Comet Prospects for 2017

February could be a busy month with the possibility of three periodic comets visible in binoculars. Three comets in parabolic orbits may also become visible in binoculars.

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 the brighter observable comets are published in the *Circulars*, and 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 from the BAA Office.

Comet **2P/Encke** makes its 63rd observed return to perihelion since its discovery by Mechain in 1786. The orbit is quite stable, and with a period of 3.3 years apparitions repeat on a 10-year cycle. This year the comet is well seen from the northern hemisphere prior to perihelion, which is in mid March. The comet starts the year as a telescopic object, but quickly brightens and could be a binocular object by mid February. It is however dropping rapidly into the northern dusk and will be lost by early March. It may be visible in the LASCO C3 field of the SOHO spacecraft from March 9 to 14. It then emerges rapidly into southern hemisphere skies, but fades equally quickly. BAA visual observations over the last 60 years show little change in the comet's absolute magnitude. The comet is the progenitor of the Taurid meteor complex and may be associated with several Apollo asteroids. This suggests that on occasion it may outburst, though nothing major has been detected to date.

Alexandre Schaumasse discovered comet **24P/Schaumasse** during a visual search with the 400mm coude equatorial at Nice, France in 1911 December as a 12^{m} diffuse object and it reaches a similar magnitude at average returns. The 1952 return was very favourable and the comet reached 5^{m}, though there may have been an outburst. The orbit is relatively stable and this will be its 12th observed return. It is a morning object throughout the brighter part of its apparition, so that despite a predicted peak of 10th

magnitude most observations are likely to be electronic ones made with robotic telescopes.

29P/Schwassmann-Wachmann is an annual comet that has outbursts, which over the last decade 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 is at a southern declination and begins the year in solar conjunction. It reaches opposition in Aquarius in August, when it is at a small phase angle and may show enhanced brightness.

Horace Tuttle was the first discoverer of **41P/Tuttle-Giacobini-Kresak** in 1858, when he found a faint comet in Leo Minor. Nearly 50 years later, Professor Michael Giacobini discovered a 13^{m} object whilst comet hunting, which was observed for a fortnight. Andrew C D Crommelin linked the apparitions in 1928 and made predictions for future returns, but the comet wasn't recovered and it was given up as lost. In 1951, Lubor Kresak discovered a 10^{m} comet in 25x100 binoculars whilst participating in the Skalnate Pleso Observatory's program of routine searches for comets. After further observations the comet was identified with the lost comet and a better orbit computed. At the 1973 return, which was similar to the 1907 return, it underwent a major outburst and reached 4^{m}, before fading and then undergoing a second outburst. Alternate returns are favourable and this, its 12^{th}, is one of them. At the last return the comet reached around 10^{th} magnitude but it should do better this time as it passes 0.14 au from the Earth in late March. The comet should be conveniently visible from the UK in the evening sky from the beginning of the year until July. It could be a binocular object from March until June, and possibly a naked eye object around the time of its close approach. A wide-field imaging opportunity comes at the end of April when the comet passes 5° from M92.

45P/Honda-Mrkos-Pajdusakova was at perihelion at the end of 2016 and has a brief observing window in the evening twilight at the beginning of January**.** It emerges from solar conjunction at the beginning of February on its way to passing 0.08 au from the Earth on February 11. It could be a binocular object as it moves rapidly across the sky during February. Though it is initially a morning object, it quickly moves into the evening sky after closest approach, but by then begins to fade fast. It passes a few degrees from M3 in mid February.

71P/Clark Michael Clark of Mount John Observatory, New Zealand discovered this comet on a variable star patrol plate in June 1973. At discovery the magnitude reached 13, but alternate returns are unfavourable and it is then 5 magnitudes fainter, though it hasn't been missed. An encounter with Jupiter in 1954 put it into its present orbit, which is such that it can approach quite closely to Mars, passing within 0.09 au in 1978. This is the comet's 9^{th} return since discovery and it could reach 10^{th} magnitude. As might be expected from the discovery, it is best seen from the southern hemisphere though there are some morning observing windows from the UK.

96P/Machholz is at a high southern declination prior to perihelion, but may be within range of visual observation. It is an intrinsically faint comet, but reaches 2^{nd} magnitude

due to its relatively close passage to the Sun at perihelion. During its solar conjunction it may be visible in the SOHO C3 field if the spacecraft is still operating.

2015 ER_{61} (PanSTARRS) PanSTARRS 1 discovered a 21st magnitude asteroid in images taken with the 1.8m Ritchey-Chretien on 2015 March 14.37, with Peter Birtwhistle contributing confirming astrometry. The asteroid, was originally classified as an Amor type NEO on a near parabolic orbit, but observations in 2015 December and 2016 January showed that the object had cometary features and a coma was then noted in images from 2015 June. It was therefore re-designated as a comet. Although the comet's orbit has an earth orbit minimum intersection distance of 0.1 au the comet doesn't actually approach us particularly closely. Despite this, it may still reach 6th magnitude around the time of perihelion. It is not a favourable apparition for UK based observers, but we may be able to catch it in the summer morning skies as it fades. For observers with access to remote telescopes there are many opportunities for picturesque imaging, particularly at the start of the year as the comet traverses the star clouds of Scorpius, Ophiuchus and Sagittarius. On January 6 the 10th magnitude comet is half a degree from 8th magnitude NGC5897. At 17 UT on January 28 it is traversing through globular cluster M80, with the comet some two magnitudes fainter than the cluster. On February 16 the 9th magnitude comet passes 10' from 10th magnitude globular cluster NGC6325. Four days later it is close to the 11th magnitude planetary nebula NGC6369, and asteroid (270) Anahita. On February 22 at 04 UT it traverses the similar magnitude globular cluster NGC6401. At the end of the month M20 is close by, and as March begins it is the turn of open cluster NGC6546. On March 8 it is just over a degree from the bright globular cluster M22. The next significant imaging opportunity is on June 13 when the the 7th magnitude comet is half a degree from 9th magnitude galaxy M74. Around August 17 the 9th magnitude comets passes close to the Pleiades and remains in their vicinity as it fades past 10th magnitude.

2015 V2 (Johnson) Jess A Johnson discovered a 17th magnitude comet in Catalina Sky Survey images with the 0.68m Schmidt on November 3.44. The comet was within visual range in late 2016 and will be well placed for viewing from the UK prior to perihelion in June, when it could reach around 6th magnitude. A morning object at the start of the year, it is at sufficiently high northern declination by February to be visible in the late evening, when it could be visible in large binoculars. It reaches opposition at the end of May, when it should be an easy binocular object, but is heading south and UK observers will loose it in early July. Southern hemisphere observers will be able to follow it until towards the end of the year. In late March it passes a few degrees from 9th magnitude globular cluster NGC6229. Southern hemisphere or remote observers could image the comet passing close to planetary nebula NGC 5882 around September 4 and open cluster NGC 6208 around October 10.

2016 M1 (PanSTARRS) will be visible from the UK in the autumn of 2017 as it brightens into visual range. It could reach 11th magnitude before it sinks into solar conjunction in December. It is at perihelion in 2018, but is not then visible from the UK.

2016 R2 (PanSTARRS) is currently brightening relatively quickly and is under electronic observation by Kevin Hills. It begins the year at 13th magnitude and is a Southern Hemisphere object as it heads towards solar conjunction in May, though this is

at an elongation of over 30 degrees. It heads north, and by the end of August might be an 11th magnitude object for southern UK observers. It continues to brighten and could be 9th magnitude by the end of the year. Further observations during 2017 will enable a better determination of the comet's magnitude parameters and its likely brightness around the time of perihelion in 2018 May.

The other periodic and parabolic comets that are at perihelion during 2017 are unlikely to become brighter than 10th 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 2018, there are three periodic comets that are likely to be of significance. **21P/Giacobini-Zinner** could be a naked eye object in the early autumn. No significant dust trail encounters are expected at this return. **38P/Stephan-Oterma**, which returns every 37 years, is well placed at the end of the year. **46P/Wirtanen** makes a close pass to the Earth in December, when it will be well placed for viewing and possibly visible to the naked eye. The brightness of 2016 R2 (PanSTARRS) around the time of its perihelion passage in May is not certain, but it could be a binocular object.

Comets reaching perihelion in 2017

Comet	T	q	P	N	H_1	K_1	Peak mag
D/Denning (1894 F1)	Aug 2.4	1.62	9.63	1	10.5	15.0	
D/Harrington-Wilson (1952 B1)	Mar 1.9	1.28	5.58	1	12.0	10.0	
P/Catalina (1999 XN_{120})	Jun 11.7	3.30	8.56	1	13.5	5.0	18
P/Skiff (2000 S1)	Jun 24.6	2.53	17.0	1	10.0	10.0	15
P/LINEAR-NEAT (2004 T1)	Oct 13.3	1.71	6.47	1	12.5	10.0	14
P/McNaught (2009 S2)	Dec 21.8	2.21	8.51	1	14.0	10.0	19
P/WISE (2010 D1)	Dec 19.3	2.69	8.49	1	13.0	10.0	19
P/Vales (2010 H2)	Sep 17.1	3.10	7.53	1	6.0	10.0	13
P/WISE (2010 P4)	Aug 18.9	1.86	7.13	1	19.5	15.0	23
P/Spacewatch (2013 YG_{46})	Jan 20.2	1.81	6.01	1	10.0	10.0	15
Schwartz (2014 B1)	Sep 10.0	9.56			4.0	10.0	19
PanSTARRS (2015 ER_{61})	May 9.8	1.05			3.8	10.9	6
PanSTARRS (2015 T2)	May 20.4	6.94			8.0	10.0	21
PanSTARRS (2015 V1)	Dec 17.7	4.27			6.5	10.0	15
Johnson (2015 V2)	Jun 12.3	1.64			5.5	6.1	6
Lemmon-Yeung-PanSTARRS (2015 VL_{62})	Aug 28.7	2.72			8.0	10.0	14
PanSTARRS (2015 X5)	Dec 31.0	6.80			7.5	10.0	20
PanSTARRS (2016 A1)	Nov 23.4	5.33			6.0	10.0	17
P/PanSTARRS (2016 A3)	Apr 13.5	4.79	21.5	1	10.0	10.0	20
PanSTARRS (2016 E1)	Jun 1.3	8.18			6.5	10.0	20
P/PanSTARRS (2016 G1)	Jan 26.3	2.04	4.15	1	12.7	13.0	19
MASTER (2016 N4)	Sep 16.6	3.20			8.5	10.0	16
PanSTARRS (2016 S1)	Mar 16.8	2.41			12.0	10.0	18
Matheny (2016 T1)	Feb 2.0	2.30			13.0	10.0	18
PanSTARRS (2016 T3)	Sep 7.5	2.66			10.5	10.0	17
NEOWISE (2016 U1)	Jan 14.1	0.32			11.5	12.7	5

2P/Encke	Mar 10.1	0.34	3.30	62	10.2	8.0	5
5D/Brorsen	Sep 19.3	0.53	5.62	5	9.5	10.0	
14P/Wolf	Dec 2.6	2.74	8.77	16	10.0	15.0	18
18D/Perrine-Mrkos	Feb 26.2	1.65	7.87	5	11.5	20.0	
24P/Schaumasse	Nov 16.5	1.21	8.26	11	7.6	24.2	10
30P/Reinmuth	Aug 18.8	1.88	7.33	11	9.5	15.0	16
41P/Tuttle-Giacobini-Kresak	Apr 11.4	1.05	5.42	11	7.2	25.3	3
47P/Ashbrook-Jackson	Jun 10.8	2.82	8.37	9	7.6	10.0	15
54P/de Vico-Swift-NEAT	Apr 15.7	2.18	7.39	5	10.0	15.0	17
62P/Tsuchinshan	Nov 15.7	1.38	6.38	8	9.5	15.0	12
65P/Gunn	Oct 16.8	2.91	7.64	8	7.9	6.6	14
71P/Clark	Jun 29.8	1.58	5.54	8	9.7	7.9	10
73P/Schwassmann-Wachmann	Mar 16.7	0.97	5.43	7	11.5	15.0	12
90P/Gehrels	Jun 19.3	2.97	14.9	3	8.5	15.0	19
93P/Lovas	Mar 1.3	1.70	9.19	4	10.1	10.7	14
96P/Machholz	Oct 28.0	0.12	5.29	6	13.0	12.0	2
103P/Hartley	Apr 20.3	1.06	6.48	4	9.0	33.2	11
128P-Shoemaker-Holt	Jan 10.6	3.06	9.56	3	8.5	10.0	15
139P/Vaisala-Oterma	Dec 10.9	3.41	9.64	3	7.0	15.0	17
145P/Shoemaker-Levy	Aug 31.7	1.90	8.43	3	13.5	10.0	17
172P/Yeung	Mar 13.1	3.34	8.63	3	13.0	10.0	21
176P/LINEAR	Mar 12.1	2.58	5.71	3	15.0	5.0	18
182P/LONEOS	Apr 11.6	1.01	5.10	3	18.0	10.0	19
183P/Korlevic-Juric	Nov 11.3	3.87	9.51	4	12.5	5.0	18
188P/LINEAR-Mueller	Feb 17.2	2.56	9.17	2	5.6	15.0	13
213P/Van Ness	Sep 24.3	1.98	6.12	2	10.5	10.0	14
217P/LINEAR	Jul 16.7	1.23	7.86	2	12.0	10.0	14
219P/LINEAR	Feb 21.0	2.37	6.97	2	11.0	10.0	20
227P/Catalina-LINEAR	Jun 21.9	1.79	6.79	3	16.5	5.0	19
229P/Gibbs	May 21.0	2.45	7.80	2	13.0	10.0	19
234P/LINEAR	Jun 1.7	2.85	7.45	2	12.0	10.0	18
236P/LINEAR	Nov 20.7	1.84	7.21	2	14.0	10.0	17
251P/LINEAR	Jul 17.0	1.73	6.56	2	16.5	5.0	18
255P/Levy	May 2.8	1.01	5.30	2	20.0	10.0	21
263P/Gibbs	Sep 29.9	1.26	5.35	2	18.0	10.0	21
311P/PANSTARRS	Jul 10.6	1.94	3.24	2	17.0	10.0	21
334P/NEAT	May 5.3	4.18	16.7	1	8.5	10.0	17
336P/McNaught	Feb 3.1	2.78	11.2	1	12.0	10.0	18
343P/NEAT-LONEOS	Feb 1.8	2.28	12.8	2	14.0	5.0	17
346P/Catalina	Feb 15.1	2.22	9.48	2	12.5	10.0	17

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. 5D has not been seen since 1879, 18D has not been seen since 1968. The magnitudes, orbits, and in particular the time of perihelion of the single apparition D/ comets, are uncertain. The asteroid may show cometary activity as it nears perihelion.

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

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