

# OCCULTATIONS OF PLANETS AND BRIGHT STARS BY THE MOON

May 26, 2019

The moon, as our nearest neighbor, sometimes blocks the light coming from a planet, a star, or the sun. Occultations are listed below for May, 2019 through 2021. The name of the planet or star, along with its visual magnitude, is listed along with the percentage of the moon's disk that is illuminated at the time, and the phase of the moon. The date and time (MST) when the geocentric angle between the center of the moon and the center of the planet or star is minimal (mid-point of the occultation), and the angle of separation are then listed.

The date and times (MST) when the occultation first commences, and last ends, for the first and last observations on earth are listed, followed by the latitude and longitude of the location where the line from the object's center through the moon's center strikes the surface of the earth at mid-occultation.

If the occultation is visible, in whole or in part, from **The Journey Museum and Learning Center**, the times (MST) of the various stages are listed along with the altitude above the horizon of the object, the moon (with azimuth), and the sun respectively. For occultations, when the moon is above the horizon, but the sun is not, this is noted with three asterisks (\*\*\*) . If, on the other hand, the Moon is visible when the object in question appears closest to the Moon, but the planet or star is not occulted because of perspective, then the angle between the edge of the Moon and the edge of the object (the miss angle) is listed.

Note: the data listed below depend on estimates of DUT1 and DUTC. Also, a number of other factors are involved in the computation of an occultation, and the results given here for more than a year in the future could be off by a few seconds. In addition, direct visual observation can be uncertain in terms of reaction time, and establishing the accuracy of the clock you use can be prolematic.

N.B. This edition replaces all previous editions.

Lunar occultations of planets and bright stars.  
Dates and times in MST  
When DST (Summer Time) is required add one hour.

Reference location: Journey Museum 44.08657 N. 103.218689 W.  
Selected stars are magnitude 2.5 or brighter.

Occultation of Saturn 0.5 by moon 63% illuminated at phase= 255 degrees  
04/25/2019 07:29:19.0 Geocentric minimum 0.4 degrees  
Global start/end: 04/25/2019 05:18:21.7 and 04/25/2019 09:40:20.2  
Mid-occultation observing point (lat., long.) -45.627 -136.507  
At Journey Museum the miss angle is 2939.0 arc-sec at 04/25/2019 08:58:44.8

Occultation of Saturn 0.3 by moon 83% illuminated at phase= 229 degrees  
05/22/2019 15:17:02.0 Geocentric minimum 0.5 degrees  
Global start/end: 05/22/2019 13:14:36.9 and 05/22/2019 17:19:32.1  
Mid-occultation observing point (lat., long.) -56.004 80.464

Occultation of Saturn 0.2 by moon 97% illuminated at phase= 201 degrees  
06/18/2019 20:48:43.5 Geocentric minimum 0.4 degrees  
Global start/end: 06/18/2019 18:43:10.1 and 06/18/2019 22:54:20.7  
Mid-occultation observing point (lat., long.) -50.551 -32.129

Occultation of Mars 1.8 by moon 3% illuminated at phase= 19 degrees  
07/03/2019 22:40:21.0 Geocentric minimum 0.1 degrees  
Global start/end: 07/03/2019 20:29:53.7 and 07/04/2019 00:50:48.5  
Mid-occultation observing point (lat., long.) 26.087 117.644

Occultation of Saturn 0.1 by moon 100% illuminated at phase= 173 degrees  
07/16/2019 00:15:38.5 Geocentric minimum 0.2 degrees  
Global start/end: 07/15/2019 22:02:31.5 and 07/16/2019 02:28:46.8  
Mid-occultation observing point (lat., long.) -36.247 -114.108  
At Journey Museum the miss angle is 2841.9 arc-sec at 07/16/2019 00:57:30.0

Occultation of Saturn 0.2 by moon 91% illuminated at phase= 146 degrees  
08/12/2019 02:52:46.8 Geocentric minimum 0.0 degrees  
Global start/end: 08/12/2019 00:36:21.0 and 08/12/2019 05:09:11.6  
Mid-occultation observing point (lat., long.) -24.908 177.504

Occultation of Saturn 0.4 by moon 74% illuminated at phase= 118 degrees  
09/08/2019 06:41:40.6 Geocentric minimum 0.0 degrees  
Global start/end: 09/08/2019 04:24:32.5 and 09/08/2019 08:58:48.0  
Mid-occultation observing point (lat., long.) -25.149 92.456

Occultation of Saturn 0.5 by moon 52% illuminated at phase= 92 degrees  
10/05/2019 13:36:50.8 Geocentric minimum 0.3 degrees  
Global start/end: 10/05/2019 11:23:10.3 and 10/05/2019 15:50:34.8  
Mid-occultation observing point (lat., long.) -38.684 -37.753

Occultation of Saturn 0.6 by moon 30% illuminated at phase= 66 degrees  
11/02/2019 00:22:29.5 Geocentric minimum 0.6 degrees  
Global start/end: 11/01/2019 22:24:36.0 and 11/02/2019 02:20:29.5  
Mid-occultation observing point (lat., long.) -61.911 136.85

Occultation of Jupiter -1.8 by moon 4% illuminated at phase= 23 degrees  
11/28/2019 03:56:48.8 Geocentric minimum 0.7 degrees  
Global start/end: 11/28/2019 02:09:13.6 and 11/28/2019 05:44:29.7  
Mid-occultation observing point (lat., long.) 25.726 42.353

Occultation of Saturn 0.6 by moon 12% illuminated at phase= 40 degrees  
11/29/2019 14:07:06.5 Geocentric minimum 0.9 degrees  
Global start/end: 11/29/2019 12:41:31.0 and 11/29/2019 15:32:46.3  
Mid-occultation observing point (lat., long.) -76.507 74.312  
At Journey Museum the miss angle is 5534.1 arc-sec at 11/29/2019 13:54:12.1

Occultation of Venus -3.9 by moon 8% illuminated at phase= 34 degrees  
12/28/2019 18:55:40.8 Geocentric minimum 1.0 degrees  
Global start/end: 12/28/2019 17:32:41.9 and 12/28/2019 20:18:43.5  
Mid-occultation observing point (lat., long.) -67.007 -21.299

Occultation of Jupiter -1.9 by moon 3% illuminated at phase= 339 degrees  
01/22/2020 19:40:54.8 Geocentric minimum 0.4 degrees  
Global start/end: 01/22/2020 17:30:51.4 and 01/22/2020 21:51:00.2  
Mid-occultation observing point (lat., long.) -45.558 120.401

Occultation of Mars 1.2 by moon 24% illuminated at phase= 302 degrees  
02/18/2020 06:24:20.4 Geocentric minimum 0.8 degrees  
Global start/end: 02/18/2020 04:34:18.7 and 02/18/2020 08:14:25.8  
Mid-occultation observing point (lat., long.) 29.427 -73.252

---For observations at Journey Museum:

02/18/2020 04:45:24.6 Start Partial (elev 8 az 135 degrees) -22.7 \*\*\*  
02/18/2020 04:45:37.4 Start Total (elev 8 az 135 degrees) -22.7 \*\*\*  
02/18/2020 05:24:35.8 OCCULTATION MID-POINT (elev 13 az 142 degrees) -15.7 \*\*\*  
02/18/2020 06:05:51.2 End Total (elev 17 az 151 degrees) -8.4 \*\*\*  
02/18/2020 06:06:05.4 End Partial (elev 17 az 151 degrees) -8.3 \*\*\*

Occultation of Jupiter -1.9 by moon 14% illuminated at phase= 317 degrees  
02/19/2020 12:40:02.1 Geocentric minimum 0.9 degrees  
Global start/end: 02/19/2020 11:14:02.8 and 02/19/2020 14:06:03.2  
Mid-occultation observing point (lat., long.) -66.582 19.049

Occultation of Mars 0.9 by moon 31% illuminated at phase= 293 degrees  
03/18/2020 01:24:30.1 Geocentric minimum 0.7 degrees  
Global start/end: 03/17/2020 23:32:16.9 and 03/18/2020 03:16:47.9  
Mid-occultation observing point (lat., long.) -75.028 2.818

Occultation of Venus -4.4 by moon 4% illuminated at phase= 337 degrees  
06/19/2020 01:32:00.8 Geocentric minimum 0.7 degrees  
Global start/end: 06/18/2020 23:46:05.9 and 06/19/2020 03:17:53.5  
Mid-occultation observing point (lat., long.) 65.864 -1.21

Occultation of Mars -1.3 by moon 72% illuminated at phase= 244 degrees  
08/09/2020 01:38:32.4 Geocentric minimum 0.7 degrees  
Global start/end: 08/08/2020 23:43:06.9 and 08/09/2020 03:33:58.7  
Mid-occultation observing point (lat., long.) -40.296 -42.392  
At Journey Museum the miss angle is 4088.0 arc-sec at 08/09/2020 02:00:26.4

Occultation of Mars -1.9 by moon 86% illuminated at phase= 224 degrees  
09/05/2020 21:44:47.9 Geocentric minimum 0.0 degrees  
Global start/end: 09/05/2020 19:24:48.3 and 09/06/2020 00:04:48.1  
Mid-occultation observing point (lat., long.) 8.281 -29.992  
At Journey Museum the miss angle is 1947.8 arc-sec at 09/05/2020 21:07:19.6

Occultation of Mars -2.5 by moon 99% illuminated at phase= 194 degrees  
10/02/2020 21:00:08.1 Geocentric minimum 0.7 degrees  
Global start/end: 10/02/2020 19:09:26.9 and 10/02/2020 22:50:49.9  
Mid-occultation observing point (lat., long.) -37.164 -26.543  
At Journey Museum the miss angle is 4242.8 arc-sec at 10/02/2020 20:46:32.3

Occultation of Venus -3.9 by moon 5% illuminated at phase= 335 degrees  
12/12/2020 14:06:17.3 Geocentric minimum 0.8 degrees  
Global start/end: 12/12/2020 12:16:08.7 and 12/12/2020 15:56:25.2  
Mid-occultation observing point (lat., long.) 27.87 -148.56

---For observations at Journey Museum:

12/12/2020 14:24:27.3 Start Partial (elev 4 az 240 degrees) 13.8  
12/12/2020 14:24:56.8 Start Total (elev 4 az 240 degrees) 13.7  
12/12/2020 14:52:09.2 OCCULTATION MID-POINT (elev 0 az 245 degrees) 10.6  
12/12/2020 15:18:18.2 End Total (elev -5 az 249 degrees) 7.3  
12/12/2020 15:18:45.3 End Partial (elev -5 az 249 degrees) 7.3

Occultation of Nunki 2.05 by moon 52% illuminated at phase= 268 degrees  
04/03/2021 23:19:53.9 Geocentric minimum 0.9 degrees  
Global start/end: 04/03/2021 21:48:44.5 and 04/04/2021 00:51:07.0  
Mid-occultation observing point (lat., long.) 39.179 -5.068

Occultation of Mars 1.5 by moon 24% illuminated at phase= 59 degrees  
04/17/2021 05:09:47.5 Geocentric minimum 0.1 degrees  
Global start/end: 04/17/2021 02:44:25.0 and 04/17/2021 07:35:09.9  
Mid-occultation observing point (lat., long.) 16.644 58.761

Occultation of Nunki 2.05 by moon 74% illuminated at phase= 241 degrees  
05/01/2021 06:37:51.6 Geocentric minimum 0.7 degrees  
Global start/end: 05/01/2021 04:51:42.6 and 05/01/2021 08:24:06.3  
Mid-occultation observing point (lat., long.) 19.008 -140.931

Occultation of Venus -3.9 by moon 1% illuminated at phase= 12 degrees  
05/12/2021 15:29:35.3 Geocentric minimum 0.7 degrees  
Global start/end: 05/12/2021 13:24:51.2 and 05/12/2021 17:34:19.1  
Mid-occultation observing point (lat., long.) -26.591 -131.922  
At Journey Museum the miss angle is 2663.6 arc-sec at 05/12/2021 16:51:18.7

Occultation of Nunki 2.05 by moon 91% illuminated at phase= 215 degrees  
05/28/2021 16:08:29.6 Geocentric minimum 0.6 degrees  
Global start/end: 05/28/2021 14:19:58.2 and 05/28/2021 17:57:06.1  
Mid-occultation observing point (lat., long.) 13.729 49.549

Occultation of Nunki 2.05 by moon 99% illuminated at phase= 189 degrees  
06/25/2021 02:41:38.9 Geocentric minimum 0.7 degrees  
Global start/end: 06/25/2021 00:54:53.2 and 06/25/2021 04:28:27.8  
Mid-occultation observing point (lat., long.) 15.062 -135.826

---For observations at Journey Museum:

06/25/2021 03:09:31.4 Start Total (elev 11 az 215 degrees) -9.3 \*\*\*  
06/25/2021 03:35:48.1 OCCULTATION MID-POINT (elev 8 az 220 degrees) -5.9 \*\*\*  
06/25/2021 04:01:13.6 End Total (elev 5 az 225 degrees) -1.7

Occultation of Nunki 2.05 by moon 98% illuminated at phase= 163 degrees  
07/22/2021 12:33:50.0 Geocentric minimum 0.7 degrees  
Global start/end: 07/22/2021 10:46:17.7 and 07/22/2021 14:21:23.5  
Mid-occultation observing point (lat., long.) 14.935 49.027

Occultation of Nunki 2.05 by moon 86% illuminated at phase= 136 degrees  
08/18/2021 20:28:53.6 Geocentric minimum 0.5 degrees  
Global start/end: 08/18/2021 18:34:08.3 and 08/18/2021 22:23:39.2  
Mid-occultation observing point (lat., long.) 7.325 -96.613  
At Journey Museum the miss angle is 400.6 arc-sec at 08/18/2021 20:17:30.7

Occultation of Nunki 2.05 by moon 67% illuminated at phase= 110 degrees  
09/15/2021 02:24:17.7 Geocentric minimum 0.3 degrees  
Global start/end: 09/15/2021 00:20:14.3 and 09/15/2021 04:28:21.9  
Mid-occultation observing point (lat., long.) -6.289 147.949

Occultation of Nunki 2.05 by moon 44% illuminated at phase= 83 degrees  
10/12/2021 07:49:01.2 Geocentric minimum 0.1 degrees  
Global start/end: 10/12/2021 05:41:04.8 and 10/12/2021 09:56:58.9  
Mid-occultation observing point (lat., long.) -19.711 40.287

Occultation of Nunki 2.05 by moon 22% illuminated at phase= 56 degrees  
11/08/2021 14:53:31.6 Geocentric minimum 0.0 degrees  
Global start/end: 11/08/2021 12:47:10.4 and 11/08/2021 16:59:53.9  
Mid-occultation observing point (lat., long.) -27.178 -92.514  
At Journey Museum the miss angle is 2434.6 arc-sec at 11/08/2021 14:32:22.4

Occultation of Mars 1.6 by moon 3% illuminated at phase= 342 degrees  
12/02/2021 17:51:33.3 Geocentric minimum 0.7 degrees  
Global start/end: 12/02/2021 16:00:00.9 and 12/02/2021 19:43:02.2  
Mid-occultation observing point (lat., long.) 19.571 159.059

Occultation of Nunki 2.05 by moon 6% illuminated at phase= 28 degrees  
12/06/2021 00:41:25.0 Geocentric minimum 0.0 degrees  
Global start/end: 12/05/2021 22:37:24.9 and 12/06/2021 02:45:26.3  
Mid-occultation observing point (lat., long.) -27.37 93.504

Occultation of Mars 1.5 by moon 6% illuminated at phase= 333 degrees  
12/31/2021 12:52:16.7 Geocentric minimum 0.9 degrees  
Global start/end: 12/31/2021 11:21:41.6 and 12/31/2021 14:22:49.4  
Mid-occultation observing point (lat., long.) -78.506 132.581  
At Journey Museum the miss angle is 5648.1 arc-sec at 12/31/2021 13:52:46.4

\*\*\* = The Moon is above the horizon, and the Sun is not a factor.

Program LOISP4 version 190401a + gglib version 190516a  
delta-T data as of 05/24/2019