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1.

EDITOR'S NOTE

Please join in celebrating and thanking Professor Pilcher for this decades-long series that has been an essential guidepost for minor planet observers.

MINOR PLANETS AT UNUSUALLY FAVORABLE ELONGATIONS IN 2025

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A list is presented of minor planets which are much brighter than usual at their 2025 apparitions. For reasons explained, the list in this article is the final installment of a 52-year sequence prepared by the author.

The minor planets in the lists which follow will be much brighter at their 2025 apparitions than at their average distances at maximum elongation. Many years may pass before these planets will be again as bright as in 2025. Observers are encouraged to give special attention to those which lie near the limit of their equipment.

These lists have been prepared by an examination of the maximum elongation circumstances of minor planets computed by the author for all years through 2060 with a full perturbation program written by Dr. John Reed, and to whom he expresses his thanks. Elements are from EMP 1992, except that for all planets for which new or improved elements have been published subsequently in the Minor Planet Circulars or in electronic form, the newer elements have been used. Planetary positions are from the JPL DE-200 ephemeris, courtesy of Dr. E. Myles Standish.

Any planets whose brightest magnitudes near the time of maximum elongation vary by at least 2.0 in this interval and in 2025 will be within 0.3 of the brightest occurring, or vary by at least 3.0 and in 2025 will be within 0.5 of the brightest occurring; and which are visual magnitude 14.5 or brighter, are included. For planets brighter than visual magnitude 13.5, which are within the range of a large number of observers, these standards have been relaxed somewhat to include a larger number of planets. Magnitudes have been computed from the updated magnitude parameters published in MPC28104-28116, on 1996 Nov. 25, or more recently in the Minor Planet Circulars.

Oppositions may be in right ascension or in celestial longitude. Here we use still a third representation, maximum elongation from the Sun, instead of opposition. Though unconventional, it has the advantage that many close approaches do not involve actual opposition to the Sun near the time of minimum distance and greatest brightness and are missed by an opposition-based program. Other data are also provided according to the following tabular listings: Minor planet number, date of maximum elongation from the Sun in format yyyy/mm/dd, maximum elongation in degrees, right ascension on date of maximum elongation, declination on date of maximum elongation, both in J2000 coordinates, date of brightest magnitude in format yyyy/mm/dd, brightest magnitude, date of minimum distance in format yyyy/mm/dd, and minimum distance in AU.

Users should note that when the maximum elongation is about 177° or greater, the brightest magnitude is sharply peaked due to enhanced brightening near zero phase angle. Even as near as 10 days before or after minimum magnitude the magnitude is generally about 0.4 magnitudes greater. This effect takes place in greater time interval for smaller maximum elongations. There is some interest in very small minimum phase angles. For maximum elongations E near 180° at Earth distance Δ , an approximate formula for the minimum phase angle ϕ is

$$\phi = (180^\circ - E) / (\Delta + 1)$$

where the units are degrees.

A special list of asteroids approaching the Earth more closely than 0.3 AU is provided following the list of temporal sequence of favorable elongations.

This author has prepared, starting with MPB V.1 No. 3 (1974 January-March), lists of minor planets brighter in the coming year than at most of their oppositions. These lists have now been prepared for 52 consecutive years. In the early years this was done by an ad hoc examination of the Institute for Theoretical Astronomy annual volumes, "Ephemerides of Minor Planets for the Year 19__." In the 1990's the author used Windows based 16-bit computers with 1990's programs to prepare the comprehensive lists that have appeared in this annual Minor Planet Bulletin series. But these lists were prepared only through the year 2025. The year 2025 is now arriving, and the computational facilities to produce listings for 2026 and forward no longer exist.

Therefore, the list in this article is the final installment of a 52-year sequence of "Minor Planets at Unusually Favorable Elongations." The author thanks users of these articles who have expressed their appreciation to him.

Table I. Numerical Sequence of Favorable Elongations

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist
6	2025/08/25	172.5°	22h32m	-17°				2025/08/26	7.6		2025/08/31	1.025					
24	2025/02/26	178.9°	10h37m	+ 9°				2025/02/26	10.7		2025/02/26	1.797					
28	2025/02/01	176.5°	8h53m	+13°				2025/02/01	9.8		2025/02/01	1.380					
61	2025/09/01	176.9°	22h38m	- 5°				2025/09/01	10.7		2025/09/01	1.490					
63	2025/08/03	174.9°	20h56m	-22°				2025/08/02	9.6		2025/07/29	1.122					
85	2025/10/16	179.5°	1h27m	+ 9°				2025/10/16	10.1		2025/10/09	1.310					
89	2025/08/10	176.1°	21h20m	-11°				2025/08/11	8.8		2025/08/15	1.138					
104	2025/11/08	179.6°	2h52m	+16°				2025/11/08	11.6		2025/11/10	1.684					
129	2025/08/05	179.0°	21h 1m	-15°				2025/08/05	10.1		2025/07/28	1.503					
139	2025/03/21	179.5°	12h 2m	+ 0°				2025/03/21	10.3		2025/03/20	1.322					
141	2025/08/08	179.0°	21h13m	-17°				2025/08/08	10.7		2025/08/15	1.285					
172	2025/07/25	170.4°	20h24m	-29°				2025/07/25	11.1		2025/07/27	1.128					
185	2025/08/31	176.9°	22h43m	-11°				2025/08/31	10.5		2025/09/02	1.445					
188	2025/06/07	174.4°	17h 5m	-17°				2025/06/07	12.1		2025/06/13	1.400					
200	2025/12/31	171.8°	6h41m	+31°				2025/12/30	11.4		2025/12/27	1.487					
226	2025/08/17	174.6°	21h59m	-17°				2025/08/17	12.2		2025/08/12	1.223					
244	2025/10/03	178.0°	0h34m	+ 5°				2025/10/03	13.4		2025/10/03	0.878					
245	2025/11/12	178.4°	3h12m	+16°				2025/11/12	10.8		2025/11/09	1.511					
259	2025/06/01	175.1°	16h37m	-17°				2025/06/01	11.3		2025/06/01	1.715					
278	2025/04/27	174.4°	14h27m	- 8°				2025/04/27	12.3		2025/04/27	1.387					
312	2025/07/16	165.0°	19h54m	-36°				2025/07/15	11.9		2025/07/13	1.371					
313	2025/03/17	179.8°	11h47m	+ 1°				2025/03/17	10.6		2025/03/12	1.037					
330	2025/12/02	167.2°	4h40m	+ 9°				2025/12/01	14.4		2025/11/25	0.931					
333	2025/10/24	176.3°	1h48m	+15°				2025/10/23	12.8		2025/10/21	1.646					
344	2025/05/25	167.4°	16h11m	-33°				2025/05/27	9.7		2025/06/04	0.868					
347	2025/04/28	164.6°	14h40m	+ 0°				2025/04/27	11.8		2025/04/24	1.288					
352	2025/12/02	179.4°	4h36m	+21°				2025/12/02	11.4		2025/11/27	0.932					
364	2025/01/15	178.0°	7h49m	+23°				2025/01/15	11.6		2025/01/09	1.019					
373	2025/09/19	176.9°	23h52m	- 4°				2025/09/19	12.6		2025/09/18	1.689					
379	2025/09/05	179.4°	22h54m	- 6°				2025/09/05	12.0		2025/09/05	1.577					
415	2025/11/02	163.9°	2h50m	- 0°				2025/11/04	11.3		2025/11/07	1.022					
419	2025/05/08	179.8°	15h 1m	-17°				2025/05/08	10.1		2025/05/18	1.046					
444	2025/09/22	174.9°	23h49m	+ 4°				2025/09/22	10.4		2025/09/20	1.293					
469	2025/02/14	177.6°	9h52m	+15°				2025/02/14	12.2		2025/02/18	1.780					
471	2025/11/11	164.2°	3h19m	+ 2°				2025/11/11	9.4		2025/11/09	1.261					
477	2025/09/30	179.2°	0h26m	+ 2°				2025/09/30	11.9		2025/09/24	1.011					
506	2025/02/17	172.1°	9h56m	+ 4°				2025/02/17	12.6		2025/02/14	1.752					
531	2025/04/22	159.2°	14h46m	+ 5°				2025/04/24	14.5		2025/04/28	1.332					
556	2025/01/13	178.8°	7h40m	+20°				2025/01/13	11.8		2025/01/13	1.228					
571	2025/12/02	170.1°	4h26m	+31°				2025/11/30	13.3		2025/11/23	0.922					
584	2025/08/24	162.2°	21h56m	+ 6°				2025/08/27	10.4		2025/08/31	0.891					
597	2025/09/24	166.6°	0h32m	-12°				2025/09/23	12.3		2025/09/21	1.312					
605	2025/09/28	167.1°	0h 1m	+14°				2025/09/27	13.4		2025/09/26	1.610					
634	2025/09/02	170.6°	23h 1m	-16°				2025/09/02	12.8		2025/09/02	1.509					
649	2025/09/13	176.8°	23h29m	- 6°				2025/09/13	13.5		2025/09/11	0.833					
665	2025/06/15	166.0°	17h26m	-37°				2025/06/15	11.7		2025/06/15	1.608					
667	2025/02/08	169.4°	9h 9m	+ 5°				2025/02/07	12.6		2025/02/05	1.706					
668	2025/08/23	168.4°	21h53m	- 0°				2025/08/23	14.2		2025/08/22	1.141					
692	2025/12/04	173.5°	4h39m	+28°				2025/12/04	13.2		2025/12/07	1.943					
697	2025/10/07	179.4°	0h53m	+ 5°				2025/10/07	12.5		2025/10/04	1.471					
747	2025/09/01	162.9°	23h18m	-22°				2025/09/05	10.7		2025/09/13	1.319					
794	2025/07/27	174.0°	20h18m	-13°				2025/07/26	13.5		2025/07/24	1.206					
855	2025/04/30	171.1°	14h20m	-23°				2025/04/30	13.6		2025/05/05	0.972					
887	2025/01/13	170.8°	7h 8m	+27°				2025/01/12	9.4		2025/01/08	0.082					
922	2025/10/12	178.6°	1h 7m	+ 8°				2025/10/12	14.2		2025/10/05	1.285					
924	2025/11/04	166.1°	2h55m	+ 2°				2025/11/03	12.8		2025/10/31	1.563					
934	2025/09/04	172.6°	22h43m	- 0°				2025/09/05	13.0		2025/09/09	1.279					
936	2025/07/09	177.2°	19h17m	-25°				2025/07/09	13.3		2025/07/12	1.618					
940	2025/08/22	170.4°	22h19m	-20°				2025/08/22	13.4		2025/08/23	1.822					
949	2025/03/01	173.9°	10h39m	+ 1°				2025/03/01	13.0		2025/03/07	1.561					
968	2025/02/24	164.7°	10h 7m	- 4°				2025/02/24	13.4		2025/02/25	1.527					
969	2025/08/22	177.0°	22h 1m	- 8°				2025/08/22	14.5		2025/08/28	1.067					
980	2025/07/02	177.4°	18h45m	-25°				2025/07/02	10.9		2025/07/10	1.479					
994	2025/09/19	177.0°	23h51m	- 4°				2025/09/19	12.7		2025/09/17	1.239					
1000	2025/07/11	158.9°	19h23m	-43°				2025/07/08	13.0		2025/07/04	1.499					
1024	2025/10/28	167.6°	2h19m	+ 0°				2025/10/27	13.4		2025/10/23	1.292					
1056	2025/08/18	172.0°	22h 3m	-20°				2025/08/18	13.0		2025/08/15	0.828					
1067	2025/01/11	179.4°	7h32m	+21°				2025/01/11	13.8		2025/01/05	1.579					
1080	2025/10/04	178.4°	0h40m	+ 6°				2025/10/04	13.6		2025/10/13	0.918					
1088	2025/11/10	178.1°	3h 4m	+15°				2025/11/10	12.4		2025/11/04	0.827					
1093	2025/05/16	179.3°	15h35m	-19°				2025/05/17	12.1		2025/05/26	1.643					
1117	2025/08/11	178.6°	21h22m	-13°				2025/08/11	12.9		2025/08/06	0.805					
1122	2025/11/14	178.1°	3h21m	+16°				2025/11/14	12.7		2025/11/09	0.974					
1126	2025/01/19	168.5°	8h16m	+31°				2025/01/20	14.0		2025/01/22	0.975					
1127	2025/01/10	171.1°	7h19m	+13°				2025/01/09	13.2		2025/01/01	1.126					
1146	2025/06/10	157.5°	17h29m	- 0°				2025/06/11	12.8		2025/06/13	1.314					
1155	2025/04/15	177.0°	13h40m	- 7°				2025/04/16	13.8		2025/04/20	1.086					
1165	2025/08/28	163.9°	22h 1m	+ 5°				2025/08/27	13.8		2025/08/23	1.555					
1251	2025/08/16	179.2°	21h46m	-14°				2025/08/16	13.1		2025/08/19	1.335					
1318	2025/03/08	168.4°	11h22m	+16°				2025/03/09	13.5		2025/03/13	0.895					
1342	2025/02/12	170.4°	9h39m	+ 4°				2025/02/13	12.9		2025/02/18	0.905					
1346	2025/10/08	167.5°	1h18m	- 5°				2025/10/09	14.0		2025/10/12	1.258					
1463	2025/09/23	173.9°	23h52m	+ 5°				2025/09/24	14.1		2025/09/27	1.682					
1475	2025/10/02	178.2°	0h29m	+ 5°				2025/10/02	14.4		2025/10/05	0.999					
1493	2025/08/15	179.1°	21h39m	-14°				2025/08/15	13.4		2025/08/16	0.934					

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	
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		Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist		Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
1342	2025/02/12	170.4°		9h39m	+ 4°				2025/02/13	12.9		2025/02/18	0.905	1734	2025/09/09	175.8°	23h 3m	- 1°	2025/09/09	14.0		2025/09/12	1.166	3687	2025/09/11	155.7°	22h33m	+17°	2025/09/10	14.3		2025/09/09	1.232	5567	2025/09/12	170.1°	23h33m	-13°	2025/09/11	13.7		2025/09/07	1.359	506	2025/02/17	172.1°	9h56m	+ 4°	2025/02/17	12.6		2025/02/14	1.752	649	2025/09/13	176.8°	23h29m	- 6°	2025/09/13	13.5		2025/09/11	0.833	137126	2025/02/20	151.8°	11h58m	- 0°	2025/03/05	13.9		2025/03/08	0.053	152664	2025/09/18	167.7°	0h25m	+ 4°	2025/09/28	13.9		2025/09/29	0.026	373	2025/09/19	176.9°	23h52m	- 4°	2025/09/19	12.6		2025/09/18	1.689	994	2025/09/19	177.0°	23h51m	- 4°	2025/09/19	12.7		2025/09/17	1.239	3918	2025/09/19	175.0°	23h58m	- 5°	2025/09/19	14.3		2025/09/19	0.776	444	2025/09/22	174.9°	23h49m	+ 4°	2025/09/22	10.4		2025/09/20	1.293	1463	2025/09/23	173.9°	23h52m	+ 5°	2025/09/24	14.1		2025/09/27	1.682	597	2025/09/24	166.6°	0h22m	-12°	2025/09/23	12.3		2025/09/21	1.312	605	2025/09/28	167.1°	0h 1m	+14°	2025/09/27	13.4		2025/09/26	1.610	2109	2025/09/28	173.4°	0h33m	- 3°	2025/09/28	13.7		2025/09/25	1.001	477	2025/09/30	179.2°	0h26m	+ 2°	2025/09/30	11.9		2025/09/24	1.011	1475	2025/10/02	178.2°	0h29m	+ 5°	2025/10/02	14.4		2025/10/05	0.999	244	2025/10/03	178.0°	0h34m	+ 5°	2025/10/03	13.4		2025/10/03	0.878	4217	2025/10/03	165.1°	0h25m	+18°	2025/10/01	13.9		2025/09/27	0.875	1080	2025/10/04	178.4°	0h40m	+ 6°	2025/10/04	13.6		2025/10/13	0.918	1916	2025/10/05	158.1°	0h21m	+25°	2025/09/14	14.7		2025/08/26	0.385	7824	2025/10/06	171.5°	1h 4m	- 2°	2025/10/05	14.5		2025/10/01	0.808	697	2025/10/07	179.4°	0h53m	+ 5°	2025/10/07	12.5		2025/10/04	1.471	3444	2025/10/07	173.4°	0h42m	+11°	2025/10/08	14.4		2025/10/15	1.049	1346	2025/10/08	167.5°	1h18m	- 5°	2025/10/09	14.0		2025/10/12	1.258	922	2025/10/12	178.6°	1h 7m	+ 8°	2025/10/12	14.2		2025/10/05	1.285	4997	2025/10/12	166.6°	1h 5m	+20°	2025/10/14	14.1		2025/10/20	1.079	85	2025/10/16	179.5°	1h27m	+ 9°	2025/10/16	10.1		2025/10/09	1.310	333	2025/10/24	176.3°	1h48m	+15°	2025/10/23	12.8		2025/10/21	1.646	164206	2025/10/27	173.0°	2h35m	+14°	2025/10/29	14.0		2025/11/07	0.112	1024	2025/10/28	167.6°	2h19m	+ 0°	2025/10/27	13.4		2025/10/23	1.292	1555	2025/10/29	168.4°	1h58m	+24°	2025/10/28	13.7		2025/10/21	1.020	4613	2025/10/29	166.6°	2h33m	+ 0°	2025/10/29	13.4		2025/10/29	0.885	3361	2025/10/30	155.3°	3h54m	+ 6°	2025/11/14	14.2		2025/11/19	0.038	415	2025/11/02	163.9°	2h50m	- 0°	2025/11/04	11.3		2025/11/07	1.022	1554	2025/11/03	178.5°	2h36m	+13°	2025/11/03	14.3		2025/10/26	1.240	924	2025/11/04	166.1°	2h55m	+ 2°	2025/11/03	12.8		2025/10/31	1.563	104	2025/11/08	179.6°	2h52m	+16°	2025/11/08	11.6		2025/11/10	1.684	4155	2025/11/09	173.8°	2h51m	+22°	2025/11/08	14.2		2025/11/01	0.914	1088	2025/11/10	178.1°	3h 4m	+15°	2025/11/10	12.4		2025/11/04	0.827	471	2025/11/11	164.2°	3h19m	+ 2°	2025/11/11	9.4		2025/11/09	1.261	245	2025/11/12	178.4°	3h12m	+16°	2025/11/12	10.8		2025/11/09	1.511	1122	2025/11/14	178.1°	3h21m	+16°	2025/11/14	12.7		2025/11/09	0.974	1672	2025/11/14	178.5°	3h18m	+16°	2025/11/14	13.7		2025/11/17	1.340	4807	2025/11/21	178.9°	3h45m	+20°	2025/11/21	14.5		2025/11/21	0.851	330	2025/12/02	167.2°	4h40m	+ 9°	2025/12/01	14.4		2025/11/25	0.931	352	2025/12/02	179.4°	4h36m	+21°	2025/12/02	11.4		2025/11/27	0.932	571	2025/12/02	170.1°	4h26m	+31°	2025/11/30	13.3		2025/11/23	0.922	692	2025/12/04	173.5°	4h39m	+28°	2025/12/04	13.2		2025/12/07	1.943	7369	2025/12/06	154.4°	3h51m	+44°	2025/12/01	14.2		2025/11/25	0.742	10142	2025/12/08	178.3°	4h58m	+24°	2025/12/07	14.4		2025/11/30	1.209	3401	2025/12/14	128.9°	2h42m	+67°	2025/12/11	14.0		2025/12/09	0.694	2078	2025/12/15	155.3°	4h34m	+45°	2025/12/07	13.2		2025/11/27	0.673	4293	2025/12/16	172.2°	5h36m	+31°	2025/12/16	14.3		2025/12/20	1.167	200	2025/12/31	171.8°	6h41m	+31°	2025/12/30	11.4		2025/12/27	1.487	89	2025/08/10	176.1°	21h20m	-11°	2025/08/11	8.8		2025/08/15	1.138	1117	2025/08/11	178.6°	21h22m	-13°	2025/08/11	12.9		2025/08/06	0.805	1493	2025/08/15	179.1°	21h39m	-14°	2025/08/15	13.4		2025/08/16	0.934	1251	2025/08/16	179.2°	21h46m	-14°	2025/08/16	13.1		2025/08/19	1.335	226	2025/08/17	174.6°	21h59m	-17°	2025/08/17	12.2		2025/08/12	1.223	1056	2025/08/18	172.0°	22h 3m	-20°	2025/08/18	13.0		2025/08/15	0.828	3773	2025/08/18	177.0°	21h56m	-15°	2025/08/18	14.3		2025/08/22	0.781	940	2025/08/22	170.4°	22h19m	-20°	2025/08/22	13.4		2025/08/23	1.822	969	2025/08/22	177.0°	22h 1m	- 8°	2025/08/22	14.5		2025/08/28	1.067	4287	2025/08/22	167.7°	22h21m	-23°	2025/08/21	14.5		2025/08/17	0.807	668	2025/08/23	168.4°	21h53m	- 0°	2025/08/23	14.2		2025/08/22	1.141	584	2025/08/24	162.2°	21h56m	+ 6°	2025/08/27	10.4		2025/08/31	0.891	6	2025/08/25	172.5°	22h32m	-17°	2025/08/26	7.6		2025/08/31	1.025	2525	2025/08/25	175.9°	22h20m	-14°	2025/08/25	14.0		2025/08/28	1.685	1165	2025/08/28	163.9°	22h 1m	+ 5°	2025/08/27	13.8		2025/08/23	1.555	3813	2025/08/30	177.2°	22h32m	- 6°	2025/08/30	14.4		2025/08/25	0.826	185	2025/08/31	176.9°	22h43m	-11°	2025/08/31	10.5		2025/09/02	1.445	61	2025/09/01	176.9°	22h38m	- 5°	2025/09/01	10.7		2025/09/01	1.490	747	2025/09/01	162.9°	23h18m	-22°	2025/09/05	10.7		2025/09/13	1.319	634	2025/09/02	170.6°	23h 1m	-16°	2025/09/02	12.8		2025/09/02	1.509	934	2025/09/04	172.6°	22h43m	- 0°	2025/09/05	13.0		2025/09/09	1.279	4520	2025/09/04	170.9°	23h 8m	-15°	2025/09/04	14.1		2025/09/05	0.778	379	2025/09/05	179.4°	22h54m	- 6°	2025/09/05	12.0		2025/09/05	1.577	1946	2025/09/08	169.9°	23h19m	-15°	2025/09/08	13.0		2025/09/10	0.763	5275	2025/09/08	165.4°	22h43m	+ 7°	2025/09/08	14.3		2025/09/07	0.646

Table III. Numerical List of Approaches Closer than 0.3 AU

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist																																													
887	2025/01/13	170.8°		7h 8m	+27°			2025/01/12	9.4		2025/01/08	0.082	3361	2025/10/30	155.3°	3h54m	+6°	2025/11/14	14.2		2025/11/19	0.038	137126	2025/02/20	151.8°	11h58m	-0°	2025/03/05	13.9		2025/03/08	0.053	152664	2025/09/18	167.7°	0h25m	+4°	2025/09/28	13.9		2025/09/29	0.026	163696	2025/05/26	177.8°	16h09m	-19°	2025/05/27	14.2		2025/06/10	0.177	164206	2025/10/27	173.0°	2h35m	+14°	2025/10/29	14.0		2025/11/07	0.112