Comet Prospects for 2016

Comet 2013 US_{10} (Catalina) is a binocular object at the beginning of the year. In the Southern Hemisphere 2013 X1 (PanSTARRS) could be visible in binoculars during their winter. 45P/Honda-Mrkos-Pajdusakova is the brightest of the periodic comets, and may be visible in binoculars at the end of the year, though it is relatively close to the Sun.

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. 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.

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.

9P/Tempel was first observed in 1867, but was lost between 1879 and 1967 following an encounter with Jupiter in 1881, which increased the perihelion distance from 1.8 to 2.1 au. Further encounters in 1941 and 1953 put q back to 1.5 au and calculations by Brian Marsden allowed Elizabeth Roemer to recover it in 1967. Alternate returns are favourable, but an encounter with Jupiter in 2024 will once again increase the perihelion distance to 1.8 au. It was the target for the Deep Impact mission, with the Stardust spacecraft subsequently passing by the comet. The comet could come into visual range in March, and remains visible for UK observers until June. It could be at its brightest around 11th magnitude in early July, when it passes south of the celestial equator, and Southern Hemisphere observers will be able to follow it as it fades.

29P/Schwassmann-Wachmann is an annual comet that has outbursts, which over the last decade seem to have become more frequent. The comet had one of its strongest outbursts yet recorded in early 2010. 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 those equipped with CCDs and it should be observed at every opportunity. The comet is at a southern declination, reaching opposition in Scorpius in June and passing through solar conjunction at the end of December.

45P/Honda-Mrkos-Pajdusakova has had several close encounters with Jupiter, the most recent in 1983 which made dramatic changes to ω and Ω. The perihelion distance has steadily decreased and is close to the smallest it has been for the last 200 years, though is now increasing again. It can approach quite closely to the Earth and did so at the last return in 2011 (0.06 au) and is on its way to another close approach post perihelion, in 2017 (0.08 au). At present the MPC only lists eight approaches closer than 0.06 au out of 20 passes closer than 0.1 au, and nine of these are by five periodic comets. It can also pass close to Venus and passed at 0.085 au in 2006, getting even closer in 2092. The comet brightens rapidly in November, but it is well south of the celestial equator. For northern observers there may be a short period when it might be visible at the close of the year, when it is at perihelion and perhaps 7th magnitude.

226P/Pigott-LINEAR-Kowalski has a rather complicated history. It was discovered by Edward Pigott from York and was observed by Herschel, Mechain and Messier amongst others. A parabolic orbit was computed, but there were suspicions that it might be of short period. It was then lost until a comet was found by LINEAR in 2003 January, which was thought to probably be the long lost comet. The comet then passed 0.056 au from Jupiter on 2006 September 10 in an encounter that considerably changed the orbit. Finally Rich Kowalski discovered a very diffuse comet during the Catalina Sky Survey on 2009 September 10, which was then linked to the Pigott and LINEAR comets. This is a favourable return for northern observers, with the comet passing the celestial equator heading north in early August. It will be brightest at perhaps 10th magnitude in the autumn when it nears opposition.

252P/LINEAR is an earth approaching comet and makes a very close approach on March 21 when it passes 0.036 au from our planet. This is the fifth closest cometary approach on record, and it is by virtue of this that this otherwise faint comet might come within visual range for a few weeks. Thanks to the close approach a faint coma may come into visual range and the comet appear brighter than expected. It races north after closest approach, and for northern observers there is an observing window of about a week from March 30 when it might be seen.

2013 US$_{10}$ (Catalina) is at its brightest in early January, having continued to approach the Earth after perihelion in 2015 November. It is well placed, reaching within 10° of Polaris at the end of January, though by then it is fading rapidly. It passes just over a degree from 9th magnitude globular NGC 5466 over January 5/6; two degrees from galaxy M101 over January 15/16 and is close to open cluster NGC 1502 on February 22/23.

2013 X1 (PanSTARRS) was 9th magnitude at the beginning of the year and well placed in the evening sky for northern hemisphere observers. It is rapidly moving south however, and after mid February will be lost to view. After solar conjunction Southern Hemisphere observers will be able to observe it from around April until September, with the comet brightest at around 6th magnitude in June.

The other periodic and parabolic comets that are at perihelion during 2016 are unlikely to become brighter than 12th magnitude or are poorly placed. Ephemerides for these can be found on the CBAT 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. Six SOHO comets are predicted to return, however these will only be visible from the SOHO or STEREO satellites.

Looking ahead to 2017, there are some good prospects for once. **45P/Honda-Mrkos-Pajdusakova** emerges from solar conjunction 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. **2P/Encke** should also be seen during February, when it is visible in the early evening, perhaps reaching binocular brightness before it is lost in the twilight. February is likely to be a busy period for the new Director, as **41P/Tuttle-Giacobini-Kresak** is also likely to be a binocular object on its way to a 0.14 au approach to the Earth on March 30. It could be a binocular object from February until June and perhaps a naked eye object when brightest.

Comets reaching perihelion in 2016

Comet	T	q	P	N	H_1	K_1	Peak mag
116P/Wild	Jan 12.2	2.18	6.50	4	2.5	25.0	12
PanSTARRS (2014 Y1)	Jan 17.8	2.24			9.5	10.0	15
P/PanSTARRS (2015 P4)	Jan 19.0	2.53	15.0	1	14.0	10.0	20
211P/Hill	Jan 27.3	2.35	6.71	2	12.5	10.0	17
Kowalski (2016 E2)	Feb 6.7	1.08			20.0	10.0	18
50P/Arend	Feb 8.2	1.92	8.25	8	9.5	15.0	15
Lemmon-PanSTARRS (2014 W5)	Feb 11.4	2.58			10.0	10.0	16
147P/Kushida-Muramatsu	Feb 27.3	2.75	7.42	3	14.0	10.0	20
194P/LINEAR	Mar 2.4	1.70	8.01	2	16.0	10.0	18
D/Denning (1894 F1)	Mar 6.7	1.38	8.30	1			
P/Lemmon-PanSTARRS (2015 TO_{19})	Mar 7.0	2.93	9.75	1	13.9	10.0	21
PanSTARRS (2016 C1)	Mar 9.2	8.47			5.5	10.0	19
P/SOHO (2003 T12 = 2012 A3)	Mar 9.4	0.58	4.12	2			
332P/Ikeya-Murakami	Mar 10.1	1.57	5.40	1			
PanSTARRS (2015 X6)	Mar 10.5	2.30	4.51	1	16.0	10.0	21
PanSTARRS (2014 W2)	Mar 10.8	2.67			7.5	10.0	14
PanSTARRS (2016 BA_{14})	Mar 15.5	1.01	5.25	1	21.0	10.0	13
127P/Holt-Olmstead	Mar 17.8	2.21	6.41	4	14.0	10.0	20
252P/LINEAR	Mar 17.8	1.00	5.34	2	14.5	35.0	4 ?
104P/Kowal	Mar 26.1	1.18	5.89	5	12.5	10.0	15
100P/Hartley	Apr 2.0	2.01	6.35	5	8.9	15.0	14
333P/LINEAR	Apr 3.9	1.12	8.68	2	10.6	20.0	11
D/Schorr (1918 W1)	Apr 6.6	2.85	8.51	1			
PanSTARRS (2016 A7)	Apr 6.9	1.99	3.84	1	16.0	10.0	19
190P/Mueller	Apr 7.8	2.03	8.74	2	13.0	10.0	19
321P/SOHO	Apr 10.4	0.05	3.77	3			
NEOWISE (2016 C2)	Apr 19.6	1.56	500		16.0	10.0	18
PANSTARRS (2013 X1)	Apr 20.7	1.31			5.7	10.0	7
53P/Van Biesbroeck	Apr 29.9	2.43	12.6	5	8.0	15.0	15
PanSTARRS (2015 D3)	Apr 30.8	8.15			5.5	10.0	19
302P/Lemmon-PanSTARRS	May 1.4	3.30	8.85	2	12.5	10.0	20
PanSTARRS (2015 B2)	May 6.4	3.37			9.5	10.0	17
77P/Longmore	May 13.6	2.34	6.88	6	7.0	20.0	15
LINEAR (2015 Y1)	May 15.9	2.50			12.0	10.0	17

Gibbs (2015 W1)	May 17.2	2.23			12.5	10.0	18
224P/LINEAR-NEAT	May 24.4	1.99	6.31	2	15.5	10.0	21
Spacewatch (2011 KP_{36})	May 26.9	4.88	238		4.5	10.0	14
Gibbs (2007 R3)	May 27.4	2.52	8.92	1	13.5	10.0	19
136P/Mueller	May 31.2	2.98	8.62	3	11.0	10.0	17
216P/LINEAR	May 31.2	2.15	7.63	2	12.4	10.0	17
157P/Tritton	Jun 10.4	1.36	6.29	3	14.0	10.0	17
202P/Scotti	Jun 10.6	2.52	7.33	3	13.5	10.0	20
P/Scotti (2011 A2)	Jun 14.0	1.55	5.47	1	16.5	10.0	20
118P/Shoemaker-Levy	Jun 17.0	1.98	6.44	4	9.3	9.6	15
PanSTARRS (2015 T4)	Jun 18.9	2.30	800	1	11.0	10.0	16
146P/Shoemaker-LINEAR	Jun 30.0	1.43	8.11	3	15.0	10.0	18
207P/NEAT	Jul 1.1	0.94	7.64	2	16.0	10.0	17
P/SOHO (1999 N5 = 2005 E4)	Jul 1.5	0.05	5.67	2			
P/SOHO (2000 O3)	Jul 1.9	0.05	5.31	3			
208P/McMillan	Jul 2.1	2.54	8.15	2	12.5	10.0	18
P/WISE (2010 N1)	Jul 8.0	1.63	5.95	1	17.0	10.0	18
279P/La Sagra	Jul 14.5	2.16	6.78	2	14.0	10.0	18
56P/Slaughter-Burnham	Jul 18.4	2.51	11.5	5	8.5	15.0	16
81P/Wild	Jul 20.3	1.59	6.41	6	8.7	6.9	12
P/Gibbs (2009 K1)	Jul 24.7	1.34	7.09	1	17.0	10.0	20
150P/LONEOS	Jul 25.0	1.76	7.66	4	13.5	10.0	18
9P/Tempel	Aug 2.6	1.54	5.58	11	6.6	19.7	11
ATLAS (2015 X7)	Aug 3.5	3.75			9.0	10.0	18
PanSTARRS (2014 R3)	Aug 7.9	7.28			6.5	10.0	19
P/Barnard (1884 O1)	Aug 10.8	1.31	5.41	1			
225P/LINEAR	Aug 16.8	1.32	6.98	2	18.0	10.0	19
43P/Wolf-Harrington	Aug 19.7	1.36	6.13	11	8.9	10.0	12
33P/Daniel	Aug 22.5	2.16	8.07	10	10.5	20.0	19
PanSTARRS (2015 V4)	Aug 25.8	5.47	80	1	8.5	10.0	19
LINEAR (TQ_{209})	Aug 27.5	1.41			10.5	10.0	14
330P/Catalina	Aug 30.0	2.96	16.9	2	10.0	10.0	17
LINEAR (2016 A8)	Aug 30.5	1.89	220		12.0	10.0	15
144P/Kushida	Aug 31.0	1.43	7.57	3	4.3	32.1	11
Sheppard-Tholen (2015 T5)	Sep 2.2	9.18	180	1	7.5	10.0	22
226P/Pigott-LINEAR-Kowalski	Sep 5.1	1.78	7.32	4	6.0	15.0	10
212P/NEAT	Sep 10.2	1.65	7.76	2	17.0	5.0	20
PanSTARRS (2015 H2)	Sep 13.3	4.97			7.5	10.0	18
314P/Montani	Oct 7.1	4.24	19.6	2	9.0	10.0	18
237P/LINEAR	Oct 11.7	1.98	6.57	2	14.5	5.0	17
P/SOHO (1999N5 = 2005 G2)	Oct 11.7	0.05	5.76	2			
238P/Read	Oct 22.8	2.36	5.63	2	14.5	10.0	19
94P/Russell	Oct 27.7	2.23	6.58	5	9.0	15.0	16
Read (2005 S3)	Nov 1.5	2.82	10.8	1	12.0	10.0	18
LINEAR (2010 A2)	Nov 8.5	2.01	3.47	1	15.5	10.0	19
288P/Spacewatch = (300163)	Nov 8.9	2.43	5.32	3	16.0	5.0	19
D/Haneda-Campos (1978 R1)	Nov 11.2	1.29	6.44	1			
P/Boattini (2008 T1)	Nov 18.2	3.06	8.76	1	11.0	10.0	18
P/McNaught (2008 J3)	Nov 23.0	2.30	7.71	1	12.0	10.0	16
323P/SOHO	Nov 23.8	0.04	4.15	3			
NEOWISE (2016 B1)	Dec 4.7	3.23			9.5	10.0	18
316P/LONEOS	Dec 6.8	2.42	11.2	1	10.0	10.0	15
PanSTARRS (2014 OE_4)	Dec 10.7	6.24			11.0	5.0	19
89P/Russell	Dec 15.2	2.24	7.32	5	11.5	15.0	19
45P/Honda-Mrkos-Pajdusakova	Dec 31.2	0.53	5.26	11	12.6	19.1	7

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. 2010 V1 was discovered in outburst, and its magnitude at this return is uncertain. The magnitudes, orbits, and in particular the time of perihelion of the single apparition D/ comets, are uncertain. Magnitude information is not given for the SOHO comets; these are now being numbered by the IAU once observed over sufficient returns.

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

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