Comet Prospects for 2022

There is a chance of a moderately bright comet at the beginning of the year for southern hemisphere observers. Northern Hemisphere observers may get a binocular comet in May and another in the summer. Four 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.

9P/Tempel reaches 11th magnitude, but it is at a southern declination. For southern hemisphere observers it will be a morning object when brightest in March.

Alphonse Borrelly discovered comet **19P/Borrelly** in 1904 from Marseilles, France, during a routine comet search with a 160mm refractor. It was put into its discovery orbit by an encounter with Jupiter in 1889, which only made minor changes, and subsequent returns slowly became more favourable. Despite having had several further moderately close approaches to Jupiter the orbit has only changed a little. The comet approached Jupiter again in 2019 and this has slightly reduced the perihelion distance. 2022 will be its 16th observed return, with two poor ones having been missed. At its best return in 1987 it reached 7.5^{m}. For UK observers the comet enters the evening sky at the end of the old year as a 9th magnitude object, and it could remain this bright for a couple of months. It fades, but remains conveniently placed for evening viewing until it sinks into the summer twilight at the end of May.

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 well placed in the evening sky and is in solar conjunction in June. It emerges into the morning sky in August on its way to opposition in late December.

67P/Churyumov-Gerasimenko returned in 2021 but should still be visible at the start of 2022 as a 9th magnitude object. It is fading, but well placed for convenient viewing in the evening sky. It will probably have faded below 11th magnitude by the end of February.

81P/Wild is an early morning object of 11th magnitude in the last few months of the year and reaches its brightest at 10th magnitude early in 2023.

Charles Kowal discovered **104P/Kowal** on plates exposed with the 1.22-m Palomar Schmidt in late January 1979. In 1991, Masao Ishikawa (Fukaya, Saitama, Japan) photographically discovered a 14th magnitude comet moving slowly south in Hydra on December 12.70 with a 0.16-m astrograph. This was subsequently identified as comet P/Kowal, returning to perihelion 54 days early. The comet had been missed at its 1985 return, which was a poor one. Frequent encounters with Jupiter regularly change the orbit, the most recent drastic change occurring in 1924. Another encounter in 2007 reduced the perihelion distance to 1.2 au, and a further one in 2019 has reduced it further to 1.1 au. The comet is another evening object, of around 9th magnitude at the start of the year, but may be large and diffuse as it will be relatively close to the Earth. It remains conveniently placed in the evening sky as it fades, but may be fainter than 11th magnitude by the end of March. It is possible that the reduction in perihelion distance will increase the activity of the comet and it will be worth electronic observers following it from mid-2021.

255P/Levy is at a poor elongation when brightest and although it reaches 9th magnitude will be a challenging target for electronic observers. More equatorially located observers may get a chance to see it in the early morning skies of July and August.

263P/Gibbs comes to perihelion in 2023 when not far from opposition, which makes this a very good return. It could reach 11th magnitude by November and be 8th magnitude at the end of the year and visible in the late evening sky. It is however likely to be large and diffuse as it is relatively close to the Earth.

2017 K2 (PanSTARRS) was discovered as a 21st magnitude object in images taken with the PanSTARRS 1 1.8m Ritchey-Chretien on 2017 May 21.49. The comet was over 16 au from the Sun at discovery. JPL classify it as a Hyperbolic Comet, though this does not imply that it is an interstellar object. During March and April it will pass a few degrees from the much brighter open cluster NGC 6709 in Aquila. Over June 20/21 it passes the fringes of open cluster IC 4665. By now the comet could be 7th magnitude and will remain near that brightness for around a year. On July 15/16 it passes close to globular cluster M10. It is heading south and UK observers will lose it by late August. There is an opportunity for well-placed imagers to capture two comets in the same field around September 22, when 73P/Schwassmann-Wachmann is nearby. At its brightest in early 2023 it will be at high southern declination.

2021 A1 (Leonard) reaches perihelion in early January, but was brightest three weeks earlier when it passed 0.23 au from the Earth. If it continues brightening at the present rate it might then reach 4th magnitude. It is however a morning object, so may not be widely observed. Having passed through conjunction it emerges into the evening sky for southern observers in the second half of December 2021, but by then will be fading due to its increasing distance from Earth, though it could remain a binocular object until late January.

2021 O3 (PanSTARRS) reaches perihelion at 0.3 au in late April, then emerges into the evening sky in early May. It quickly becomes circumpolar, but equally will be fading rapidly. How bright it will be is uncertain. At discovery it was given an absolute magnitude of 10, so it might not survive perihelion. Equally visual observers often find comets to be brighter than estimated by the search programmes. VEM magnitudes made by imagers from discovery to early 2022 will help refine the magnitude parameters, but it is not expected to be seen visually prior to perihelion. If the predictions are correct it will be about 6th magnitude and sporting a short tail in early May.

45P/Honda-Mrkos-Pajdusakova will be in solar conjunction when brightest and therefore only visible in satellite coronographs. The other periodic and parabolic comets that are at perihelion during 2022 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, 2023 may offer ten comets brighter than 9th magnitude with orbits for some comets due to return in the future yet to be published by the MPC. 2024 will see the return of P/Pons-Brooks, which could reach 4th magnitude.

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 a supplement, but here only those comets expected to be brighter than 14th magnitude during the year are listed.

Comets brighter than magnitude 14 in 2022

Comet	T	q	P	N	H_1	K_1	Peak mag	Elong at peak
At perihelion in 2021								
4P/Faye	Sep 9.4	1.62	7.48	22	9.7	8.5	12	164
52P/Harrington-Abell	Oct 5.2	1.78	7.60	10	6.6	20.3	14	92
67P/Churyumov-Gerasimenko	Nov 2.1	1.21	6.42	9	9.2	7.1	9	150
132P/Helin-Roman-Alu	Nov 13.1	1.69	7.66	4	10.1	10.0	13	103
At perihelion in 2022								
9P/Tempel	Mar 4.8	1.54	5.58	13	6.6	17.8	11	67
19P/Borrelly	Feb 1.8	1.31	6.84	16	7.1	11.7	9	73
22P/Kopff	Mar 18.1	1.55	6.38	18	7.0	15.0	11	49
41P/Tuttle-Giacobini-Kresak	Sep 13.3	1.05	5.43	11	10.8	15.9	13	18
44P/Reinmuth	Apr 23.3	2.11	7.10	11	8.9	10.0	14	136
45P/Honda-Mrkos-Pajdusakova	Apr 26.6	0.56	5.34	12	11.3	13.6	9	8
51P-Harrington	Oct 3.9	1.69	7.14	8	10.0	10.0	12	160
61P/Shajn-Schaldach	Oct 23.8	2.13	7.09	8	9.4	10.0	13	173
73P/Schwassmann-Wachmann	Aug 25.7	0.97	5.44	8	11.5	10.0	11	59
80P/Peters-Hartley	Dec 8.9	1.62	8.07	5	8.5	15.0	14	11
81P/Wild	Dec 15.6	1.60	6.42	7	6.6	12.3	11	60
97P/Metcalf-Brewington	Feb 14.3	2.57	10.45	4	5.5	15.0	13	96
100P/Hartley	Aug 10.9	2.02	6.36	5	9.0	10.0	13	126
104P/Kowal	Jan 11.2	1.07	5.74	6	9.6	9.9	9	81
107P/Wilson-Harrington	Aug 24.8	0.97	4.25	10	15.0	5.0	13	82
116P/Wild	Jul 16.9	2.20	6.52	5	5.6	13.4	11	146
117P/Helin-Roman-Alu	Jul 7.7	3.04	8.25	5	0.3	22.7	13	171
118P/Shoemaker-Levy	Nov 24.3	1.83	6.12	5	7.1	14.1	11	147
119P/Parker-Hartley	Aug 12.0	2.33	7.42	4	9.0	8.0	13	156
181P/Shoemaker-Levy	Jan 8.8	1.16	7.62	3	10.5	10.0	12	47
205P/Giacobini	Jan 13.4	1.53	6.67	3	10.0	10.0	14	29
255P/Levy	Sep 1.9	0.82	5.02	2	9.0	10.0	9	26
PanSTARRS (2017 K2)	Dec 19.7	1.80			4.3	6.8	8	42
ATLAS (2019 L3)	Jan 9.6	3.55			-2.4	18.2	10	171
ATLAS (2019 T4)	Jun 9.1	4.24			0.8	13.5	12	156
ATLAS (2020 R7)	Sep 16.3	2.96			7.0	8.0	13	138
ATLAS (2020 Y2)	Jun 17.7	3.13			6.5	10.0	14	96
Leonard (2021 A1)	Jan 3.3	0.62			8.6	10.5	6	38
ZTF (2021 E3)	Jun 11.9	1.78			8.5	10.0	11	106
PanSTARRS (2021 O3)	Apr 20.5	0.29			10.3	10.3	5	17
ATLAS (2021 P4)	Jul 31.7	1.09			9.5	10.0	11	20
Fuls (2021 T2)	Jun 7.6	1.24			12.0	10.0	13	73
At perihelion in 2023								
71P/Clark	Jan 21.7	1.59	5.55	9	10.5	6.0	14	15

96P/Machholz	Jan 31.1	0.12	5.28	7	11.3	9.9	12	24
237P/LINEAR	May 14.7	1.99	6.58	2	-7.6	53.5	13	43
263P/Gibbs	Feb 1.5	1.25	5.34	2	9.0	10.0	8	133
PanSTARRS (2020 K1)	May 9.3	3.07			5.5	10.0	14	5
ZTF (2020 V2)	May 8.4	2.23			7.0	8.0	12	116
ATLAS (2021 Y1)	Apr 30.9	2.03			7.0	10.0	12	126

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

Full list of comets reaching perihelion in 2022

Comet	T	q	P	N	H_1	K_1	Peak mag
1884 O1 (D/Barnard)	Jan 6.3	1.30	5.40	1	8.9	10.0	
1952 B1 (D/Harrington-Wilson)	Sep 21.7	1.23	5.49	1	12.0	10.0	
1997 B1 (P/Kobayashi)	Mar 28.8	2.06	25.15	1	12.0	10.0	17
2005 E4 (P/SOHO)	Feb 24.8	0.05	5.68	2			
2005 G2 (P/SOHO)	Jul 9.4	0.05	5.77	2			
2007 A2 (P/Christensen)	Nov 28.9	2.80	15.96	1	13.5	10.0	19
2007 S1 (P/Zhao)	Oct 7.9	2.52	7.47	1	13.0	10.0	18
2010 TO_{20} (P/LINEAR-Grauer)	Nov 29.3	5.51	14.09	1	9.0	10.0	20
2011 Q3 (P/McNaught)	Aug 19.5	2.32	11.08	1	13.5	10.0	18
2011 W1 (P/PANSTARRS)	Feb 7.7	3.32	10.07	1	11.5	10.0	19
2012 O3 (P/McNaught)	May 29.8	1.61	9.78	1	16.5	10.0	19
2013 G4 (P/PANSTARRS)	Jun 19.4	2.62	9.35	1	15.0	10.0	21
2014 R5 (P/Lemmon-PANSTARRS)	Aug 18.8	2.38	8.18	1	15.0	10.0	19
2015 X1 (P/PANSTARRS)	Sep 6.6	2.11	6.94	1	16.0	10.0	20
2016 J1 (P/PANSTARRS)	Feb 20.7	2.45	5.65	1	16.5	10.0	21
2017 S8 (P/PANSTARRS)	Sep 16.2	1.69	4.63	1	14.8	16.0	20
9P/Tempel	Mar 4.8	1.54	5.58	13	6.6	17.8	11
19P/Borrelly	Feb 1.8	1.31	6.84	16	7.1	11.7	9
22P/Kopff	Mar 18.1	1.55	6.38	18	7.0	15.0	11
41P/Tuttle-Giacobini-Kresak	Sep 13.3	1.05	5.43	11	10.8	15.9	13
44P/Reinmuth	Apr 23.3	2.11	7.10	11	8.9	10.0	14
45P/Honda-Mrkos-Pajdusakova	Apr 26.6	0.56	5.34	12	11.3	13.6	9
51P-Harrington	Oct 3.9	1.69	7.14	8	10.0	10.0	12
61P/Shajn-Schaldach	Oct 23.8	2.13	7.09	8	9.4	10.0	13
73P/Schwassmann-Wachmann	Aug 25.7	0.97	5.44	8	11.5	10.0	11
80P/Peters-Hartley	Dec 8.9	1.62	8.07	5	8.5	15.0	14

81P/Wild	Dec 15.6	1.60	6.42	7	6.6	12.3	11
86P/Wild	Feb 7.6	2.26	6.83	6	8.5	15.0	15
97P/Metcalf-Brewington	Feb 14.3	2.57	10.45	4	5.5	15.0	13
99P/Kowal	Apr 12.5	4.71	15.12	3	4.5	15.0	17
100P/Hartley	Aug 10.9	2.02	6.36	5	9.0	10.0	13
104P/Kowal	Jan 11.2	1.07	5.74	6	9.6	9.9	9
107P/Wilson-Harrington	Aug 24.8	0.97	4.25	10	15.0	5.0	13
113P/Spitaler	May 29.0	2.13	7.13	6	13.5	10.0	19
116P/Wild	Jul 16.9	2.20	6.52	5	5.6	13.4	11
117P/Helin-Roman-Alu	Jul 7.7	3.04	8.25	5	0.3	22.7	13
118P/Shoemaker-Levy	Nov 24.3	1.83	6.12	5	7.1	14.1	11
119P/Parker-Hartley	Aug 12.0	2.33	7.42	4	9.0	8.0	13
127P/Holt-Olmstead	Aug 10.5	2.21	6.42	4	14.0	10.0	18
129P/Shoemaker-Levy	Dec 8.9	3.92	8.85	4	11.0	10.0	19
135P/Shoemaker-Levy	Apr 7.3	2.68	7.41	2	6.5	20.0	16
148P/Anderson-LINEAR	Jun 13.7	1.63	6.88	5	17.0	5.0	20
152P/Helin-Lawrence	Jan 13.2	3.10	9.48	3	11.5	10.0	18
157P/Tritton	Sep 9.8	1.57	6.67	4	14.0	10.0	17
169P/NEAT	Jul 9.7	0.60	4.20	7	16.0	5.0	15
176P/LINEAR	Nov 21.0	2.58	5.72	2	15.0	5.0	18
179P/Jedicke	May 27.9	4.12	14.48	2	2.5	20.0	18
181P/Shoemaker-Levy	Jan 8.8	1.16	7.62	3	10.5	10.0	12
182P/LONEOS	May 12.7	1.00	5.08	3	18.0	10.0	19
189P/NEAT	Aug 28.8	1.21	5.06	4	19.0	10.0	19
196P/Tichy	Oct 29.4	2.18	7.42	3	13.5	10.0	17
197P/LINEAR	Dec 7.4	1.06	4.86	3	16.5	5.0	18
204P/LINEAR-NEAT	Nov 16.9	1.83	6.78	3	12.0	10.0	15
205P/Giacobini	Jan 13.4	1.53	6.67	3	10.0	10.0	14
211P/Hill	Oct 4.6	2.33	6.68	3	12.5	10.0	18
214P/LINEAR	Sep 26.2	1.86	6.89	2	13.0	10.0	18
224P/LINEAR-NEAT	Sep 29.9	2.03	6.38	2	15.5	10.0	19
230P/LINEAR	Mar 19.3	1.57	6.41	4	13.0	10.0	17
238P/Read	Jun 5.5	2.37	5.64	3	14.5	10.0	19
244P/Scotti	Nov 17.3	3.92	10.83	2	9.0	10.0	17
255P/Levy	Sep 1.9	0.82	5.02	2	9.0	10.0	9
259P/Garradd	Feb 8.4	1.81	4.51	3	15.5	10.0	20
272P/NEAT	Jul 17.1	2.43	9.42	2	16.0	10.0	22
274P/Tombaugh-Tenagra	Apr 8.5	2.45	9.15	3	13.0	10.0	18
286P/Christensen	May 12.6	2.36	8.33	2	14.0	10.0	19
288P/Spacewatch (300163)	Mar 3.7	2.43	5.32	4	16.0	5.0	19
319P/Catalina-McNaught	Mar 31.4	1.19	6.74	2	15.0	10.0	17
325P/Yang-Gao	Mar 29.2	1.43	6.61	2	15.0	10.0	17
327P/Van Ness	Sep 2.4	1.56	6.73	2	16.0	10.0	17
335P/Gibbs	Aug 12.0	1.62	6.77	2	17.0	10.0	21
337P/WISE	Jul 1.2	1.65	5.96	2	17.0	10.0	18
348P/PANSTARRS	Feb 10.1	2.18	5.59	2	14.0	10.0	18
382P/Larson	Feb 17.4	4.42	16.46	1	8.0	10.0	17
408P/Novichonok-Gerke	Oct 5.0	3.47	10.33	1	11.0	10.0	18
429P/LINEAR-Hill	Jan 2.1	1.81	6.69	1	13.2	10.0	16
420P/Hill	May 22.5	2.79	13.02	1	11.5	10.0	17
422P/Christensen	Jan 13.8	3.11	15.89	1	11.0	10.0	18
431P/Scotti	Feb 13.3	1.81	6.47	2	14.0	10.0	18
2017 K2 (PANSTARRS)	Dec 19.7	1.80			4.3	6.8	8
2019 K3 (P/Larson)	Feb 17.4	4.42	16.46	0	8.0	10.0	17
2019 L3 (ATLAS)	Jan 9.6	3.55			4.5	10.0	12

2019 T4 (ATLAS)	Jun 9.2	4.24			7.0	8.0	15
PanSTARRS (2020 R2)	Feb 24.6	4.69			10.0	8.0	18
ATLAS (2020 R7)	Sep 4.8	2.96			7.0	8.0	13
PanSTARRS (2020 U4)	Apr 8.0	5.35			9.0	8.0	18
PanSTARRS (2020 U5)	Apr 28.1	3.76			9.5	8.0	17
ATLAS (2020 Y2)	Jun 17.7	3.13			6.5	10.0	14
Leonard (2021 A1)	Jan 3.3	0.62			8.6	10.5	4
ZTF (2021 D2)	Feb 4.2	2.94			9.0	10.0	16
ZTF (2021 E3)	Jun 11.9	1.78			8.5	10.0	11
A/(2021 E4)	Apr 25.4	4.68			13.5	5.0	20
A/(2021 F1)	Apr 6.9	1.00			17.5	5.0	19
Catalina (2021 K3)	Feb 2.8	5.23			10.0	10.0	21
Borisov (2021 L3)	Mar 12.3	8.40			6.0	10.0	20
PanSTARRS (2021 O3)	Apr 20.5	0.29			10.0	10.0	5
PanSTARRS (2021 P1)	Jun 1.5	4.38			11.0	10.0	21
ATLAS (2021 P4)	Jul 31.7	1.09			9.5	10.0	11
ATLAS (2021 Q3)	Jan 23.2	5.22			8.0	10.0	19
P/Rankin (2021 R5)	Jan 10.0	3.33	10.5	0	12.0	10.0	20
ATLAS (2021 S1)	Jan 29.5	6.14			7.0	10.0	19
Fuls (2021 T2)	Jun 7.6	1.24			12.0	10.0	13
Catalina (2021 U5)	Jan 26.5	2.36			13.0	10.0	18
Rankin (2021 V1)	April 30.4	3.01			13.0	10.0	21
P/PanSTARRS (2021 V3)	Aug 18.4	3.40	9.74	1	13.0	10.0	20
A/(2021 X2)	Jul 8.2	3.00			16.5	5.0	21
Sarneczky (2022 A1)	Jan 31.1	1.25			19.0	10.0	18

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) 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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