Neptune series began 2016 June 25, and there are 13 in 2017, ending on Nov. 27.

The nearer planets dodge north and south of the ecliptic more quickly, and thus get occulted more irregularly.

As Jean Meeus points out (*Astronomical Tables*, p. 283), "On 2017 Sep. 18 (UT date), three planets (Venus, Mars, Mercury) and a first-magnitude star (Regulus) will be occulted by the Moon, but nowhere simultaneously."

Each picture is the view from the occulted body to the Earth, with the Moon passing between. The Moon's outline is drawn at three moments: the middle of the occultation, and an hour before and after. (A broad arrow on the equator shows how much the Earth rotates in two hours.) These outlines are the "shadows" of the Moon cast by the occulted body on the Earth; that is, they are the regions from within which the occultation is seen. The outlines and their track on the Earth's surface are inexact, at left and right, because the turning of the Earth during the two hours is not taken into account. And the most interesting and sensitive observations are of "grazing" occultations, seen from the track's north or south boundaries, where the planet or star may reappear several times between mountains at the Moon's limb (edge).

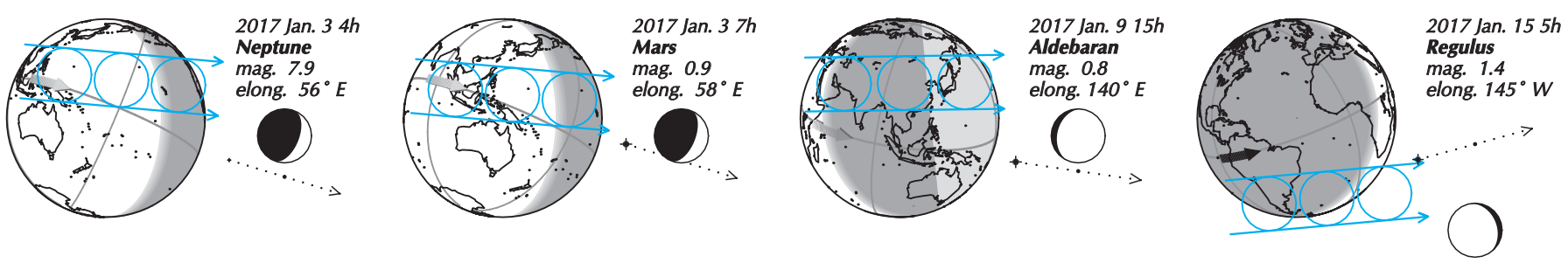
The disappearance of a body, at the Moon's leading limb, is the easier phenomenon to watch. To be ready to catch the reappearance at the following limb, you need to know more exactly the predicted time and point. A star disappearing or reappearing at the Moon's bright limb is liable to be overwhelmed by glare. Yet the Moon's surface is far darker than that of Venus, whose tiny burning crescent, close to and far beyond the nearer, vaster, duller corresponding shape of the Moon, is an amazing sight.

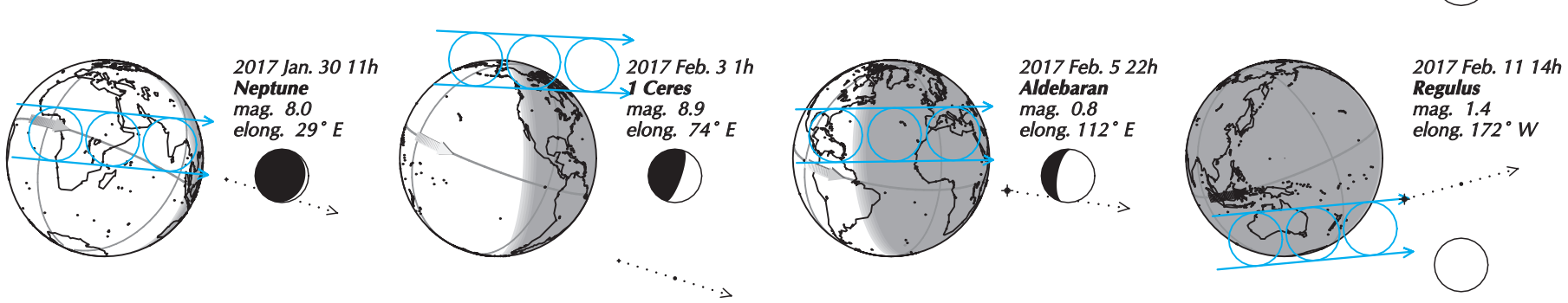
The time given is the Universal Time of the middle of the occultation, to the nearest hour. "Mag." is the magnitude (brightness) of the occulted body. "Elong." is its elongation or angular distance from the Sun. Thus "elong. 8° E" would mean it is in the evening sky (east of the Sun——left of it as seen from the northern hemisphere) but very close to the Sun; "elong. 80° W" would mean it is well away from the Sun, but in the morning sky.

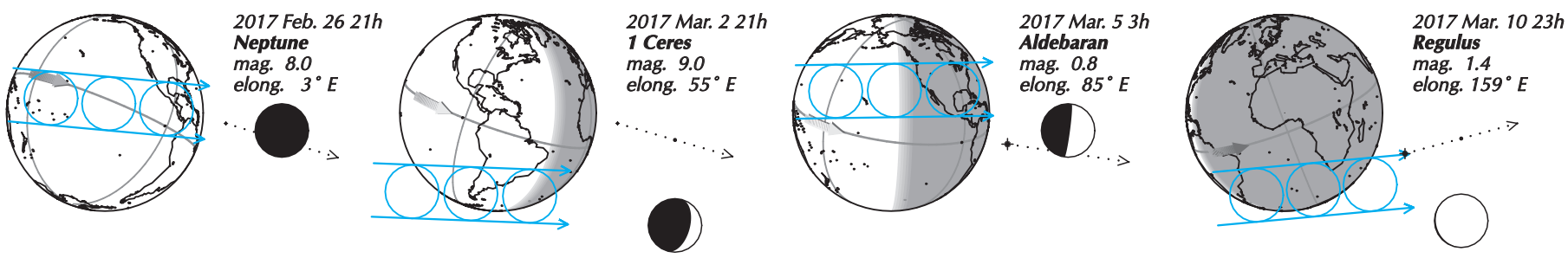
All occultations of the chosen kinds are shown, for comparison, but only a few are really observable. It depends on the phase of the Moon or elongation from the Sun, and the moment in the turning of the Earth. Only parts of the Earth that are in night can see the occulted body——except for Venus and Jupiter, so bright that their occultations can sometimes with care be observed in daylight. If the elongation is small because the Moon is near New, it and the planet will be too near to the Sun to be seen. If the elongation is large because the Moon is near Full, most or all of the band across the Earth can see the occultation by night, but in bright moonlight and against a bright limb on one or both sides of the Moon. If the occultation track comes near to missing the Earth, only some Arctic or Antarctic regions fall within it.

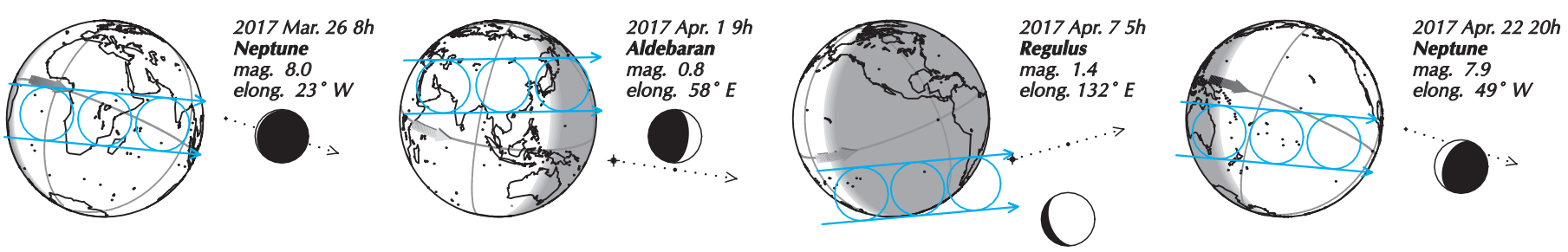
The globes are oriented with ***ecliptic north*** at the top, so as to show why the Moon's "shadow" makes tracks at various angles across the Earth's geography. The Earth is tilted with its north pole backward along its orbital path in March, toward the Sun in June, forward in September, and away from the Sun in December; but the Moon keeps on around the Earth in an orbit nearly the same as the ecliptic plane.

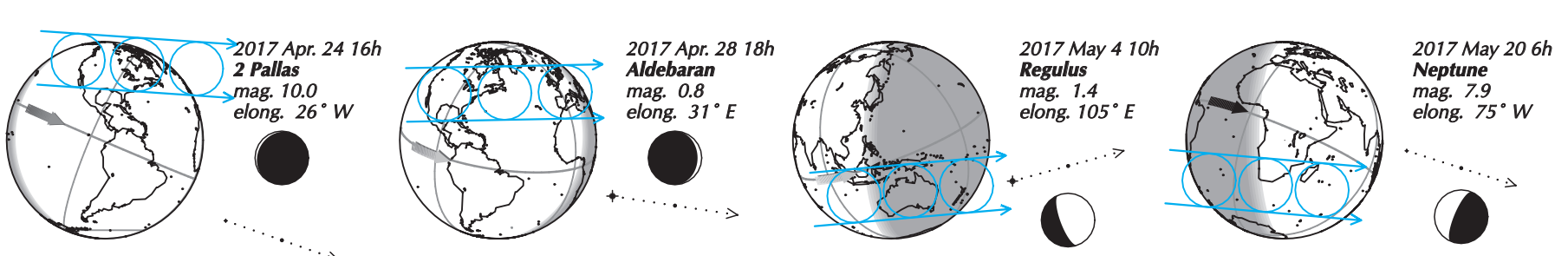
Side-diagrams show the phase of the Moon, and the occulted body passing behind it at intervals of 10 minutes over the same 2-hour span, as seen from the center of the Earth. These diagrams have ***celestial north*** at the top, to suit the view through telescopes. From places north of the Earth's center, the Moon will appear farther south, and vice versa.

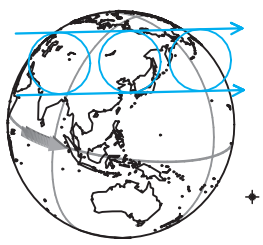




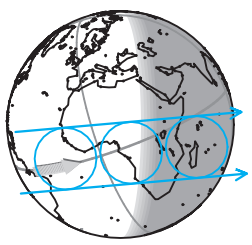




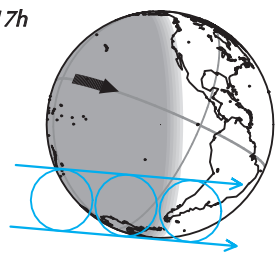




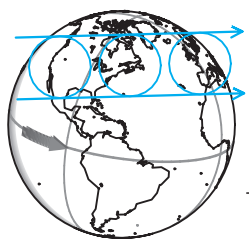
2017 May 26 4h
Aldebaran
mag. 0.8
elong. 7° E



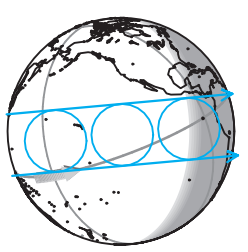
2017 May 31 17h
Regulus
mag. 1.4
elong. 79° E



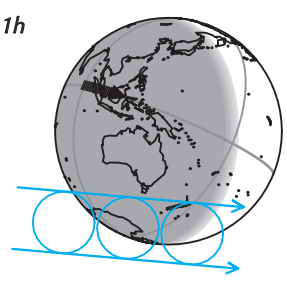
2017 June 16 13h
Neptune
mag. 7.9
elong. 101° W



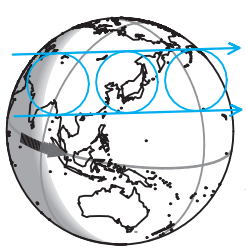
2017 June 22 15h
Aldebaran
mag. 0.8
elong. 22° W



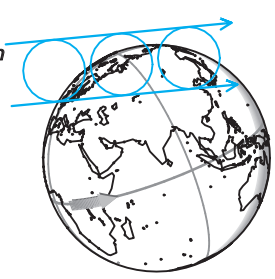
2017 June 28 1h
Regulus
mag. 1.4
elong. 53° E



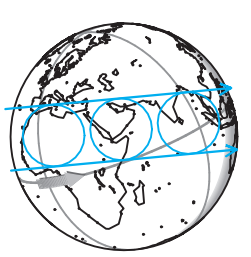
2017 July 13 18h
Neptune
mag. 7.8
elong. 127° W



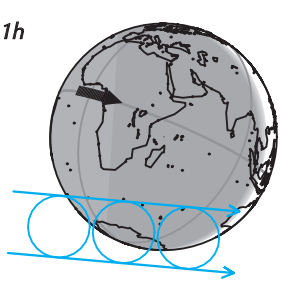
2017 July 20 0h
Aldebaran
mag. 0.8
elong. 47° W



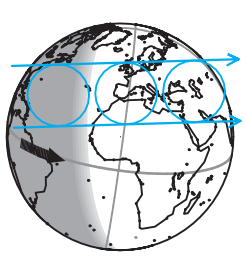
2017 July 25 9h
Mercury
mag. 0.3
elong. 26° E



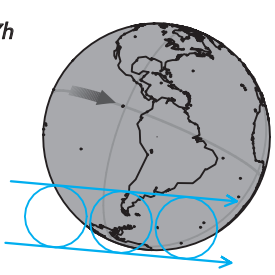
2017 July 25 11h
Regulus
mag. 1.4
elong. 27° E



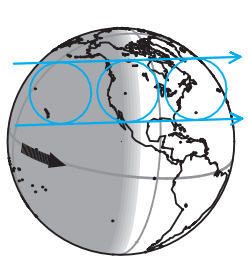
2017 Aug. 9 23h
Neptune
mag. 7.8
elong. 153° W



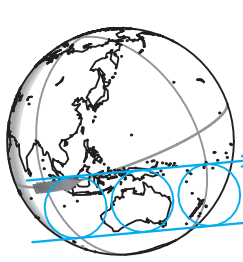
2017 Aug. 16 7h
Aldebaran
mag. 0.8
elong. 73° W



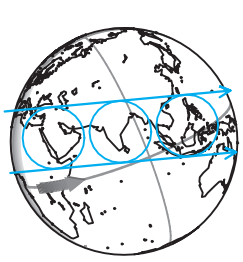
2017 Sep. 6 5h
Neptune
mag. 7.8
elong. 178° E



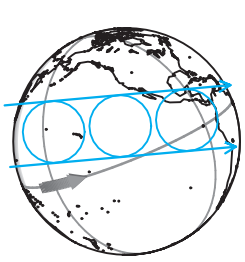
2017 Sep. 12 13h
Aldebaran
mag. 0.8
elong. 99° W



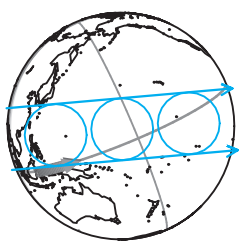
2017 Sep. 18 1h
Venus
mag. -3.9
elong. 27° W



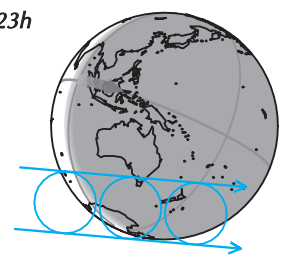
2017 Sep. 18 5h
Regulus
mag. 1.4
elong. 25° W



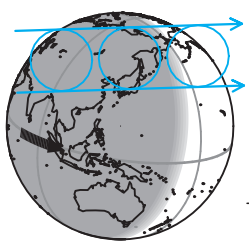
2017 Sep. 18 20h
Mars
mag. 1.8
elong. 17° W



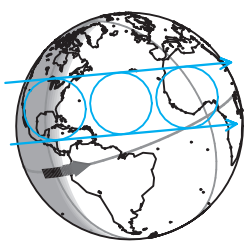
2017 Sep. 18 23h
Mercury
mag. -1.0
elong. 15° W



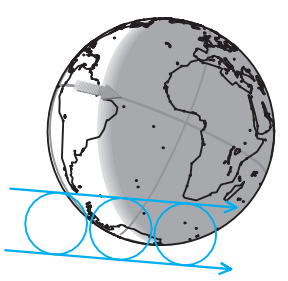
2017 Oct. 3 12h
Neptune
mag. 7.8
elong. 151° E



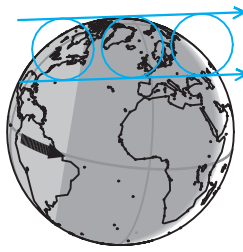
2017 Oct. 9 18h
Aldebaran
mag. 0.8
elong. 126° W



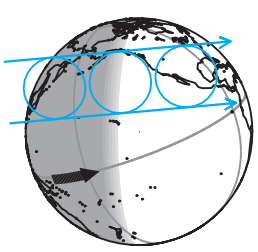
2017 Oct. 15 11h
Regulus
mag. 1.4
elong. 52° W



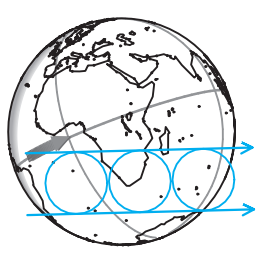
2017 Oct. 30 21h
Neptune
mag. 7.9
elong. 123° E



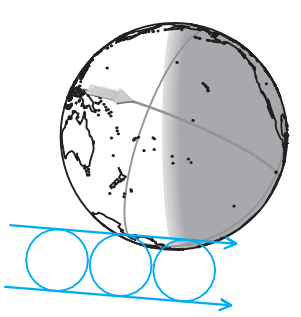
2017 Nov. 6 3h
Aldebaran
mag. 0.8
elong. 153° W



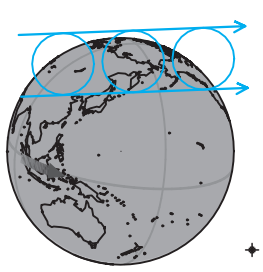
2017 Nov. 11 17h
Regulus
mag. 1.4
elong. 79° W



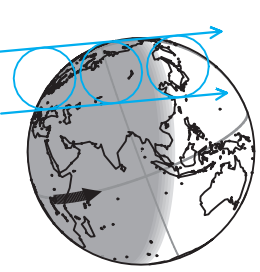
2017 Nov. 16 8h
4 Vesta
mag. 7.9
elong. 24° W



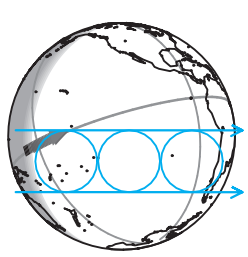
2017 Nov. 27 5h
Neptune
mag. 7.9
elong. 96° E



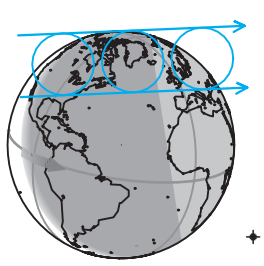
2017 Dec. 3 13h
Aldebaran
mag. 0.8
elong. 174° E



2017 Dec. 8 23h
Regulus
mag. 1.4
elong. 106° W



2017 Dec. 14 18h
4 Vesta
mag. 7.9
elong. 38° W



2017 Dec. 31 1h
Aldebaran
mag. 0.8
elong. 150° E