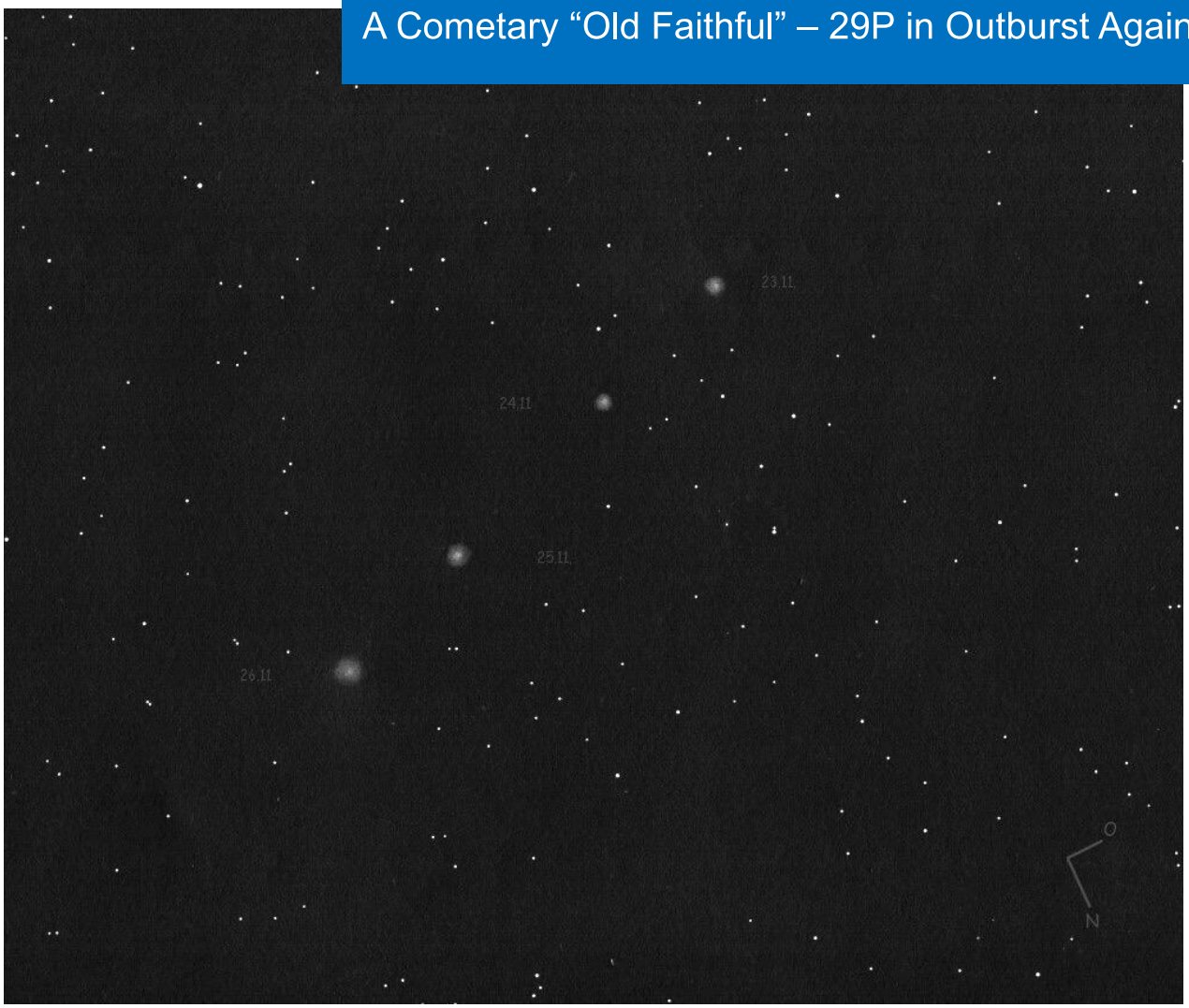
December 2022

ALPO Comet News

A Publication of the Comets Section of the Association of Lunar and Planetary Observers

A Cometary “Old Faithful” – 29P in Outburst Again



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On the Front Cover:

Christian Harder (Jeersdorf, Germany) drew this composite sketch of 29P/Schwassmann-Wachmann over the course of 4 nights, 2022 November 23-26. He used a 12” dobsonian at various magnifications (96, 132, 176 power). His sequence not only shows the comet’s motion against the background stars but also the expansion of its coma after a recent series of outbursts.

The monthly ALPO Comet News PDF can be found on the ALPO Comets Section website (http://www.alpo-astronomy.org/cometblog/). A shorter version of this report is posted on a dedicated Cloudy Nights forum (https://www.cloudynights.com/topic/853639-alpo-comet-news-for-december-2022/) All are encouraged to join the discussion over at Cloudy Nights. The ALPO Comets Section welcomes all comet related articles, observations, images, drawings, magnitude estimates, or spectra. One does not have to be a member of ALPO to submit material, though membership is appreciated.

Please send your observations to the Comets Section at < comets@alpo-astronomy.org >, Coordinator Carl Hergenrother < carl.hergenrother@alpo-astronomy.org > and/or Acting Assistant Coordinator Michel Deconinck < michel.deconinck@alpo-astronomy.org >.

To learn more about the ALPO, please visit us @ http://www.alpo-astronomy.org.

Summary

December sees our focus shift to comet C/2022 E3 (ZTF). It is very possible that this comet will be the brightest comet in 2023. While not expected to be a Great Comet, it should become a nice borderline naked eye object in January and February. Unlike many comets that are at their best close to the horizon in twilight, ZTF will be placed high up in a dark sky, first for northern hemisphere observers and then starting in February for the southern hemisphere.

This month, ZTF is a rapidly brightening object starting the month around magnitude 8.6 and finishing the year around 6.9. If it continues its recent brightening trend, it could be a 4th magnitude object at its best.

A few more comets are expected to be brighter than magnitude 10 in December. Northern hemisphere observers can observe C/2020 V2 (ZTF) at 9th magnitude and C/2022 A2 (PANSTARRS) at 9-10th magnitude while southern observers have C/2017 K2 (PANSTARRS) at magnitude 8.

Among the fainter targets, 29P/Schwassmann-Wachmann has once again experienced a series of major outbursts and is currently a 11th magnitude object near opposition in Gemini/Auriga.

Last month the ALPO Comets Section received 95 magnitude estimates and 42 images/sketches of comets C/2022 P1 (NEOWISE), C/2022 E3 (ZTF), C/2022 A2 (PANSTARRS), C/2021 Y1 (ATLAS), C/2021 X1 (Maury-Attard), C/2021 T4 (Lemmon), C/2021 E3 (ZTF), C/2020 Y2 (ATLAS), C/2020 V2 (ZTF), C/2019 L3 (ATLAS), C/2017 K2 (PANSTARRS), 119P/Parker-Hartley, 118P/Shoemaker-Levy, 117P/Helin-Roman-Alu, 107P/Wilson-Harrington, 81P/Wild, 73P/Schwassmann-Wachmann, 61P/Shajn-Schaldach, and 29P/Schwassmann-Wachmann. A big thanks to our recent contributors: Dan Bartlett, Todd Bossaller, Denis Buczynski, Jef DeWit, J. J. Gonzalez, Jose Guilherme de Souza Aguiar, Christian Harder, Carl Hergenrother, Martin Mobberley, Uwe Pilz, Gregg, Ruppel, Tenho Tuomi, and Chris Wyatt.

Request for Observations

As always, the Comet Section is happy to receive all comet observations, whether textual descriptions, images, drawings, magnitude estimates, or spectra. Please send your observations via email to the Comets Section < comets @ alpo-astronomy . org >, Comets Section Coordinator Carl Hergenrother < carl.hergenrother @ alpo-

astronomy . org > and/or Comets Section Acting Assistant Coordinator Michel Deconinck < michel.deconinck @ alpo-astronomy . org >.

Photometric Corrections to Magnitude Measurements

We try to include up-to-date lightcurves for the comets discussed in these reports as well as applying aperture and personal corrections to the visual observations and personal just corrections to digital observations. All magnitude estimates are affected by many factors including instrumental (aperture, focal length, magnification, type of optics), environmental (sky brightness due to moonlight, light pollution, twilight, aurora activity, zodiacal light, etc.), cometary (degree of condensation, coma color, strength and type of gas emission lines, coma-tail interface) and personal (sensitivity to different wavelengths, personal technique, observational biases). The first correction used here corrects for differences in aperture [Charles S. Morris, On Aperture Corrections for Comet Magnitude Estimates. Publ Astron Soc Pac 85, 470, 1973]. Visual observations are corrected to a standard aperture of 6.78 cm by 0.019 magnitudes per centimeter for refractors and 0.066 magnitudes per centimeter for reflectors. After applying the aperture correction and if a sufficient number of visual observations are submitted for a particular comet, we also determine personal corrections for each observer for each individual comet. For digital observations only a personal correction is applied. A single observer submitting both visual and digital magnitude measurements may also have separate corrections for each observing method. If the magnitudes shown in the text don't match those plotted in the lightcurves, it is because of the application of these corrections.

Acknowledgements

In addition to observations submitted directly to the ALPO, we occasionally use data from other sources to augment our analysis. We would like to acknowledge with thanks observations submitted directly to the ALPO as well as those originally submitted to the International Comet Quarterly, Minor Planet Center, and COBS Comet Observation Database. In particular we have been using observations submitted to the COBS site by Thomas Lehmann for our analyzes so we would like to thank Thomas for his COBS observations. We would also like to thank the Jet Propulsion Laboratory for making available their Small-Body Browser and Orbit Visualizer and Seiichi Yoshida for his Comets for Windows programs that are used to produce the lightcurves and orbit diagrams in these pages. And last but not least, we'd like to thank Syuichi Nakano and the Minor Planet Center for their comet orbit elements, the asteroid surveys and dedicated comet hunters for their discoveries, and all of the observers who volunteer their time to adding to our knowledge of these amazing objects.

Thank you to everyone who contributed to the ALPO Comets Section!

Clear skies!
- Carl Hergenrother

Comets Calendar

Lunar Phases

Dec 07 - Full Moon
Dec 16 - Last Quarter Moon
Dec 23 - New Moon
Dec 29 - First Quarter Moon

Comets at Perihelion

Dec 07 - 197P/LINEAR at perihelion (q = 1.06 au, 4.9-yr period, discovered in 2003, observed at 3 returns, missed in 2018, yet to be seen in 2022 due to placement behind Sun)
Dec 08 - 80P/Peters-Hartley at perihelion (q = 1.62 au, 8.1-yr period, discovered in 1846, re-discovered in 1982, seen at 5 returns, also located behind the Sun at perihelion)
Dec 15 - 81P/Wild at perihelion (q = 1.60 au, 6.4-yr period, V ~ 11, discovered in 1978, 2022 is its 8th observed return, more below)
Dec 19 - C/2017 K2 (PANSTARRS) at perihelion (q = 1.80 au, V ~ 8, more details below)

Photo Opportunities

Dec 08 - C/2019 L3 (ATLAS) passes within 0.5 deg of 10th mag galaxy NGC 3109
Dec 13 - 73P/Schwassmann-Wachmann within 0.8 deg of the Helix Nebula (NGC 7293)
Dec 20 - C/2020 V2 (ZTF) passes over 12th mag galaxy pair NGC 2276 and 2300
Dec 29 - 73P/Schwassmann-Wachmann within 0.5 deg of 10th mag globular cluster NGC 7492
Dec 31 - C/2017 K2 (PANSTARRS) passes very close to 10th mag galaxy NGC 6684

Recent Magnitudes Contributed to the ALPO Comets Section

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia	COMA DC	TAIL LENG	TAIL PA	ICQ CODE	Observer Name
C/2022 P1 (NEOWISE)												
2022P1	2022 11 26.95	M	10.7	TK	30.0L	5 109	2	3			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 25.94	M	10.6	TK	30.0L	5 109	2	3			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 23.42	xM	10.4	AQ	40.0L	4 59	5.6	4			ICQ XX WYA	Christopher Wyatt
2022P1	2022 11 18.94	M	10.6	TK	30.0L	5 109	2	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 18.43	xM	10.4	AQ	25.0L	5 40	4.6	4			ICQ XX WYA	Christopher Wyatt
2022P1	2022 11 17.95	M	10.6	TK	30.0L	5 109	2	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 16.94	M	10.5	TK	30.0L	5 109	2	3			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 12.94	M	10.4	TK	30.0L	5 109	2	3/			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 08.94	M	10.3	TK	30.0L	5 109	2	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 05.94	M	10.1	TK	30.0L	5 109	3	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2022P1	2022 11 04.91	M	10.1	TK	30.0L	5 109	3	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
C/2022 E3 (ZTF)												
2022E3	2022 11 27.20	S	9.4	TI	29.8L	4 78	2.4	4	7	m 50	ICQ XX HAR11	Christian Harder
2022E3	2022 11 23.75	S	9.2	TI	29.8L	4 79	2.8	4	6	m 50	ICQ XX HAR11	Christian Harder
2022E3	2022 11 18.80	S	9.6	TK	20.3T10	77	3	4			ICQ XX GON05	Juan Jose Gonzalez Suarez
2022E3	2022 11 14.72	S	9.7	TI	53.1L	139	1.5	s4	6.5	m 50	ICQ XX HAR11	Christian Harder
2022E3	2022 11 14.72	S	9.5	TK	32.0L	5 48	1	6	0.05	210	ICQ XX PIL01	Uwe Pilz
2022E3	2022 11 12.72	S	9.8	TI	25.2L	4 92	1.8	s4	6.5	m 60	ICQ XX HAR11	Christian Harder
C/2022 A2 (PANSTARRS)												
2022A2	2022 11 27.18	S	11.5	TK	32.0L	5 80	1.5	2/			ICQ XX PIL01	Uwe Pilz
2022A2	2022 11 27.18	S	10.8	TI	29.8L	4 78	3	3/			ICQ XX HAR11	Christian Harder
C/2021 Y1 (ATLAS)												
2021Y1	2022 11 25.64	xM	14.7	AQ	40.0L	4 261	0.4	6			ICQ XX WYA	Christopher Wyatt
2021Y1	2022 11 23.50	xM	13.6	AQ	40.0L	4 182	0.5	6			ICQ XX WYA	Christopher Wyatt
C/2021 X1 (Maury-Attard)												
2021X1	2022 11 25.63	xM	14.5	AQ	40.0L	4 182	0.8	6			ICQ XX WYA	Christopher Wyatt
2021X1	2022 11 23.49	xM	14.6	AQ	40.0L	4 108	0.6	5/			ICQ XX WYA	Christopher Wyatt
C/2021 T4 (Lemmon)												
2021T4	2022 11 23.45	xM	14.5	AQ	40.0L	4 182	0.7	4			ICQ XX WYA	Christopher Wyatt
C/2020 Y2 (ATLAS)												
2020Y2	2022 11 25.62	xM	14.9	AQ	40.0L	4 182	0.8	4/			ICQ XX WYA	Christopher Wyatt
2020Y2	2022 11 23.53	xM	15.0	AQ	40.0L	4 261	0.5	5/			ICQ XX WYA	Christopher Wyatt
C/2020 V2 (ZTF)												
2020V2	2022 11 27.19	S	10.6	TI	29.8L	4 78	2	4/			ICQ XX HAR11	Christian Harder
2020V2	2022 11 27.18	S	11.1	TK	32.0L	5 80	0.7	5			PIL01	Uwe Pilz
2020V2	2022 11 25.92	S	10.5	TI	29.8L	4 108	2.2	s4			ICQ XX HAR11	Christian Harder
2020V2	2022 11 24.83	S	10.2	TI	35.3L	122	2.5	4			ICQ XX HAR11	Christian Harder
2020V2	2022 11 23.76	S	10.6	TI	29.8L	4 92	2.5	4			ICQ XX HAR11	Christian Harder
2020V2	2022 11 21.52	Z	10.3	U4	7.2R	5A200	10.9		6.9	m150	ICQ xx HER02	Carl Hergenrother
2020V2	2022 11 21.48	S	10.5	TK	12.5B	30	3	4			ICQ xx HER02	Carl Hergenrother
2020V2	2022 11 18.82	S	10.2	TK	20.3T10	77	4	3/			ICQ XX GON05	Juan Jose Gonzalez Suarez
2020V2	2022 11 18.77	S	10.5	TI	35.3L	122	1.4	4			ICQ XX HAR11	Christian Harder
2020V2	2022 11 14.73	S	10.9	TI	53.1L	139	1.6	4	2.2	m150	ICQ XX HAR11	Christian Harder
2020V2	2022 11 14.72	S	10.6	TK	32.0L	5 80	1.5	4			ICQ XX PIL01	Uwe Pilz
2020V2	2022 11 12.72	S	10.5	TI	25.2L	4 92	2.5	4			ICQ XX HAR11	Christian Harder
2020V2	2022 11 05.12	S	11.2	TI	29.8L	4 108	1.7	5			ICQ XX HAR11	Christian Harder
2020V2	2022 11 01.91	S	10.7	TI	29.8L	4 132	1.6	4/	2	m140	ICQ XX HAR11	Christian Harder
C/2019 L3 (ATLAS)												
2019L3	2022 11 27.26	M	11.1	AQ	30.0L	5 89	1	3/			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2019L3	2022 11 25.66	xM	11.2	AQ	40.0L	4 59	2.4	6			ICQ XX WYA	Christopher Wyatt
2019L3	2022 11 20.25	M	11.1	TK	30.0L	5 89	1	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2019L3	2022 11 17.28	M	11.2	TK	30.0L	5 89	1	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2019L3	2022 11 16.28	M	11.2	TK	30.0L	5 89	1	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2019L3	2022 11 05.30	M	11.4	TK	30.0L	5 89	1	5			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2019L3	2022 11 04.28	M	11.5	TK	30.0L	5 89	2	5			ICQ XX DES01	Jose Guilherme de Souza Aguiar
C/2017 K2 (PANSTARRS)												
2017K2	2022 11 23.42	xM	8.3	TK	40.0L	4 59	3.6	5	10.5	m 27	ICQ XX WYA	Christopher Wyatt
2017K2	2022 11 18.42	xM	8.3	TK	25.0L	5 40	4.3	5	10.5	m 21	ICQ XX WYA	Christopher Wyatt
2017K2	2022 11 16.93	aM	8.7	TK	10.0B	25	2	5			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 15.93	aM	8.7	TK	10.0B	25	3	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 12.93	aM	8.6	TK	10.0B	25	3	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 10.93	aM	8.6	TK	10.0B	25	2	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 09.92	M	8.5	TK	10.0B	25	2	4/			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 08.92	M	8.6	TK	10.0B	25	2	4/			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 07.91	M	8.6	TK	10.0B	25	2	4			ICQ XX DES01	Jose Guilherme de Souza Aguiar
2017K2	2022 11 06.91	M	8.8	TK	10.0B	25	2	3/			ICQ XX DES01	Jose Guilherme de Souza Aguiar

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   2017K2  2022 11 05.90  M  8.8 TK 10.0B    25   2    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 04.90  M  8.8 TK 10.0B    25   3    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
119P/Parker-Hartley
119        2022 11 25.67 xS 15.1 AQ 40.0L 4 261   0.3  3/          ICQ XX WYA   Christopher Wyatt
118P/Shoemaker-Levy
118        2022 11 25.66 xS 14.0 AQ 40.0L 4 108   1.1  3           ICQ XX WYA   Christopher Wyatt
118        2022 11 21.50  Z 12.6 U4  7.2R 5A200   3.0       1.8m275 ICQ xx HER02 Carl Hergenrother
117P/Helin-Roman-Alu
117        2022 11 23.43 xM 14.7 AQ 40.0L 4 261   0.6  5/          ICQ XX WYA   Christopher Wyatt
107P/Wilson-Harrington
107        2022 11 18.16  B 13.0:TK 25.0C15 100                    ICQ XX DECaa Michel Deconinck
81P/Wild
 81        2022 11 27.29  M 11.2 AQ 30.0L 5 109   2    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 21.51  Z 11.0 U4  7.2R 5A200   5.2       0.2 290 ICQ xx HER02 Carl Hergenrother
 81        2022 11 17.29  M 11.4 AQ 30.0L 5 109   2    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 16.29  M 11.5 AQ 30.0L 5 109   2    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 05.31  M 11.7 AQ 30.0L 5 109   1    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 04.30  M 11.8 AQ 30.0L 5 109   1    4/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
73P/Schwassmann-Wachmann
 73        2022 11 26.96  M 11.8 AQ 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 25.97  M 11.6 AQ 30.0L 5 109   1    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 24.96  M 11.5 TK 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 23.44 xM 11.8 AQ 40.0L 4  59   3.9  4/          ICQ XX WYA   Christopher Wyatt
 73        2022 11 18.97  M 11.4 TK 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 18.81  S 10.5 TK 20.3T10  77   6    2/          ICQ XX GON05 Juan Jose Gonzalez Suarez
 73        2022 11 17.96  M 11.4 TK 30.0L 5 109   1    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 16.96  M 11.3 TK 30.0L 5 109   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 12.93  M 11.3 TK 30.0L 5 109   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 08.91  M 11.2 TK 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 05.90  M 11.2 TK 30.0L 5 109   1    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 04.90  M 11.1 TK 30.0L 5 109   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
61P/Shajn-Schaldach
 61        2022 11 23.46 xM 15.8 AQ 40.0L 4 261   0.2  7           ICQ XX WYA   Christopher Wyatt
29P/Schwassmann-Wachmann
 29        2022 11 27.19  S 11.4 TI 29.8L 4  92   1.1  7           ICQ XX HAR11 Christian Harder
 29        2022 11 27.18  M 11.3 AQ 30.0L 5 109   1    5/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 11 27.17  S 11.3 TK 32.0L 5  80   0.7                 PIL01 Uwe Pilz
 29        2022 11 26.94  S 11.3 TI 29.8L 4  92   1.1  6           ICQ XX HAR11 Christian Harder
 29        2022 11 26.17  M 11.4 AQ 30.0L 5 109   1    6           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 11 25.98  E 11.3 TK 25.0C15  86   0.5  7           ICQ XX DECaa Michel Deconinck
 29        2022 11 25.91  S 11.4 TI 29.8L 4 132   0.7  6           ICQ XX HAR11 Christian Harder
 29        2022 11 25.64 xM 11.5 AQ 40.0L 4  59   0.6  5/          ICQ XX WYA   Christopher Wyatt
 29        2022 11 24.85  S 11.3 TI 35.3L   176   0.5  7           ICQ XX HAR11 Christian Harder
 29        2022 11 23.89  S 11.2 TK 32.0L 5  80   0.3 S8           ICQ XX PIL01 Uwe Pilz
 29        2022 11 23.80  S 11.8 TI 29.8L 4 132   0.4  6           ICQ XX HAR11 Christian Harder
 29        2022 11 23.52 xM 12.6 AQ 40.0L 4 108   0.5  6           ICQ XX WYA   Christopher Wyatt
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New Discoveries, Recoveries and Other Comets News

Comets in the News

7P/Pons-Winnecke – Mike S. P. Kelly et al. report in ATel #15772 that short-period comet 7P/Pons-Winnecke experienced a ~2 magnitude outburst sometime between November 20 @ 07:48 UT and November 21 @ 07:19 UT. The observations were made by the Zwicky Transient Facility.

7P is ~1.5 years passed its May 2021 perihelion at 1.23 au. During this return, a peak brightness around magnitude 10 was reached. 7P has a history of outbursts. In 2008, a ~3 magnitude outburst occurred a few months before perihelion. And even during the current apparition, Mike Kelley and the ZTF team reported a ~0.7 magnitude outburst which started sometime between 2021 May 30 and June 2.

New Discoveries and Recoveries

P/2022 W1 (Rankin) – David Rankin discovered the 10th comet to bear his name on 2022 November 18 at 19th magnitude. P/2022 W1 was discovered with the University of Arizona and Mount Lemmon Survey 1.5-m reflector located on Mount Lemmon to the north of Tucson, Arizona. The comet is now 2 months past its September 15 perihelion at 3.37 au and has likely already peaked in brightness. It will next return to perihelion in 18 years. [CBET 5196, MPEC 2022-W159]

P/2022 V1 = P/2010 BN109 (WISE-Lemmon) – The Mount Lemmon Survey also picked up an apparently asteroidal object on 2022 November 1 at 19th magnitude. Additional observations from a number of follow-up observers including H. Sato, Michael Jaeger, L. Buzzi, F. Bellini, and Eric Bryssinck found the object to be cometary. Syuichi Nakano linked P/2022 V1 with an apparently asteroid object found by the WISE spacecraft in late January 2010 and designated at the time as 2010 BN109. Perihelion occurs on 2023 March 3 at 2.28 au. A peak brightness around magnitude 18 should occur this month and January as the comet will be close to opposition. P/2022 V1 (WISE-Lemmon) has an orbital period of 12.8 years. [CBET 5193, MPEC-2022W148, Nakano Note 4850]

P/2022 U5 = P/2013 W3 (PANSTARRS) – The Pan-STARRS program discovered a 21st magnitude comet on 2022 October 28 with their Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii. P/2022 U5 is a short-period comet with an orbital period of 8.6-years and perihelion back on 2022 July 25 at 2.69 au. Rob Weryk (University of Western Ontario) found pre-discovery observations by Pan-STARRS from 2013 and 2014 when the object appeared asteroidal. The comet's next perihelion will be in 2031. [CBET 5197, MPEC 2022-W234]

C/2022 U4 (Bok) – This and the next comet were both found with the University of Arizona 2.3-m Bok reflector at Kitt Peak to the west of Tucson, Arizona as part of the Bok NEO Survey. Greg Leonard reported the new 20th magnitude comet on images taken on 2022 October 26. Pre-discovery images were found by Rob Weryk in Pan-STARRS data going back to January 2022 when the comet was reported at 22nd-23rd magnitude. With a perihelion on 2023 August 3 at 2.90 au, C/2022 U4 is expected to peak around magnitude 17.

This is the 4th comet to bear the Bok name. The first, C/1949 N1 (Bappu-Bok-Newkirk), was discovered by Dr. Bart Bok. The last three were Bok NEO Survey finds with the Bok 2.3-m which was named after Dr. Bok. [CBET 5195, MPEC 2022-W158, Nakano Note 4851]

C/2022 U3 (Bok) – Hannes Groeller and Cassandra Lejoly found this 19th magnitude comet on 2022 October 31. Rob Weryk also found pre-discovery observations of this comet. In this case back to June 2021 when the

comet was 23rd magnitude. Currently at 5.9 au from the Sun, C/2022 U3 will get a little closer to the Sun at 4.83 au when it arrives at perihelion on 2024 July 28. It should peak at 16th magnitude in late 2023 through early 2025. [CBET 5188, MPEC 2022-V83, Nakano Note 4822]

P/2020 MK4 (PANSTARRS) - An apparently asteroidal object was found in images made with the Pan-STARRS1 1.8-m reflector on Haleakala, Hawaii, on 2020 June 24. At the time it was given the asteroidal designation 2020 MK4. Starting shortly after discovery, numerous observers noted cometary activity into 2021. The most recent observations were made on 2022 September 24 and October 29 by Steve Tegler and William Romanishin with the 4.3-m Lowell Observatory Discovery Telescope in northern Arizona. The comet was much fainter than expected in their observations at magnitude 24.5.

P/2020 MK4 has an orbit somewhat similar to 29P/Schwassmann-Wachmann in that it has a low-inclination, a very low-eccentricity, and is located just outside of Jupiter's orbit. Perihelion occurs over 5 years from now on 2028 May 21 at 6.11 au. With an eccentricity of 0.0115, aphelion is only a little further away at 6.26 au.

Considering the comet's low eccentricity, it shouldn't experience much of a change in brightness. And yet the comet was seen to rapidly brighten at discovery from ~21 on 2020 June 15 to ~18 only a month later. Now the comet is much fainter at 24th magnitude. And this was 5-7 years before its 2027 June 17 perihelion. Also add the fact that if it were routinely 18-20th magnitude over the past 20-25 years, it should have been picked up years ago by the professional near-Earth asteroid surveys. It looks like we may be seeing a usually faint comet which experienced a ~6 or more magnitude outburst in 2020. [CBET 5191, MPEC 2020-N36, 2022-W78, Nakano Note 4849]

Comets Brighter Than Magnitude 8

C/2022 E3 (ZTF)

Discovered 2022 March 2 by the Zwicky Transient Facility (ZTF)
Dynamically old long-period comet

Orbit (from Minor Planet Center, MPEC 2022-W269)

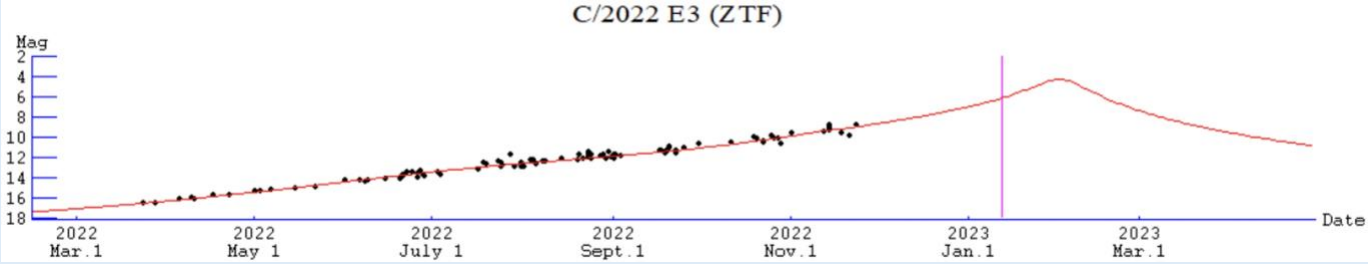
```
    C/2022 E3 (ZTF)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Jan. 12.78458 TT                                  Rudenko
q   1.1122523           (2000.0)            P               Q
z  -0.0002982      Peri.  145.81517     -0.60064011     -0.07341125
 +/-0.0000010      Node   302.55536     +0.33752546     +0.87940946
e   1.0003317      Incl.  109.16818     +0.72478136     -0.47037196
From 4561 observations 2021 July 10-2022 Nov. 27, mean residual 0".5.
1/a(orig) = +0.000762 AU**-1, 1/a(fut) = -0.000027 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2022 E3 (ZTF)                                                      Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2022-Dec-01  15 52  +24 51    1.308   1.757     47M    Ser   8.6    18    0
2022-Dec-06  15 52  +25 15    1.268   1.662     49M    Ser   8.3    23    0
2022-Dec-11  15 53  +25 49    1.232   1.558     52M    CrB   8.1    28    0
2022-Dec-16  15 53  +26 35    1.200   1.446     55M    CrB   7.8    32    0
2022-Dec-21  15 53  +27 35    1.172   1.326     58M    CrB   7.6    37    0
2022-Dec-26  15 53  +28 55    1.149   1.199     62M    CrB   7.3    42    0
2022-Dec-31  15 53  +30 40    1.132   1.066     66M    CrB   7.0    47    0
2023-Jan-05  15 52  +33 02    1.119   0.928     71M    CrB   6.6    52    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  5.6 + 5 log d + 12.5 log r [Through 50 days before perihelion]
m1 =  6.4 + 5 log d +  8.0 log r [Since 50 days before perihelion, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
             (UT)                      T         Dia  DC  LENG  PA
   2022E3  2022 11 27.20  S  9.4 TI 29.8L 4  78   2.4  4   7   m 50 ICQ XX HAR11 Christian Harder
   2022E3  2022 11 23.75  S  9.2 TI 29.8L 4  79   2.8  4   6   m 50 ICQ XX HAR11 Christian Harder
   2022E3  2022 11 18.80  S  9.6 TK 20.3T10  77   3    4            ICQ XX GON05 Juan Jose Gonzalez Suarez
   2022E3  2022 11 14.72  S  9.7 TI 53.1L   139   1.5 s4   6.5 m 50 ICQ XX HAR11 Christian Harder
   2022E3  2022 11 14.72  S  9.5 TK 32.0L 5  48   1    6   0.05 210 ICQ XX PIL01 Uwe Pilz
   2022E3  2022 11 12.72  S  9.8 TI 25.2L 4  92   1.8 s4   6.5 m 60 ICQ XX HAR11 Christian Harder
```

C/2022 E3 (ZTF) is still on pace to be the brightest comet of 2023, probably. The "probably" is due to whether an even brighter comet will be found in the coming months to challenge ZTF's crown. To add another caveat, the title "Brightest Comet of 2023" is for comets visible from Earth at their brightest so doesn't include objects only observable by SOHO in their entirety, like mini-sungrazers, or at their best, like 96P/Machholz which will also be at perihelion in 2023.

C/2022 E3 is predicted to start December at magnitude 8.6 in the morning constellation of Serpens and brighten to around magnitude 6.9 by the end of the month when it will have moved into Corona Borealis. Due to its location far north of the Sun and ecliptic, it is only visible from the northern hemisphere, a situation that will remain true until February when it will also be observable from the southern hemisphere.

On December 1, its distance from the Sun is at 1.31 au. This distance will drop to a minimum of 1.11 au at perihelion on 2023 January 12. Its distance to Earth on December 1 is 1.76 au. This value will fall substantially by the time of closest approach to Earth on February 1 at 0.29 au. The point here is that most of the comet's increase in brightness over the next two months to due to the large decrease in geocentric distance rather than the smaller decrease in distance to the Sun.

Since discovery last March at 17th magnitude, ZTF has been brightening at a rapid 2.5n ~ 12.5 rate. If it continues this rate of brightening, the comet may peak at magnitude 3.8 around February 1. If the comet slows to a 2.5n = 8 rate, peak brightness will be slightly fainter at 4.2. Even if it stops brightening and maintains its current rate of dust and gas production (2.5n = 5), the comet will reach magnitude 4.5. In short, there is a very good chance that ZTF will be a nice borderline naked eye object for folks under reasonably dark skies.

Juan Jose Gonzalez Suarez, Christian Harder and Uwe Pilz observed C/2022 E3 visually on 5 separate nights in November. Last month the comet was located low in both the evening and morning sky so it wasn't the easiest object to observe. Still, they found the comet to possess a moderately condensed 1'-3' coma and 6'-7' long tail. Imagers have detected both a broad curved dust tail and a longer, but fainter and narrower gas tail.

Figure 1 - Denis Buczynski imaged C/2022 E3 (ZTF) on 2022 November 25 with his 12" f/4 newtonian + ASI 1600MM Pro. The image is a composite of 25x60s Green exposures.

Comets Between Magnitude 8 and 10

C/2017 K2 (PANSTARRS)

Discovered 2017 May 21 by the Pan-STARRS survey with the Pan-STARRS1 1.8-m on Haleakala
Dynamically ??? long-period comet

Orbit (from Minor Planet Center, MPEC 2022-U349)

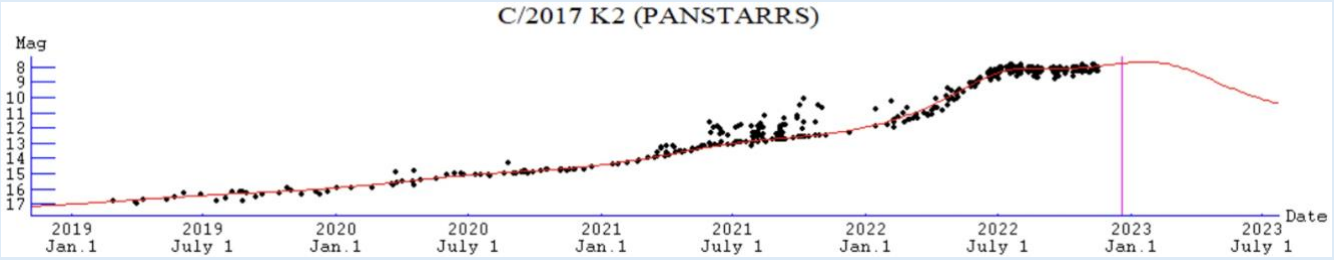
```
    C/2017 K2 (PANSTARRS)
Epoch 2022 Aug. 9.0 TT = JDT 2459800.5
T 2022 Dec. 19.68354 TT                                  Rudenko
q   1.7969118           (2000.0)            P               Q
z  -0.0004417      Peri.  236.19771     +0.01819614     +0.04924663
 +/-0.0000001      Node    88.23507     -0.18093987     +0.98245713
e   1.0007937      Incl.   87.56203     -0.98332582     -0.17986873
From 10980 observations 2015 Nov. 23-2022 Sept. 27, mean residual 0".5.
1/a(orig) = +0.000059 AU**-1, 1/a(fut) = +0.001150 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2017 K2 (PANSTARRS)                                                  Max El
                                                                       (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2022-Dec-01  17 07   -53 13    1.813    2.566     32M    Ara    8.2      0   13
2022-Dec-06  17 19   -55 06    1.805    2.548     33M    Ara    8.2      0   13
2022-Dec-11  17 31   -57 00    1.800    2.526     34M    Ara    8.1      0   14
2022-Dec-16  17 45   -58 56    1.798    2.502     35M    Pav    8.1      0   15
2022-Dec-21  18 02   -60 52    1.797    2.475     37M    Pav    8.1      0   16
2022-Dec-26  18 21   -62 48    1.799    2.446     39M    Pav    8.1      0   17
2022-Dec-31  18 43   -64 41    1.803    2.416     41M    Pav    8.0      0   19
2023-Jan-05  19 09   -66 29    1.809    2.386     43M    Pav    8.0      0   21
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  4.4 + 5 log d + 6.7 log r
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Estimates submitted to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
               (UT)                    T         Dia  DC  LENG  PA
   2017K2  2022 11 23.42 xM  8.3 TK 40.0L 4  59   3.6  5  10.5 m 27 ICQ XX WYA   Christopher Wyatt
   2017K2  2022 11 18.42 xM  8.3 TK 25.0L 5  40   4.3  5  10.5 m 21 ICQ XX WYA   Christopher Wyatt
   2017K2  2022 11 16.93 aM  8.7 TK 10.0B    25   2    5            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 15.93 aM  8.7 TK 10.0B    25   3    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 12.93 aM  8.6 TK 10.0B    25   3    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 10.93 aM  8.6 TK 10.0B    25   2    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 09.92  M  8.5 TK 10.0B    25   2    4/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 08.92  M  8.6 TK 10.0B    25   2    4/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 07.91  M  8.6 TK 10.0B    25   2    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 06.91  M  8.8 TK 10.0B    25   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 05.90  M  8.8 TK 10.0B    25   2    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2017K2  2022 11 04.90  M  8.8 TK 10.0B    25   3    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

First discovered in May 2017 at 16 au from the Sun and with pre-discovery observation back to 2013 when it was at the distance of Uranus, C/2017 K2 (PANSTARRS) finally arrives at perihelion this month on December 19 at 1.80 au.

No longer visible from the northern hemisphere object, the comet has been solely observed by southern observers and facilities. In November Chris Wyatt and Jose Guilherme de Souza Aguiar observed K2 on 12 different nights. Their magnitude estimates were consistently in the 8.3 to 8.8 magnitude range. Correcting for personal biases and aperture brought their estimates up to between magnitude 7.7 to 8.4. Thomas Lehmann submitted two CCD observations to the COBS website and found a magnitude of 8.2 on both nights.

Chris Wyatt detected a 10' long northward extending tail on November 18 and 23 in his 0.25-m and 0.40-m reflectors. Thomas Lehmann imaged a large tail up to 0.44 deg in length on November 10 and 11.

Having just passed through solar conjunction, though well south of the Sun so it always remained visible, K2 is now a morning object. Like last month, it is only visible from the southern hemisphere as its moves through the Ara (Dec 1-14) and Pavo (14-31). It may brighten a little this month but generally stay around magnitude 8.0 or a slightly fainter.

We pass through the orbital plane of the comet on December 19. It should be quite the sight both for visual observers and imagers. It will be interesting to see how long the tail can be followed at that time.

C/2020 V2 (ZTF)

Discovered 2020 November 2 by the ZTF survey
Dynamically new long-period comet

Orbit (from Minor Planet Center, MPEC 2022-W269)

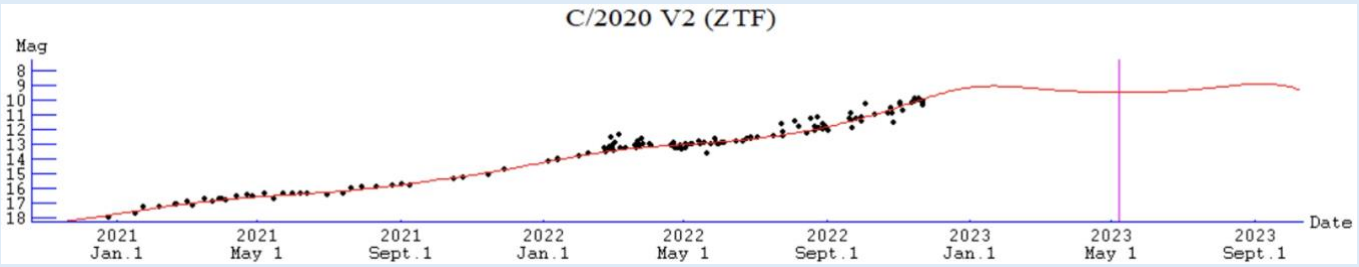
```
    C/2020 V2 (ZTF)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 May 8.56633 TT                                  Rudenko
q   2.2277882           (2000.0)            P              Q
z  -0.0004160      Peri.  162.43258     +0.69788185     +0.59389212
 +/-0.0000004      Node   212.37223     +0.53387592     -0.05877945
e   1.0009269      Incl.  131.61096     +0.47742793     -0.80239462
From 3147 observations 2020 Apr. 18-2022 Nov. 30, mean residual 0".4.
1/a(orig) = -0.000142 AU**-1, 1/a(fut) = -0.000380 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2020 V2 (ZTF)                                                      Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2022-Dec-01  11 07  +73 49    2.855   2.391    108M   Dra    9.7    55    0
2022-Dec-06  10 57  +76 53    2.821   2.310    111M   Dra    9.6    53    0
2022-Dec-11  10 36  +80 08    2.788   2.239    114M   Dra    9.5    50    0
2022-Dec-16  09 47  +83 22    2.756   2.178    116M   Cam    9.4    46    0
2022-Dec-21  07 31  +85 44    2.724   2.129    117M   Cep    9.3    44    0
2022-Dec-26  04 05  +84 59    2.693   2.093    117E   Cep    9.2    45    0
2022-Dec-31  02 30  +81 43    2.663   2.071    116E   Cep    9.2    48    0
2023-Jan-05  01 54  +77 46    2.633   2.062    114E   Cep    9.1    52    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = -1.4 + 5 log d + 15.9 log r [up to T-580 days
m1 =  3.2 + 5 log d + 10.1 log r [between T-580 and T-170 days]
m1 =  4.2 + 5 log d +  8.0 log r [T-170 days and onward, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL     ICQ    CODE  Observer Name
              (UT)                    T         Dia  DC  LENG  PA
   2020V2  2022 11 27.19  S 10.6 TI 29.8L 4  78   2    4/           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 27.18  S 11.1 TK 32.0L 5  80   0.7  5                PIL01 Uwe Pilz
   2020V2  2022 11 25.92  S 10.5 TI 29.8L 4 108   2.2 s4           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 24.83  S 10.2 TI 35.3L   122   2.5  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 23.76  S 10.6 TI 29.8L 4  92   2.5  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 21.52  Z 10.3 U4  7.2R 5A200  10.9       6.9m150 ICQ xx HER02 Carl Hergenrother
   2020V2  2022 11 21.48  S 10.5 TK 12.5B    30   3    4           ICQ xx HER02 Carl Hergenrother
   2020V2  2022 11 18.82  S 10.2 TK 20.3T10  77   4    3/          ICQ XX GON05 Juan Jose Gonzalez Suarez
   2020V2  2022 11 18.77  S 10.5 TI 35.3L   122   1.4  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 14.73  S 10.9 TI 53.1L   139   1.6  4   2.2 m150 ICQ XX HAR11 Christian Harder
   2020V2  2022 11 14.72  S 10.6 TK 32.0L 5  80   1.5  4           ICQ XX PIL01 Uwe Pilz
   2020V2  2022 11 12.72  S 10.5 TI 25.2L 4  92   2.5  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 05.12  S 11.2 TI 29.8L 4 108   1.7  5           ICQ XX HAR11 Christian Harder
   2020V2  2022 11 01.91  S 10.7 TI 29.8L 4 132   1.6  4/  2   m140 ICQ XX HAR11 Christian Harder
```

Though not the brightest comet in the sky, or even the 2nd brightest, C/2020 V2 (ZTF) was the best observed comet in November based on submission to the ALPO.

C/2020 V2 is a dynamically new comet presumably making its first perihelion close to the Sun. Though dynamically new comets usually brighten slowly (for example, see C/2017 K2), V2 has brightened at a rapid clip since discovery. Visual observers found a brightness between magnitude 10.2 and 11.2 in November. Imagers came in closer to the brighter visual values. Visually the coma was moderately condensed with a diameter between 1.4' and 4'. In images, the gas coma was much larger at ~11'.

V2's peak brightness depends on whether it can keep up its rapid brightening. Assuming a more sedate 2.5n ~ 8 rate results in a peak brightness of 9.2 in January when the comet reaches the first of two minimum distances to the Earth (2023 January 6 at 2.06 au from the Earth while 2.63 au from the Sun). A second brighter peak at magnitude 9.0 is predicted around the time of its second close approach (September 17 at 1.85 au at 2.68 au from the Sun). Though the comet should be intrinsically brightest around its May 8 perihelion at 2.23 au, it will be located at 3.22 au from Earth on the far side of the Sun at that time.

This month, C/2022 V2 continues to move through the far northern constellations of Ursa Major (Nov 1-29) and Draco (29-30) making V2 a northern circumpolar object. Being near opposition, it is best seen around midnight.

Figure 2 - Todd Bossaller imaged C/2022 V2 (ZTF) on 2022 November 21 UT with a Takahashi FC100DZ f/5.3 refractor + ZWO ASI 2600mc Pro camera. The image is a combine of 12x300-s exposures at a plate scale of 1.46"/pixel.

C/2022 A2 (PANSTARRS)

Discovered 2022 January 10 by Pan-STARRS with the Pan-STARRS2 telescope at Haleakala
Dynamically new long-period comet

Orbit (from Minor Planet Center, MPEC 2022-W269)

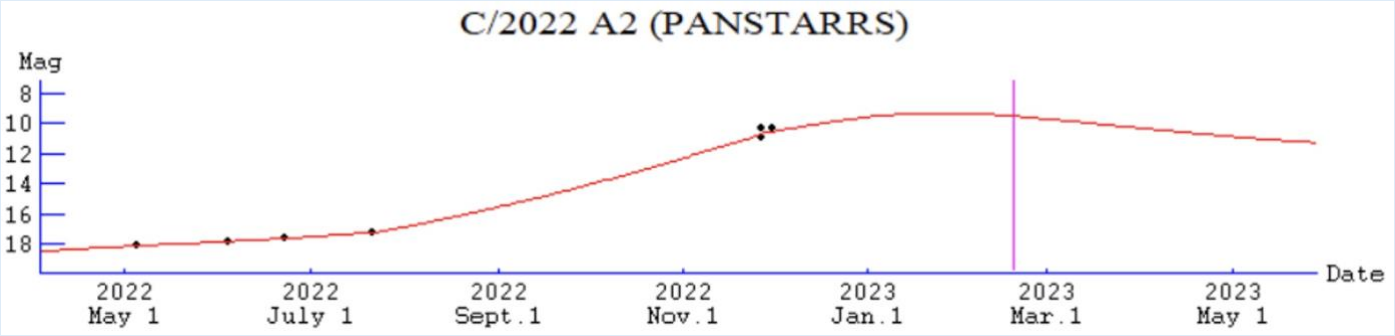
```
    C/2022 A2 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Feb. 18.26799 TT                                  Rudenko
q   1.7353029           (2000.0)            P               Q
z  -0.0001821      Peri.   88.36677     +0.01739572     +0.99011805
 +/-0.0000005      Node   171.57950     -0.09145046     -0.13701537
e   1.0003161      Incl.  108.14692     +0.99565767     -0.02988370
From 558 observations 2022 Jan. 9-Nov. 29, mean residual 0".4.
1/a(orig) = -0.000047 AU**-1, 1/a(fut) = -0.000064 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2022 A2 (PANSTARRS)                                                Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2022-Dec-01  13 38  +30 53    2.014   2.196     66M    CVn  10.5    46    0
2022-Dec-06  13 51  +33 06    1.982   2.096     69M    CVn  10.4    49    0
2022-Dec-11  14 06  +35 34    1.953   2.001     72M    CVn  10.2    52    0
2022-Dec-16  14 23  +38 16    1.924   1.913     75M    Boo  10.1    54    0
2022-Dec-21  14 43  +41 10    1.898   1.833     78M    Boo   9.9    55    0
2022-Dec-26  15 05  +44 14    1.873   1.763     80M    Boo   9.8    56    0
2022-Dec-31  15 30  +47 22    1.850   1.705     82M    Boo   9.6    55    0
2023-Jan-05  16 00  +50 27    1.828   1.660     83M    Boo   9.5    54    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  5.6 + 5 log d + 12.8 log r [Through 80 days before perihelion]
m1 =  6.7 + 5 log d +  8.0 log r [After 80 days after perihelion, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
             (UT)                      T         Dia  DC  LENG  PA
   2022A2  2022 11 30.50  Z 10.4 U4 10.6R 5A440  10.5                ICQ xx HER02 Carl Hergenrother
   2022A2  2022 11 27.18  S 11.5 TK 32.0L 5  80   1.5  2/            ICQ XX PIL01 Uwe Pilz
   2022A2  2022 11 27.18  S 10.8 TI 29.8L 4  78   3    3/            ICQ XX HAR11 Christian Harder
```

Earlier this year on January 9, the Pan-STARRS survey discovered C/2022 A2 (PANSTARRS) at 19-20th magnitude with the Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii. At discovery, the comet was 4.9 au from the Sun and 4.6 au from Earth. Over the next few months. it will pass closest to Earth on 2023 January 17 at 1.61 au and arrive at perihelion on February 18 at 1.74 au.

When I wrote about the discovery of this comet in the February-March 2022 issue of the ALPO Comet News, I noted: "Unless it brightens rapidly, it may only reach 13th magnitude at perihelion. Still, this will be one to watch as it could end up in the range of visual observers." Even though the latest Minor Planet Center orbit (on

MPEC 2022-W269) suggests it is a dynamically new long-period comet, C/2022 A2 must have brightened at a rapid rate. On November 27, both Uwe Pilz and Christian Harder visually observed the comet at magnitude 11.5 and 10.8, respectively. Aperture correcting these measurements yield magnitude of 11.0 and 10.4. Uwe recorded a diffuse 1.5' coma while Christian estimated a large coma at 3'.

Images taken by Dan Bartlett on November 23 show a nice gaseous coma and a hint of a gas tail (gas based on its orientation in the anti-sunward direction). I used the iTelescopes T14 FSQ106 refractor to collect images on the 30th and measured a brightness of 10.4 (agreeing with Christian's brightness from a few nights earlier) and larger 10.5' coma.

Observations reported to COBS between late March and July showed a comet brightening from magnitude ~18.0 to 17.0. Due to solar conjunction, the comet wasn't seen again till last month. It is possible its current brightness is due to an outburst. Assuming it isn't in outburst and the comet is brightening at an assumed 2.5n = 10 rate, C/2022 A2 could become a 9th magnitude object by the end of December.

December sees A2 as a morning object. Due to its placement in the northern constellations of Canes Venatici (Dec 1-11) and Boötes (11-31), it is only visible to northern hemisphere observers.

Figure 3 - Dan Bartlett caught C/2022 A2 (PANSTARRS) on 2022 November 23 with his Celestron RASA11 f/2.2 schmidt telescope and ZWO ASI 2600 MC Pro camera. The color image is composed of 75 1-min sub frames.

Comets Between Magnitude 10 and 12

29P/Schwassmann-Wachmann

Discovered 1927 November 15 by the Arnold Schwassmann and Arno Arthur Wachmann at the Hamburg Observatory in Bergedorf, Germany
Centaur comet with orbital period of ~14.9 years

Orbit (from Minor Planet Center, MPEC 2022-W269)

```
  29P/Schwassmann-Wachmann
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2019 Apr. 22.09170 TT                                  Rudenko
q   5.7776680            (2000.0)            P              Q
n   0.06626515     Peri.   51.08644     +0.99049590     -0.06694825
a   6.0480115      Node   312.39743     -0.00101621     +0.86995718
e   0.0446996      Incl.    9.36345     +0.13753850     +0.48856161
P  14.9
From 14357 observations 2018 June 18-2022 Nov. 29, mean residual 0".6.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
29P/Schwassmann-Wachmann                                                Max El
                                                                         (deg)
    Date      R.A.   Decl.     r       d    Elong  Const  Mag    40N   40S
2022-Dec-01  06 52  +29 21   6.048   5.202   146M   Gem  11-13    79    21
2022-Dec-06  06 50  +29 24   6.049   5.163   151M   Gem  11-13    79    21
2022-Dec-11  06 48  +29 26   6.051   5.131   157M   Gem  11-13    79    21
2022-Dec-16  06 45  +29 27   6.053   5.107   162M   Gem  11-13    79    21
2022-Dec-21  06 43  +29 28   6.054   5.090   167M   Gem  11-13    79    21
2022-Dec-26  06 40  +29 28   6.056   5.080   171M   Gem  11-13    79    21
2022-Dec-31  06 37  +29 28   6.057   5.079   173E   Aur  11-13    79    21
2023-Jan-05  06 34  +29 26   6.059   5.086   171E   Aur  11-13    79    21
```

Comet Magnitude Formula

```
None, due to frequent outbursts.
```

Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T          Dia  DC  LENG  PA
 29        2022 11 27.19  S 11.4 TI 29.8L 4  92   1.1  7           ICQ XX HAR11 Christian Harder
 29        2022 11 27.17  S 11.3 TK 32.0L 5  80   0.7              ICQ XX PIL01 Uwe Pilz
 29        2022 11 26.94  S 11.3 TI 29.8L 4  92   1.1  6           ICQ XX HAR11 Christian Harder
 29        2022 11 25.98  E 11.3 TK 25.0C15  86   0.5  7           ICQ XX DECaa Michel Deconinck
 29        2022 11 25.91  S 11.4 TI 29.8L 4 132   0.7  6           ICQ XX HAR11 Christian Harder
 29        2022 11 25.64 xM 11.5 AQ 40.0L 4  59   0.6  5/          ICQ XX WYA   Christopher Wyatt
 29        2022 11 24.85  S 11.3 TI 35.3L   176   0.5  7           ICQ XX HAR11 Christian Harder
 29        2022 11 23.89  S 11.2 TK 32.0L 5  80   0.3 S8           ICQ XX PIL01 Uwe Pilz
 29        2022 11 23.80  S 11.8 TI 29.8L 4 132   0.4  6           ICQ XX HAR11 Christian Harder
 29        2022 11 23.52 xM 12.6 AQ 40.0L 4 108   0.5  6           ICQ XX WYA   Christopher Wyatt
```

29P/Schwassmann-Wachmann was discovered photographically on 1927 November 15 by German observing team Arnold Schwassmann and Arno Arthur Wachmann. The Schwassmann-Wachmann duo discovered 4 comets together, three short-period comets (29P/Schwassmann-Wachmann, 31P/Schwassmann-Wachmann, and 73P/Schwassmann-Wachmann) and a long-period comet shared with American visual observer extraordinaire Leslie Peltier [C/1930 D1 (Peltier-Schwassmann-Wachmann)]. You'll be able to read more about 73P/Schwassmann-Wachmann in a few pages.

29P is one of the more enigmatic comets. Its nucleus is one of the largest known for an active comet with a recent study using Spitzer infrared data placing its size at 64.6 +/- 6.2 km. Combining the Spitzer diameter with an assumed cometary nucleus albedo of 0.04 yields an absolute magnitude of ~10.1. If 29P were to be completely inactive, its nucleus would still be currently observable at a magnitude of ~18.0.

Outbursts occur multiple times per year with the largest resulting in a peak brightness of 10th magnitude though the majority of outbursts are much fainter. The constant outbursts are especially odd since the comet's orbit lies just outside the orbit of Jupiter and is nearly circular (e=0.04), meaning the comet does not experience large variations in solar heating like most comets. Richard Miles (Director of the British Astronomical Society's Asteroids and Remote Planets Section) has published a series of papers on 29P and its outbursts and found that as many as 6 active areas are producing outbursts on a nucleus with a rotation period of ~57-58 days.

Back in September, October, and November of last year, a number of large outbursts were observed resulting in 29P reaching 10th magnitude, which is about as bright as it ever gets. Recently two large outbursts were detected on November 22 and 27 with another smaller one on Nov 29. As a result, 29P is once again a nice visual object for large aperture visual observers. Christian Harder, Uwe Pilz, and Chris Wyatt observed 29P 10 times since November 23 and usually finding the comet between magnitude 11.2 and 11.5 with a small but growing coma. Opposition is on December 30 with the comet spending the month in Gemini (Dec 1-26) and Auriga (26-31).

If you observe 29P, please consider contributing to two pro-am programs spearheading the effort to better understand this amazing object: the British Astronomical Society's (BAA) Mission 29P monitoring program coordinated by Richard Miles. (https://britastro.org/node/18562 & https://britastro.org/node/25120) and the University of Maryland's 29P Observation campaign (https://wirtanen.astro.umd.edu/29P/29P_obs.shtml).

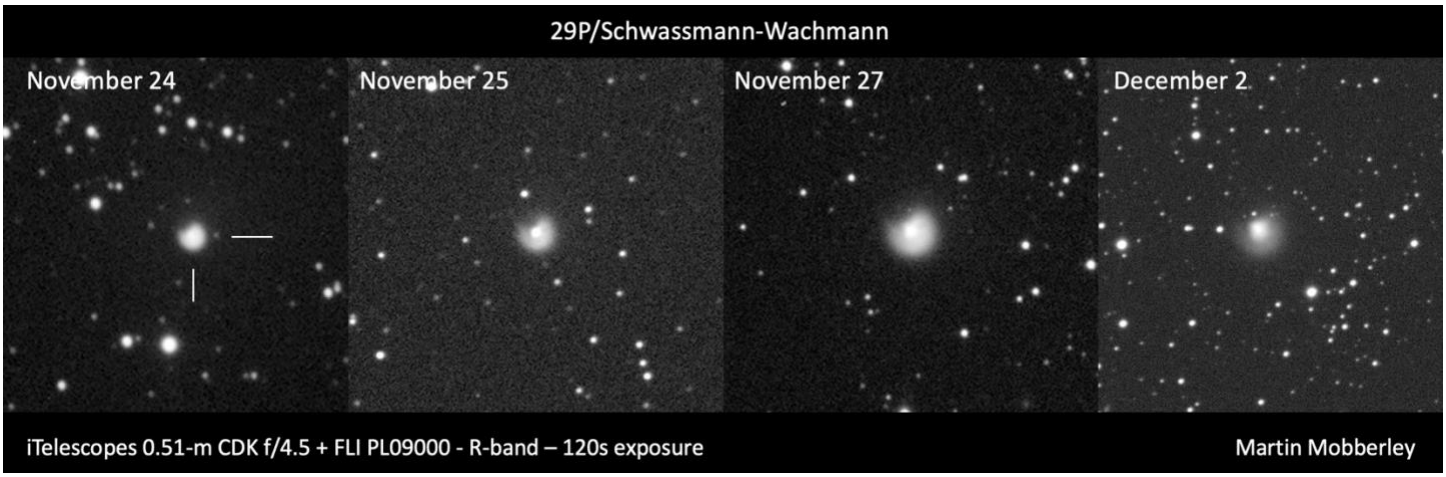


Figure 4 - Martin Mobberley imaged the expansion and evolution of the dust coma produced by the recent 29P outbursts.

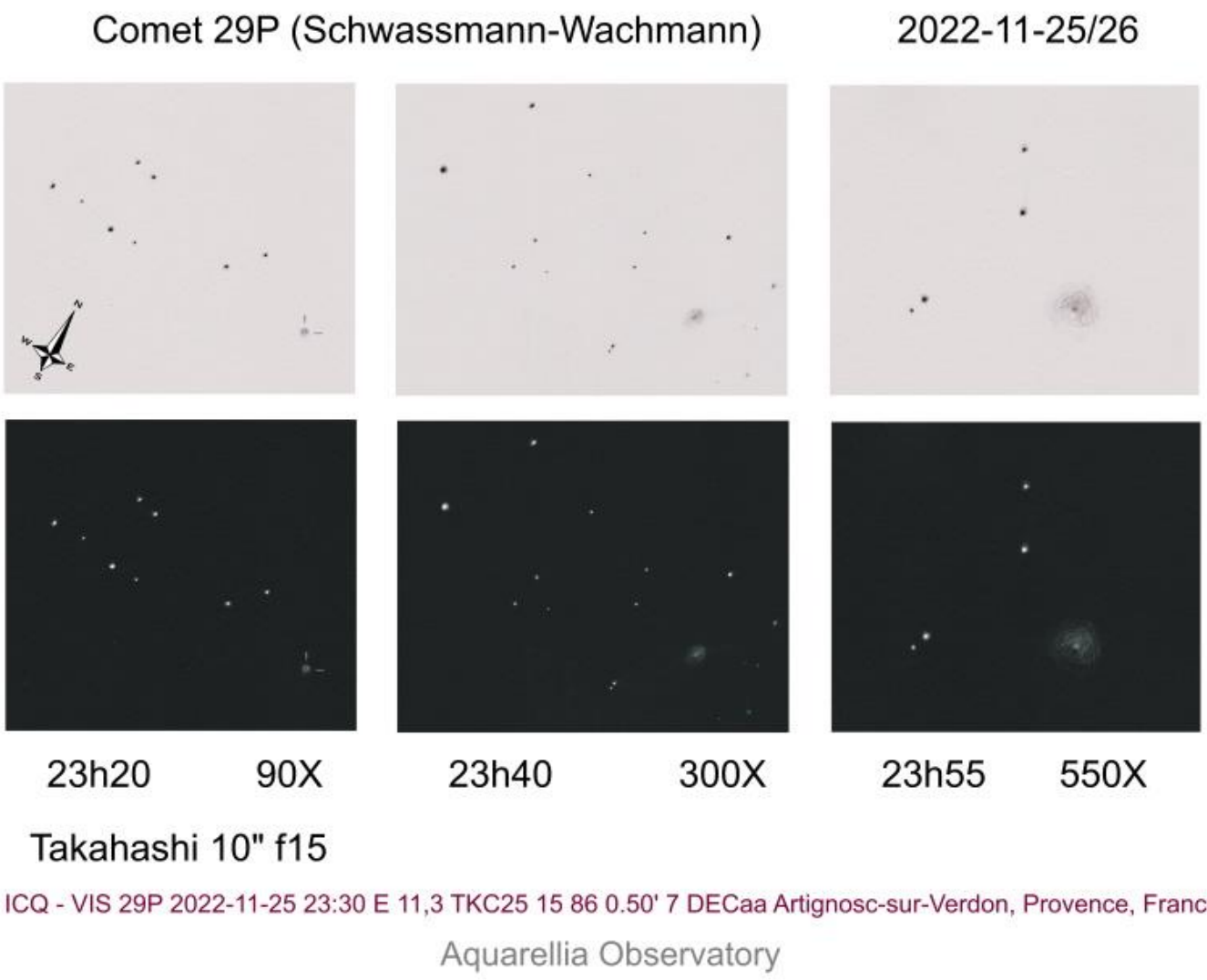


Figure 5 - Michel Deconinck visually observed 29P between its 2 recent large outbursts. His sketches show the comet's appearance under different magnifications.

73P/Schwassmann-Wachmann

Discovered photographically on 1930 May 30 by Arnold Schwassmann and Arno Arthur Wachmann at Hamburg Observatory in Bergedorf, Germany

Orbit (from Minor Planet Center MPEC 2022-W269)

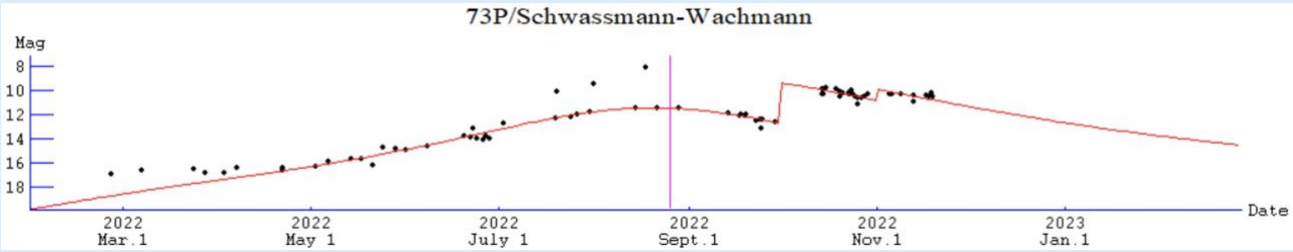
```
  73P/Schwassmann-Wachmann
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Aug. 25.80904 TT                                  Rudenko
q   0.9728786           (2000.0)            P               Q
n   0.18114721     Peri.  199.50719     -0.02162904     +0.98296424
a   3.0934869      Node    69.59682     -0.88945859     +0.06444071
e   0.6855074      Incl.   11.22937     -0.45650367     -0.17212987
P   5.44
From 2762 observations 2016 Feb. 13-2022 Nov. 28, mean residual 0".9.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
73P/Schwassmann-Wachmann                                              Max El
                                                                       (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2022-Dec-01  21 50  -24 32   1.613    1.589     73E    Cap   11.4     24   39
2022-Dec-06  22 05  -22 51   1.659    1.670     72E    Aqr   11.6     26   36
2022-Dec-11  22 19  -21 11   1.705    1.753     70E    Aqr   11.8     27   33
2022-Dec-16  22 33  -19 33   1.751    1.838     69E    Aqr   12.1     28   30
2022-Dec-21  22 45  -17 57   1.797    1.925     67E    Aqr   12.3     29   27
2022-Dec-26  22 57  -16 23   1.842    2.014     65E    Aqr   12.5     30   24
2022-Dec-31  23 08  -14 52   1.888    2.103     63E    Aqr   12.7     30   21
2023-Jan-05  23 19  -13 24   1.933    2.194     61E    Aqr   12.9     30   19
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 11.7 + 5 log d + 14.7 log r(T + 7) [Through T + 36 days]
m1 =  9.0 + 5 log d + 11.9 log r        [T + 36 days to T + 67 days]
m1 =  8.3 + 5 log d + 10.0 log r        [Since T + 67 days]
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
              (UT)                    T          Dia  DC  LENG  PA
 73        2022 11 26.96  M 11.8 AQ 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 25.97  M 11.6 AQ 30.0L 5 109   1    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 24.96  M 11.5 TK 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 23.44 xM 11.8 AQ 40.0L 4  59   3.9  4/          ICQ XX WYA   Christopher Wyatt
 73        2022 11 18.97  M 11.4 TK 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 18.81  S 10.5 TK 20.3T10  77   6    2/          ICQ XX GON05 Juan Jose Gonzalez Suarez
 73        2022 11 17.96  M 11.4 TK 30.0L 5 109   1    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 16.96  M 11.3 TK 30.0L 5 109   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 12.93  M 11.3 TK 30.0L 5 109   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 08.91  M 11.2 TK 30.0L 5 109   1    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 05.90  M 11.2 TK 30.0L 5 109   1    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 11 04.90  M 11.1 TK 30.0L 5 109   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

73P/Schwassmann-Wachmann should be too faint to be highlighted here. But thanks to an outburst sometime between September 30 and October 5 the comet is back up to 10th magnitude. Actually, based on the lightcurve,

it is possible that S-W experienced another small outburst in very late October/early November. As a result, it is still around magnitude 11 as it moves through Capricornus (Dec 1-3) and Aquarius (3-31) in the evening sky.

Its recent outburst(s) shouldn't be much of a surprise since 73P has a history of outbursts and splitting events. The 1995 return saw a series of outbursts resulted in a jump in brightness from 12th to 6th magnitude. Those outbursts were the result of a splitting event that released multiple secondary components. The next return in 2000 was poor. Even then, two nuclei were observed. 2006 saw the comet's best return since 1930 with a close approach to Earth of 0.07 au. Visual observers were treated to a bright double comet with components B and C reaching 4-5th magnitude. Imagers detected dozens of fainter components with some components like B and G shedding hundreds of short-lived smaller components during the course of the apparition. While only a single component, the primary C, was seen in 2011, 2017 saw the C component return as well as a new secondary, designated BT. 2017 also saw 73P experience a ~2 magnitude brightening many months after perihelion.

During the current return, Michael Jäger, Gerald Rhemann and Lukas Demetz identified five secondaries in July and August (now designated BU, BV, BW, BX, and BY). All were around 18-19th magnitude. It will be interesting to see if the most recent outburst(s) released any new secondaries.

Since 73P's current brightness is related to an outburst(s), the above prediction is uncertain. Not only could yet another outburst occur, but the recent rate of fading after the outburst is uncertain. Still, like last month, 73P should start the month around magnitude 11.0 but may fade quickly.

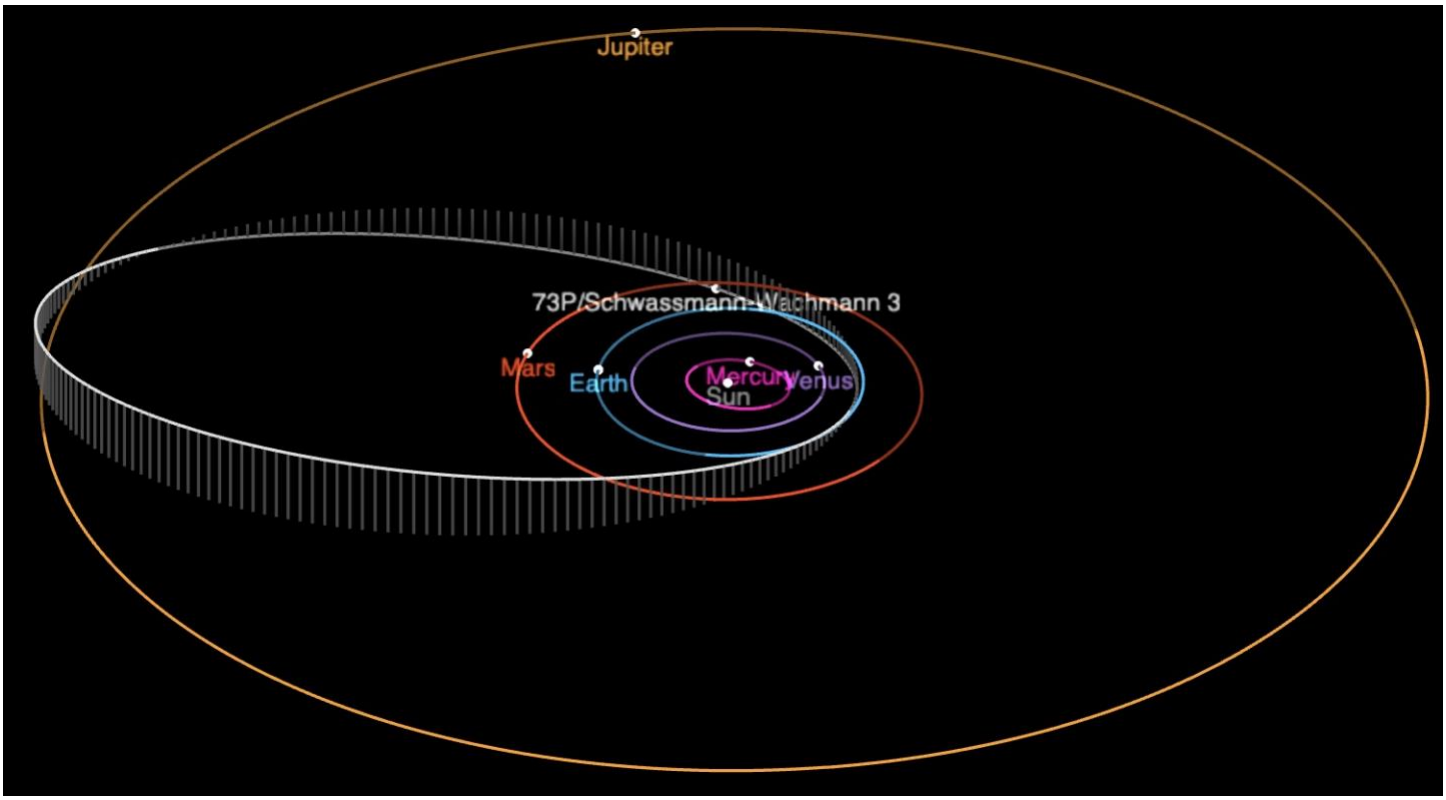


Figure 6 - The orbit of 73P for 2022 December 15 from the JPL Small-Body Database.

81P/Wild

Discovered photographically on 1978 January 6 by Paul Wild at Zimmerwald, Switzerland

Orbit (from Minor Planet Center, MPEC 2022-W269)

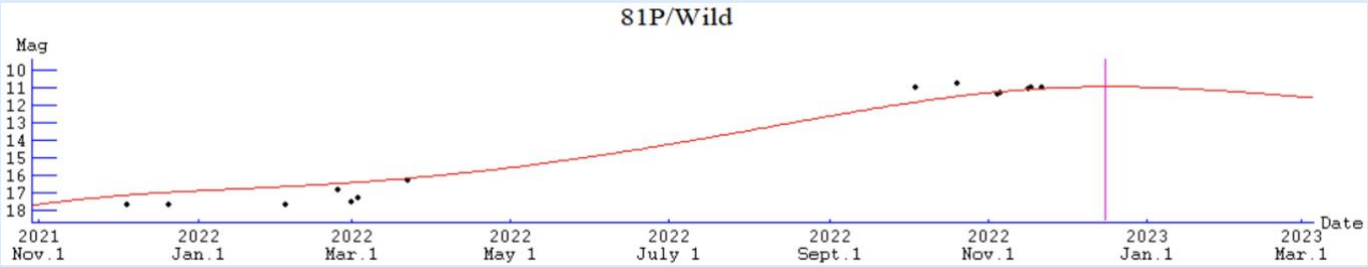
```
  81P/Wild
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Dec. 15.61730 TT                                  Rudenko
q   1.5984229            (2000.0)            P              Q
n   0.15352482     Peri.   41.62818     -0.99847787     -0.03884951
a   3.4542226      Node   136.09795     +0.02218430     -0.93275780
e   0.5372554      Incl.    3.23649     +0.05049548     -0.35840425
P   6.42
From 1909 observations 2014 Oct. 18-2022 Nov. 26, mean residual 0".6.
     Nongravitational parameters A1 = -0.04, A2 = -0.1008.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
81P/Wild                                                          Max El
                                                                   (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2022-Dec-01  13 06   -05 33    1.605   2.030     51M    Vir   11.0     28    4
2022-Dec-06  13 20   -06 49    1.601   1.998     52M    Vir   11.0     29    5
2022-Dec-11  13 34   -08 02    1.599   1.968     53M    Vir   11.0     29    7
2022-Dec-16  13 47   -09 13    1.598   1.938     55M    Vir   11.0     29    8
2022-Dec-21  14 01   -10 21    1.599   1.909     56M    Vir   11.0     29   11
2022-Dec-26  14 15   -11 25    1.602   1.881     58M    Vir   11.0     30   13
2022-Dec-31  14 29   -12 25    1.606   1.853     59M    Lib   11.0     30   16
2023-Jan-05  14 42   -13 22    1.611   1.826     61M    Lib   11.0     30   18
```

Comet Magnitude Formula (from Seiichi Yoshida)

```
m1 =  6.3 + 5 log d + 18.0 log r (t + 20) [Through 95 days after perihelion]
m1 =  8.2 + 5 log d + 12.5 log r [95 days after perihelion and afterwards]
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
               (UT)                      T         Dia  DC  LENG  PA
 81        2022 11 27.29  M 11.2 AQ 30.0L 5 109   2    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 21.51  Z 11.0 U4  7.2R 5A200   5.2       0.2 290 ICQ xx HER02 Carl Hergenrother
 81        2022 11 17.29  M 11.4 AQ 30.0L 5 109   2    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 16.29  M 11.5 AQ 30.0L 5 109   2    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 05.31  M 11.7 AQ 30.0L 5 109   1    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 11 04.30  M 11.8 AQ 30.0L 5 109   1    4/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

Paul Wild of the Astronomical Institute at Berne University in Switzerland discovered 81P/Wild (formerly Wild 2) on photographic plates obtained on 1978 January 6 taken with the 0.4-m Schmidt telescope at Zimmerwald, Switzerland. 81P is best known as the target of the Stardust mission which not only obtained close-up imaging in 2004 but also collected a sample of cometary particles and returned them to Earth in 2006.

Currently the comet is on a short-period orbit with an orbital period of 6.4 years and perihelion of 1.60 au. Prior to a very close approach to Jupiter of 0.0063 au on 1974 September 9, 81P had a much larger orbit with a period

of ~47 years ranging between 5.0 and 21.2 au (from around the orbit of Jupiter to just beyond Uranus). The discovery apparition of 1978 marked the comet's first close perihelion to the Sun after the 1974 Jupiter encounter.

Since the 1974, Wild has been on a fairly stable orbit with perihelion ranging between 1.49 and 1.60 au. Its best returns were in 1997 with a close approach to Earth of 0.85 au and 2010 at 0.67 au from Earth. During both of those returns the comet reached 8-9th magnitude. During its last return in 2016 when it passed a more distant 1.47 au from Earth, the comet reached 11th magnitude.

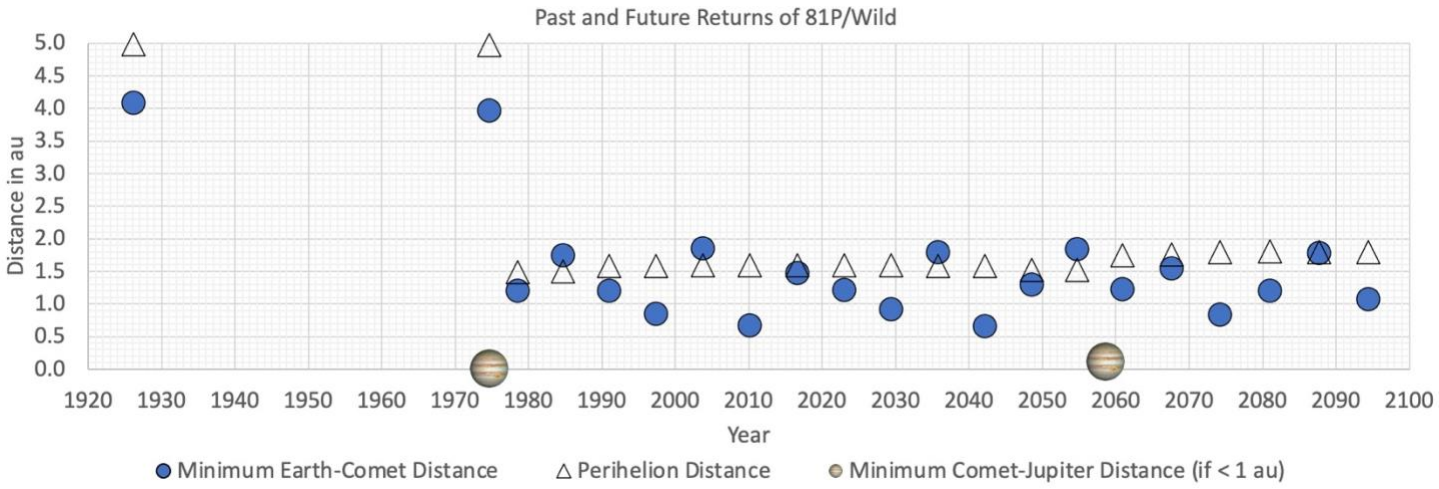


Figure 7 - Orbital evolution of 81P/Wild.

This year's return is better than 2016's but worse than in 1997 and 2010. Perihelion will be on 2022 December 15 at 1.60 au when the comet will be 1.94 au from Earth. The first half of 2023 will see the comet move towards a close approach to Earth on 2023 May 18 at 1.22 au.

81P is a morning object in Virgo (Dec 1-28) and Libra (28-31). It is a better object for northern observers though it should become better placed for southern observers as the month progresses. Visual observers consistently placed 81P at 11th magnitude in November with a small 1-2' moderately condensed coma. We should expect more of the same in December.

Figure 8 – Dan Bartlett caught 81P and its telltale coma morphology on 2022 November 25. This is a crop of his image taken with a Celestron RASA11 schmidt and ZWO ASI2600mcP camera. It is a combine of 14x45-s exposures.

118P/Shoemaker-Levy

Discovered photographically on 1990 February 9 by Gene and Caroline Shoemaker and David Levy at Palomar Observatory

Orbit (from Minor Planet Center MPEC 2022-W269)

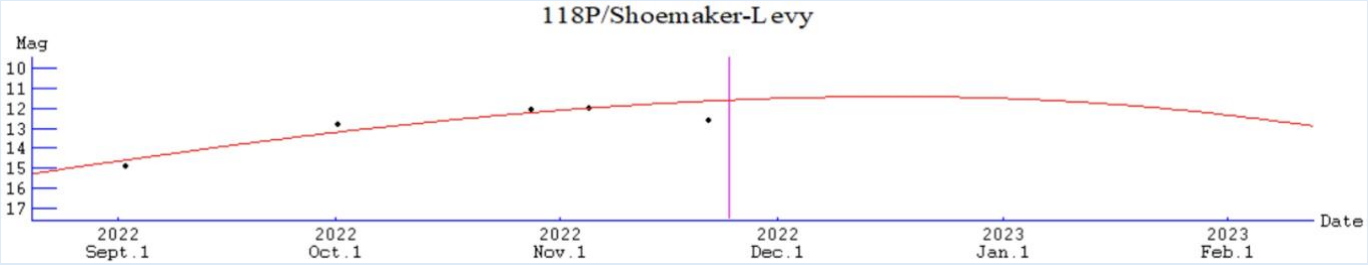
```
118P/Shoemaker-Levy
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Nov. 24.34922 TT                                  Rudenko
q   1.8290088            (2000.0)            P              Q
n   0.16098294     Peri.  314.84293     -0.12756456     -0.98597149
a   3.3466950      Node   142.09682     +0.95223922     -0.15210720
e   0.4534881      Incl.   10.09170     +0.27743062     +0.06872862
P   6.12
From 858 observations 2015 Sept. 15-2022 Nov. 29, mean residual 0".6.
     Nongravitational parameters A1 = -0.17, A2 = -0.0178.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
118P/Shoemaker-Levy                                                  Max El
                                                                      (deg)
    Date      R.A.    Decl.     r       d     Elong  Const  Mag    40N  40S
2022-Dec-01  08 32  +07 33   1.830   1.134   119M   Cnc  11.5     57   39
2022-Dec-06  08 37  +07 27   1.832   1.097   123M   Cnc  11.5     57   40
2022-Dec-11  08 40  +07 26   1.835   1.062   127M   Cnc  11.4     57   41
2022-Dec-16  08 42  +07 33   1.838   1.030   131M   Cnc  11.4     57   42
2022-Dec-21  08 44  +07 46   1.843   1.001   136M   Cnc  11.4     58   42
2022-Dec-26  08 44  +08 08   1.849   0.975   141M   Cnc  11.5     58   42
2022-Dec-31  08 44  +08 37   1.856   0.954   146M   Cnc  11.5     59   41
2023-Jan-05  08 43  +09 14   1.863   0.937   151M   Cnc  11.6     59   41
```

Comet Magnitude Formula (from Seiichi Yoshida)

```
m1 = -4.5 + 5 log d + 60.0 log r [-100 to ~100 days from perihelion]
m1 =  8.2 + 5 log d + 18.0 log r [+100 to 435 days from perihelion]
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ CODE Observer Name
               (UT)                      T         Dia  DC  LENG  PA
118        2022 11 25.66 xS 14.0 AQ 40.0L 4 108   1.1  3           ICQ XX WYA   Christopher Wyatt
118        2022 11 21.50  Z 12.6 U4  7.2R 5A200   3.0       1.8m275 ICQ xx HER02 Carl Hergenrother
```

118P was a photographic discovery by the prolific comet and asteroid discovery team of Carolyn and Gene Shoemaker and formal ALPO Comets Section Recorder David Levy. As with all of the team's finds, 118P was found with the 0.46-m Schmidt on Mount Palomar in southern California. Caroline and Gene made 32 comet discoveries while David made 23 (22 with the Levy name and 1 named after his Jarnac Observatory). 13 comets were co-discovered by the three of them and named Shoemaker-Levy, the brightest being the Jupiter impacting D/1993 F2 (Shoemaker-Levy 9).

118P/Shoemaker-Levy (formerly Shoemaker-Levy 4) was discovered on 1991 February 9 at 17th magnitude. Having been discovered 7 months after perihelion it faded rapidly after discovery. Its next return in 1997 saw the

comet reach 12th magnitude. Nine months after perihelion and peaking at 14th magnitude in 2003, 118P experienced a ~2 magnitude outburst. 2010 was another good return with a peak brightness of 11-12th magnitude.

Looking at the comet's orbital evolution, each return alternated between good returns (1997, 2010, 2022) and poor returns (1990, 2003, 2016). This alternating pattern extended back to a return in 1958. If 118P was reaching 11-12th magnitude every ~13 years since the late 1950s, we have to wonder why it wasn't discovered previously. Perhaps it was just a matter of being a little too faint for visual hunters and missed by photographic surveys which were still very limited in sky coverage. Or perhaps the comet was less active in those years.

In July 2020, a close encounter with Jupiter at 0.66 au resulted in a decrease in perihelion distance from 1.98 to 1.83 au. Due to the change in perihelion distance and orbital period, the 2022 and 2029 returns should be the best in the 20th-21st centuries.

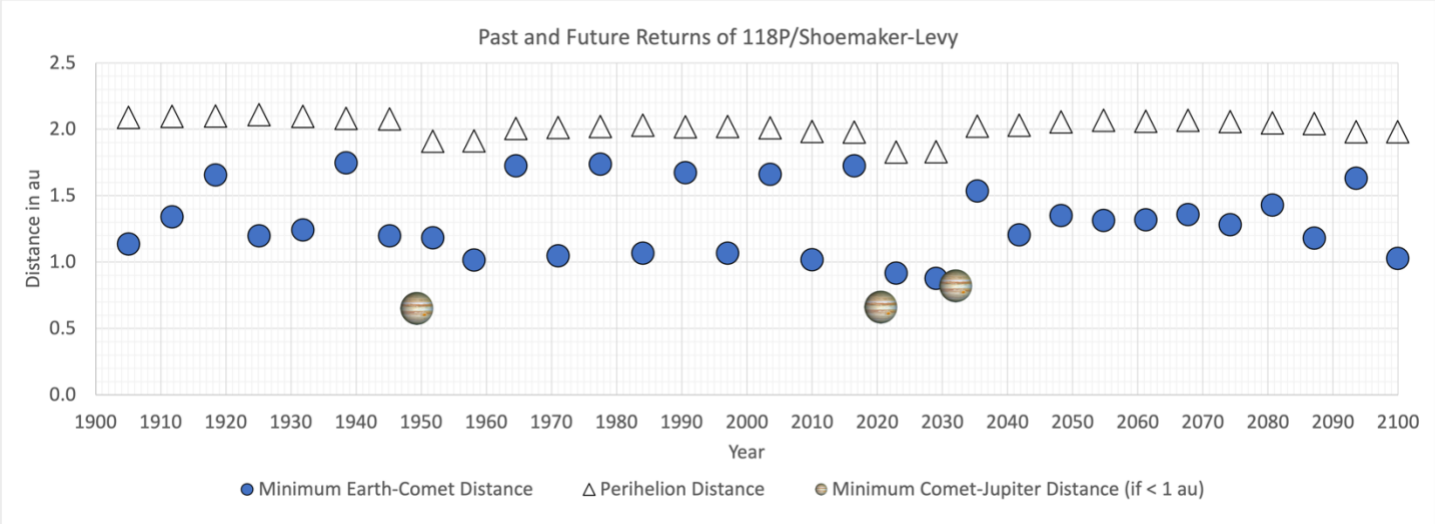


Figure 9 - Orbital evolution of 118P/Shoemaker-Levy.

Perihelion occurred on 2022 November 24 at 1.83 au though closest approach to Earth won't be till 2023 January 18 at 0.92 au. Chris Wyatt reported a faint visual magnitude of 14.0 on November 25. Imagers Carl Hergenrother and Thomas Lehmann (via COBS) found the comet to be brighter, between 12.0 and 12.6. Maximum brightness should be reached this month at a few tenths of a magnitude brighter than 12.0. While still a morning object, 118P will be moving through Cancer as it approaches opposition.

C/2019 L3 (ATLAS)

Discovered 2019 June 10 by the ATLAS survey with one of their 0.5-m f/2 Schmidt

Orbit (from Minor Planet Center, MPEC 2022-W269)

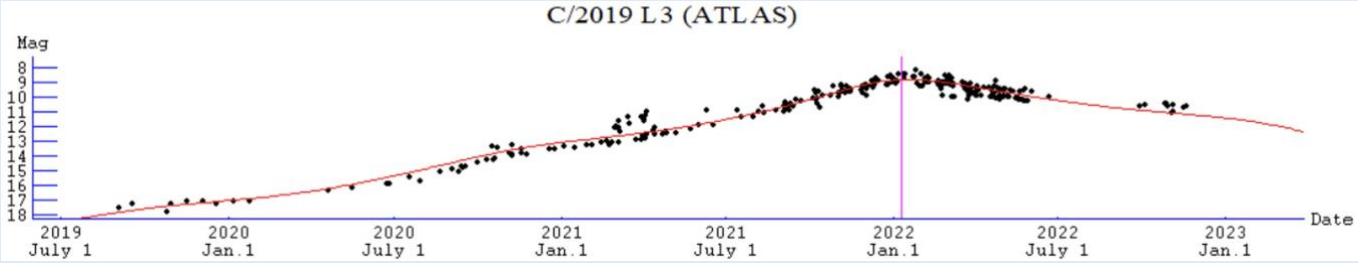
```
    C/2019 L3 (ATLAS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Jan.  9.64987 TT                                   Rudenko
q   3.5544154           (2000.0)            P               Q
z  -0.0005743      Peri.  171.61743     -0.26040905     -0.66641954
 +/-0.0000002      Node   290.77990     +0.83684045     +0.20509911
e   1.0020413      Incl.   48.35088     +0.48154459     -0.71681194
From 5343 observations 2019 June 10-2022 Nov. 29, mean residual 0".4.
1/a(orig) = +0.000109 AU**-1, 1/a(fut) = -0.000873 AU**-1.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2019 L3 (ATLAS)                                                    Max El
                                                                      (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2022-Dec-01  10 00   -24 41    4.587    4.536     86M   Hya   11.3     25   51
2022-Dec-06  10 00   -25 44    4.614    4.500     90M   Hya   11.3     24   55
2022-Dec-11  10 00   -26 46    4.641    4.466     94M   Hya   11.3     23   59
2022-Dec-16  09 59   -27 46    4.669    4.433     97M   Ant   11.3     22   63
2022-Dec-21  09 59   -28 43    4.696    4.402    101M   Ant   11.4     21   67
2022-Dec-26  09 57   -29 38    4.724    4.373    105M   Ant   11.4     20   72
2022-Dec-31  09 55   -30 30    4.752    4.347    108M   Ant   11.4     19   77
2023-Jan-05  09 53   -31 19    4.780    4.325    111M   Ant   11.5     19   81
```

Comet Magnitude Formula and Lightcurve (from ALPO and COBS data)

```
m1 = -3.5 + 5 log d + 18.4 log r(t - 76)
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD    Mag  SC APER FL POW   COMA     TAIL     ICQ CODE Observer Name
              (UT)                    T          Dia  DC  LENG  PA
   2019L3  2022 11 25.66 xM 11.2 AQ 40.0L 4  59   2.4  6           ICQ XX WYA   Christopher Wyatt
   2019L3  2022 11 20.25  M 11.1 TK 30.0L 5  89   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 11 17.28  M 11.2 TK 30.0L 5  89   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 11 16.28  M 11.2 TK 30.0L 5  89   1    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 11 05.30  M 11.4 TK 30.0L 5  89   1    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 11 04.28  M 11.5 TK 30.0L 5  89   2    5           ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

C/2019 L3 was discovered by ATLAS (Asteroid Terrestrial-impact Last Alert System) back on 2019 June 10. At that time the comet was 18th magnitude and 8.5 au from the Sun. Perihelion occurred nearly a year ago on 2022 January 9 at 3.55 au. Around that time, the comet was at its best at 9th magnitude.

C/2019 L3 continues to slowly fade at around magnitude 11.3 to 11.5. That's according to a fit to the comet's magnitude. If you look closely at its lightcurve above, recently observations have been coming in a little brighter so the ephemeris above may be a few tenths of a magnitude too faint. This month, the comet is visible from both hemispheres though it is getting a bit south for northerners as it moves through Hydra (Dec 1-12) and Antlia (12-31) in the morning sky.

C/2022 P1 (NEOWISE)

Discovered 2022 August 8 by the NEOWISE spacecraft
Halley-family comet

Orbit (from Minor Planet Center, MPEC 2022-W269)

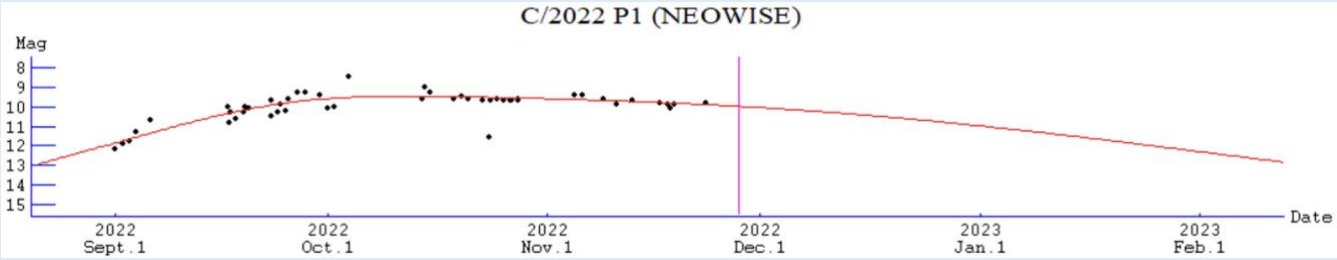
```
    C/2022 P1 (NEOWISE)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Nov. 28.48165 TT                                  Rudenko
q   1.5951921           (2000.0)            P              Q
n   0.01247256     Peri.  249.93894     +0.67040000     -0.71938657
a  18.4147442      Node   205.08211     -0.41149352     -0.56432606
e   0.9133742      Incl.  154.60673     -0.61744386     -0.40499268
P  79.0
From 599 observations 2022 Aug. 8-Nov. 14, mean residual 0".4.
```

Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2022 P1 (NEOWISE)                                                    Max El
                                                                       (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2022-Dec-01  19 35   -39 24    1.598   2.159     43E    Sgr   10.1     0   22
2022-Dec-06  19 32   -39 06    1.600   2.248     38E    Sgr   10.2     0   18
2022-Dec-11  19 30   -38 50    1.606   2.329     33E    Sgr   10.3     0   13
2022-Dec-16  19 29   -38 37    1.614   2.401     29E    Sgr   10.4     0    9
2022-Dec-21  19 28   -38 26    1.625   2.463     24E    Sgr   10.6     0    6
2022-Dec-26  19 27   -38 17    1.638   2.516     21E    Sgr   10.8     0    3
2022-Dec-31  19 27   -38 11    1.654   2.559     18E    Sgr   10.9     0    1
2023-Jan-05  19 26   -38 06    1.672   2.592     16E    Sgr   11.1     0    0
```

Comet Magnitude Formula

```
m1 =  1.3 + 5 log d + 34.8 log r
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
              (UT)                      T         Dia  DC  LENG  PA
   2022P1  2022 11 23.42 xM 10.4 AQ 40.0L 4  59   5.6  4           ICQ XX WYA   Christopher Wyatt
   2022P1  2022 11 18.94  M 10.6 TK 30.0L 5 109   2    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2022P1  2022 11 18.43 xM 10.4 AQ 25.0L 5  40   4.6  4           ICQ XX WYA   Christopher Wyatt
   2022P1  2022 11 17.95  M 10.6 TK 30.0L 5 109   2    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2022P1  2022 11 16.94  M 10.5 TK 30.0L 5 109   2    3           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2022P1  2022 11 12.94  M 10.4 TK 30.0L 5 109   2    3/          ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2022P1  2022 11 08.94  M 10.3 TK 30.0L 5 109   2    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2022P1  2022 11 05.94  M 10.1 TK 30.0L 5 109   3    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2022P1  2022 11 04.91  M 10.1 TK 30.0L 5 109   3    4           ICQ XX DES01 Jose Guilherme de Souza Aguiar
```

C/2022 P1 is a Halley type comet with an orbital period of 79 years. Visual observers Jose Guilherme de Souza Aguiar and Chris Wyatt observed C/2022 P1 on 8 different nights in November. Brightness measurements mainly fell in the 10.1 to 10.6 range (aperture corrected to 9.4 to 10.1). Thomas Lehmann CCD found a similar brightness of 9.9 on Nov. 20, in line with the aperture corrected visual measurements. Visually the comet had a moderately condensed coma (DC between 3 and 4) between 2' and 5.6' in diameter. C/2022 P1 (NEOWISE) is an evening object in Sagittarius and should fade from around magnitude 10.1 to 10.9 this month. It is currently visible only from the southern hemisphere and even then only till the end of the month when it will be too low to be observed.