January 2023

ALPO Comet News

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

C/2022 E3 (ZTF) Owns the Stage in January

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On the Front Cover:

Chris Schur (Payson, Arizona, USA) used a 10” f/3.9 Orion Astrograph Newtonian and CMOS one shot color camera to capture C/2022 E3 (ZTF) on 2022 December 26. The exposure time was 90 minutes. http://www.schursastrophotography.com/newcomets/zti-122622.html

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/857600-alpo-comet-news-for-january-2023/) 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

Happy New Year! Just like with 2022, 2023 starts out with a nice bright comet. C/2022 E3 (ZTF) begins the year at around magnitude 7.5. With perihelion on January 12 and a close approach to Earth at 0.29 au on February 1, E3 could peak as bright as magnitude 4.7 by the end of the month. Not super bright, but a nice binocular object for all and a borderline naked eye object for those under dark skies. Though the comet will be too far north for most southern hemisphere observers, it will be a circumpolar object for northern hemisphere observers.

While C/2022 E3 will be the center of attention in January, it won't be the only comet visible. C/2017 K2 (PANSTARRS) will be around 8th magnitude for southern observers, while northerners will also be able to follow a trio of 9th magnitude comets: C/2020 V2 (ZTF), C/2022 A2 (PANSTARRS), and C/2022 U2 (ATLAS). Those able to go a little fainter (to magnitude 12.0) can also observed 29P/Schwassmann-Wachmann, 81P/Wild, C/2019 L3 (ATLAS), C/2019 U5 (PANSTARRS), and C/2020 K1 (PANSTARRS).

Somewhat surprisingly, the brightest comet of the month will not be C/2022 E3 (ZTF) but rather 96P/Machholz at 2nd magnitude or perhaps even brighter. But no one on Earth will be able to see 96P at that brightness with their own eyes. Instead, we'll be able to watch it through the eyes of the SOHO spacecraft as it will only be a few degrees from the Sun at its brightest in late January.

Last month the ALPO Comets Section received 101 magnitude estimates and 67 images/sketches of comets C/2022 U2 (ATLAS), 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/2020 Y2 (ATLAS), C/2020 V2 (ZTF), C/2019 U5 (PANSTARRS), C/2019 L3 (ATLAS), C/2017 K2 (PANSTARRS), 119P/Parker-Hartley, 118P/Shoemaker-Levy, 81P/Wild, 73P/Schwassmann-Wachmann, 29P/Schwassmann-Wachmann, and 22P/Kopff. A big thanks to our recent contributors: Dan Bartlett, Denis Buczynski, J. J. Gonzalez, Jose Guilherme de Souza Aguiar, Christian Harder, Carl Hergenrother, Eliot Herman, Michael Jager, Martin Mobberley, Uwe Pilz, Gregg Ruppel, 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

Jan 06 - Full Moon
Jan 14 - Last Quarter Moon
Jan 21 - New Moon
Jan 28 - First Quarter Moon

Comets at Perihelion

Jan 06 - P/2013 YG46 (Spacewatch) [q = 1.79 au, 5.9-yr period, discovered in 2013 but near aphelion, observed for 2 months, not seen since, likely discovered due to aphelic outburst]
Jan 07 - P/2022 O2 (PANSTARRS) [q = 1.76 au, 15.9-yr period, V ~ 18, discovered in July 2022]
Jan 12 - 285P/LINEAR [q = 1.72 au, 9.6-yr period, V ~ 17?, discovered in 2003, 3rd observed return, experienced large ~5 mag outburst in July 2022 to 14th mag]
Jan 12 - C/2022 S3 (ZTF) [q = 1.11 au, V ~ 4, more below]
Jan 14 - C/2022 U2 (ATLAS) [q = 1.33 au, V ~ 10-11]
Jan 21 - P/2021 V2 (Fuls) [q = 3.50 au, 27.2-yr period, V ~ 17, first return]
Jan 21 - C/2022 S3 (PANSTARRS) [q = 0.84 au, V ~ 13]
Jan 22 - C/2021 P2 (PANSTARRS) [q = 5.07 au, V ~ 19, low elongation at perihelion]
Jan 22 - 71P/Clark [q = 1.59 au, 5.6-yr period, V ~ 13, discovered in 1973, 10th observed return, alternating good and bad returns, at good returns can reach 9-10th mag, 2023 is a bad return with comet behind Sun at perihelion]
Jan 30 - 263P/Gibbs [q = 1.24 au, 5.3-yr period, V ~ 16, found in 2006, 4th observed return, close approach to Earth of 0.34 au in early February, close to as good a return as is currently possible, still going to be a faint object]
Jan 31 - 96P/Machholz [q = 0.12 au, 5.3-yr period, V ~ 2 if you have a coronagraph in space, V ~ 7 on Earth, visual discovery in 1986, 8th observed return, more below]
Jan 31 - C/2022 Q2 (ATLAS) [q = 1.64 au, 186-yr period, V ~ 16, too close to Sun to observe at perihelion]

Photo Opportunities

Jan 13 - C/2019 L3 (ATLAS) passes within 0.4 deg of 11-13th mag galaxy triplet NGC 3038, IC 2512 & 2513
Jan 16 - 81P/Wild passes within 15' of 12th mag galaxy NGC 5892
Jan 22 - C/2020 V2 (ZTF) passes ~10' from 9th mag open cluster NGC 559
Jan 23 - C/2022 E3 (ZTF) passes 0.3 deg of 13th mag galaxy NGC 5894
Jan 26 - C/2020 V2 (ZTF) passes ~40' from 7th mag open cluster M103
Jan 29 - C/2020 V2 (ZTF) passes between 6th mag open cluster NGC 457 (~1.2 deg away) and large but faint planetary nebula Simeis 22 (~10' away)

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 U2 (ATLAS)												
2022U2	2022 12 28.11	S 10.8	TK	20.3T10		100	7	2/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022U2	2022 12 26.84	S 12.0	TI	29.8L	4	108	2	3			ICQ XX	HAR11 Christian Harder
C/2022 P1 (NEOWISE)												
2022P1	2022 12 15.93	aM 11.6	TK	30.0L	5	89	2	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2022P1	2022 12 14.94	aM 11.4	TK	30.0L	5	89	2	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2022P1	2022 12 08.94	M 11.1	TK	30.0L	5	89	2	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2022P1	2022 12 07.94	M 11.0	TK	30.0L	5	89	2	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
C/2022 E3 (ZTF)												
2022E3	2022 12 30.24	S 7.3	TI	8.0R	5	10	11	5			ICQ XX	HAR11 Christian Harder
2022E3	2022 12 28.18	S 7.3	TK	5.0B		10	7	5			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022E3	2022 12 27.23	S 7.5	TK	7.0B	6	16	3	5	0.08	330		PIL01 Uwe Pilz
2022E3	2022 12 27.14	S 7.8	TI	19.6L	5	56	3.5	5	8	m345	ICQ XX	HAR11 Christian Harder
2022E3	2022 12 25.20	S 7.6	TK	7.0B	6	16	5	s7	0.13	340		PIL01 Uwe Pilz
2022E3	2022 12 24.53	S 7.7	TK	5.0B		10	7	5			ICQ xx	HER02 Carl Hergenrother
2022E3	2022 12 21.52	S 7.8	TK	5.0B		10	6	5			ICQ xx	HER02 Carl Hergenrother
2022E3	2022 12 21.52	S 8.2	TK	12.5B		30	5.5	5	5	m 20	ICQ xx	HER02 Carl Hergenrother
2022E3	2022 12 18.21	S 8.3	TI	19.6L	5	67	3	5	3	m	ICQ XX	HAR11 Christian Harder
2022E3	2022 12 02.24	S 9.2	TK	20.3T10		77	3	4/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2022 A2 (PANSTARRS)												
2022A2	2022 12 28.20	S 9.9	TK	20.3T10		77	5	3/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2022A2	2022 12 24.53	S 10.0	TK	12.5B		30	4	3			ICQ xx	HER02 Carl Hergenrother
2022A2	2022 12 18.20	S 9.0	TI	25.2L		68	4.5	3	4.5	m330	ICQ XX	HAR11 Christian Harder
2022A2	2022 12 02.14	S 10.1	TK	20.3T10		77	6	3			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2021 Y1 (ATLAS)												
2021Y1	2022 12 26.53	xM 14.2	AQ	40.0L	4	108	0.6	6			ICQ XX	WYA Christopher Wyatt
2021Y1	2022 12 20.48	xM 14.2	AQ	40.0L	4	108	0.8	6			ICQ XX	WYA Christopher Wyatt
C/2021 X1 (Maury-Attard)												
2021X1	2022 12 26.53	xM 14.8	AQ	40.0L	4	108	0.9	5			ICQ XX	WYA Christopher Wyatt
2021X1	2022 12 20.47	xM 14.4	AQ	40.0L	4	182	0.9	5/			ICQ XX	WYA Christopher Wyatt
C/2021 T4 (Lemmon)												
2021T4	2022 12 26.51	xM 14.8	AQ	40.0L	4	182	0.6	4			ICQ XX	WYA Christopher Wyatt
2021T4	2022 12 20.46	xM 14.8	AQ	40.0L	4	182	1.1	4/			ICQ XX	WYA Christopher Wyatt
C/2020 Y2 (ATLAS)												
2020Y2	2022 12 26.52	xM 14.9	AQ	40.0L	4	182	0.5	6			ICQ XX	WYA Christopher Wyatt
2020Y2	2022 12 20.47	xM 15.0	AQ	40.0L	4	182	0.6	5/			ICQ XX	WYA Christopher Wyatt
C/2020 V2 (ZTF)												
2020V2	2022 12 28.10	S 9.7	TK	20.3T10		77	3.5	4	0.1	110	ICQ XX	GON05 Juan Jose Gonzalez Suarez
2020V2	2022 12 26.84	S 9.9	TI	29.8L	4	79	2.6	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 12 24.86	S 10.1	TI	29.8L	4	79	2.5	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 12 24.53	S 9.9	TK	12.5B		30	2.5	5			ICQ xx	HER02 Carl Hergenrother
2020V2	2022 12 21.53	S 9.8	TK	12.5B		30	3	3			ICQ xx	HER02 Carl Hergenrother
2020V2	2022 12 17.92	S 9.8	TI	25.2L	4	78	3	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 12 17.73	S 9.9	TI	35.3L		105	3	4	4.5	m140	ICQ XX	HAR11 Christian Harder
2020V2	2022 12 15.74	S 9.8	TI	29.8L	4	92	2.7	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 12 14.74	S 9.9	TI	29.8L	4	92	2.8	4	4	m155	ICQ XX	HAR11 Christian Harder
2020V2	2022 12 13.72	S 9.9	TI	29.8L	4	92	2.8	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 12 12.74	S 10.0	TI	29.8L	4	78	2.8	4	4	m155	ICQ XX	HAR11 Christian Harder
2020V2	2022 12 11.70	S 9.8	TI	29.8L	4	92	3	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 12 02.15	S 10.2	TK	20.3T10		77	3.5	4/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2019 U5 (PANSTARRS)												
2019U5	2022 12 23.29	M 12.4	AQ	30.0L	5	122	1	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019U5	2022 12 18.29	M 12.4	AQ	30.0L	5	122	1	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019U5	2022 12 15.29	M 12.5	AQ	30.0L	5	122	1	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019U5	2022 12 14.29	M 12.5	AQ	30.0L	5	122	1	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019U5	2022 12 09.29	M 12.6	AQ	30.0L	5	122	1	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019U5	2022 12 02.25	S 11.3	TK	20.3T10		100	4	2/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2019 L3 (ATLAS)												
2019L3	2022 12 26.54	xM 11.5	AQ	40.0L	4	59	2.2	6	2.4	m330	ICQ XX	WYA Christopher Wyatt
2019L3	2022 12 24.25	M 11.6	AQ	30.0L	5	101	1	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019L3	2022 12 23.24	M 11.6	AQ	30.0L	5	101	1	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019L3	2022 12 20.50	xM 11.6	AQ	40.0L	4	59	2.4	6			ICQ XX	WYA Christopher Wyatt
2019L3	2022 12 18.24	M 11.7	AQ	30.0L	5	101	1	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019L3	2022 12 17.28	M 11.7	AQ	30.0L	5	101	1	4			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019L3	2022 12 16.28	M 11.6	AQ	30.0L	5	101	1	4			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019L3	2022 12 15.27	M 11.6	AQ	30.0L	5	101	1	3			ICQ XX	DES01 Jose Guilherme de Souza Aguiar
2019L3	2022 12 14.28	M 11.5	AQ	30.0L	5	101	1	3/			ICQ XX	DES01 Jose Guilherme de Souza Aguiar

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   2019L3  2022 12 10.28  M 11.4 AQ 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 09.27  M 11.3 AQ 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 08.27  M 11.3 AQ 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 02.21  S 10.9 TK 20.3T10  77   4    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
C/2017 K2 (PANSTARRS)
   2017K2  2022 12 26.45 xM  8.2 TK  7.0B    11   6.2  6            ICQ XX WYA   Christopher Wyatt
   2017K2  2022 12 20.44 xM  8.7 TK 40.0L 4  59   2.7  5/ 18   m  1 ICQ XX WYA   Christopher Wyatt
119P/Parker-Hartley
119        2022 12 26.57 xM 15.1 AQ 40.0L 4 261   0.3  5/           ICQ XX WYA   Christopher Wyatt
118P/Shoemaker-Levy
118        2022 12 26.55 xM 14.6 AQ 40.0L 4 182   0.7  4/           ICQ XX WYA   Christopher Wyatt
118        2022 12 23.24  M 13.6 AQ 30.0L 5 122   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
118        2022 12 20.51 xM 14.0 AQ 40.0L 4 108   1    4            ICQ XX WYA   Christopher Wyatt
118        2022 12 18.23  M 13.5 AQ 30.0L 5 122   1    2/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
118        2022 12 16.25  M 13.6 AQ 30.0L 5 122   1    2/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
81P/Wild
 81        2022 12 28.22  S 10.5 TK 20.3T10  77   5    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 81        2022 12 26.68 xM 11.7 AQ 40.0L 4  59   2.1  4/           ICQ XX WYA   Christopher Wyatt
 81        2022 12 24.28  M 10.8 TK 30.0L 5  89   2    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 23.28  M 10.8 TK 30.0L 5  89   2    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 17.29  M 10.8 TK 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 16.29  M 10.9 TK 30.0L 5 101   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 15.29  M 10.9 TK 30.0L 5 101   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 14.28  M 10.9 TK 30.0L 5 101   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 11.28  M 11.0 TK 30.0L 5 101   2    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 10.28  M 11.0 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 09.28  M 11.1 AQ 30.0L 5 101   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 08.28  M 11.1 AQ 30.0L 5 101   2    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 02.23  S 10.5 TK 20.3T10  77   5    3   0.1  290 ICQ XX GON05 Juan Jose Gonzalez Suarez
73P/Schwassmann-Wachmann
 73        2022 12 26.51 xM 13.2 AQ 40.0L 4 182   1    6            ICQ XX WYA   Christopher Wyatt
 73        2022 12 20.45 xM 13.5 AQ 40.0L 4 182   0.8  6            ICQ XX WYA   Christopher Wyatt
 73        2022 12 17.96  M 12.6 AQ 30.0L 5 122   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 12 17.72  S 12.0 TI 35.3L   176   1.3  3            ICQ XX HAR11 Christian Harder
 73        2022 12 14.96  M 12.3 AQ 30.0L 5 101   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 73        2022 12 08.96  M 12.1 AQ 30.0L 5 101   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
29P/Schwassmann-Wachmann
 29        2022 12 26.85  S 11.2 TI 29.8L 4 108   2.2  3            ICQ XX HAR11 Christian Harder
 29        2022 12 26.56 xS 11.1 AQ 40.0L 4  59   3    1            ICQ XX WYA   Christopher Wyatt
 29        2022 12 24.87  S 11.2 TI 29.8L 4 108   1.9  2            ICQ XX HAR11 Christian Harder
 29        2022 12 20.49 xS 11.3 AQ 40.0L 4  59   4.2  1            ICQ XX WYA   Christopher Wyatt
 29        2022 12 17.90  S 11.2 TI 25.2L 4  92   2    2            ICQ XX HAR11 Christian Harder
 29        2022 12 17.75  S 11.3 TI 35.3L   176   1.4  2            ICQ XX HAR11 Christian Harder
 29        2022 12 17.11  M 11.5 AQ 30.0L 5 101   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 12 16.11  M 11.4 AQ 30.0L 5 101   1    4/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 12 15.77  S 11.2 TI 29.8L 4 170   1.4  2            ICQ XX HAR11 Christian Harder
 29        2022 12 15.12  M 11.5 AQ 30.0L 5 101   1    5            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 12 14.76  S 12.6 TI 29.8L 4 170   1.2  2            ICQ XX HAR11 Christian Harder
 29        2022 12 12.76  S 11.6 TI 29.8L 4 145   1    2            ICQ XX HAR11 Christian Harder
 29        2022 12 02.22  S 11.1 TK 20.3T10  77   1.3  5/           ICQ XX GON05 Juan Jose Gonzalez Suarez
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New Discoveries, Recoveries and Other Comets News

New Comet Videos and Podcasts
The "Comets of 2023" are the topic of the latest installment of the Association of Lunar and Planetary Observers (ALPO) The Observers Notebook podcast series. In this episode of the Observers Notebook podcast, host Tim Robertson talks to the me (ALPO Comets Section Coordinator Carl Hergenrother) about the brighter comets visible throughout 2023, including

C/2017 K2 (PANSTARRS) [peak at 7-8th mag in January],
C/2022 E3 (ZTF) [peak at 4-5th mag in January/February],
C/2020 V2 (ZTF) [peak at 9th mag from January through October],
96P/Machholz [peak at 7-8th mag in February, though could be brighter than 2nd mag in SOHO images],
C/2021 T4 (Lemmon) [could reach 7-8th mag in July],
103P/Hartley [peak at 7th mag in October],
2P/Encke [peak at 5th mag in October],
C/2021 S3 (PANSTARRS) [could reach 8th mag by end of year, may peak at 7th mag in 2024],
62P/Tsuchinshan [peak at 9th mag in December and into January 2024], and
12P/Pons-Brooks [reaches 9th mag at end of year, peaks at 4th mag in April 2024].

The Observers Notebook covers a large range of topic related to planetary astronomy and observation. You can listen to the podcasts on SoundCloud and YouTube at the following addresses.

https://soundcloud.com/observersnotebook
https://www.youtube.com/@associationoflunarandplane6336

A new YouTube channel called "ICQ Comets (and Cousins)" with comet-related videos is being produced by the editorial staff of the International Comet Quarterly. The staff includes myself, Dan Green, and Charles Morris with help from Maik Meyer and Neil Norman. The first few videos have been posted to YouTube and include an interview with Maik Meyer, recollections of C/1983 H1 (IRAS-Araki-Alcock), and Comet News.

The "ICQ Comets (and Cousins)" channel can be found at:

https://www.youtube.com/@icqcometsandcousins8186

Comets of 2023 by Gideon van Buitenen
Gideon van Buitenen has produced an excellent summary of noteworthy comets observable in 2023. It can be found at http://astro.vanbuitenen.nl/docs/comets2023.pdf .

New Discoveries and Recoveries
P/2022 R7 = P/2017 S9 = P/2011 Q5 (PANSTARRS) – Short-period comet P/2017 S9 (PANSTARRS) was recovered by the Pan-STARRS project on 2022 August 6 and September 2 at 22nd magnitude with the Pan-STARRS1 1.8-m reflector on Haleakala on the island of Maui. Rob Weryk (University of Western Ontario) also found pre-discovery Pan-STARRS observations from 2011. The object appeared asteroidal in 2011 and 2023. With a perihelion distance of 2.19 au and aphelion of 4.11 au, P/2017 S9 orbits entirely within the Main Belt and is likely a Main Belt Comet or Activated Asteroid. In 2017, it reached a maximum brightness of 20th magnitude. A search of the literature finds no published explanation for its activity, so it's possible this object was active for non-cometary reasons, such as a rotational breakup. [CBET 5200, MPEC 2022-Y14]

Comets Brighter Than Magnitude 6

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-Y232)

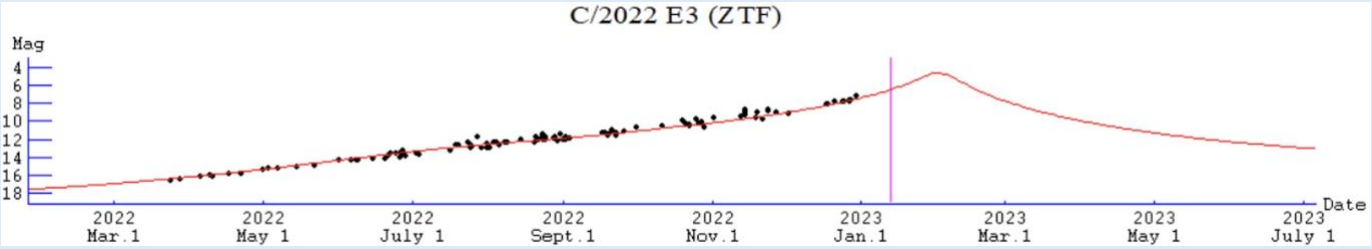
```
    C/2022 E3 (ZTF)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Jan. 12.78389 TT                                  Rudenko
q   1.1122299           (2000.0)            P               Q
z  -0.0002953      Peri.  145.81598     -0.60063738     -0.07340314
 +/-0.0000007      Node   302.55517     +0.33754047     +0.87940389
e   1.0003284      Incl.  109.16796     +0.72477663     -0.47038364
From 4863 observations 2021 July 10-2022 Dec. 30, 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
2023-Jan-01  15 53  +31 05   1.129   1.039     67M   CrB   7.4    48    0
2023-Jan-06  15 51  +33 36   1.118   0.900     72M   CrB   7.1    53    0
2023-Jan-11  15 49  +37 12   1.113   0.758     78M   CrB   6.7    59    0
2023-Jan-16  15 44  +42 35   1.113   0.616     84M   Boo   6.2    64    0
2023-Jan-21  15 32  +51 14   1.120   0.479     93M   Boo   5.7    68    0
2023-Jan-26  14 53  +65 56   1.133   0.361    104M   UMi   5.1    62    0
2023-Jan-31  08 44  +79 20   1.151   0.290    118M   Cam   4.7    52    0
2023-Feb-05  05 17  +52 00   1.174   0.304    121M   Aur   4.9    79    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  5.9 + 5 log d + 11.9 log r [Through T-90 days]
m1 =  6.9 + 5 log d +  8.0 log r [Since T-90 days, 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 12 30.24  S  7.3 TI  8.0R 5  10  11    5           ICQ XX HAR11 Christian Harder
   2022E3  2022 12 28.18  S  7.3 TK  5.0B     10   7    5           ICQ XX GON05 Juan Jose Gonzalez Suarez
   2022E3  2022 12 27.23  S  7.5 TK  7.0B 6   16   3    5   0.08 330        PIL01 Uwe Pilz
   2022E3  2022 12 27.14  S  7.8 TI 19.6L 5   56   3.5  5   8   m345 ICQ XX HAR11 Christian Harder
   2022E3  2022 12 25.20  S  7.6 TK  7.0B 6   16   5   s7   0.13 340        PIL01 Uwe Pilz
   2022E3  2022 12 24.53  S  7.7 TK  5.0B     10   7    5           ICQ xx HER02 Carl Hergenrother
   2022E3  2022 12 21.52  S  7.8 TK  5.0B     10   6    5           ICQ xx HER02 Carl Hergenrother
   2022E3  2022 12 21.52  S  8.2 TK 12.5B     30   5.5  5    5  m 20 ICQ xx HER02 Carl Hergenrother
   2022E3  2022 12 18.21  S  8.3 TI 19.6L 5   67   3    5   3   m    ICQ XX HAR11 Christian Harder
   2022E3  2022 12 02.24  S  9.2 TK 20.3T10   77   3    4/          ICQ XX GON05 Juan Jose Gonzalez Suarez
```

C/2022 E3 (ZTF) was discovered on 2022 March 2 at 17th magnitude by the Zwicky Transient Facility (ZTF) with the 1.2-m f/2.4 Schmidt on Mount Palomar when it was 4.3 au from the Sun. The ZTF uses the 1.2-m f/2.4 Samuel Oschin Schmidt on Mount Palomar which is equipped with a gigantic 16x6kx6k CCD array covering 47 square degrees of sky. The Oschin was completed in 1948 and has been used for both Palomar Sky Surveys as

well as numerous asteroid and supernovae surveys. If my count is correct, the Oschin has been used to discover 100 comets including comets bearing the names Wilson, Harrington, Abell, Baade, Humason, Van Houten, Kearns, Kwee, Anderson, Barbon, Rudnicki, Gunn, Gehrels, Huchra, Sandage, van den Bergh, Kowal, Helin, Mueller, Maury, Phinney, NEAT, Palomar, Ye, and now ZTF. The Palomar and Ye discoveries were also made as part of the ZTF survey.

ZTF is a dynamically old long-period comet which means this is not its first time approaching close to the Sun. Based on the latest orbit published by the Minor Planet Center on MPEC 2022-Y232, it was last at perihelion nearly 47,000 years ago. Perturbations by the major planets do result in this possibly being its last trip through the inner solar system. The negative 1/a(fut) value means it will recede back into the depth of deep space on a hyperbolic orbit and ultimately leave our solar system forever.

This month, C/2022 E3 (ZTF) takes center stage. Visual observers J. J. Gonzalez, Christian Harder, Carl Hergenrother, and Uwe Pilz watched E3 brighten from around magnitude 9.2 to 7.3 in December. Its coma was described as moderately condensed (DC ~ 5) and growing (as large as 11" on December 30 in an 80mm refractor). A visual tail up to 8' in length was also observed.

With perihelion on January 12, the comet will spend the entire month within 0.06 au of its perihelion distance of 1.11 au. Most of its brightening this January will be due to the comet's Earth-Sun distance dropping from 1.04 au on the 1st to 0.29 au on February 1. With the comet around magnitude 7.5 on the 1st, it is predicted to peak at around magnitude 4.7 on February 1. This is assuming a rather conservative 8 log r brightening rate throughout the month. Since the comet will be about 3-4 times closer to the Earth since late December, its coma may also appear 3-4 larger than what was observed in late December.

While a magnitude 4.7 star is visible to the naked eye under Bortle 7 or better, ZTF will not be a point source so its brightness will be spread over a large area, perhaps as large as the Full Moon. While a nice binocular and small telescope object, it may only be visible to the naked eye for those under dark skies.

This month the comet will move through Corona Borealis (Jan 1-13), Boötes (13-21), Draco, (21-25), Ursa Minor (25-28) and Camelopardalis (28-31). This means that during the 2nd half of January when the comet is at its best it will be located in the far northern circumpolar sky. Unlike many bright comets which are only observable around twilight or at low elevations, ZTF will be observable in a dark sky when located high in the sky, with morning observing being best. At least this will be the case if you live in the northern hemisphere. Observers at mid-latitudes in the southern hemisphere will have to wait till February to see the comet though it should still be fairly close to peak brightness at that time.

On the imaging front, two prominent tails have developed. A short broad dust tail about 0.25 deg in length but extending over 90 degrees in position angle and a long narrow gas tail imaged over 2 deg in length. The dust and gas tail should remain well separated this month. One thing to look forward to is an orbit plan crossing on January 23. On that date, it is possible the comet will have three tails: the usual long narrow gas tail, a long but narrow dust tail composed of older dust, and a short but narrow dust anti-tail composed of newer dust extending opposite the main dust tail. Figure 1 shows a Finson-Probstein analysis produced with the online Comet-Toolbox (https://www.comet-toolbox.com/FP.html#) for 2023 January 2 (the time of a recent Michael Jäger image) and January 23 (the time of orbit plane crossing). Hopefully the three tails will be bright enough to be visually observable.

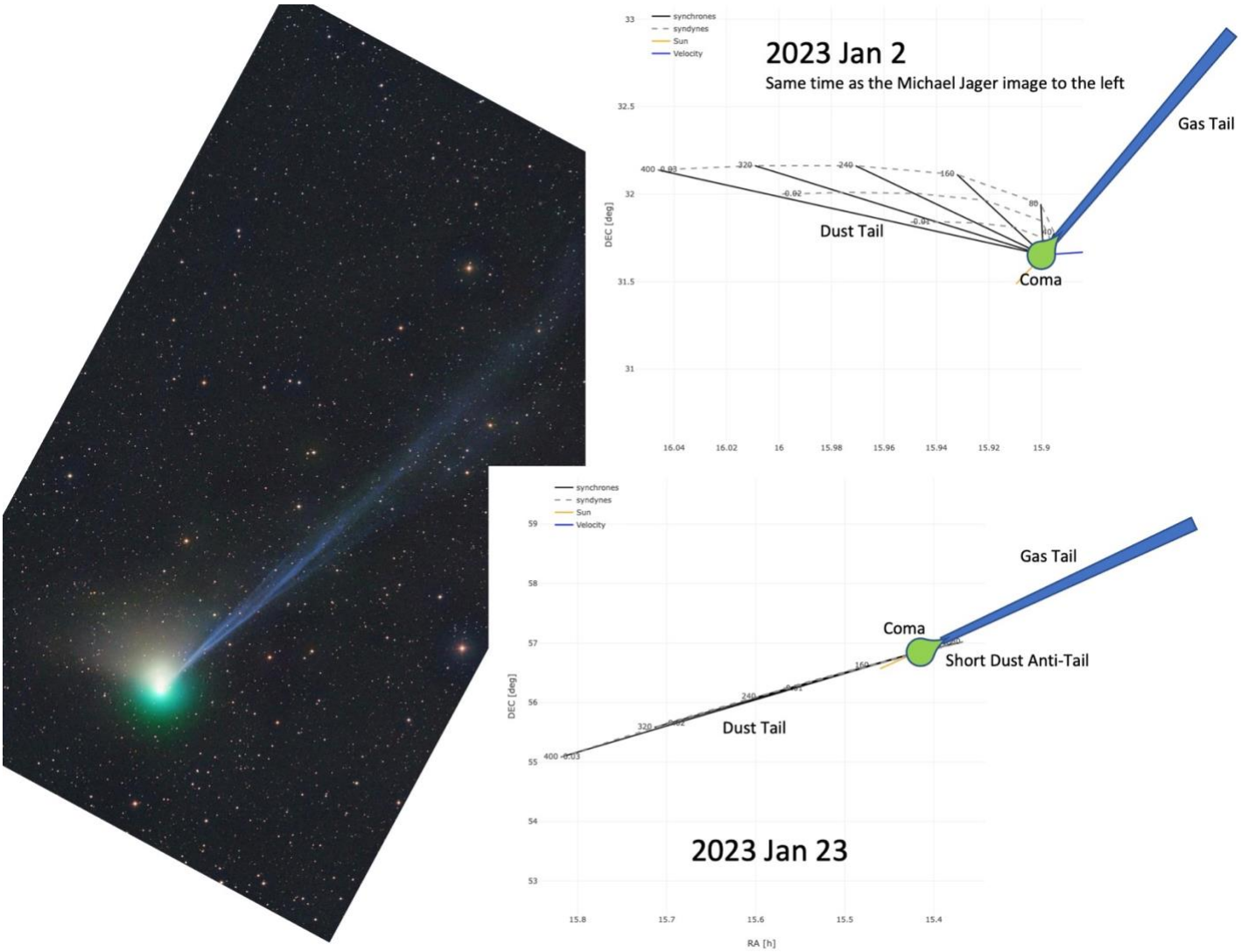


Figure 1 - The image on the left was taken by Michael Jäger on 2023 January 2 with a RASA 11" schmidt and QHY600 camera. It is a composite of consisting of 45 min of LRGB exposures. The Finson-Probstein diagram to the upper right is modified from one produced with the Comet-Toolbox (https://www.comet-toolbox.com/FP.html#) and is valid for the time of the Jäger image and shows the orientation of the gas and dust tails. It shows the dust tail to be composed of dust released up to ~400 days prior to the image. The lower right image shows the orientation of the tails on January 23, the date of orbit plane crossing. It shows that three tails should be visible on that date: the usual long narrow gas tail, a long narrow dust tail consisting of dust released ~100-120 days prior to the 23rd, and a short anti-tail composed of newer dust released in the previous 100-120 days. The orientation in the image and 2 figures is north up and east to the left.

Comets Between Magnitude 6 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-Y232)

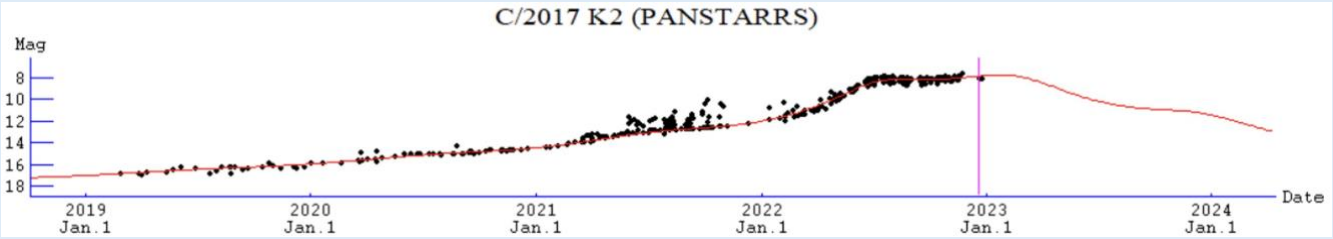
```
    C/2017 K2 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Dec. 19.68874 TT                                  Rudenko
q   1.7968938           (2000.0)            P               Q
z  -0.0004373      Peri.  236.20152     +0.01818938     +0.04921870
 +/-0.0000001      Node    88.23602     -0.18087339     +0.98247049
e   1.0007857      Incl.   87.56336     -0.98333817     -0.17980336
From 10998 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
2023-Jan-01  18 48  -65 03   1.804   2.410     42E    Pav   7.8     0   20
2023-Jan-06  19 15  -66 49   1.811   2.380     44E    Pav   7.8     0   22
2023-Jan-11  19 47  -68 23   1.820   2.350     46E    Pav   7.8     0   24
2023-Jan-16  20 24  -69 39   1.831   2.321     48E    Pav   7.8     0   26
2023-Jan-21  21 07  -70 30   1.844   2.295     51E    Pav   7.8     0   28
2023-Jan-26  21 53  -70 48   1.859   2.271     53E    Ind   7.8     0   30
2023-Jan-31  22 41  -70 28   1.877   2.252     55E    Ind   7.8     0   33
2023-Feb-05  23 27  -69 28   1.896   2.238     57E    Ind   7.8     0   35
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  4.2 + 5 log d + 6.6 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 12 26.45 xM  8.2 TK  7.0B    11   6.2  6            ICQ XX WYA   Christopher Wyatt
   2017K2  2022 12 20.44 xM  8.7 TK 40.0L 4  59   2.7  5/ 18   m  1 ICQ XX WYA   Christopher Wyatt
```

C/2017 K2 (PANSTARRS) may only be a month from its 2022 December 19 perihelion at 1.80 au, but it is located a rather distant 2.3 au from Earth. Only two visual observations were submitted in December, both by Christopher Wyatt who estimated a brightness of magnitude 8.7 on the 20th and 8.2 on the 26th. At the time, K2 was a low evening object.

January will see the comet gradually pull away from the Sun in the evening sky though it will remain limited to observers in the southern hemisphere as it moves through the southern constellations of Pavo (Jan 1-23) and Indus (23-31). With little change in its distance to the Sun and Earth in January, it should stay around magnitude 8.0 all month long.

C/2020 V2 (ZTF)

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

Orbit (from Minor Planet Center, MPEC 2022-Y232)

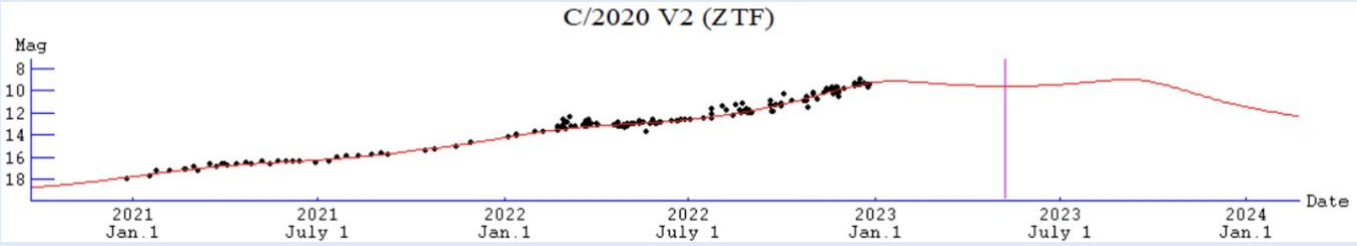
```
    C/2020 V2 (ZTF)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 May 8.56892 TT                                  Rudenko
q   2.2278156           (2000.0)            P              Q
z  -0.0004155      Peri.  162.43218     +0.69787776     +0.59389692
 +/-0.0000003      Node   212.37223     +0.53387626     -0.05877565
e   1.0009257      Incl.  131.61095     +0.47743352     -0.80239135
From 3427 observations 2020 Apr. 18-2022 Dec. 29, 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
2023-Jan-01  02 20  +80 58    2.657   2.068    116E   Cep    9.3    49    0
2023-Jan-06  01 50  +76 57    2.627   2.062    114E   Cas    9.2    53    0
2023-Jan-11  01 37  +72 49    2.598   2.070    111E   Cas    9.2    57    0
2023-Jan-16  01 31  +68 44    2.570   2.090    107E   Cas    9.2    61    0
2023-Jan-21  01 28  +64 46    2.543   2.122    103E   Cas    9.2    63    0
2023-Jan-26  01 28  +61 00    2.516   2.165     99E   Cas    9.2    65    0
2023-Jan-31  01 29  +57 28    2.491   2.216     94E   Cas    9.2    64    0
2023-Feb-05  01 31  +54 11    2.466   2.275     89E   Per    9.2    63    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-220 days]
m1 =  4.2 + 5 log d +  8.0 log r [T-220 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 12 28.10  S  9.7 TK 20.3T10  77   3.5  4   0.1  110 ICQ XX GON05 Juan Jose Gonzalez Suarez
   2020V2  2022 12 26.84  S  9.9 TI 29.8L 4  79   2.6  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 12 24.86  S 10.1 TI 29.8L 4  79   2.5  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 12 24.53  S  9.9 TK 12.5B    30   2.5  5           ICQ xx HER02 Carl Hergenrother
   2020V2  2022 12 21.53  S  9.8 TK 12.5B    30   3    3           ICQ xx HER02 Carl Hergenrother
   2020V2  2022 12 17.92  S  9.8 TI 25.2L 4  78   3    4           ICQ XX HAR11 Christian Harder
   2020V2  2022 12 17.73  S  9.9 TI 35.3L   105   3    4   4.5 m140 ICQ XX HAR11 Christian Harder
   2020V2  2022 12 15.74  S  9.8 TI 29.8L 4  92   2.7  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 12 14.74  S  9.9 TI 29.8L 4  92   2.8  4   4   m155 ICQ XX HAR11 Christian Harder
   2020V2  2022 12 13.72  S  9.9 TI 29.8L 4  92   2.8  4           ICQ XX HAR11 Christian Harder
   2020V2  2022 12 12.74  S 10.0 TI 29.8L 4  78   2.8  4   4   m155 ICQ XX HAR11 Christian Harder
   2020V2  2022 12 11.70  S  9.8 TI 29.8L 4  92   3    4           ICQ XX HAR11 Christian Harder
   2020V2  2022 12 02.15  S 10.2 TK 20.3T10  77   3.5  4/          ICQ XX GON05 Juan Jose Gonzalez Suarez
```

While C/2017 K2 is limited to southern observers, the next three comets are all limited to northern observers. While spending much of December near the north celestial pole, C/2020 V2 (ZTF) was well observed visually. J. J. Gonzalez, Christian Harder, and Carl Hergenrother found V2 to be consistently between magnitude 9.7 and

10.2 (aperture corrected to 9.4 to 9.7). Its coma was also consistently described as moderately condensed (DC ~ 4) with a diameter between 2.5’ and 3.5’. J. J. and Christian also observed a 4’ to 6’ long tail.

C/2020 V2 is a dynamically new comet presumably making its first perihelion close to the Sun. Though that perihelion is still 5 months away on 2023 May 8, it is at a distant 2.23 au from the Sun. As a result, the comet will stay brighter than magnitude 10 for most of 2023 with two likely peaks in brightness. The first peak occurs this month at around magnitude 9.2 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 slightly brighter peak at magnitude 9.0 is predicted around the time of its second close approach (September 17 at 1.85 au from Earth and 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 3.22 au from Earth and on the far side of the Sun at that time.

This month, C/2022 V2 continues to move through the far northern constellations of Cepheus (Jan 1-5) and Cassiopeia (5-31) making V2 a northern circumpolar object. Now past opposition, it has entered the evening sky.

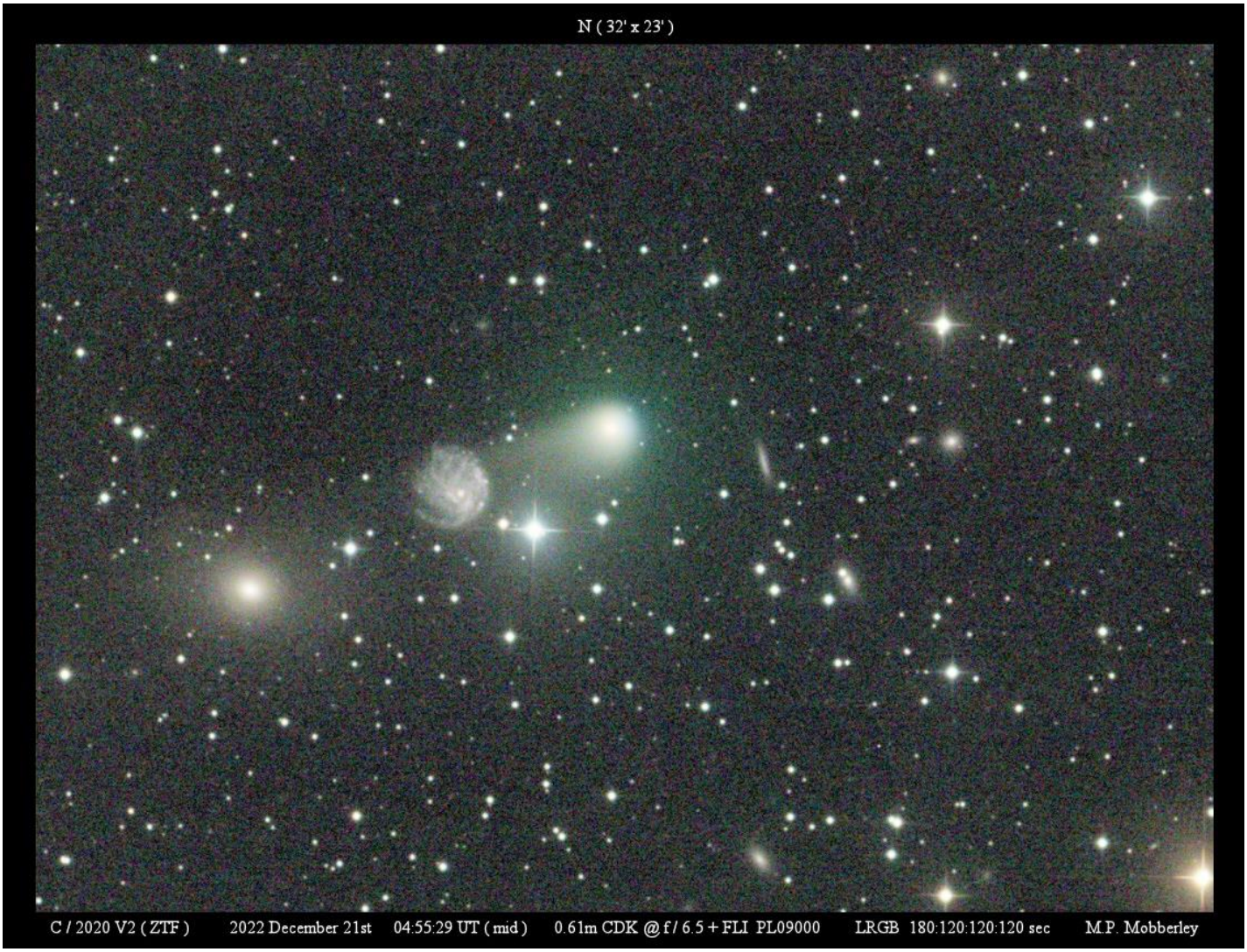


Figure 2 – Martin Mobberley imaged C/2022 V2 (ZTF) on 2022 December 21 UT with the iTelescopes 0.61-m f/6.5 CDK and FLI PL09000 camera. The image is a combine of a LRGB set with exposure times of 180:120:120:120 seconds. The two bright galaxies to the left of the comet are NGC 2276 and 2300.

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-Y232)

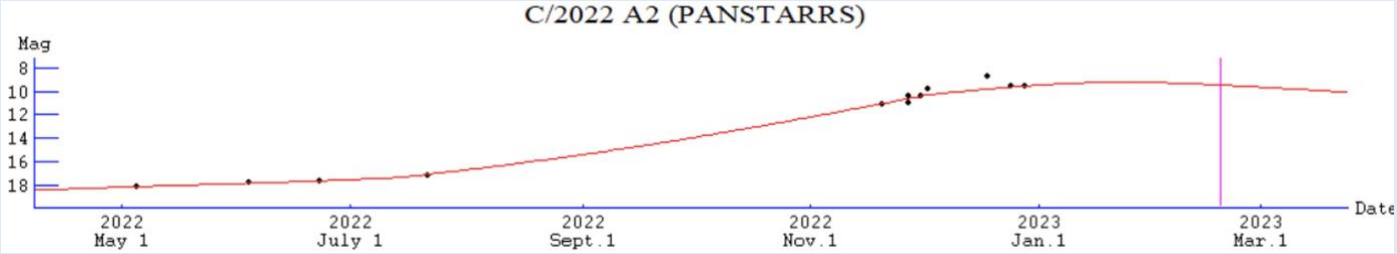
```
    C/2022 A2 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Feb. 18.26716 TT                                  Rudenko
q   1.7352832           (2000.0)            P              Q
z  -0.0001832      Peri.   88.36723     +0.01740434     +0.99011784
 +/-0.0000004      Node   171.57947     -0.09144852     -0.13701510
e   1.0003179      Incl.  108.14710     +0.99565770     -0.02989197
From 699 observations 2022 Jan. 9-Dec. 28, mean residual 0".5.
1/a(orig) = -0.000049 AU**-1, 1/a(fut) = -0.000066 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
2023-Jan-01  15 36  +48 00    1.845   1.694     82M   Boo    9.5    55    0
2023-Jan-06  16 06  +51 02    1.824   1.652     83M   Her    9.4    54    0
2023-Jan-11  16 41  +53 48    1.805   1.625     83M   Dra    9.3    51    0
2023-Jan-16  17 20  +56 05    1.789   1.613     83M   Dra    9.3    49    0
2023-Jan-21  18 03  +57 43    1.774   1.617     82M   Dra    9.2    45    0
2023-Jan-26  18 47  +58 35    1.762   1.635     80M   Dra    9.2    42    0
2023-Jan-31  19 31  +58 40    1.752   1.667     78M   Dra    9.3    38    0
2023-Feb-05  20 12  +58 07    1.744   1.710     75M   Cyg    9.3    35    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  7.6 + 5 log d + 13.6 log r [Through T-220 days]
m1 = -1.2 + 5 log d + 31.2 log r [Between T-220 and T-80 days]
m1 =  6.2 + 5 log d +  8.0 log r [After T-80 days, 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 12 28.20  S  9.9 TK 20.3T10  77   5    3/           ICQ XX GON05 Juan Jose Gonzalez Suarez
   2022A2  2022 12 24.53  S 10.0 TK 12.5B    30   4    3            ICQ xx HER02 Carl Hergenrother
   2022A2  2022 12 18.20  S  9.0 TI 25.2L    68   4.5  3   4.5 m330 ICQ XX HAR11 Christian Harder
   2022A2  2022 12 02.14  S 10.1 TK 20.3T10  77   6    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
```

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 back at the start of 2022 on January 10. At discovery, the comet was 4.9 au from the Sun and 4.6 au from Earth but has since rapidly brightened to around 9th magnitude in December.

January should see C/2022 A2 reach it's brightest at around magnitude 9.0 to 9.5. Unfortunately, it will remain rather distant from Earth and never gets any closer than 1.61 au on January 17. Perihelion is also at a similar distance of 1.74 au from the Sun on February 18.

Images taken by Dan Bartlett and Denis Buczynski in December found a gas-rich coma and gas tail. The tail was also observed visually by Christian Harder on December 18 when he measured it at 4.5’ in a 0.25-m (10”) reflector at 68 power. Most visual observers found a weakly condensed coma with a diameter between 4’ and 6’.

C/2022 A2 is a morning object in January and located in the far northern constellations of Boötes (Jan 1-3), Hercules (3-6), and Draco (6-31). As a result, it is only visible to northern hemisphere observers this month.

Figure 3 - Denis Buczynski (Tarbatness, Scotland) caught C/2022 A2 (PANSTARRS) on 2022 December 22 with 0.3-m f/4 newtonian and ZWO ASI 1600 MM Pro camera. The image is composed of 20 1-min sub frames.

C/2022 U2 (ATLAS)

Discovered 2022 October 25 by the Asteroid Terrestrial-Impact Last Alert System (ATLAS)
Dynamically old long period comet

Orbit (from Minor Planet Center, MPEC 2022-Y232)

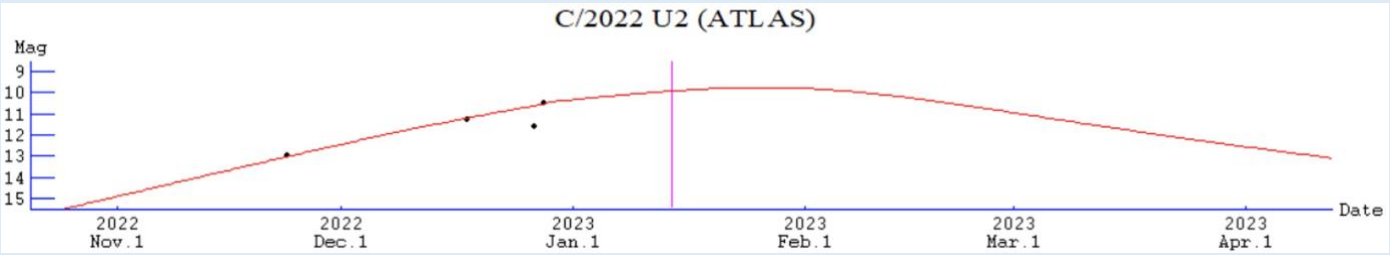
```
    C/2022 U2 (ATLAS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Jan. 14.22179 TT                                  Rudenko
q   1.3280419           (2000.0)            P               Q
z  +0.0104139      Peri.  147.90947     -0.18794970     -0.76578271
 +/-0.0000641      Node   304.47603     +0.66684200     +0.36024511
e   0.9861698      Incl.   48.24996     +0.72110794     -0.53272912
From 387 observations 2022 Oct. 25-Dec. 29, mean residual 0".4.
1/a(orig) = +0.011633 AU**-1, 1/a(fut) = +0.010154 AU**-1.
```

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

```
C/2022 U2 (ATLAS)                                                  Max El
                                                                    (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag   40N  40S
2023-Jan-01  21 21  +76 03    1.342    0.730    102E    Cep  10.3    47    0
2023-Jan-06  22 39  +77 27    1.333    0.683    104E    Cep  10.2    49    0
2023-Jan-11  00 22  +77 11    1.328    0.641    107E    Cep  10.0    52    0
2023-Jan-16  02 01  +74 17    1.328    0.605    111E    Cas   9.9    56    0
2023-Jan-21  03 12  +68 52    1.331    0.579    114E    Cas   9.8    61    0
2023-Jan-26  03 59  +61 44    1.339    0.565    116E    Cam   9.8    68    0
2023-Jan-31  04 31  +53 40    1.350    0.564    118E    Cam   9.8    76    0
2023-Feb-05  04 54  +45 21    1.366    0.579    119E    Per   9.9    85    4
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  7.0 + 5 log d + 31.6 log r [Till T-17 day]
m1 = 10.0 + 5 log d +  8.0 log r [After T-17 days, 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
   2022U2  2022 12 28.11  S 10.8 TK 20.3T10 100   7    2/          ICQ XX GON05 Juan Jose Gonzalez Suarez
   2022U2  2022 12 26.84  S 12.0 TI 29.8L 4 108   2    3           ICQ XX HAR11 Christian Harder
```

The "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) search program found C/2022 U2 (ATLAS) at 19th magnitude on 2022 October 25 at a far northern declination of +69 deg. C/2022 U2 (ATLAS) is a dynamically old long-period comet last at perihelion ~800 years ago.

Like C/2022 A2, this was another comet to keep an eye on in case it brightened faster than expected and it also appears to have not disappointed. Visual and imaging observations made in mid to late December found C/2022 U2 at around magnitude 10.5 to 11.0. Assuming the comet is really that bright as well as a conservative 8.0 log r brightening trend, U2 may just break the magnitude 10.0 level towards the end of January as it reaches perihelion on 2023 January 14 at 1.33 au and closest approach to Earth on January 28 at 0.56 au.

This month, the comet is solely a northern hemisphere object as it is circumpolar for most of December as it moves through Cepheus (Jan 1-11), Cassiopeia (11-21), Camelopardalis (21-31), and Perseus (31) in the evening sky. Southern hemisphere observers will get a chance to observe it next month as it moves south.

Figure 4 - C/2022 U2 (ATLAS) among the interstellar cirrus. Dan Bartlett (June Lake, CA, USA) imaged the comet on 2022 December 20 with his RASA11 schmidt telescope and ZWO ASI2600mcP camera. The composite consists of 24 90s color exposures.

Comets Between Magnitude 10 and 12

29P/Schwassmann-Wachmann

Discovered 1927 November 15 by 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-Y232)

```
  29P/Schwassmann-Wachmann
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2019 Apr. 22.08465 TT                                  Rudenko
q   5.7776660            (2000.0)            P              Q
n   0.06626531     Peri.   51.08589     +0.99049650     -0.06693946
a   6.0480015      Node   312.39747     -0.00102392     +0.86995712
e   0.0446983      Incl.    9.36345     +0.13753411     +0.48856292
P  14.9
From 14986 observations 2018 June 18-2022 Dec. 31, 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
2023-Jan-01  06 37  +29 27   6.058   5.080   173E   Aur  11-13    79    21
2023-Jan-06  06 34  +29 26   6.059   5.088   170E   Aur  11-13    79    21
2023-Jan-11  06 31  +29 24   6.061   5.104   165E   Aur  11-13    79    21
2023-Jan-16  06 29  +29 21   6.062   5.128   160E   Aur  11-13    79    21
2023-Jan-21  06 26  +29 17   6.064   5.159   154E   Aur  11-13    79    21
2023-Jan-26  06 24  +29 12   6.065   5.197   149E   Aur  11-13    79    21
2023-Jan-31  06 22  +29 07   6.067   5.242   144E   Aur  11-13    79    21
2023-Feb-05  06 20  +29 02   6.068   5.293   138E   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 12 26.85  S 11.2 TI 29.8L 4 108   2.2  3            ICQ XX HAR11 Christian Harder
 29        2022 12 26.56 xS 11.1 AQ 40.0L 4  59   3    1            ICQ XX WYA   Christopher Wyatt
 29        2022 12 24.87  S 11.2 TI 29.8L 4 108   1.9  2            ICQ XX HAR11 Christian Harder
 29        2022 12 20.49 xS 11.3 AQ 40.0L 4  59   4.2  1            ICQ XX WYA   Christopher Wyatt
 29        2022 12 17.90  S 11.2 TI 25.2L 4  92   2    2            ICQ XX HAR11 Christian Harder
 29        2022 12 17.75  S 11.3 TI 35.3L   176   1.4  2            ICQ XX HAR11 Christian Harder
 29        2022 12 17.11  M 11.5 AQ 30.0L 5 101   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 12 16.11  M 11.4 AQ 30.0L 5 101   1    4/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 12 15.77  S 11.2 TI 29.8L 4 170   1.4  2            ICQ XX HAR11 Christian Harder
 29        2022 12 15.12  M 11.5 AQ 30.0L 5 101   1    5            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 29        2022 12 14.76  S 12.6 TI 29.8L 4 170   1.2  2            ICQ XX HAR11 Christian Harder
 29        2022 12 12.76  S 11.6 TI 29.8L 4 145   1    2            ICQ XX HAR11 Christian Harder
 29        2022 12 02.22  S 11.1 TK 20.3T10  77   1.3  5/           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

29P/Schwassmann-Wachmann (formerly S-W 1) was discovered photographically on 1927 November 15 by the German observing team of 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)].

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. The large size of 29P's nucleus was recently confirmed during an occultation visible across the southwest USA on December 19 when two chords were observed consistent with a nuclear size of ~60 km.

29P experiences outbursts 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 outbursting is 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 2021, 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 moderate one on December 26. As a result, 29P is once again a nice visual object for large aperture visual observers. J. J. Gonzalez, Jose Guilherme de Souza Aguiar, Christian Harder, and Chris Wyatt observed 29P 13 times in December and found the comet mainly between magnitude 11.1 and 11.6. Opposition was at the end of December on the 30th with the comet now located just to the evening side of opposition in Auriga.

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 5 – Eliot Herman imaged the start of the latest outburst of 29P on 2022 December 27.

81P/Wild

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

Orbit (from Minor Planet Center, MPEC 2022-Y232)

```
  81P/Wild
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Dec. 15.61750 TT                                  Rudenko
q   1.5984236            (2000.0)            P              Q
n   0.15352436     Peri.   41.62817     -0.99847785     -0.03885008
a   3.4542295      Node   136.09792     +0.02218482     -0.93275779
e   0.5372561      Incl.    3.23649     +0.05049572     -0.35840422
P   6.42
From 1985 observations 2014 Oct. 18-2022 Dec. 28, mean residual 0".6.
     Nongravitational parameters A1 = -0.03, A2 = -0.0896.
```

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
2023-Jan-01  14 32  -12 37    1.607    1.848     60M    Lib   10.6     30   16
2023-Jan-06  14 45  -13 33    1.612    1.821     61M    Lib   10.6     29   19
2023-Jan-11  14 59  -14 24    1.620    1.795     63M    Lib   10.6     29   22
2023-Jan-16  15 12  -15 11    1.629    1.769     65M    Lib   10.6     29   25
2023-Jan-21  15 25  -15 53    1.639    1.743     67M    Lib   10.6     29   29
2023-Jan-26  15 38  -16 31    1.650    1.717     69M    Lib   10.7     29   32
2023-Jan-31  15 50  -17 04    1.663    1.691     71M    Lib   10.7     29   35
2023-Feb-05  16 02  -17 33    1.677    1.666     73M    Lib   10.7     29   39
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  5.0 + 5 log d + 20.6 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 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 12 28.22  S 10.5 TK 20.3T10  77   5    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 81        2022 12 26.68 xM 11.7 AQ 40.0L 4  59   2.1  4/           ICQ XX WYA   Christopher Wyatt
 81        2022 12 24.28  M 10.8 TK 30.0L 5  89   2    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 23.28  M 10.8 TK 30.0L 5  89   2    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 17.29  M 10.8 TK 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 16.29  M 10.9 TK 30.0L 5 101   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 15.29  M 10.9 TK 30.0L 5 101   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 14.28  M 10.9 TK 30.0L 5 101   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 11.28  M 11.0 TK 30.0L 5 101   2    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 10.28  M 11.0 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 09.28  M 11.1 AQ 30.0L 5 101   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 08.28  M 11.1 AQ 30.0L 5 101   2    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
 81        2022 12 02.23  S 10.5 TK 20.3T10  77   5    3   0.1  290 ICQ XX GON05 Juan Jose Gonzalez Suarez
```

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.

81P is a short-period comet 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 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.

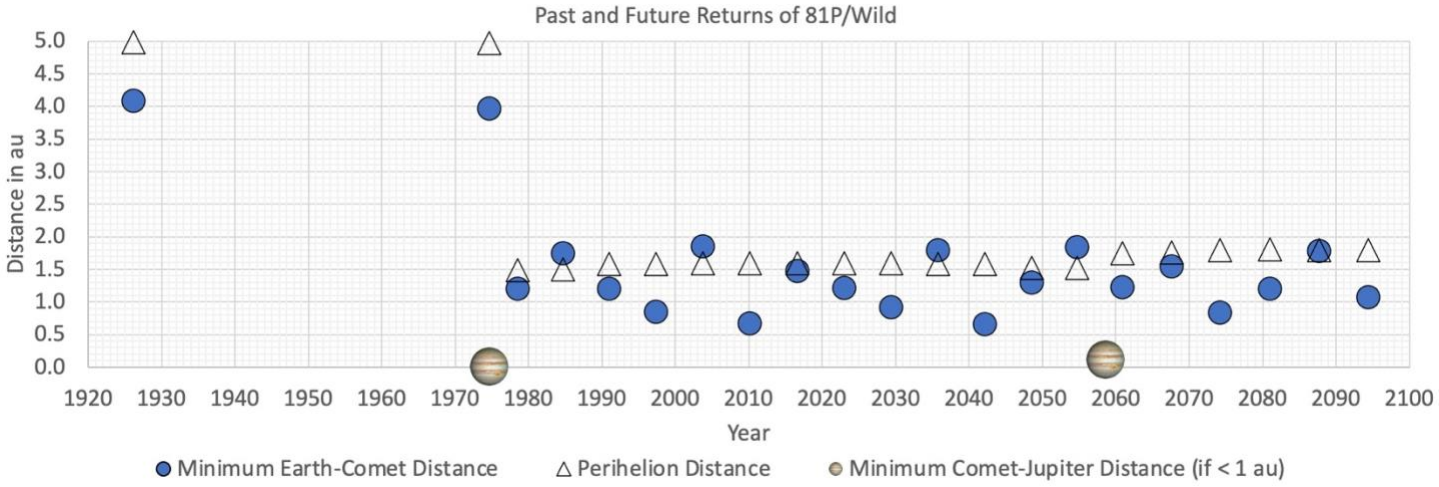


Figure 6 - Orbital evolution of 81P/Wild.

This year's return is better than 2016's but worse than in 1997 and 2010. Perihelion was on 2022 December 15 at 1.60 au when the comet was also a distant 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 Libra (Jan 1-31). It was well observed visually in December with J. J. Gonzalez, Jose Guilherme de Souza Aguiar, and Chris Wyatt estimating magnitude mainly between 10.5 and 11.1 (aperture corrected to 10.2 and 10.7). With last month's perihelion but a slowly decreasing Earth-comet distance, 81P should only fade slightly from around magnitude 10.5 to 10.6 in January.

.

96P/Machholz

Discovered visually on 1986 May 12 by Donald Machholz

Orbit (from Minor Planet Center, MPEC 2017-T14)

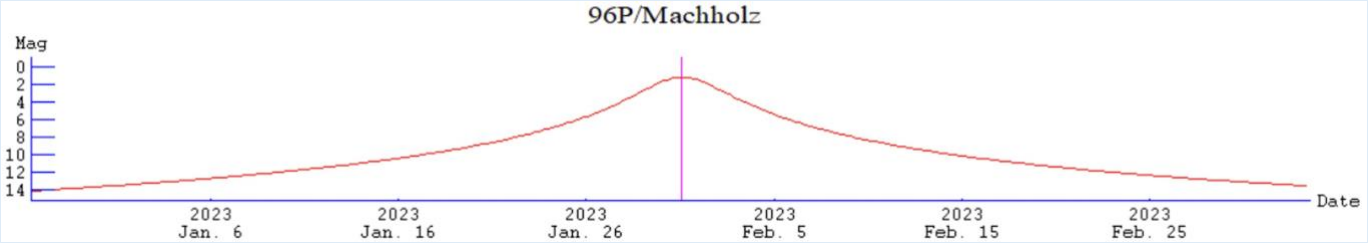
```
  96P/Machholz
Epoch 2023 Jan. 16.0 TT = JDT 2459960.5
T 2023 Jan. 31.08465 TT                                   MPCW
q   0.1164254            (2000.0)            P              Q
n   0.18680100     Peri.   14.74858     -0.20313326     -0.50076303
a   3.0307487      Node    93.95410     +0.79107878     -0.59032451
e   0.9615853      Incl.   57.50295     +0.57700195     +0.63305083
P   5.28
From 925 observations 2007 Apr. 9-2017 Aug. 19, mean residual 0".6.
     Nongravitational parameters A1 = -0.01, A2 = -0.0002.
```

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

```
96P/Machholz                                                        Max El
                                                                     (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2023-Jan-01  19 53   -42 27    0.922    1.726     24E    Sgr  13.5      0    7
2023-Jan-06  20 08   -41 13    0.811    1.621     22E    Sgr  12.7      0    5
2023-Jan-11  20 24   -39 36    0.691    1.505     21E    Sgr  11.7      0    4
2023-Jan-16  20 42   -37 20    0.561    1.374     19E    Mic  10.4      0    2
2023-Jan-21  21 00   -33 55    0.417    1.226     17E    Mic   8.6      0    0
2023-Jan-26  21 16   -28 02    0.255    1.053     13E    Mic   5.7      0    0
2023-Jan-31  21 05   -15 19    0.117    0.888      3E    Cap   1.2      0    0
2023-Feb-05  20 25   -07 29    0.248    0.996     14M    Aql   5.4      0    0
```

Comet Magnitude Formula (from Seiichi Yoshida)

```
m1 = 12.7 + 5 log d + 12.0 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 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
None.
```

While the best comet of January should be C/2022 E3 (ZTF), the brightest comet of January is likely to be 96P/Machholz which could brighten to magnitude 2 or even brighter. Wait, what??? You must be thinking "How have I not heard of this comet?!" Well, 96P often brightens to around magnitude 2 or brighter at each of its perihelia which occur once every 5.3 years. But… and it's a big but, 96P is always within a few degrees of the Sun when at its very small perihelion distance of 0.12 au. Things will be no different this year. Southern hemisphere observers may be able to observe 96P brighten up to around magnitude 10 by mid-month before moving too close to the Sun to observe. Northern observers will have a chance in mid-February though it should be no brighter than 8-9th magnitude and only a few degrees above the horizon at the start of astronomical twilight. In order to see 96P at its brightest, we'll need to monitor the SOHO LASCO C3 coronagraph images during the last days of January (https://soho.nascom.nasa.gov/data/realtime/c3/512/).

96P was visually discovered in 1986 by former ALPO Comets Section Coordinator Donald Machholz.

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-Y232)

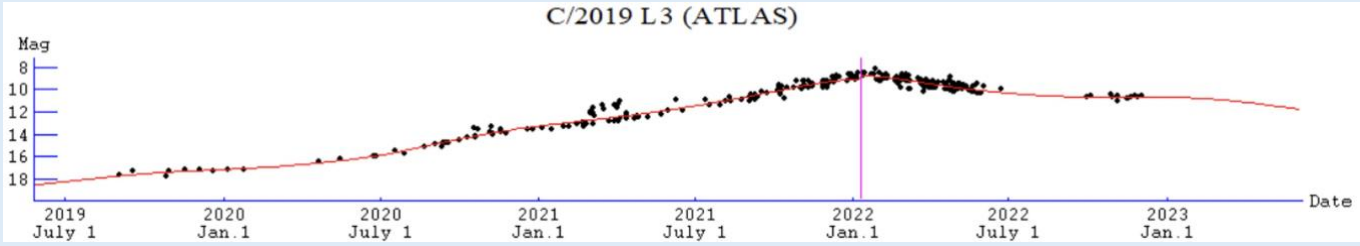
```
    C/2019 L3 (ATLAS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2022 Jan.  9.64943 TT                                   Rudenko
q   3.5544183           (2000.0)            P               Q
z  -0.0005751      Peri.  171.61735     -0.26040789     -0.66641984
 +/-0.0000001      Node   290.77989     +0.83684022     +0.20510049
e   1.0020441      Incl.   48.35089     +0.48154562     -0.71681126
From 5774 observations 2019 June 10-2022 Dec. 31, mean residual 0".4.
1/a(orig) = +0.000039 AU**-1, 1/a(fut) = -0.000717 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
2023-Jan-01  09 55   -30 40    4.758   4.342    109M   Ant   10.7     19   78
2023-Jan-06  09 53   -31 28    4.786   4.321    112M   Ant   10.7     18   81
2023-Jan-11  09 50   -32 12    4.814   4.303    115M   Ant   10.7     18   82
2023-Jan-16  09 48   -32 52    4.843   4.289    118M   Ant   10.7     17   83
2023-Jan-21  09 45   -33 27    4.871   4.279    121M   Ant   10.7     16   84
2023-Jan-26  09 41   -33 58    4.900   4.274    124M   Ant   10.7     16   84
2023-Jan-31  09 38   -34 23    4.929   4.275    126M   Ant   10.7     15   85
2023-Feb-05  09 34   -34 43    4.958   4.280    128M   Ant   10.8     15   85
```

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

```
m1 =  2.5 + 5 log d + 12.1 log r [Until T-550 days]
m1 = -4.9 + 5 log d + 21.7 log r [Between T-550 and T+0 days]
m1 =  3.3 + 5 log d +  6.2 log r [Since T+0 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
   2019L3  2022 12 26.54 xM 11.5 AQ 40.0L 4  59   2.2  6   2.4 m330 ICQ XX WYA   Christopher Wyatt
   2019L3  2022 12 24.25  M 11.6 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 23.24  M 11.6 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 20.50 xM 11.6 AQ 40.0L 4  59   2.4  6            ICQ XX WYA   Christopher Wyatt
   2019L3  2022 12 18.24  M 11.7 AQ 30.0L 5 101   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 17.28  M 11.7 AQ 30.0L 5 101   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 16.28  M 11.6 AQ 30.0L 5 101   1    4            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 15.27  M 11.6 AQ 30.0L 5 101   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 14.28  M 11.5 AQ 30.0L 5 101   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 10.28  M 11.4 AQ 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 09.27  M 11.3 AQ 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 08.27  M 11.3 AQ 30.0L 5  89   2    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019L3  2022 12 02.21  S 10.9 TK 20.3T10  77   4    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
```

Now a year past its 2022 January 9 perihelion at 3.55 au, C/2019 L3 is still hanging on at around magnitude 11. This month, the comet is visible from both hemispheres though it is getting a bit south for northerners as it moves through the southern constellation of Antlia (Jan 1-31) in the morning sky.

C/2019 U5 (PANSTARRS)

Discovered 2019 October 22 with the Pan-STARRS1 1.8-m on Haleakala

Orbit (from Minor Planet Center, MPEC 2022-Y232)

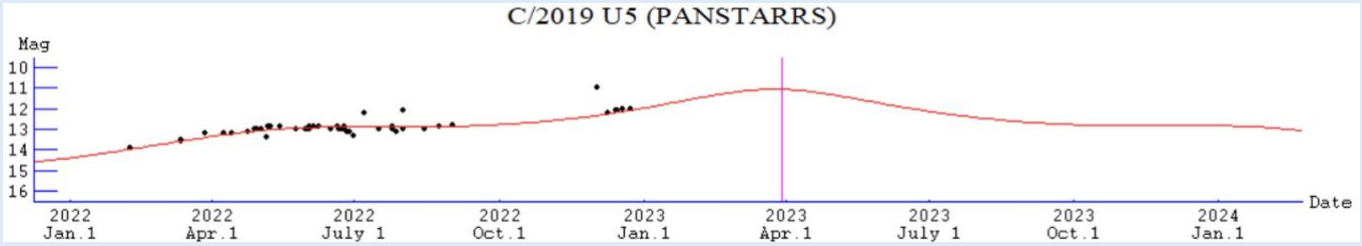
```
    C/2019 U5 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 Mar. 29.84814 TT                                  Rudenko
q   3.6241907           (2000.0)            P               Q
z  -0.0004147      Peri.  181.49708     -0.99907962     +0.00774191
 +/-0.0000003      Node     2.63726     -0.02311661     +0.73134210
e   1.0015028      Incl.  113.52062     -0.03613216     -0.68196686
From 3026 observations 2019 Oct. 11-2022 Dec. 29, mean residual 0".4.
1/a(orig) = +0.000083 AU**-1, 1/a(fut) = -0.000098 AU**-1.
```

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

```
C/2019 U5 (PANSTARRS)                                                  Max El
                                                                        (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2023-Jan-01  13 51   +03 42    3.710   3.825     75M   Vir   12.0     49   13
2023-Jan-06  13 50   +03 15    3.701   3.726     80M   Vir   11.9     50   19
2023-Jan-11  13 48   +02 49    3.692   3.626     86M   Vir   11.8     52   24
2023-Jan-16  13 46   +02 25    3.683   3.525     91M   Vir   11.8     52   29
2023-Jan-21  13 43   +02 02    3.676   3.424     96M   Vir   11.7     52   34
2023-Jan-26  13 39   +01 40    3.668   3.325    102M   Vir   11.6     52   39
2023-Jan-31  13 35   +01 20    3.662   3.228    108M   Vir   11.6     51   43
2023-Feb-05  13 30   +01 00    3.656   3.134    114M   Vir   11.5     51   47
```

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

```
m1 =  3.6 + 5 log d + 9.6 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 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
   2019U5  2022 12 23.29  M 12.4 AQ 30.0L 5 122   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2022 12 18.29  M 12.4 AQ 30.0L 5 122   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2022 12 15.29  M 12.5 AQ 30.0L 5 122   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2022 12 14.29  M 12.5 AQ 30.0L 5 122   1    3            ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2022 12 09.29  M 12.6 AQ 30.0L 5 122   1    3/           ICQ XX DES01 Jose Guilherme de Souza Aguiar
   2019U5  2022 12 02.25  S 11.3 TK 20.3T10 100   4    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
```

C/2019 U5 (PANSTARRS) was discovered by the Pan-STARRS survey on 2019 October 22. At that time the comet was 21st magnitude and 10.4 au from the Sun, or a little further than the orbit of Saturn. U5 will be closer when it arrives at perihelion on 2023 March 29 though still at a distant 3.62 au. Around that time, the comet may reach its brightest at around magnitude 11.

Last month Jose Guilherme de Souza Aguiar found the comet between magnitude 12.4 and 12.6 (aperture corrected to magnitude 12.0 to 12.2) on five nights in December. He also detected a small 1' coma. J. J. Gonzalez came in a bit brighter at magnitude 11.3 (aperture corrected to 11.0) with a larger 4' coma. This month C/2019 U5 is a morning object in Virgo slowly brightening from magnitude 12.0 to 11.6.

C/2020 K1 (PANSTARRS)

Discovered 2020 May 17 by the Pan-STARRS survey with their Pan-STARRS2 1.8-m reflector at Haleakala on Maui
Dynamically old long period comet with ~174,000 year orbital period

Orbit (from Minor Planet Center, MPEC 2022-X67)

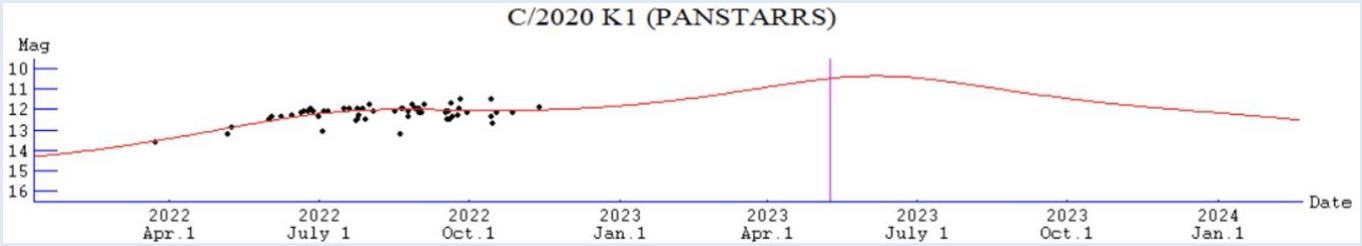
```
    C/2020 K1 (PANSTARRS)
Epoch 2023 Feb. 25.0 TT = JDT 2460000.5
T 2023 May  9.07766 TT                                  Rudenko
q   3.0732768           (2000.0)            P              Q
z  -0.0000033      Peri.  213.98423     +0.06618018     -0.03767448
 +/-0.0000006      Node    94.35493     -0.53600738     +0.84152066
e   1.0000101      Incl.   89.66942     -0.84161527     -0.53890965
From 2762 observations 2020 Apr. 17-2022 Nov. 27, mean residual 0".4.
1/a(orig) = +0.000247 AU**-1, 1/a(fut) = +0.000978 AU**-1.
```

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

```
C/2020 K1 (PANSTARRS)                                                 Max El
                                                                       (deg)
    Date       R.A.    Decl.     r       d     Elong  Const  Mag    40N  40S
2023-Jan-01  18 25  -25 15   3.318   4.297     4M    Sgr  11.8      0    0
2023-Jan-06  18 30  -26 03   3.300   4.268     8M    Sgr  11.8      0    0
2023-Jan-11  18 35  -26 52   3.283   4.235    12M    Sgr  11.8      0    0
2023-Jan-16  18 41  -27 41   3.266   4.196    16M    Sgr  11.7      0    0
2023-Jan-21  18 47  -28 31   3.250   4.152    20M    Sgr  11.7      0    1
2023-Jan-26  18 52  -29 22   3.235   4.103    24M    Sgr  11.6      0    5
2023-Jan-31  18 58  -30 14   3.220   4.049    28M    Sgr  11.6      0    9
2023-Feb-05  19 04  -31 08   3.206   3.991    32M    Sgr  11.6      0   13
```

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

```
m1 =  4.5 + 5 log d +  8.0 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 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
None.
```

C/2020 K2 (PANSTARRS) was discovered by Pan-STARRS on 2020 May 17. At that time the comet was 20th magnitude and 9.5 au from the Sun. Like C/2019 U5, it is a few months from a distant perihelion. In K1's case, on 2023 May 9 at 3.07 au. It should peak at between magnitude 10 and 11 in May and June.

C/2020 K1 starts the month too close to the Sun to be observed. Circumstances improve by the end of the month for southern hemisphere observers. At that time, K1 will be a low morning object in Sagittarius around magnitude 11.6.