

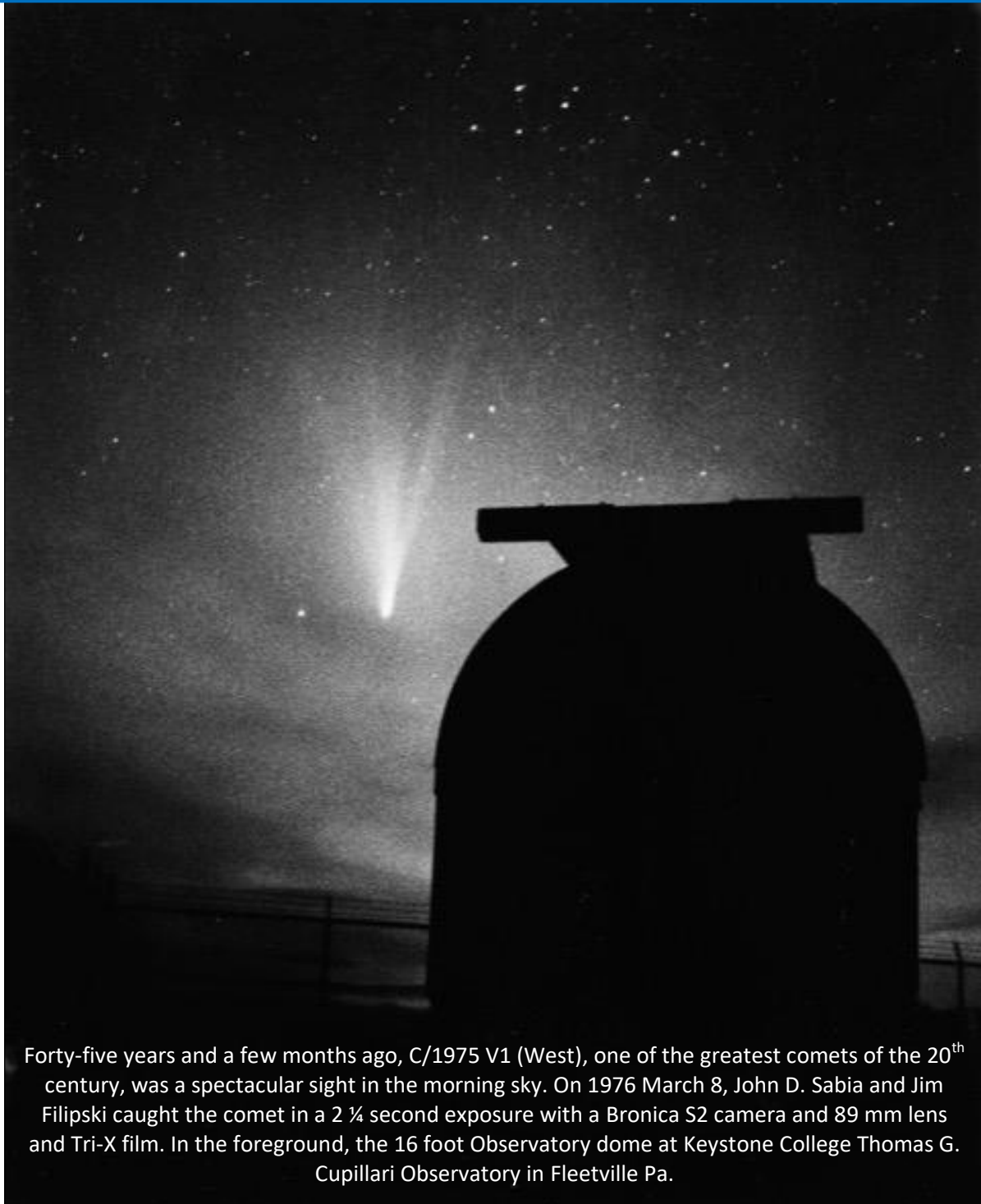
ALPO COMET NEWS

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

July 2021

alpo-astronomy.org

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Forty-five years and a few months ago, C/1975 V1 (West), one of the greatest comets of the 20th century, was a spectacular sight in the morning sky. On 1976 March 8, John D. Sabia and Jim Filipski caught the comet in a 2 ¼ second exposure with a Bronica S2 camera and 89 mm lens and Tri-X film. In the foreground, the 16 foot Observatory dome at Keystone College Thomas G. Cupillari Observatory in Fleetville Pa.

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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/779139-alpo-comet-news-for-july-2021/>). All are encouraged to join the discussion over at Cloudy Nights. The ALPO Comet 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 encouraged.

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

We are still in the midst of a bright comet drought. The brightest comets of July should be around magnitude 10.0. These include two comets that ranked among the “brightest” last month, C/2020 T2 (Palomar) and 7P/Pons-Winnecke. Joining them around the magnitude 10.0 level will be another short-period comet, 15P/Finlay, which should reach its brightest at the end of July into early August. Between 11th and 13th magnitude are a number of other comets such as 4P/Faye, 8P/Tuttle, C/2017 K2 (PANSTARRS), and C/2019 L3 (ATLAS). Imagers are encouraged to continue monitoring inbound C/2021 A1 (Leonard). While this comet still has the potential to be a notable object at the end of the year, that hope is fading as the comet has been slow to brighten. Among newly discovered objects, C/2014 UN271 (Bernardinelli-Bernstein) ranks as one of the most interesting discoveries in some time. This object is still 10 years away from an extremely large perihelion distance of 10.95 au. Bernardinelli-Bernstein has already been imaged going back to 2014 and it is possible modestly equipped imagers may be able to follow it as an active object for another 20 years!

Comets Section News

Since June 1, the ALPO Comets Section received 15 images and/or sketches from John Chumack, Michel Deconinck, Jim Filipiski, Carl Hergenrother, Martin, Mobberley, Mike Olason, John D. Sabia, and Tenho Tuomi of the following comets: 4P/Faye, 6P/d’Arrest, 7P/Pons-Winnecke, 8P/Tuttle, 15P/Finlay, 57P/du Toit-Neujmin-Delporte, 108P/Schuster, 246P/NEAT, C/2020 J1 (SONEAR), C/2020 T2 (Palomar), C/2021 A1 (Leonard), C/2021 D2 (ATLAS), P/2021 J3 (ATLAS), and an oldie but goodie of C/1975 V1 (West).

Also since June 1, the Section has received 58 magnitude measurements from Michel Deconinck, J. J. Gonzalez, Carl Hergenrother, and Chris Wyatt of comets 7P/Pons-Winnecke, 10P/Tempel, 15P/Finlay, 67P/Churyumov-Gerasimenko, 117P/Helin-Roman-Alu, 246P/NEAT, C/2017 K2 (PANSTARRS), C/2018 U1 (Lemmon), C/2019 F1 (ATLAS-Africano), C/2019 L3 (ATLAS), C/2019 T4 (ATLAS), C/2020 F5 (MASTER), C/2020 J1 (SONEAR), C/2020 R4 (ATLAS), C/2020 S3 (Erasmus), C/2020 T2 (Palomar), and C/2021 A1 (Leonard).

In addition to observations submitted to the ALPO, we also occasionally use data submitted to other sources for our analysis. We acknowledge with thanks the comet observations from the International Comet Quarterly, the Minor Planet Center, the COBS Comet Observation Database, and our own ALPO contributors used in this report.

Comets Calendar for July 2021

July 01 – Last Quarter Moon

July 05 – C/2020 T4 (PANSTARRS) at perihelion ($q = 2.19$ au, $V \sim 17$)

July 09 – New Moon

July 10 – 252P/LINEAR at perihelion ($q = 1.00$ au, $V \sim ???$, reached $\sim 4^{\text{th}}$ mag in 2016 during an especially close approach to Earth at 0.036 au, 252P may have been abnormally active during the 2016 return, the current return is poor and located at low elongations, comet may be anywhere between mag 12 and 19 depending on activity level, lack of recent observations suggests 252P has been faint).

July 11 – C/2020 T2 (Palomar) at perihelion ($q = 2.05$ au, $V \sim 10$, more below)

July 13 – 15P/Finlay at perihelion ($q = 0.99$ au, 6.6-year orbit, $V \sim 10$, more below)

July 15 – C/2021 A7 (NEOWISE) at perihelion ($q = 1.97$ au, $V \sim 14$)

July 17 – First Quarter Moon

July 17 – P/2020 V4 (Rankin) at perihelion ($q = 5.15$ au, 29-year orbit, $V \sim 18$, low elongation)

July 20 – 413P/Larson at perihelion ($q = 2.14$ au, 7.2-year orbit, $V \sim 17$)

July 22 – C/2021 G1 (Leonard) at perihelion ($q = 3.42$ au, $V \sim 21$)

July 23 – Full Moon

July 25 – 241P/LINEAR at perihelion ($q = 1.92$ au, $V \sim 17$)

July 27 – D/1977 C1 (Skiff-Kosai) at perihelion ($q = 2.80$ au, 7.5-year orbit, $V \sim ?$, only seen at in 1977)

July 31 – Last Quarter Moon

Bright Comets (magnitude < 10.0)

None, though C/2020 T2 (Palomar) is straddling the 10.0 magnitude level with some observers placing it slightly brighter than magnitude 10.0.

Fainter Comets of Interest (generally magnitude 10.0 to 13.0)

C/2020 T2 (Palomar)

Discovered 2020 October 7 at 19th magnitude by the Zwicky Transient Facility (ZTF)

Discovery Telescope: 1.2-m Samuel Oschin Schmidt on Mount Palomar

Perihelion on 2021 July 11 at 2.05 au, inclination = 27.9 deg, eccentricity = 0.9935

Dynamically old long-period comet with orbital period of ~5600 years

C/2020 T2 (Palomar)

Date	R.A.	Decl.	r	d	Elong	Const	Mag	Max El	
								40N	40S
2021-Jul-01	13 50	+10 02	2.058	1.591	102E	Boo	10.1	47	40
2021-Jul-06	13 55	+07 44	2.056	1.626	99E	Boo	10.2	43	42
2021-Jul-11	14 00	+05 27	2.055	1.665	97E	Vir	10.2	40	45
2021-Jul-16	14 05	+03 11	2.056	1.707	94E	Vir	10.3	37	47
2021-Jul-21	14 12	+00 57	2.058	1.751	92E	Vir	10.4	34	49
2021-Jul-26	14 18	-01 14	2.062	1.798	89E	Vir	10.4	31	51
2021-Jul-31	14 25	-03 22	2.068	1.847	87E	Vir	10.5	29	52
2021-Aug-05	14 32	-05 27	2.076	1.899	85E	Vir	10.6	26	53

Comet Magnitude Parameters --- H = 6.0, 2.5n = 10.0

Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia DC	TAIL LENG PA	ICQ CODE	Observer Name
2020T2	2021 07 05.43	xM 10.5	AQ	40.0L	4	59	4.2 5/		ICQ XX WYA	Christopher Wyatt
2020T2	2021 07 04.96	S 9.8	TK	20.3T10	77	77	6 3/		ICQ XX GON05	J J Gonzalez
2020T2	2021 07 04.36	xM 10.4	AQ	25.0L	5	40	3.8 5		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 30.38	xM 10.5	AQ	25.0L	5	40	3.8 5		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 24.89	I[12.5	TK	25.0C10	192	192			ICQ XX DECaa	Michel Deconinck
2020T2	2021 06 15.46	xM 10.6	AQ	40.0L	4	59	4 6	8.0m118	ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 09.96	S 9.9	TK	20.3T10	77	77	6 3/		ICQ XX GON05	J J Gonzalez
2020T2	2021 06 06.37	xM 10.3	AQ	40.0L	4	59	4.3 6		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 05.42	xM 10.4	AQ	25.0L	5	40	5.3 6		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 05.21	V 10.1	U4	10.6R	5A840	14			ICQ xx HER02	Carl Hergenrother
2020T2	2021 06 04.96	S 10.0	TK	20.3T10	77	77	5 3/		ICQ XX GON05	J J Gonzalez

When C/2020 T2 (Palomar) was discovered on 2020 October 7 at 19th magnitude and 4.4 au from the Sun, it was only expected to brighten to about 14th magnitude at perihelion. Thanks to a rapid rate of brightening, the comet is currently near a peak of 9-10th magnitude.

This month Palomar comes to perihelion on the 11th at 2.05 au. Due to an increasing Earth-comet distance (1.59 to 1.85 au), the comet may start to slowly fade this month as it moves through Boötes (July 1-6) and Virgo (6-31). It is well placed for observation in the evening sky from both hemispheres.

Last month, visual and CCD observations by Michel Deconinck, J. J. Gonzalez, Carl Hergenrother, and Chris Wyatt found Palomar between magnitude 9.9 and 10.6 with a visual coma diameter between 3.8' and 6' and CCD diameter as large as 14'. After applying an aperture correction to the data by normalizing the aperture as described in [Morris, C. S. "On Aperture Corrections for Comet Magnitude Estimates". *Publ Astron Soc Pac* 85, 470 (1973)], the corrected visual magnitudes fell into a tighter range of 9.7 to 10.2. CCD and aperture corrected visual magnitude measurements submitted to the ALPO have been consistent with CCD magnitudes submitted by Michael Lehmann to the COBS site. A combination of the ALPO and Lehmann observations going back to the start of 2021 can be well fit by the following photometric parameters: $H_0 = 0.5$ and $2.5n = 27.0$ (Figure 3).

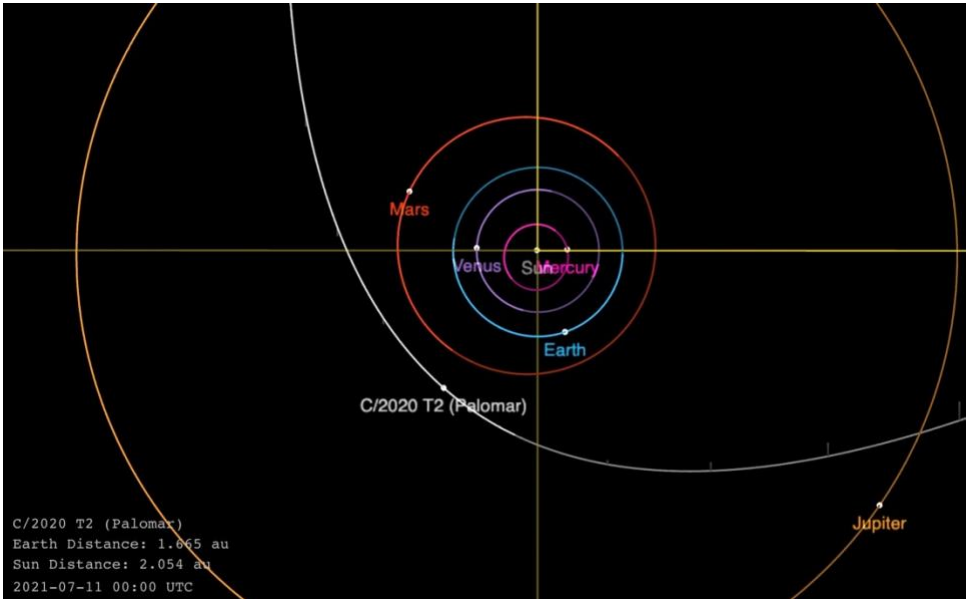


Figure 1 - Orbit of C/2020 T2 (Palomar) and the inner planets and Jupiter for 2021 July 11, the date of Palomar's perihelion. Image produced with the JPL Small-Body Database Browser.

Plotting the same with the addition of pre-2021 CCD photometry submitted to the Minor Planet Center extends the lightcurve back to 2019 December 11, which is 7 months prior to discovery thanks to the large number of pre-discovery observations (Figure 4). The addition of this older data shows the comet was brightening at a $2.5n \sim 12$ rate from December 2019 till the start of 2021 when it started to brighten at the quicker $2.5n \sim 27$ rate found above. The comet was around 3.0 au from the Sun at the time of the increase in brightening. For July, my brightness prediction assumes a $2.5n \sim 10$ rate. If the comet's lightcurve continues to follow the $2.5n \sim 27$ rate after perihelion, it would fade quicker than shown in the ephemeris above.



Figure 2 - C/2020 T2 (Palomar) as seen on 2021 June 13 by Tenho Tuomi. Image taken with a 0.3-m f/5 Newtonian and DSLR. Co-add of 20 60-s exposures at ISO 6400.

C/2020 T2 (PANSTARRS)

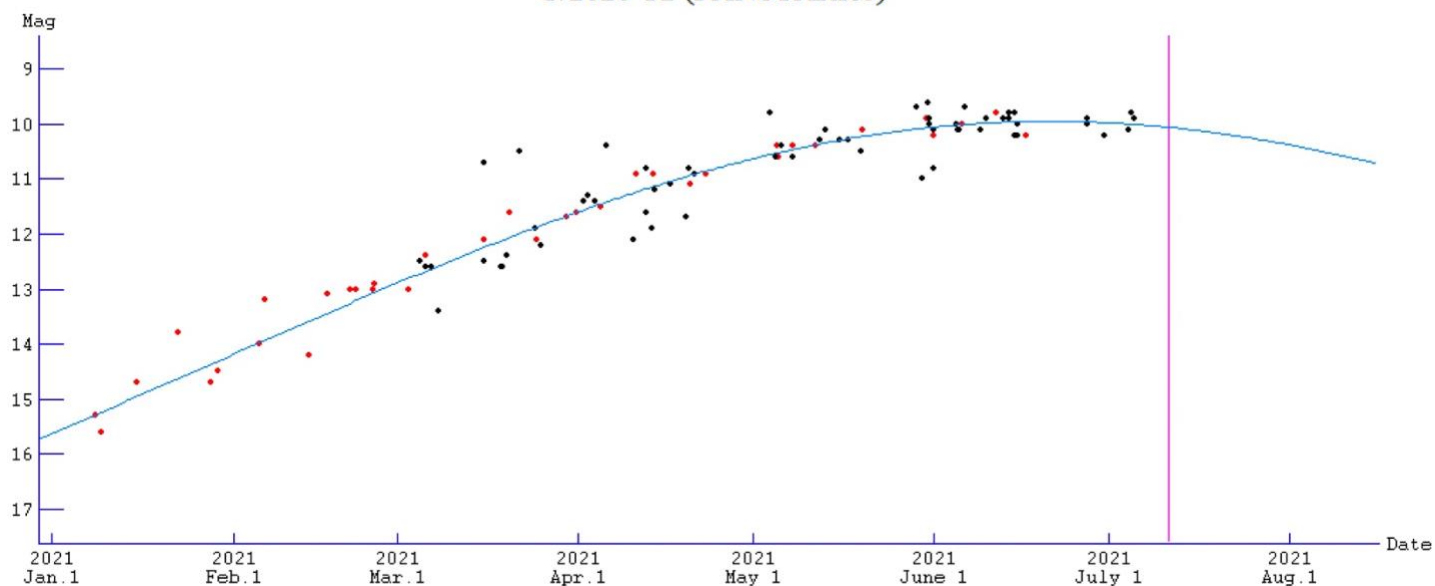


Figure 3 – Lightcurve of C/2020 T2 (Palomar) based on visual data submitted to the ALPO Comet Section [black points] by Michel Deconinck, J. J. Gonzalez, Carl Hergenrother, and Chris Wyatt, and CCD observations submitted to the COBS site by Michael Lehmann [red points]. The blue line corresponds to photometric parameters of $H_0 = 0.5$ and $2.5n = 27.0$. The purple vertical line corresponds to the date of perihelion. Plot and photometric parameters produced with Seiichi Yoshida's Comets for Windows program.

C/2020 T2 (PANSTARRS)

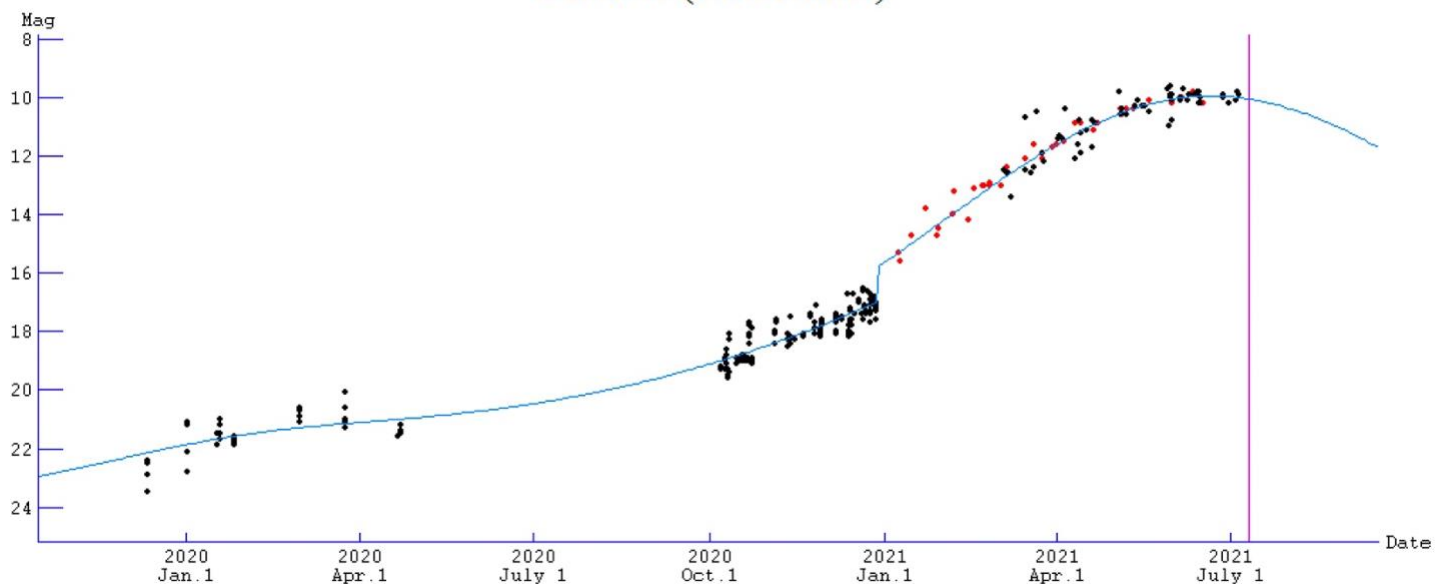


Figure 4 – Same as above except with the addition of photometry submitted to the Minor Planet Center prior to 2021 January 1 [pre-2021 black points]. The pre-2021 photometric parameters are $H_0 = 9.0$ and $2.5n = 11.9$.

7P/Pons-Winnecke

Discovered on 1819 June 12 by the Jean-Luis Pons
 Rediscovered on 1858 March 9 by Friedrich August Theodor Winnecke
 Perihelion on 2021 May 27 at 1.23 au, inclination = 22.4 deg, eccentricity = 0.64
 Short-period comet with orbital period of ~6.31 years

7P/Pons-Winnecke									Max El (deg)	
Date	R.A.	Decl.	r	d	Elong	Const	Mag	40N	40S	
2021-Jul-01	23 18	-31 53	1.307	0.467	118M	Scl	10.8	12	82	
2021-Jul-06	23 31	-34 54	1.328	0.482	120M	Scl	11.0	10	85	
2021-Jul-11	23 42	-37 43	1.351	0.499	122M	Scl	11.2	9	88	
2021-Jul-16	23 51	-40 18	1.376	0.518	124M	Phe	11.5	7	90	
2021-Jul-21	23 58	-42 40	1.403	0.540	126M	Phe	11.8	6	87	
2021-Jul-26	00 03	-44 47	1.432	0.563	127M	Phe	12.1	5	85	
2021-Jul-31	00 06	-46 39	1.462	0.589	129M	Phe	12.4	3	83	
2021-Aug-05	00 07	-48 15	1.493	0.618	130M	Phe	12.8	2	82	

Comet Magnitude Parameters --- H = 9.7, 2.5n = 26.6, offset = +11 days

Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia DC	TAIL LENG PA	ICQ CODE	Observer Name
7	2021 07 06.71 xM	11.8	AQ	40.0L	4	59	4.8 6		ICQ XX WYA	Christopher Wyatt
7	2021 06 15.83 C	10.5	U4	10.6R	5a600		17.5	8.5m260	ICQ xx HER02	Carl Hergenrother
7	2021 06 10.08 S	10.6	TK	20.3T10	100		5 2/	0.15 270	ICQ XX GON05	J J Gonzalez
7	2021 06 05.18 C	11.0	U4	50.0R	7A540		9.2	7.8m260	ICQ xx HER02	Carl Hergenrother
7	2021 06 05.10 S	10.8	TK	20.3T10	77		4 2/	0.15 260	ICQ XX GON05	J J Gonzalez
7	2021 06 03.44 C	11.0	U4	61.0Y	7A600		9.2	3.5m260	ICQ xx HER02	Carl Hergenrother

Comet 7P/Pons-Winnecke was an 8th magnitude object when visually discovered by Jean-Luis Pons on 1819 June 12. At the time, a short-period orbit was calculated for the object. Unfortunately, the orbit was not precise enough to support the comet's recovery and the comet would have to be re-discovered. That re-discovery occurred thirty-nine years later on 1858 March 9 by Friedrich August Theodor Winnecke. Throughout the 19th and early 20th century, Pons-Winnecke routinely reached 6th magnitude during its better placed apparitions. In 1927 during an especially close approach to Earth (0.04 au), the comet peaked at magnitude 3.5. Unfortunately, it hasn't had a bright return since 1939 (6th magnitude) and nowadays usually gets no brighter than ~10-11th magnitude. The recent drought of bright apparitions is due to an increase in

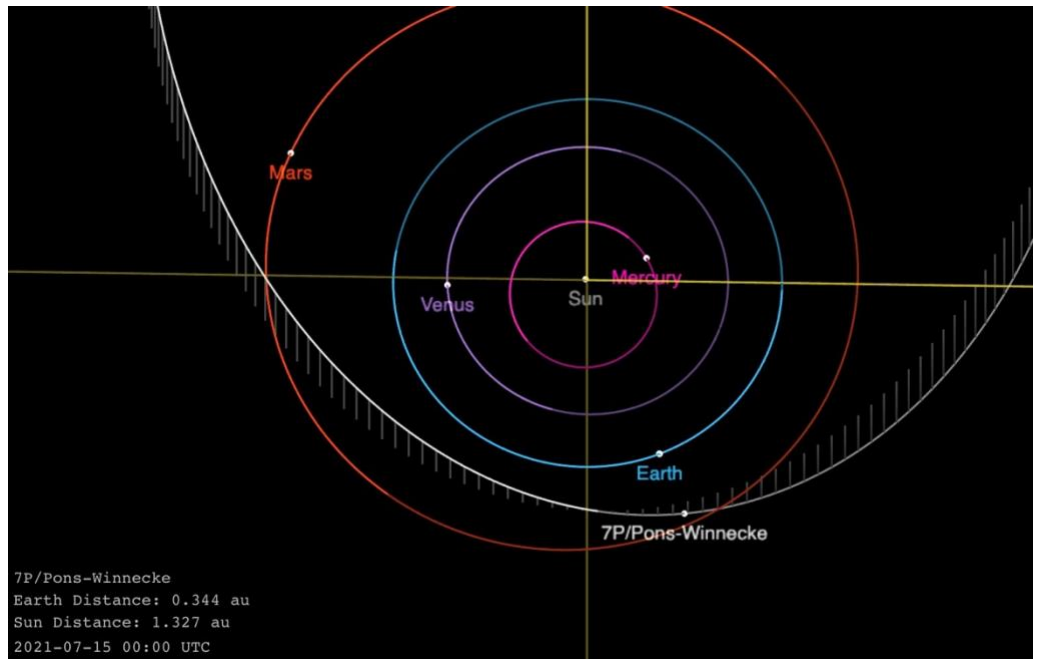


Figure 5 - Orbit of 7P/Pons-Winnecke and the inner planets and Jupiter for mid-July. Image produced with the JPL Small-Body Database Browser.

perihelion distance from 0.76 au in 1841 to a maximum of 1.26 au in 1989. This year's perihelion occurred on 2021 May 27 at 1.23 au as 7P is still close to its maximum perihelion distance.

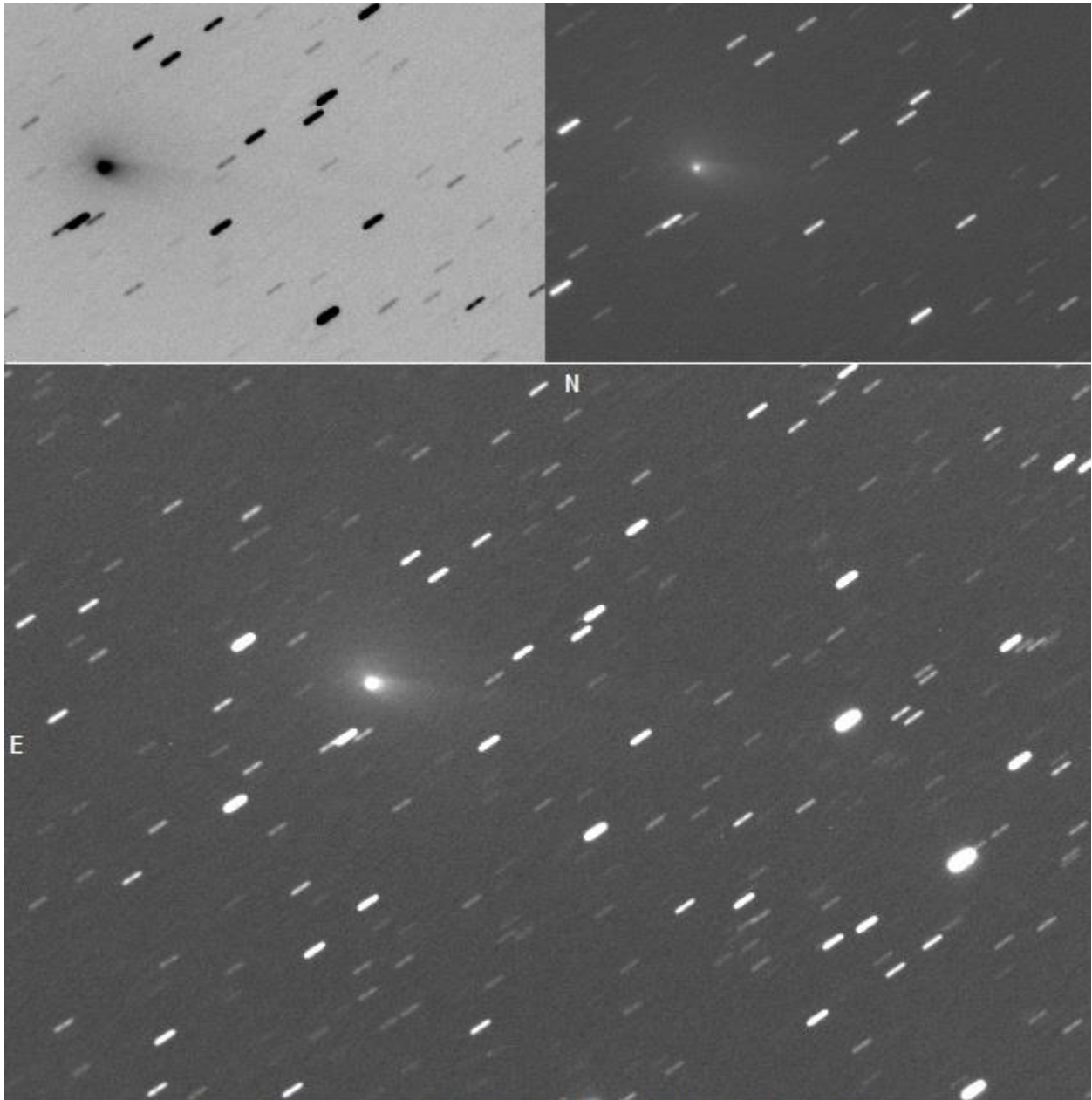
The perihelion distance of Pons-Winnecke will steadily decrease over the coming decades from this year's 1.23 au to 1.13 au in 2027, 0.98 au in 2039, 0.87 au in 2051, and a minimum near 0.84 au for a large number of perihelia from 2062 through the end of the 21st century. The smaller distances will once again allow close approaches to Earth, in particular, approaches in 2045 (0.21 au), 2062 (0.17 au), 2073 (0.19 au), and 2084 (0.31 au). Check out Kazuo Kinoshita's Comet Orbit Page entry for 7P for more details on 7P's past and future orbital evolution at <http://jcometobs.web.fc2.com/pcmtn/0007p.htm>.

Two visual and three CCD magnitude estimates were submitted to the Comets Section. J. J. Gonzalez visually observed a very diffuse coma as large as 4-5' in diameter. CCD measurements in June by Carl Hergenrother found a similar brightness to J. J.'s visual measurements but also a significantly larger coma (up to 17.5' in diameter).

Pons-Winnecke has likely peaked in brightness for this apparition. With increasing heliocentric and geocentric distances, the comet should fade from around magnitude 10.8 to 12.4 as it moves through the morning constellations of Sculptor (July 1-14) and Phoenix (14-31). Its location at southern declinations makes it a difficult object from the northern hemisphere but well placed for southern hemisphere observers.



Figure 6 - 7P/Pons-Winnecke and the Helix Nebula imaged by Martin Moberley on 2021 June 16.



7P/Pons-Winnecke, 2021June7 0937-0947UT, 10x60s, FOV 25.7'x17.5'
11" SCT f/6.4 STF-8300M **Mike Olason, Tucson Arizona**

Figure 7 - A closer look at 7P by Mike Olason on 2021 June 7.

4P/Faye

Discovered on 1843 November 23 by the Herve Faye
 Perihelion on 2021 September 9 at 1.62 au, inclination = 8.0 deg, eccentricity = 0.58
 Short-period comet with orbital period of ~7.48 years

4P/Faye									Max El (deg)	
Date	R.A.	Decl.	r	d	Elong	Const	Mag	40N	40S	
2021-Jul-01	01 57	+13 46	1.769	1.900	66M	Ari	12.4	23	32	
2021-Jul-06	02 10	+14 37	1.750	1.846	68M	Ari	12.2	25	31	
2021-Jul-11	02 24	+15 24	1.731	1.795	69M	Ari	12.0	28	31	
2021-Jul-16	02 37	+16 07	1.714	1.745	71M	Ari	11.8	31	31	
2021-Jul-21	02 51	+16 47	1.699	1.696	72M	Ari	11.6	33	30	
2021-Jul-26	03 05	+17 21	1.684	1.649	74M	Ari	11.5	36	30	
2021-Jul-31	03 19	+17 51	1.671	1.604	75M	Ari	11.3	39	30	
2021-Aug-05	03 33	+18 16	1.659	1.560	77M	Tau	11.2	41	29	
Comet Magnitude Parameters --- H = 3.7, 2.5n = 29.5										

Comet 4P was discovered visually by Herve Faye on 1843 November 23 at 5th-6th magnitude. This year's apparition is the 22nd observed return with the comet only having been missed at perihelia in 1903 and 1918. At its best returns, as in 1991 and 2006, Faye reached 9th magnitude. 2021 is a moderately good but not great return for Faye and should see it reach magnitude 10.3 at the end of September.

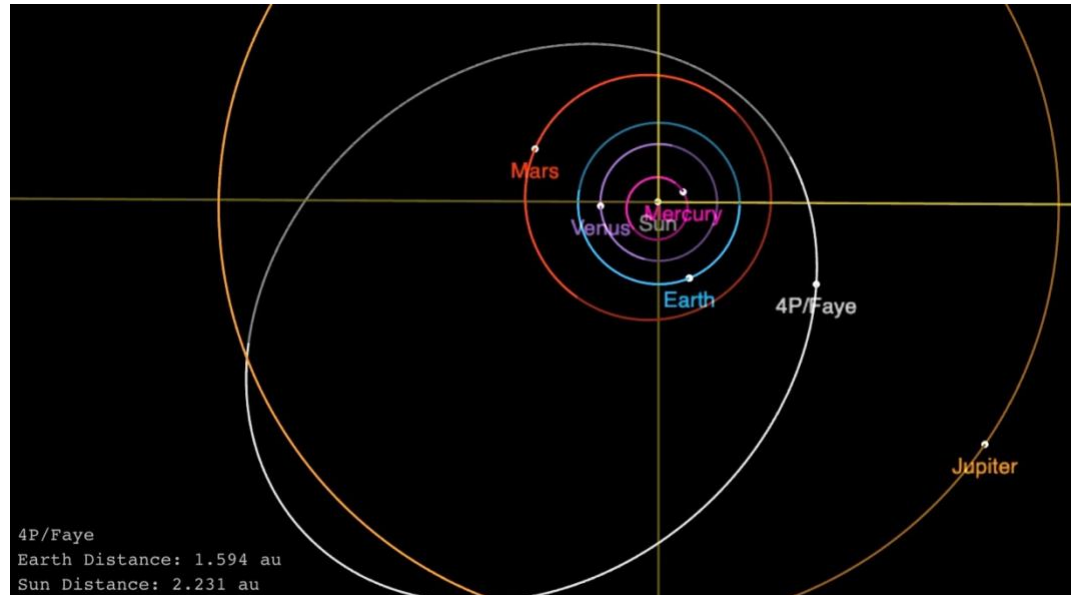


Figure 8 - Orbit of 4P/Faye and the inner planets and Jupiter for mid-July. Image produced with the JPL Small-Body Database Browser.

While no observations of 4P/Faye have been submitted to the ALPO in June, three observations submitted to the COBS site by Michael Lehmann showed the comet brightening from 13.4 to 12.6 between June 6 and 22. As with all of Michael's observations, these are CCD measurements. He also observed the coma increasing in diameter from 4.2' to 6.2'.

Perihelion occurs on September 8 at 1.62 au followed by a minimum distance to Earth a few months later on December 5 at 0.94 au. Faye is currently a morning object observable from both hemispheres and should brighten from around magnitude 12.4 to 11.2 as its moves through Aries.

8P/Tuttle

Discovered on 1790 January 9 by Pierre F. A. Mechain
 Rediscovered on 1858 January 5 by Horace Tuttle
 Perihelion on 2021 August 27 at 1.03 au, inclination = 54.9 deg, eccentricity = 0.82
 Short-period comet with orbital period of ~13.6 years

8P/Tuttle									Max El (deg)	
Date	R.A.	Decl.	r	d	Elong	Const	Mag		40N	40S
2021-Jul-01	05 24	+39 08	1.339	2.220	22M	Aur	12.7		4	0
2021-Jul-06	05 43	+37 23	1.295	2.180	22M	Aur	12.4		3	0
2021-Jul-11	06 02	+35 25	1.252	2.140	21M	Aur	12.1		3	0
2021-Jul-16	06 20	+33 13	1.212	2.100	21M	Aur	11.7		2	0
2021-Jul-21	06 37	+30 47	1.175	2.062	21M	Aur	11.4		2	0
2021-Jul-26	06 55	+28 07	1.141	2.024	21M	Gem	11.1		1	0
2021-Jul-31	07 12	+25 14	1.110	1.989	21M	Gem	10.7		0	0
2021-Aug-05	07 28	+22 08	1.083	1.955	22M	Gem	10.4		0	0
Comet Magnitude Parameters			---	H = 7.0,	2.5n = 20.0,	offset = +25 days				

Similar to the discovery story of Pons-Winnecke, 8P/Tuttle was discovered during two widely separated apparitions. Pierre François André Méchain made the first discovery in January 1790. Sixty-eight years later, 8P was re-discovered by Horace Parnell Tuttle in January 1858. With a 13.6-year period, 8P/Tuttle is making its 13th observed return. Tuttle's relatively large semi-major axis of 5.7 au and inclination of 54.9° makes it a Halley-type rather than a Jupiter-family comet.

The current return is relatively poor with Tuttle arriving at perihelion nearly on the opposite side of the Sun from Earth. Even with such poor placement and a minimum distance to Earth on September 12 of 1.81 au, Tuttle is expected to brighten to magnitude 8.5 in September.

It will be very difficult to observe Tuttle this month as it will be at a low elongation all month (21-22 deg). The comet will become better placed by late August though that is only true for southern hemisphere observers. Tuttle's large inclination results in it spending most of its time post-perihelion far south of the ecliptic, as a result the comet won't be visible to northern observers until it has faded and become a difficult CCD target.

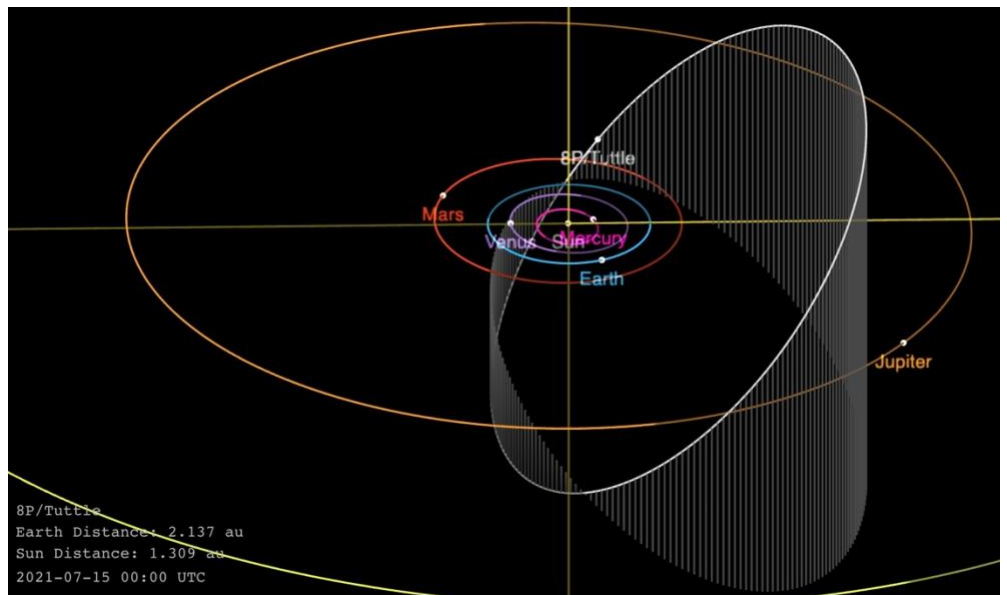


Figure 9 - Orbit of 8P/Tuttle and the inner planets and Jupiter for mid-July. Image produced with the JPL Small-Body Database Browser.

15P/Finlay

Discovered 1886 September 26 by the William Henry Finlay
 Perihelion on 2021 July 13 at 0.99 au, inclination = 6.8 deg, eccentricity = 0.72
 Short-period comet with orbital period of ~6.56 years

15P/Finlay										Max El (deg)	
Date	R.A.	Decl.	r	d	Elong	Const	Mag	40N	40S		
2021-Jul-01	02 44	+12 51	1.009	1.109	56M	Ari	10.5	13	27		
2021-Jul-06	03 07	+15 13	0.998	1.127	55M	Ari	10.3	15	25		
2021-Jul-11	03 30	+17 22	0.993	1.148	54M	Tau	10.2	16	22		
2021-Jul-16	03 52	+19 17	0.992	1.173	53M	Tau	10.1	18	20		
2021-Jul-21	04 14	+20 57	0.998	1.199	52M	Tau	10.1	20	18		
2021-Jul-26	04 35	+22 24	1.008	1.227	52M	Tau	10.0	22	16		
2021-Jul-31	04 56	+23 36	1.024	1.256	52M	Tau	10.0	24	15		
2021-Aug-05	05 16	+24 36	1.044	1.286	52M	Tau	9.9	25	13		
Comet Magnitude Parameters			---	H = 9.6,	2.5n = 15.7,	offset = +20 days					

Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia DC	TAIL LENG PA	ICQ CODE	Observer Name
15	2021 07 06.76 xM	11.1	AQ	40.0	L	4	59 2.9 4		ICQ XX WYA	Christopher Wyatt

15P/Finlay was discovered in 1886 by William Henry Finlay at the Royal Observatory at Cape of Good Hope in South Africa. This apparition marks the 16th observed return of 15P. Its best return was in 1906 when it passed 0.27 au from Earth and reached 6th magnitude. During its previous return in 2014/2015, 15P experienced two outbursts of 2-3 mag outburst with the brightest reaching 7th magnitude.

Chris Wyatt visually observed 15P at magnitude 11.1 on July 6 with his 0.40-m f/4 reflector. The comet had a moderately condensed 2.9' coma. CCD observations by Michael Lehmann and Jose Chambo were submitted to the COBS site and found the comet brightening to magnitude 10.9 by June 24. Aperture correcting Chris' July 6 estimate finds the comet may have been as bright as 10.5 on July 6 which closely matches the ephemeris prediction above (the photometric parameters used above are from Seiichi Yoshida).

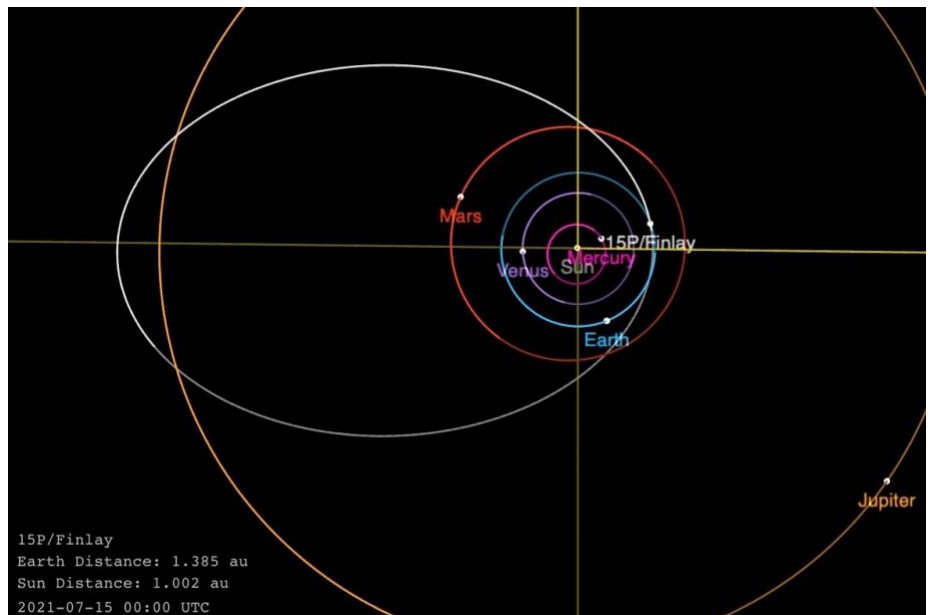


Figure 10 - Orbit of 15P/Finlay and the inner planets and Jupiter for mid-July. Image produced with the JPL Small-Body Database Browser.

Perihelion occurs this month on 13th at 0.99 au. The comet should continue to brighten to a maximum close to 9.9 in early August. The comet is currently a morning object in Aries (July 1-9) and Taurus (9-31).

C/2017 K2 (PANSTARRS)

Discovered 2017 May 21 by the Pan-STARRS survey with the Pan-STARRS1 1.8-m on Haleakala
 Perihelion on 2022 December 19 at 1.80 au, inclination = 87.6 deg, eccentricity = 1.00008
 Dynamically old long-period comet

C/2017 K2 (PANSTARRS)									Max El (deg)	
Date	R.A.	Decl.	r	d	Elong	Const	Mag	40N	40S	
2021-Jul-01	17 33	+42 33	5.983	5.519	112E	Her	13.2	87	7	
2021-Jul-06	17 28	+42 06	5.942	5.489	111E	Her	13.2	88	8	
2021-Jul-11	17 24	+41 34	5.900	5.462	110E	Her	13.1	88	8	
2021-Jul-16	17 20	+40 58	5.858	5.439	109E	Her	13.1	89	9	
2021-Jul-21	17 16	+40 18	5.816	5.420	108E	Her	13.1	90	10	
2021-Jul-26	17 12	+39 33	5.774	5.405	106E	Her	13.1	88	10	
2021-Jul-31	17 09	+38 45	5.732	5.393	104E	Her	13.0	85	11	
2021-Aug-05	17 06	+37 53	5.690	5.385	102E	Her	13.0	82	12	

Comet Magnitude Parameters --- H = 3.6, 2.5n = 7.6

Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia DC	TAIL LENG PA	ICQ CODE	Observer Name
2017K2	2021 07 05.49 xM	13.5	AQ	40.0L	4	182	1.0 5/	ICQ XX WYA	Christopher Wyatt	
2017K2	2021 07 04.98 S	12.3	AQ	20.3T10	133	1.5 4		ICQ XX GON05	J J Gonzalez	
2017K2	2021 06 24.89 I	13.3:TK	25.0C10	62	&	0.5 5		ICQ XX DECaa	Michel Deconinck	
2017K2	2021 06 15.50 xM	13.5	AQ	40.0L	4	108	1.3 4	ICQ XX WYA	Christopher Wyatt	
2017K2	2021 06 09.99 S	12.2	AQ	20.3T10	133	1.5 4		ICQ XX GON05	J J Gonzalez	
2017K2	2021 06 05.00 S	12.3	AQ	20.3T10	100	1.5 4		ICQ XX GON05	J J Gonzalez	

Get ready to hear about this comet every month in these pages for quite some time. C/2017 K2 (PANSTARRS) was discovered on 2017 May 21 by the Pan-STARRS1 1.8-m on Haleakala. At discovery the comet was around 21st magnitude and located at once seemed like an extreme 16.1 au from the Sun (that is until the discovery of C/Bernardinelli-Bernstein, more on that one later). Pre-discovery observations were found back to May of 2013 when the comet was 23.7 au from the Sun. For comparison Uranus has a semi-major axis of 19.2 au.

C/2017 K2 (PANSTARRS) is about one and a half years out from its 2022 December 19 perihelion at 1.80 au when it should peak around 7th magnitude (if its current 2.5n ~ 7.6 brightening trend continues which it probably won't). Over the past few weeks, Michel Deconinck, J. J. Gonzalez, and Chris Wyatt have observed C/2017 K2 between magnitude 12.2 and 13.5. With the PANSTARRS still over 5 au from the Sun and Earth, it is a small object with all three visual observers reporting a small moderately condensed coma of up to 1.5' in diameter.

C/2017 K2 is a northern object in Hercules though still observable from the southern hemisphere as shown by Chris Wyatt's observations from Australia. The comet will continue to slowly brighten throughout the remainder of 2021 and all of 2022.

The comet has already been the subject of intense investigation with no less than 8 papers already published on it as well as dedicated HST observing campaigns. We'll talk about some of these results in the months to come.

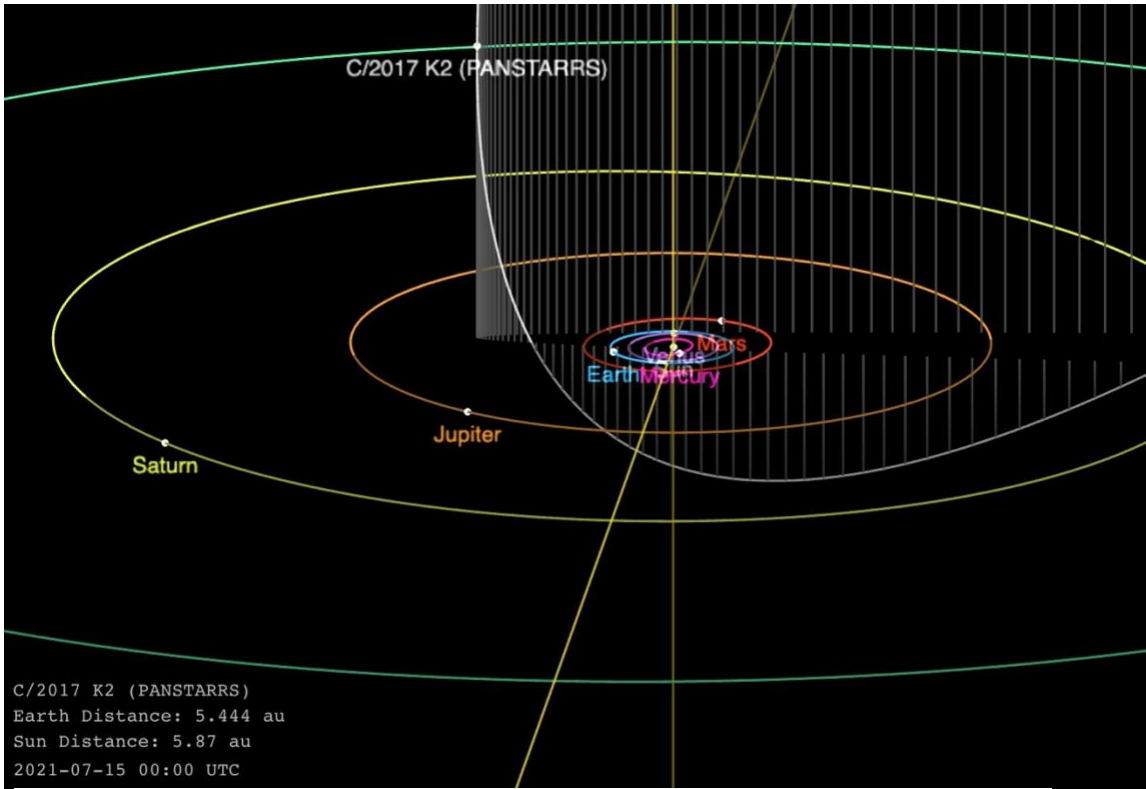
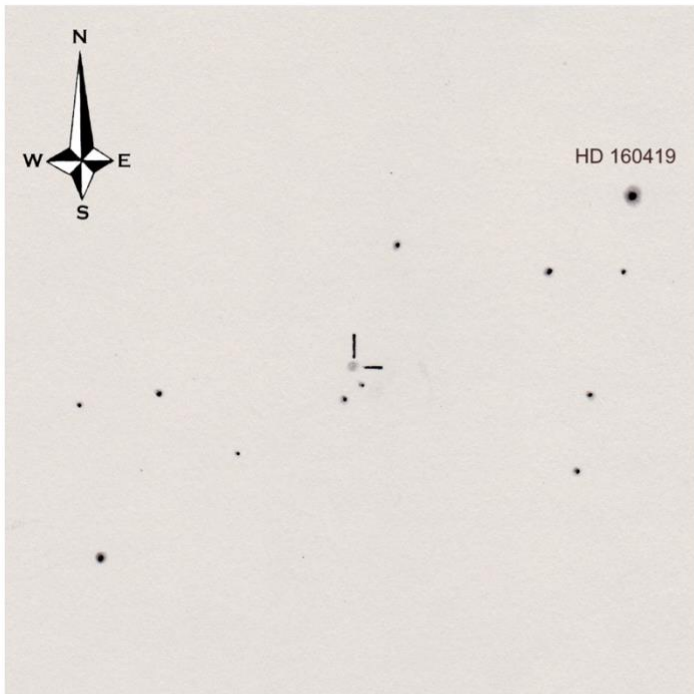


Figure 11 - Orbit diagram for C/2017 K2 (PANSTARRS) for mid-July. Produced with the JPL Small-Body Database Browser.



Comet C/2017 K2 (PanStarrs)
 Takahashi Mewlon 10" - 125x

2021/06/24 - 21h28 UTC
 F.O.S.: 30'

Aquarellia Observatory

Figure 12 - A sketch of C/2017 K2 (PANSTARRS) by Michel Deconinck).

C/2019 L3 (ATLAS)

Discovered 2017 May 21 by the Pan-STARRS survey with the Pan-STARRS1 1.8-m on Haleakala
 Perihelion on 2022 January 9 at 3.55 au, inclination = 48.4 deg, eccentricity = 1.0016
 Dynamically new long-period comet

C/2019 L3 (ATLAS)									Max El	
Date	R.A.	Decl.	r	d	Elong	Const	Mag		40N	40S
										(deg)
2021-Jul-01	05 14	+49 17	3.959	4.795	31M	Aur	12.2		13	0
2021-Jul-06	05 23	+49 04	3.939	4.759	32M	Aur	12.2		15	0
2021-Jul-11	05 33	+48 50	3.920	4.720	34M	Aur	12.1		16	0
2021-Jul-16	05 42	+48 35	3.902	4.677	36M	Aur	12.1		18	0
2021-Jul-21	05 51	+48 19	3.883	4.632	38M	Aur	12.0		20	0
2021-Jul-26	05 59	+48 02	3.866	4.584	40M	Aur	12.0		22	0
2021-Jul-31	06 08	+47 44	3.848	4.533	42M	Aur	11.9		25	0
2021-Aug-05	06 16	+47 25	3.831	4.479	45M	Aur	11.8		27	0

Comet Magnitude Parameters --- H = -2.4, 2.5n = 18.8

Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD	Mag	SC	APER	FL	POW	COMA	TAIL	ICQ CODE	Observer Name
										(UT)
										T
										Dia DC
										LENG PA
										ICQ XX
2019L3	2021 06 10.10	S 11.2	TK	20.3	T10	100	2.5	3/	ICQ XX	GON05 J J Gonzalez

C/2019 L3 has recently passed solar conjunction as it passed north of the Sun last month. July will see the comet become an easier object to observe at least for northern observers (it won't be visible to southern observers in July) as it moves through Auriga (18-30).

J. J. Gonzalez spied L3 at magnitude 11.2 on June 10 with a 2.5' coma. CCD photometry submitted to the COBS site has the comet a magnitude fainter than J. J. with the CCD measurements falling in the 12.2 to 12.4 range.

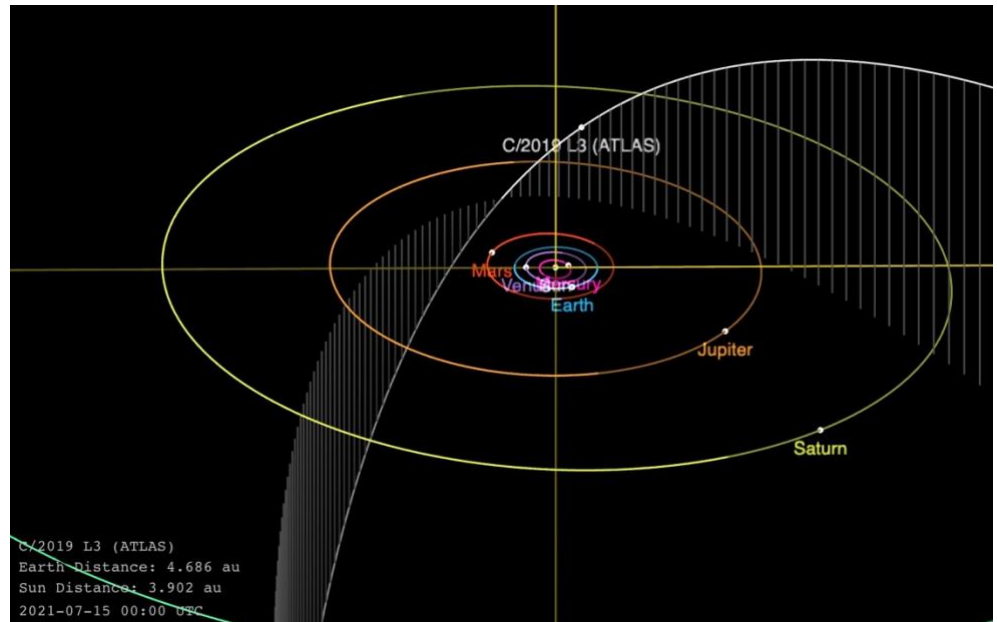


Figure 13 - Orbit diagram of C/2019 L3 (ATLAS) from the JPL Small-body Database Browser.

C/2019 L3 arrives at perihelion on 2022 January 9 at 3.57 au. The large perihelion distance means C/2019 L3 could remain a visual object well into 2022 and possibly even 2023. If the comet brightens at a conservative 2.5n = 8 rate, it could reach magnitude 10.0 at the end of 2021.

C/2021 A1 (Leonard)

Discovered 2022 January 3 by Greg Leonard of the Catalina Sky Survey with the 1.5-m on Mount Lemmon
 Perihelion on 2022 January 3 at 0.61 au, inclination = 132.7 deg, eccentricity = 1.00002
 Dynamically old long-period comet

C/2021 A1 (Leonard)										Max El (deg)	
Date	R.A.	Decl.	r	d	Elong	Const	Mag	40N	40S		
2021-Jul-01	10 28	+51 35	3.091	3.614	51E	UMa	16.8	33	0		
2021-Jul-06	10 28	+50 40	3.029	3.601	48E	UMa	16.7	30	0		
2021-Jul-11	10 28	+49 45	2.966	3.582	45E	UMa	16.7	28	0		
2021-Jul-16	10 29	+48 51	2.903	3.559	43E	UMa	16.6	25	0		
2021-Jul-21	10 31	+47 59	2.840	3.531	40E	UMa	16.5	23	0		
2021-Jul-26	10 33	+47 07	2.775	3.497	38E	UMa	16.4	21	0		
2021-Jul-31	10 35	+46 17	2.711	3.458	36E	UMa	16.3	19	0		
2021-Aug-05	10 37	+45 28	2.645	3.412	34E	UMa	16.2	17	0		

Comet Magnitude Parameters --- H = 10.3, 2.5n = 7.6

Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia DC	TAIL LENG PA	ICQ CODE	Observer Name
2021A1	2021 07 05.23	V 17.3	U4	61.0Y	7A200	0.5	0.6m 85	ICQ xx	HER02	Carl Hergenrother
2021A1	2021 06 14.25	C 17.6	U4	61.0Y	7a540	0.4	1.0m 95	ICQ xx	HER02	Carl Hergenrother
2021A1	2021 06 08.25	C 17.6	U4	61.0Y	7a600	0.4	2.0m 95	ICQ xx	HER02	Carl Hergenrother

C/2021 A1 (Leonard) was found on 2021 January 3 by Greg Leonard with the Mount Lemmon 1.5-m reflector. At discovery, it was around 19th magnitude and located 5.1 au from the Sun.

C/2021 A1 has the potential to become a nice object at the end of the year. It has a few things going for it including 1) a relatively small perihelion of 0.62 au on 2022 January 3, 2) a close approach to within 0.233 au from Earth on December 12, and 3) a phase angle that reaches a maximum of 160 degrees at the time of close approach. The high phase angle may result in a few magnitudes of enhanced brightness due to forward scattering of light by cometary dust. Working against it will be a small solar elongation at the time of maximum brightness (a minimum elongation of 15 deg). Also in the minus column is the comet's slow rate of brightening. The comet has been brightening at a rate of $2.5n \sim 7.6$. Extrapolating that into the future produces a peak brightness around magnitude 6.3. Even with 2-3 magnitudes of dust forward scattering enhancement, Leonard may be a very difficult object to observe when at its best.

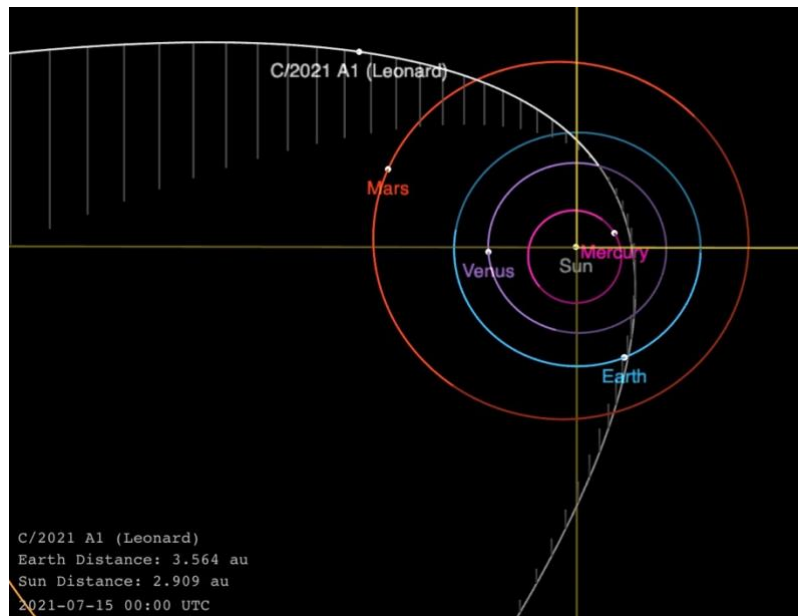


Figure 14 - Orbit of C/2021 A1 (Leonard) from the JPL Small-body Database Browser.

C/Leonard is an evening object near 16-17th magnitude located in Ursa Major. Imagers are strongly encouraged to monitor C/2021 A1 over the coming months.

New Discoveries, Recoveries and Other Comets in the News

New Periodic Comet Numbering

421P/2009 U4 = P/2020 H10 (McNaught) [Ref: MPC 130596]

P/2021 L5 = P/2021 S2 (La Sagra) – Michael Rudenko (of the Minor Planet Center) found recovery observations of this comet in astrometry obtained with the 1.8-m Pan-STARRS1 telescope on Haleakala on 2021 June 6. Rob Weryk (University of Western Ontario) was then able to go back and find pre-recovery observations back to 2020 April 26 when the comet was 23rd magnitude in April 2020. Independent of the Pan-STARRS observations, Hirohisa Sato recovered P/La Sagra on 2021 July 3 with an iTelescopes 0.43-m at Siding Spring in Australia. It was measured at 19th magnitude with a small condensed 6" coma in Sato's images. P/La Sagra arrives at perihelion on 2021 October 31 at 1.36 au when it should be around magnitude 17. [Ref: MPEC 2021-N47, CBET 4994]

P/2021 L4 (PANSTARRS) – Richard Wainscoat (University of Hawaii) reported the discovery of a 20-21st magnitude comet by the Pan-STARRS1 1.8-m on 2021 June 14. P/2021 L4 is a Jupiter-family comet with a 5.64-year period and is already nearly two years past a 2019 September 17 perihelion at 2.75 au. Although pre-discovery observations have been found back to 2021 June 3, the lack of observations closer to perihelion suggests an object either in outburst or possessing a strong seasonal post-perihelion offset in activity. This is the 251st comet to be named after the Pan-STARRS survey. [Ref: MPEC 2021-M77, CBET 4986]

C/2021 L3 (Borisov) – Gennady Borisov has discovered the 11th comet to bear his name. Borisov used his 0.65-m f/1.5 astrograph at the MARGO observatory near Nauchnij, Crimea to find C/2021 L3 at 20th magnitude on 2021 June 8 at a far northern declination of +71 degrees. A long-period comet with a distant perihelion distance of 8.44 au (T = 2022 March 3), the newest Comet Borisov is unlikely to get much brighter than 19th magnitude. [Ref: MPEC 2021-M75, CBET 4985]

P/2021 L2 (Leonard) – Greg Leonard of the Catalina Sky Survey found his 12th named comet on 2021 June 8 at 20th magnitude with the Mount Lemmon 1.5-m. P/2021 L2 is a Jupiter-family comet with a 2021 July 24 perihelion at 1.94 au. Peak brightness is expected around 19th magnitude. [Ref: MPEC 2021-M74, CBET 4984]

P/2021 L1 = P/2006 S4 (Christensen) – C. Jacques reported the recovery of P/2006 S4 (Christensen) on images taken on 2021 June 5 and 6 by E. Pimental, J. Barros, and himself with the SONEAR 0.45-m f/2.9 reflector. The comet was 18th magnitude at recovery. P/Christensen is on a 15.9-year orbit and reaches perihelion on 2022 January 13 at 3.11 au. The comet peaked at 17-18th magnitude in 2006 and expected to reach the same brightness this summer. [Ref: MPEC 2021-M34, CBET 4979]

C/2021 K3 (Catalina) – The Catalina Sky Survey uses a number of telescopes in southern Arizona in their search for potentially hazardous near-Earth asteroids and comets. Discoveries with the 0.7-m Catalina Schmidt on Mount Bigelow north of Tucson are either named "Catalina" or after the observer responsible for the discovery. Comets named "Lemmon" were found with a 1.5-m Cassegrain on Mount Lemmon, just a bit further up the road than the Catalina Schmidt. While the Catalina Schmidt and Lemmon telescope are almost exclusively used by the Catalina Sky Survey, they also acquire time on other telescopes at the University of Arizona.

C/2021 K3 (Catalina) was discovered on 2021 May 20 at 21st magnitude with the University of Arizona's 2.3-m Bok Cassegrain on Kitt Peak. This high-q comet comes to perihelion on 2022 February 1 at 5.23 au. Peak brightness at 20th magnitude should occur around opposition July/August 2021 and June/July 2022. This is the 62nd comet to bear the name Catalina. [Ref: MPEC 2021-M87, CBET 4991]

The Bok telescope is named after Bart J. Bok, former director of the University of Arizona's Steward Observatory, discoverer of Bok globules, and even the focus of a biography by former ALPO Comets Section Recorder David Levy. Bok

was also the discoverer of comet, [C/1949 N1 \(Bappu-Bok-Newkirk\)](#). The story of C/1949 N1 is interesting in its own right. The first named discoverer M. K. Vainu Bappu is considered the father of Indian astronomy. A nice write-up on the comet, its discovery, and some of the repercussions of the discovery can be found here <https://iucaa-rpl.weebly.com/uploads/1/7/1/7/17179300/0116.pdf>.

C/2021 K2 (MASTER) – This apparently asteroidal object was discovered on 2021 May 23 with a double 0.4-m f/2.5 reflector operated by the "Mobile Astronomical System of the Telescope-Robots" or MASTER survey at the South African Astronomical Observatory. The comet was 18th magnitude at discovery and will likely peak at 17th magnitude this month as it approaches a distant $q = 5.47$ au perihelion on 2021 September 8. MASTER has 4 other comets named after it. [Ref: CBET 4975 & MPEC 2021-L89]

C/2021 G3 (PANSTARRS) – This 22nd magnitude large- q long-period comet was discovered on 2021 April 1 with the Pan-STARRS1 1.8-m on Haleakala. Perihelion will be on 2021 October 18 at 5.18 au. The comet is not expected to become much brighter than 21st magnitude. [Ref: 2021-M86, CBET 4990]

A/2021 G2 - An apparently asteroidal object was discovered on 2021 April 11 at 19th magnitude with the ATLAS 0.5-m f/2 astrograph on Mauna Loa. Pre-discovery observations have been found back to November 2020. The object is currently 9.7 au from Sun and over 3 years from its 2024 September 8 perihelion at 4.98 au. CBET 4988 reports that multiple observers have detected a coma making A/2021 G2 an active comet. It will presumably be redesignated C/2021 G2 (ATLAS). [Ref: MPEC 2021-M79, CBET 4988]

A/2021 E4 – This is yet another apparently asteroidal object on a cometary orbit. Discovered on 2021 March 7 with the Mount Lemmon 1.5-m, A/2021 E4 is currently 21st magnitude and 5.2 au from the Sun. Pre-discovery observations were found back to December 2020. Perihelion is on 2022 April 25 at 4.68 au. The object should peak at a little brighter than magnitude 19.0. [Ref: MPEC 2021-M78]

P/2021 A12 = P/2008 CL94 (Lemmon) - A team led by University of Central Florida comet researchers Charles Schambeau and Yan Fernandez recovered P/2008 CL94 at a faint 22nd magnitude with the 8-m Gemini North telescope on Mauna Kea. Observations made on 2021 January 9 and 15 showed a very condensed object with a slight tailward extension. When originally discovered on 2008 February 8 by the Mount Lemmon Survey, the comet was 20th magnitude and ~1.5 years passed perihelion. Observations a year later in 2009 found a brighter 18-19th magnitude object. The current return sees perihelion on 2021 September 19 at 5.42 au. [Ref: 2021-M89, CBET 4992]

C/2014 UN271 (Bernardinelli-Bernstein) – On June 19, the Minor Planet Center announced the discovery of asteroid 2014 UN271 on Minor Planet Electronic Circular 2021-M52. The discovery by Pedro Bernardinelli and Gary Bernstein was the result of a search for slow moving Trans-Neptunian objects (TNO) in images taken with the Dark Energy Camera (DECam) on the Blanco 4-m at Cerro Tololo Inter-American Observatory in Chile. DECam observed UN271 on 20 separate nights between 2014 October 20 and 2018 November 8. Additional observations by Pan-STARRS and follow up astrometrists have extended the arc to 7 years (from 2014 August 14 to 2021 June 22). The resulting orbit on CBET 4989 shows a truly remarkable object. At discovery, it was 22nd magnitude and located at 29.0 au from the Sun. For comparison, the average distance to the Sun for Neptune is 30.1 au. On 2021 July 1, it will still be 20.1 au from the Sun, a little further away than Uranus' average distance.

Though originally announced as an asteroid, recent observations and new analysis of older observations confirmed the cometary nature of this object. In ATel 14759, Tony Farnham (U. of Maryland) was able to co-add 976 30-minute exposures (over 20 days! of exposure!) taken with the TESS spacecraft in September and October 2018 to detect cometary activity at 23.8 au. It is very possible that the comet was active at even larger distances, something that is not as unprecedented as you might think considering the above-mentioned C/2017 K2 (PANSTARRS) may have been active as far out as 35 au [Jewitt, D. et al. Cometary Activity Begins at Kuiper Belt Distances: Evidence from C/2017 K2.

Astronomical J 161, 188 (2021)] and C/2012 S2 (ISON) at 20 au [Sekanina, Z. Comet C/2012 S1 (ISON), CBET 3722, eds. D. Green].

Perihelion is still an astonishing 10 years away! When it arrives at perihelion on 2031 January 22, it will be 10.95 au from the Sun, comparable in distance to Saturn (9.6 au). C/Bernardinelli-Bernstein is a long-period comet with an original semi-major axis that is slightly hyperbolic suggesting it is on its first trip this “close” to the Sun.

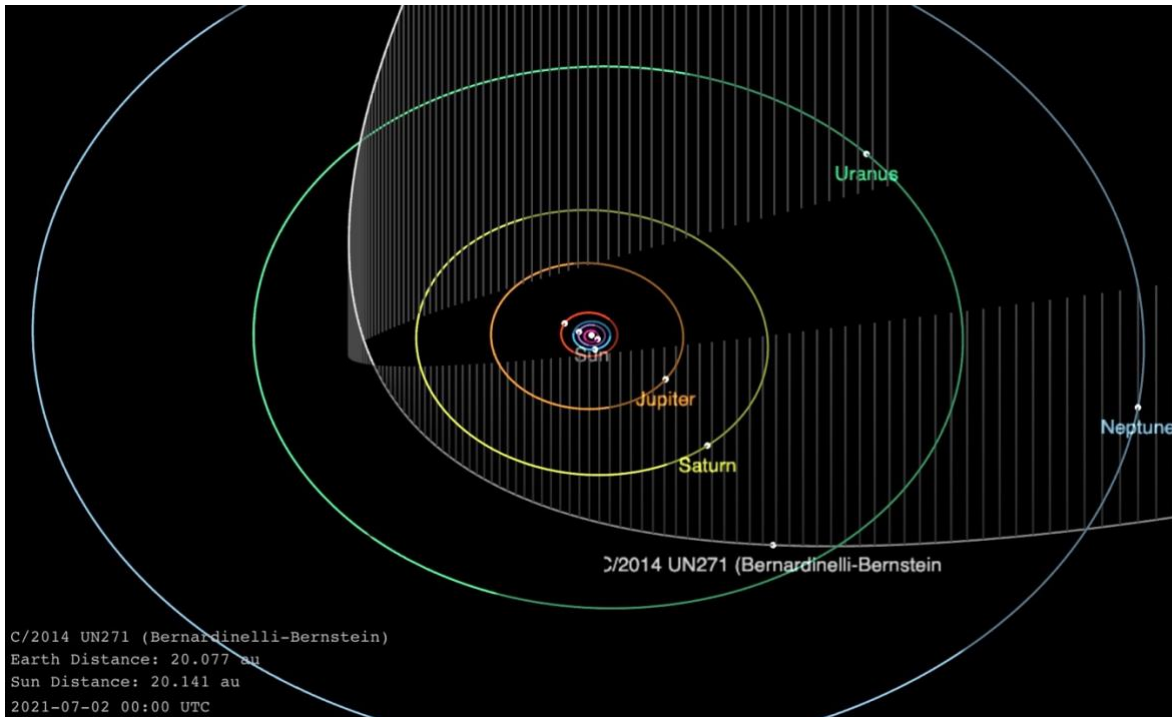


Figure 15 - Plot of the orbit of C/2014 UN271 (Bernardinelli-Bernstein) from the JPL Small-body Database Browser.

As is usual for such an interesting object, there have been a lot of articles published in the media about Bernardinelli-Bernstein. Most focus on the size of the nucleus. When the object was still considered asteroidal, one could estimate a nuclear size between ~60 and 200 km depending on its albedo. Now that we know it is cometary and some (perhaps significant) fraction of its brightness is due to a dust coma, the diameter of the nucleus is probably being overestimated. Hopefully a repaired Hubble or soon-to-be-launched JWST will shed some light on the true size of Bernardinelli-Bernstein.

C/Bernardinelli-Bernstein is currently located at a southern declination of -51 deg at ~19th magnitude. Its inclination of 95 deg will carry it further south through 2027. Though still at a declination of -38 deg at perihelion, it will be moving north at that time and become a progressively easier object to observe from the northern hemisphere in the years after perihelion. How bright this comet will get is an open question and one we can spend the next 10 years discussing. If we use the magnitudes reported to the MPC in June as a starting point and assume 2.5n parameters, here is what we get for peak brightness:

2.5n	Peak Brightness
8.0	15.9
10.0	15.5
15.0	14.1
20.0	12.8

It is possible that Bernardinelli-Bernstein could become a visual object for observers with modestly large apertures. Time will tell. [Ref: MPEC 2021-M52, 2021-M83, CBET 4983, 4989]

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 >.

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

Stay safe and enjoy the sky!
- Carl Hergenrother

Recent Magnitudes Contributed to the ALPO Comets Section

Comet Des	YYYY MM DD.DD (UT)	Mag	SC	APER	FL	POW	COMA Dia DC	TAIL LENG PA	ICQ CODE	Observer Name
				T						
C/2021 A1 (Leonard)										
2021A1	2021 07 05.23	V 17.3	U4	61.0Y	7A200		0.5	0.6m 85	ICQ xx HER02	Carl Hergenrother
2021A1	2021 06 14.25	C 17.6	U4	61.0Y	7a540		0.4	1.0m 95	ICQ xx HER02	Carl Hergenrother
2021A1	2021 06 08.25	C 17.6	U4	61.0Y	7a600		0.4	2.0m 95	ICQ xx HER02	Carl Hergenrother
C/2020 T2 (Palomar)										
2020T2	2021 07 05.43	xM 10.5	AQ	40.0L	4 59		4.2 5/		ICQ XX WYA	Christopher Wyatt
2020T2	2021 07 04.96	S 9.8	TK	20.3T	10 77		6 3/		ICQ XX GON05	J J Gonzalez Suarez
2020T2	2021 07 04.36	xM 10.4	AQ	25.0L	5 40		3.8 5		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 30.38	xM 10.5	AQ	25.0L	5 40		3.8 5		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 24.89	I [12.5	TK	25.0C	10 192				ICQ XX DECaa	Michel Deconinck
2020T2	2021 06 15.46	xM 10.6	AQ	40.0L	4 59		4 6	8.0m118	ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 09.96	S 9.9	TK	20.3T	10 77		6 3/		ICQ XX GON05	J J Gonzalez Suarez
2020T2	2021 06 06.37	xM 10.3	AQ	40.0L	4 59		4.3 6		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 05.42	xM 10.4	AQ	25.0L	5 40		5.3 6		ICQ XX WYA	Christopher Wyatt
2020T2	2021 06 05.21	V 10.1	U4	10.6R	5A840		14		ICQ xx HER02	Carl Hergenrother
2020T2	2021 06 04.96	S 10.0	TK	20.3T	10 77		5 3/		ICQ XX GON05	J J Gonzalez Suarez
C/2020 S3 (Erasmus)										
2020S3	2021 06 15.45	C 15.8	U4	61.0Y	7a480		1.7	> 0.25 260	ICQ xx HER02	Carl Hergenrother
2020S3	2021 06 15.45	C 17.0	U4	61.0Y	7a480		0.4		ICQ xx HER02	Carl Hergenrother
C/2020 R4 (ATLAS)										
2020R4	2021 06 09.94	S 11.5	TK	20.3T	10 77		6 1/		ICQ XX GON05	J J Gonzalez Suarez
2020R4	2021 06 06.39	xM 14.0	AQ	40.0L	4 108		1.3 3/		ICQ XX WYA	Christopher Wyatt
2020R4	2021 06 05.18	V 13.4	U4	10.6R	5A840		3.5	2.9m110	ICQ xx HER02	Carl Hergenrother
2020R4	2021 06 04.94	S 11.7	TK	20.3T	10 77		6 1/		ICQ XX GON05	J J Gonzalez Suarez
C/2020 J1 (SONEAR)										
2020J1	2021 07 05.50	xM 13.9	AQ	40.0L	4 182		0.6 6		ICQ XX WYA	Christopher Wyatt
2020J1	2021 07 04.95	S 11.2	TK	20.3T	10 77		5 2/		ICQ XX GON05	J J Gonzalez Suarez
2020J1	2021 07 04.37	xM 13.9	AQ	25.0L	5 125		1.3 4		ICQ XX WYA	Christopher Wyatt
2020J1	2021 06 30.39	xM 13.7	AQ	25.0L	5 125		1.0 4/		ICQ XX WYA	Christopher Wyatt
2020J1	2021 06 27.35	xM 13.6	AQ	40.0L	4 108		0.8 6		ICQ XX WYA	Christopher Wyatt
2020J1	2021 06 15.48	xM 13.6	AQ	40.0L	4 182		1.8 6		ICQ XX WYA	Christopher Wyatt
2020J1	2021 06 09.97	S 11.6	TK	20.3T	10 77		5 3		ICQ XX GON05	J J Gonzalez Suarez
2020J1	2021 06 06.38	xM 13.1	AQ	40.0L	4 59		2 6		ICQ XX WYA	Christopher Wyatt
2020J1	2021 06 04.98	S 11.6	TK	20.3T	10 77		5 2/		ICQ XX GON05	J J Gonzalez Suarez
C/2020 F5 (MASTER)										
2020F5	2021 07 06.72	xM 14.9	AQ	40.0L	4 182		0.5 6		ICQ XX XX WYA	Christopher Wyatt
C/2019 T4 (ATLAS)										
2019T4	2021 07 05.42	xM 14.4	AQ	40.0L	4 182		0.5 4/		ICQ XX WYA	Christopher Wyatt
2019T4	2021 06 27.36	xM 14.3	AQ	40.0L	4 182		0.6 4		ICQ XX WYA	Christopher Wyatt
2019T4	2021 06 06.38	xM 14.3	AQ	40.0L	4 182		0.5 6		ICQ XX WYA	Christopher Wyatt
2019L3	2021 06 10.10	S 11.2	TK	20.3T	10 100		2.5 3/		ICQ XX GON05	J J Gonzalez Suarez
C/2019 L3 (ATLAS)										
2019L3	2021 06 10.10	S 11.2	TK	20.3T	10 100		2.5 3/		ICQ XX GON05	J J Gonzalez Suarez
C/2019 F1 (ATLAS-Africano)										
2019F1	2021 07 06.70	xM 14.8	AQ	40.0L	4 261		0.5 4		ICQ XX WYA	Christopher Wyatt
2019F1	2021 07 05.47	xM 14.9	AQ	40.0L	4 261		0.3 4		ICQ XX WYA	Christopher Wyatt
2019F1	2021 06 27.37	xM 14.8	AQ	40.0L	4 182		0.5 5		ICQ XX WYA	Christopher Wyatt
2019F1	2021 06 15.47	xM 14.7	AQ	40.0L	4 182		0.6 6		ICQ XX WYA	Christopher Wyatt
C/2018 U1 (Lemmon)										
2018U1	2021 07 05.48	xM 15.0	AQ	40.0L	4 261		0.3 5/		ICQ XX WYA	Christopher Wyatt
C/2017 K2 (PANSTARRS)										
2017K2	2021 07 05.49	xM 13.5	AQ	40.0L	4 182		1.0 5/		ICQ XX WYA	Christopher Wyatt
2017K2	2021 07 04.98	S 12.3	AQ	20.3T	10 133		1.5 4		ICQ XX GON05	J J Gonzalez Suarez
2017K2	2021 06 24.89	I 13.3:TK	25.0C	10 62	& 0.5 5				ICQ XX DECaa	Michel Deconinck
2017K2	2021 06 15.50	xM 13.5	AQ	40.0L	4 108		1.3 4		ICQ XX WYA	Christopher Wyatt
2017K2	2021 06 09.99	S 12.2	AQ	20.3T	10 133		1.5 4		ICQ XX GON05	J J Gonzalez Suarez
2017K2	2021 06 05.00	S 12.3	AQ	20.3T	10 100		1.5 4		ICQ XX GON05	J J Gonzalez Suarez
246P/NEAT										
246	2021 07 06.70	xM 13.8	AQ	40.0L	4 182		0.8 4/		ICQ XX WYA	Christopher Wyatt
246	2021 07 05.46	xM 14.0	AQ	40.0L	4 182		0.6 5		ICQ XX WYA	Christopher Wyatt
117P/Helin-Roman-Alu										
117	2021 06 06.40	xM 15.3	AQ	40.0L	4 182		0.6 4		ICQ XX WYA	Christopher Wyatt
67P/Churyumov-Gerasimenko										
67	2021 07 06.73	xM 15.1	AQ	40.0L	4 261		0.3 6		ICQ XX WYA	Christopher Wyatt
15P/Finlay										
15	2021 07 06.76	xM 11.1	AQ	40.0L	4 59		2.9 4		ICQ XX WYA	Christopher Wyatt
10P/Tempel										
10	2021 07 06.75	xM 13.5	AQ	40.0L	4 182		1.0 3/		ICQ XX WYA	Christopher Wyatt
7P/Pons-Winnecke										

7	2021	07	06.71	xM	11.8	AQ	40.0L	4	59	4.8	6				ICQ	XX	WYA	Christopher	Wyatt
7	2021	06	15.83	C	10.5	U4	10.6R	5a600		17.5			8.5m260		ICQ	xx	HER02	Carl	Hergenrother
7	2021	06	10.08	S	10.6	TK	20.3T10	100		5	2/	0.15	270		ICQ	XX	GON05	J J	Gonzalez Suarez
7	2021	06	05.18	C	11.0	U4	50.0R	7A540		9.2			7.8m260		ICQ	xx	HER02	Carl	Hergenrother
7	2021	06	05.10	S	10.8	TK	20.3T10	77		4	2/	0.15	260		ICQ	XX	GON05	J J	Gonzalez Suarez
7	2021	06	03.44	C	11.0	U4	61.0Y	7A600		9.2			3.5m260		ICQ	xx	HER02	Carl	Hergenrother