Comet Prospects for 2023

The best prospect is for a comet discovered in 2022 that makes a relatively close approach to the Earth, when it might be just visible to the naked eye. There is also a chance of a moderately bright long period comet at the beginning of the year for southern hemisphere observers. Six periodic comets may be bright enough for easy visual observation, but will still require large binoculars or a telescope.

These predictions focus on comets that are likely to be within range of visual observers, though comets often do not behave as expected and can spring surprises. Members are encouraged to make visual magnitude estimates, particularly of periodic comets, as long term monitoring over many returns helps understand their evolution. Please submit your magnitude estimates in ICQ format. Guidance on visual observation and how to submit estimates is given in the BAA Observing Guide to Comets. Drawings are also useful, as the human eye can sometimes discern features that initially elude electronic devices.

Theories on the structure of comets suggest that any comet could fragment at any time, so it is worth keeping an eye on some of the fainter comets, which are often ignored. They would make useful targets for those making electronic observations, especially those with time on instruments such as the Faulkes telescopes. Such observers are encouraged to report electronic visual equivalent magnitude estimates via COBS. When possible use a waveband approximating to Visual or V magnitudes. These estimates can be used to extend the visual light curves, and hence derive more accurate absolute magnitudes. Such observations of periodic comets are particularly valuable as observations over many returns allow investigation into the evolution of comets.

In addition to the information in the BAA Handbook and on the Section web pages, ephemerides for new and currently observable comets are on the JPL, CBAT and Seiichi Yoshida's web pages. The BAA Observing Guide to Comets is available on the Section web page.

2P/Encke makes an autumn return, which is good news for northern hemisphere observers. The bad news is that it will only be visible in the morning sky. It could come into visual range in August and brightens by three magnitudes during September. It is however diving south towards perihelion and will be lost in the morning twilight in mid October when it may have reached 6th magnitude. It will pass through the SOHO coronagraph fields (if the satellite is still operational) between about October 26 and November 12.

12P/Pons-Brooks does not reach perihelion until 2024, however it deserves mention as a Halley-type comet with a 70 year period. It was discovered by Jean-Louis Pons in 1812, then recovered as a new comet by William R Brooks in 1883. It was next seen in 1954 when it was well observed by the BAA comet section, with observations by George Alcock, Mike Hendrie, Albert Jones, Gerald Merton, Roy Panther, W. H. “Steave” Steavenson and Reggie Waterfield amongst others. Studies by Maik Meyer linked comets seen in 1385 and 1457 with 12P. With a well-defined orbit it was recovered at this return in mid-June 2020. It does not reach perihelion until 2024 April, but could be as bright as 11th magnitude at the end of the year, when it will be best seen in the early evening sky.

29P/Schwassmann-Wachmann is an annual comet that has outbursts, which over the last few decades seem to have become more frequent, though this could just reflect more intense coverage. Richard Miles has developed a theory that suggests that these outbursts are in fact periodic, and arise from at least four independent active areas on the slowly rotating nucleus. The activity of the active areas evolves with time. The comet is an ideal target for electronic observations and it should be observed at every opportunity. The comet begins the year in Auriga, near opposition. It passes through solar conjunction in July, with UK observers being able to follow it again from September. It ends the year in Cancer.

62P/Tsuchinshan passed 0.27 au from Jupiter in 2020 April in an encounter that further reduced the comet's perihelion distance by 0.1 au. Such reductions often lead to enhanced cometary activity, though observations up to 2017 show a consistent behaviour for this comet. It is well placed for observation from the UK when brightest, but it is essentially a morning object. If it follows the pattern of the last apparition it could be bright enough for observation with large binoculars by November. It may be within range of small binoculars in December, when it passes through perihelion. It is making a moderately close approach to the Earth at 0.5 au, so the smaller apertures may give a better view. The comet passes open cluster M44 around November 17 and the faint galaxy NGC 3489 around December 23. A day either side of December 29 it is close to galaxies M65, M66 and NGC 3628.

96P/Machholz will not be well placed when bright. Near equatorial observers have a potential chance of seeing it in late February after perihelion, when it has already faded to 10th magnitude.

103P/Hartley has a good return for UK observers, with the comet well placed when brightest in early October, though best seen in the morning sky. It should be visible in large binoculars during the late evening sky in September but the moon interferes later in the month and the comet will essentially be a morning object by the time the moon has waned in October. It is likely to be quite a large, diffuse object as it passes 0.4 au from Earth in late September.

144P/Kushida is brightening on its way to perihelion in January 2024. It should come into view for users of small telescopes/large binoculars during October, when it is visible in the evening sky for UK observers. The comet continues brightening and stays conveniently placed in the evening sky. It may be visible in small binoculars by the end of the year. This is another comet that is likely to have a large and diffuse coma, as it passes 0.6 au from the Earth during December. There are no obvious imaging opportunities when it is close to a nebula.

226P/Pigott-LINEAR-Kowalski is at high southern declination until late in the year. It may be brighter than 11th magnitude from October onwards, and by November is moving more rapidly northwards. UK observers may pick it up in mid December, although the waxing moon will interfere as the comet's elevation improves. It is notable for being a treble-barrelled comet name, having been discovered by Pigott in 1783. It was then lost until a comet was discovered by the LINEAR search programme in 2003. The comet was named for LINEAR, with suggestions that the observations could be fitted by a return of Pigott's comet. In 2009 Rich Kowalski discovered a comet during the Catalina Sky Survey and this was then linked to the comet of 2003 and thence to Pigott's comet. It had passed very close (0.06 au) to Jupiter in 2006 September and this had made any prior orbits impossible to extrapolate.

237P/LINEAR brightened unusually rapidly at the 2016 return and may not repeat the performance in 2023.

263P/Gibbs comes to perihelion when not far from opposition, which makes this a very good return. It could be 8th magnitude during the first three months of the year and visible in the evening sky. It is however likely to be large and diffuse as it passes 0.33 au from Earth.

364P/PanSTARRS is another comet that will make a close pass to the Earth, reaching 0.12 au in early April. The magnitude parameters are a little uncertain and it could be anywhere between 8th and 11th magnitude. It is an intrinsically faint object, so activity is likely to be low and the diffuse coma best seen from a really dark-sky location. It is well placed in the morning sky as it brightens during March, but is heading south and will be lost to UK observers by mid-April, by which time it will already be fading.

2017 K2 (PanSTARRS) was at perihelion in late 2022. It will be at its brightest in early 2023, when it will be at high southern declination. During the apparition to date it has brightened slowly, although there is some scatter in the observations. It is therefore likely to be around 8th magnitude at the start of the year. The slow change in brightness also means that it should fade slowly and it could still be 11th magnitude when it returns to northern skies in the autumn.

2019 L3 (ATLAS) has an unusually bright absolute magnitude and was an easy large-binocular object in early 2022 due to its well condensed coma. It will however be fading and probably a difficult visual object.

2021 S3 (PanSTARRS) is brightening on its way to perihelion in 2024 and may have reached 9th magnitude by the end of the year. It is another object best suited to visual observers in the southern hemisphere in 2023, however it is a northern object after perihelion.

2021 T4 (Lemmon) potentially reaches 8th magnitude just before perihelion when it passes 0.5 au from the Earth, but will then be at high southern declination. Those with access to southern hemisphere remote telescopes should be able to get some good images as the comet will be near opposition when at perihelion and the Moon is new.

2022 E3 (ZTF) could be the brightest well placed comet of the year, reaching 6th magnitude. It approaches within ten degrees of Polaris at the end of January, when it is at its brightest. This is however during a pass by the Earth when it is only 0.3 au away, so it is likely to show a large, diffuse coma. The best observing circumstances are likely to be between perihelion and closest approach, when the Moon is near new. After the pass it quickly moves south and fades, so that it will be lost by the end of March. In 2022 December the 9th magnitude comet passes through Corona Borealis and is best seen in the morning sky. In late January the comet enters Ursa Minor and tracks rapidly across the polar regions. On February 12 the fading comet is close to the very much brighter Mars, then tracks past the Hyades. With a perihelion distance just outside the Earth's orbit it is unlikely to develop a prominent tail for visual observers, however imagers will find more detail. Maximum tail length is expected in late January.

The other periodic and parabolic comets that are at perihelion during 2023 are unlikely to become brighter than 11th magnitude or are poorly placed. Ephemerides for these can be found on the CBAT or other WWW pages. Several D/ comets have predictions for a return, though searches at favourable returns in the intervening period have failed to reveal the comets and the orbits will have been perturbed by Jupiter. There is however always a chance that they will be rediscovered accidentally by one of the Sky Survey patrols.

Looking ahead to 2024, 12P/Pons-Brooks could reach 4th magnitude and 2021 S3 7th magnitude, but no other comets are currently predicted to get brighter than 10th magnitude. However, some orbits for comets due to return in the future are yet to be published by the MPC.

With more and more discoveries and recoveries of periodic comets being made, the number of expected returns increases every year. A full list of returning comets is given as an online supplement, but here only those comets expected to be brighter than 14th magnitude during the year are listed.

Comets brighter than magnitude 14 in 2023

Comet	T	q	P	N	H_1	K_1	Elong at peak	Peak mag
At perihelion in 2022								
51P-Harrington	Oct 3.9	1.69	7.14	8	10.0	10.0	87	14
80P/Peters-Hartley	Dec 8.9	1.62	8.07	5	8.5	15.0	17	14
81P/Wild	Dec 15.6	1.60	6.42	7	6.6	12.3	65	11
116P/Wild	Jul 16.9	2.20	6.52	5	5.6	13.4	23	13
118P/Shoemaker-Levy	Nov 24.3	1.83	6.12	5	7.1	14.1	155	11
119P/Parker-Hartley	Aug 12.0	2.33	7.42	4	9.0	8.0	164	13
255P/Levy	Sep 1.9	0.82	5.02	2	9.0	10.0	47	14

2017 K2 (PanSTARRS)	Dec 19.7	1.80			5.0	5.9	51	8
2019 L3 (ATLAS)	Jan 9.6	3.55			-4.0	20.3	110	13
2020 R7 (ATLAS)	Sep 16.3	2.96			8.0	7.6	106	14
2019 T4 (ATLAS)	Jun 9.1	4.24			0.7	13.6	108	13
2021 P1 (NEOWISE)	Jun 2.3	4.37			11.0	10.0	17	12
At perihelion in 2023								
2P/Encke	Oct 22.5	0.34	3.30	64	10.2	9.6	12	6
62P/Tsuchinshan	Dec 25.1	1.26	6.18	8	4.8	32.8	110	7
71P/Clark	Jan 21.7	1.59	5.55	9	10.5	6.0	25	14
72P/Denning-Fujikawa	Jun 15.9	0.78	8.94	3	15.5	25.0	30	14
77P/Longmore	Apr 3.1	2.35	6.90	7	5.7	17.1	162	13
96P/Machholz	Jan 31.1	0.12	5.28	7	11.3	9.9	4	2
103P/Hartley	Oct 12.5	1.06	6.48	6	9.0	33.2	88	8
126P/IRAS	Jul 5.5	1.71	13.4	3	9.0	10.0	98	12
185P/Petriew	Jul 12.9	0.93	5.45	4	10.7	19.6	35	11
226P/Pigott-LINEAR-Kowalski	Dec 27.2	1.77	7.31	5	6.0	15.0	108	10
237P/LINEAR	May 14.7	1.99	6.58	2	-7.6	53.5	134	9 ?
263P/Gibbs	Feb 1.5	1.25	5.34	2	9.0	10.0	137	8
364P/PanSTARRS	May 14.0	0.80	4.89	2	12.9	5.0	75	8
2019 U5 (PANSTARRS)	Mar 29.6	3.62			4.3	10.5	177	12
2020 K1 (PanSTARRS)	May 9.3	3.07			4.4	10.6	118	12
2020 V2 (ZTF)	May 8.4	2.23			4.4	9.4	123	10
2021 T4 (Lemmon)	Jul 31.4	1.48			7.5	10.0	144	8
2021 Y1 (ATLAS)	Apr 30.9	2.03			7.0	10.0	52	12
2022 E3 (ZTF)	Jan 12.8	1.11			8.6	7.6	123	6
At perihelion in 2024								
12P/Pons-Brooks	Apr 21.0	0.78	70	5	5.0	15.0	62	11
13P/Olbers	Jul 1.0	1.18	69	3	5.0	15.0	114	13
144P/Kushida	Jan 25.7	1.40	7.49	4	5.5	18.7	128	7
2021 S3 (PanSTARRS)	Feb 14.9	1.32			5.5	10.0	81	9

The date of perihelion (T), perihelion distance (q), period (P), the number of previously observed returns (N), the magnitude parameters H_1 and K_1, the brightest magnitude (which must be regarded as uncertain) and the approximate elongation at which this occurs are given for each comet. In most cases the comet will be brightest at around the time of perihelion.

Note: $m_1 = H_1 + 5.0 * \log(d) + K_1 * \log(r)$

Online supplement list of all comets predicted to reach perihelion in 2023

Comet	T	q	P	N	H_1	K_1	Elong	Peak mag
2P/Encke	Oct 22.5	0.34	3.30	64	10.2	9.6	12	6
5D/Brorsen	Apr 14.7	0.52	5.61	5	9.5	10.0	31	??
26P/Grigg-Skjellerup	Dec 25.7	1.08	5.23	21	12.0	40.0	31	15
39P/Oterma	Jul 11.6	5.71	19.43	5	5.0	15.0	176	20
62P/Tsuchinshan	Dec 25.1	1.26	6.18	8	4.8	32.8	110	7
71P/Clark	Jan 21.7	1.59	5.55	9	10.5	6.0	25	14
72P/Denning-Fujikawa	Jun 15.9	0.78	8.94	3	15.5	25.0	30	14
77P/Longmore	Apr 3.1	2.35	6.90	7	5.7	17.1	162	13
79P/du Toit-Hartley	Sep 30.3	1.12	5.05	6	16.0	10.0	9	18
94P/Russell	May 21.1	2.23	6.58	6	9.6	13.1	153	15
96P/Machholz	Jan 31.1	0.12	5.28	7	11.3	9.9	4	2
103P/Hartley	Oct 12.5	1.06	6.48	6	9.0	33.2	88	8
121P/Shoemaker-Holt	Jun 28.7	3.73	9.81	5	4.5	15.0	152	15

126P/IRAS	Jul 5.5	1.71	13.4	3	9.0	10.0	98	12
147P/Kushida-Muramatsu	Dec 1.5	2.99	7.85	3	14.0	10.0	179	20
170P/Christensen	Apr 19.9	2.92	8.64	3	12.0	10.0	156	19
180P/NEAT	Jul 12.2	2.50	7.61	4	11.0	10.0	149	17
185P/Petriew	Jul 12.9	0.93	5.45	4	10.7	19.6	35	11
199P/Shoemaker	Aug 7.6	2.91	14.32	2	10.0	10.0	174	16
213P/Van Ness	Nov 12.0	1.98	6.12	3	10.5	10.0	140	15
225P/LINEAR	Aug 8.6	1.32	6.98	3	18.0	10.0	72	20
226P/Pigott-LINEAR-Kowalski	Dec 27.2	1.77	7.31	5	6.0	15.0	108	10
237P/LINEAR	May 14.7	1.99	6.58	2	-7.6	53.5	134	9 ?
256P/LINEAR	Mar 12.2	2.70	9.99	2	14.0	5.0	152	17
263P/Gibbs	Feb 1.5	1.25	5.34	2	9.0	10.0	137	8
279P/La Sagra	Apr 19.6	2.15	6.76	3	14.0	10.0	138	19
280P/Larsen	Aug 4.6	2.64	9.64	2	12.5	10.0	154	18
281P/MOSS	Feb 1.6	4.03	10.77	2	11.0	10.0	177	19
285P/LINEAR	Jan 12.3	1.72	9.58	2	15.0	10.0	52	19
287P/Christensen	Jul 6.0	3.03	8.49	2	11.0	10.0	169	17
291P/NEAT	May 4.2	2.57	9.67	2	11.5	10.0	142	18
300P/Catalina	Apr 11.1	0.83	4.43	3	17.5	10.0	29	18
310P/Hill	Oct 23.7	2.42	8.57	2	19.0	10.0	167	24
321P/SOHO	Oct 26.6	0.05	3.77	5				??
322P/SOHO	Aug 21.1	0.05	3.97	5				??
326P/Hill	Dec 30.2	2.77	8.20	3	13.5	10.0	170	19
339P/Gibbs	Aug 30.9	1.35	7.12	2	17.0	10.0	25	20
347P/PANSTARRS	Jul 20.1	2.21	6.85	3	15.0	10.0	154	19
354P/LINEAR	Oct 13.9	2.00	3.47	2	15.5	10.0	140	19
358P/PANSTARRS	Nov 10.9	2.39	5.59	3	15.0	10.0	162	20
364P/PanSTARRS	May 14.0	0.80	4.89	2	12.9	5.0	75	8
365P/PANSTARRS	Oct 9.4	1.32	5.61	2	17.2	11.0	24	20
404P/Bressi	Nov 4.1	4.13	10.31	2	9.0	10.0	179	18
426P/PANSTARRS	Sep 14.5	2.67	5.69	1	13.5	10.0	160	19
427P/ATLAS	Mar 19.3	2.17	5.64	1	14.0	10.0	146	19
1978 R1 (D/Haneda-Campos)	Apr 17.7	1.28	6.43	1	13.5	10.0	7	16
2000 C4 (P/SOHO)	Feb 24.8	0.04	5.77	2				??
2002 R4 (P/SOHO)	Nov 27.6	0.05	5.32	2				??
P/2004 V3 (Siding Spring)	Nov 21.9	3.96	19.10	1	11.5	10.0	130	20
P/2005 E1 (Tubbiolo)	Sep 30.1	4.40	18.66	1	10.0	10.0	168	19
2007 T2 (P/Kowalski)	Nov 15.6	0.65	5.31	1	18.5	10.0	54	15
P/2008 L2 (Hill)	May 11.4	2.33	14.80	1	12.5	10.0	128	18
P/2012 WA_{34} (Lemmon-PANSTARRS)	Jul 8.9	3.07	10.12	1	13.5	10.0	143	21
P/2013 YG_{46} (Spacewatch)	Jan 6.3	1.79	5.92	1	10.0	10.0	7	15
P/2014 A3 (PANSTARRS)	Apr 22.5	3.47	9.89	1	12.0	10.0	132	20
P/2014 W1 (PANSTARRS)	Dec 18.6	2.73	9.47	1	15.5	10.0	168	21
A/2014 XK6 [PanSTARRS]	Aug 30.1	0.71	4.47	1	19.2	5.0	18	16
2015 T3 (P/PanSTARRS)	May 3.05	2.15	8.12	1	14.0	10.0	137	19
A/2017 MC9 [PanSTARRS]	Oct 7.7	1.61	6.23	1	19.2	5.0	130	21
P/2017 S9 (PANSTARRS)	Feb 27.1	2.19	5.61	1	16.8	10.0	60	22
P/2018 P3 (PANSTARRS)	Dec 26.5	1.75	5.21	1	17.5	10.0	129	21
P/2019 A4 (PANSTARRS)	Mar 2.6	2.38	4.22	1	15.0	10.0	153	20
C/2019 E3 (ATLAS)	Nov 15.3	10.31			2.5	10.0	93	18
A/2019 O2 [PanSTARRS]	Apr 7.2	9.68			9.7	10.0	127	24
2019 U5 (PanSTARRS)	Mar 29.6	3.62			10.0	5.0	177	15
2020 K1 (PanSTARRS)	May 9.3	3.07			5.5	10.0	118	12
2020 S4 (PanSTARRS)	Feb 7.6	3.36			8.5	8.0	170	15
2020 V2 (ZTF)	May 8.4	2.23			7.0	8.0	125	12
2021 A9 (PANSTARRS)	Dec 1.9	7.76			6.0	10.0	166	19
2021 C5 (PANSTARRS)	Feb 11.0	3.24			9.0	10.0	109	17
2021 P2 (PANSTARRS)	Jan 22.3	5.08			9.0	10.0	140	19
2021 Q4 (Fuls)	Jun 8.8	7.57			6.0	10.0	151	19
2021 S4 (Tsuchinshan)	Dec 26.2	6.78			6.5	10.0	161	19

2021 T4 (Lemmon)	Jul 31.4	1.48			7.5	10.0	144	8
2021 V2 (Fuls)	Jan 21.6	3.50	27.16		10.0	10.0	163	17
2021 X1 (Maury-Attard)	May 27.4	3.23			11.5	5.0	164	16
2021 Y1 (ATLAS)	Apr 30.9	2.03			7.0	10.0	52	12
2022 A2 (PANSTARRS)	Feb 16.0	1.73			9.5	10.0	81	13
2022 A3 (Lemmon-ATLAS)	Sep 28.9	3.70			8.0	10.0	82	17
2022 E3 (ZTF)	Jan 12.8	1.11			8.6	7.6	123	6
2022 O2 (PANSTARRS)	Jan 7.1	1.76	15.85		16.0	10.0	65	20

The date of perihelion (T), perihelion distance (q), period (P), the number of previously observed returns (N), the magnitude parameters H_1 and K_1 and the brightest magnitude (which must be regarded as uncertain) and the elongation at which it occurs are given for each comet. The magnitudes, orbits, and in particular the time of perihelion of the D/ comets are uncertain. The SOHO comets are only likely to be observed by satellite and some of the linkages are uncertain.

Note: $m_1 = H_1 + 5.0 * \log(d) + K_1 * \log(r)$

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