

OCCULTATION SERIES OF FIVE STARS

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For stars lying less than about $3^{\circ}\cdot93$ from the ecliptic, there are *two* series of occultations by the Moon per period of 18.6 years—the regression period of the lunar nodes. In the first of these series, the occultations are first visible near one of the polar regions of the Earth, then the visibility region moves towards the equator, and finally the last occultations of the series are visible near the other pole of the Earth. During the next series, the displacement of the area of visibility is opposite.

For stars whose ecliptic latitude is between $3^{\circ}\cdot93$ and $6^{\circ}\cdot35$ (north or south), there is only *one* series of occultations in the 18.6 year period. The first and the last occultations of each of these series take place at the same pole of the Earth.

In the Belgian journal *Ciel et Terre* [87, 240–252 (1971)], one of us (J.M.) has given a process for an approximate calculation of these series for any given star. In the present paper, we provide the exact dates of the beginning and the end of the occultation series for five stars, between the years 1940 and 2050. These five stars, whose ecliptic positions are given in Table I, are: the four 1st-magnitude stars Aldebaran, Regulus, Spica and Antares; and Alcyone, the brightest star of the Pleiades.

The results are given in Table II. These dates have been found, for past years, from the published astronomical almanacs; for future years, we used the lunar positions calculated by G.P.K.—see our paper entitled ‘Extreme Declinations of the Moon’ [*J. Brit. astr. Ass.*, 82 (3), 192 (1972)].

For Aldebaran and Antares, the series begin and end in the northern hemisphere. Those of Alcyone begin and end in the southern one. For Regulus and Spica, the series indicated by an asterisk begin in the northern hemisphere and end in the southern one. The other series evolve from south to north.

For example, an occultation series of Regulus began on 1969 December 1 with an occultation in the northern hemisphere, and ended on 1971 April 6 in the southern regions of the Earth. The next series for this star will begin in the southern hemisphere with an occultation on 1979 November 12, and will end in the northern regions on 1980 December 26.

TABLE I
LONGITUDES AND LATITUDES OF FIVE STARS

Star	A.D. 1950.0		A.D. 2050.0	
	Long °	Lat. °	Long. °	Lat. °
Aldebaran (α Tau)	69.090	−5.471	70.488	−5.464
Regulus (α Leo)	149.134	+0.463	150.524	+0.466
Spica (α Vir)	203.143	−2.051	204.539	−2.058
Antares (α Sco)	249.064	−4.563	250.460	−4.577
Alcyone (η Tau)	59.294	+4.046	60.691	+4.056

TABLE II
FIRST AND LAST OCCULTATION OF EACH SERIES

	<i>First</i>	<i>Last</i>	<i>Number</i>
Aldebaran	1940 Sept. 22	1944 Mar. 1	47
	1959 Mar. 16	1962 Sept. 19	48
	1978 Jan. 19	1981 Apr. 8	44
	1996 Aug. 8	2000 Feb. 14	48
	2015 Jan. 29	2018 Sept. 3	49
	2033 Aug. 18	2037 Feb. 23	48
Regulus	1942 July 16	1943 Oct. 23	18
	1951 May 14*	1952 June 27	16
	1961 Feb. 2	1962 May 12	18
	1969 Dec. 1*	1971 Apr. 6	19
	1979 Nov. 12	1980 Dec. 26	16
	1988 June 19*	1989 Oct. 24	19
	1998 June 1	1999 Oct. 5	19
	2007 Jan. 7*	2008 May 12	19
	2016 Dec. 18	2018 Apr. 24	19
	2025 July 26*	2026 Dec. 27	20
	2035 June 11	2036 Nov. 11	20
2044 May 5*	2045 Oct. 7	20	
Spica	1949 Dec. 15*	1951 June 15	21
	1956 Sept. 7	1958 Feb. 8	20
	1968 July 31*	1970 Jan. 2	20
	1975 Mar. 28	1976 Nov. 19	23
	1987 Feb. 18*	1988 June 24	18
	1993 Oct. 15	1995 June 9	23
	2005 Sept. 7*	2007 Jan. 11	19
	2012 July 25	2013 Dec. 27	20
	2024 June 16*	2025 Nov. 17	20
	2031 Feb. 12	2032 July 15	19
	2043 Jan. 4*	2044 June 6	20
2049 Sept. 1	2051	—	
Antares	1949 Feb. 20	1954 Feb. 26	68
	1967 Sept. 10	1972 Sept. 14	68
	1986 Mar. 30	1991 Apr. 4	68
	2005 Jan. 7	2010 Feb. 7	69
	2023 Aug. 25	2028 Aug. 27	68
	2042 Mar. 13	2047 Mar. 17	68
Alcyone	1949 Apr. 2	1955 Feb. 28	80
	1968 Jan. 11	1973 Sept. 17	77
	1986 July 30	1992 Mar. 10	76
	2005 Feb. 16	2010 Dec. 19	79
	2023 Sept. 5	2029 July 7	79
	2042 Mar. 25	2048 Jan. 25	79

The last column of Table II mentions the number of the occultations in each series. Two important remarks should be made:

1. Some occultations are actually not observable by reason of the proximity of the Sun. For example, there was an occultation of Spica on 1969 October 11, but it occurred only ten hours after the time of New Moon, and consequently could not be observed.
2. In the case of Aldebaran, which is more than 5° from the ecliptic, some occultations may be missing at the beginning and at the end of a series. For example, the 1959–1962 series of this star began on 1959 March 16 with an occultation in N.W. Siberia. Then there was an occultation on April 12 visible from Greenland, and on May 9 there was a very short occultation visible from a part of the Arctic Ocean. But at the next conjunction, on 1959 June 6, no occultation took place, the ‘shadow’ of the Moon not touching the Earth. (It happens that it was also New Moon that day!) Then there was again an occultation on July 3, and the series further went on without any other interruption.

These rare ‘missing occultations’ are included in the total number mentioned in Table II.