ALPO COMET NEWS

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

FEBRUARY & MARCH 2022
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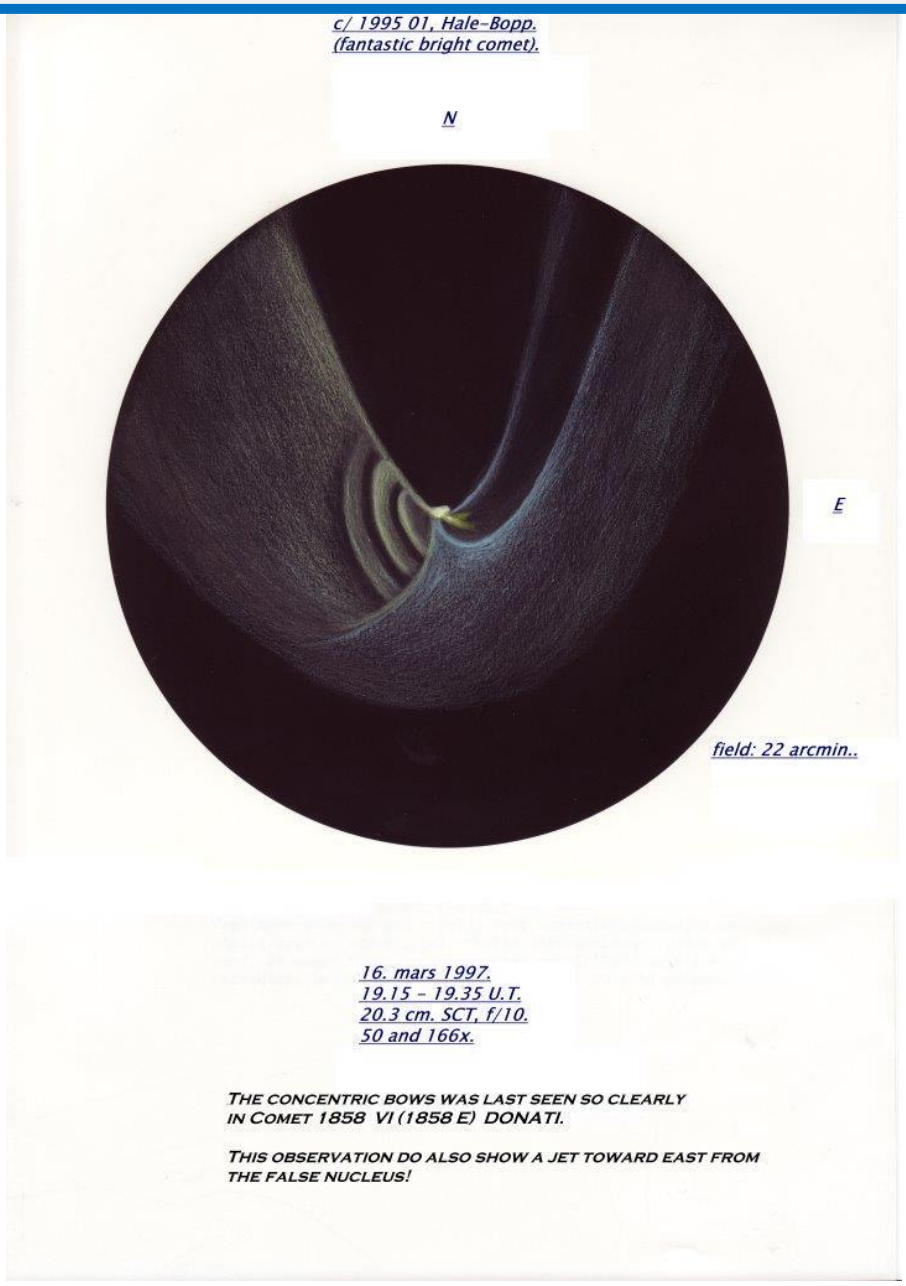

Twenty-five years ago, comet C/1995 O1 (Hale-Bopp) was near its best. Hale-Bopp was the last Great Comet visible from the Northern Hemisphere under a dark sky (though C/2006 P1 was visible up north during the day and in bright twilight). This sketch by Per-Jonny Bremseth was made on 1997 March 16 with a 0.2-m SCT at f/10 and 50 and 166 power. The sketch shows the amazing diversity of near-nucleus features Hale-Bopp displayed throughout its apparition.

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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/813168-alpo-comet-news-for-february-march-2022). 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 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

Well, this Comet News is either very late for February or a few days early for March. Due to delays in getting this out for February, it will cover the remainder of February and all of March.

A large number of comets are in the 8th-10th magnitude range including 19P/Borrelly, 67P/Churyumov-Gerasimenko, 104P/Kowal, and C/2019 L3 (PANSTARRS) in the evening and C/2017 K2 (PANSTARRS) and C/2021 F1 (Lemmon-PANSTARRS) in the morning sky. On a bit of the fainter side are receding 4P/Faye and 6P/d'Arrest, incoming C/2019 T4 (ATLAS) and C/2021 E3 (ZTF), and two short-period comets at perihelion 9P/Tempel and 22P/Kopff. After spending a few weeks too close to the Sun for observation, last year's comet highlight, C/2021 A1 (Leonard), should reappear as a fainter object of ~11-12th magnitude but only for observers in the southern hemisphere.

Since January 1, the ALPO Comets Section has received 111 magnitude estimates and 61 images and sketches of comets C/2022 A1 (Sárneczky), C/2021 O3 (PANSTARRS), C/2021 F1 (Lemmon-PANSTARRS), C/2021 A1 (Leonard), C/2020 V2 (ZTF), C/2019 U5 (PANSTARRS), C/2019 T4 (ATLAS), C/2019 L3 (ATLAS), C/2017 K2 (PANSTARRS), 430P/Scotti, 116P/Wild, 104P/Kowal, 67P/Churyumov-Gerasimenko, 29P/Schwassmann-Wachmann, 19P/Borrelly, 6P/d'Arrest and 4P/Faye. Observations were contributed by Paul G. Abel, Dan Bartlett, Michel Besson, Denis Buczynski, John Chumack, Michel Deconinck, Lukas Demetz, J. J. Gonzalez, Christian Harder, Jan Hattenbach, Carl Hergenrother, Eliot Herman, Michael Jäger, Gianluca Masi, Martin Mobberley, Michael Olason, Uwe Pilz, Ludovic Prebet, Raymond Ramlow, Tenho Tuomi, and Chris Wyatt.

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. 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.

Aperture Corrections to Magnitude Measurements

We try to include up to date lightcurves for most of the objects discussed in this report as well as applying aperture corrections to the visual 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 correction used here only corrects for differences in aperture [C. 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. As our work develops, we will investigate the determination of personal corrections for each observer for each individual comet as well as for digital observations.

Comets Calendar for February & March 2022

Feb 01 - 19P/Borrelly at perihelion (q = 1.31 au, 6.9-yr period, V ~8, discovered in 1904, 16th observed return since discovery, target of Deep Space 1 mission, more below)
Feb 02 - C/2021 K3 (Catalina) at perihelion (q = 5.23 au, V ~ 20-21, at small elongation this month)
Feb 03 - C/2021 D2 (ZTF) at perihelion (q = 2.95 au, V ~ 16-17)
Feb 07 - 86P/Wild at perihelion (q = 2.26 au, 6.8-yr period, V ~20, discovered in 1980, should be 7th observed return since discovery, still awaiting recovery)
Feb 07 - P/2011 W1 (PANSTARRS) at perihelion (q = 3.32 au, 10.1-yr period, V ~???, discovered in 2011, first return since discovery, still awaiting recovery)
Feb 08 - First Quarter Moon
Feb 12 - 348P/PANSTARRS at perihelion (q = 2.18 au, 5.6-yr period, V ~ 18-19, discovered in 2010, 3rd observed return)
Feb 13 - 431P/Scotti at perihelion (q = 1.81 au, 6.5-yr period, V ~18-19, discovered in 2002, 3rd observed return)
Feb 14 - C/2021 L3 (Borisov) at perihelion (q = 8.46 au, V ~ 19)
Feb 15 - 97P/Metcalf-Brewington at perihelion (q = 2.57 au, 10.4-yr period, V ~ 16-17, at small elongation this month, discovered in 1906, re-discovered in 1991, 2nd observed return)
Feb 16 - Full Moon
Feb 17 - 382P/Larson at perihelion (q = 4.42 au, 16.5-yr period, V ~ 17, at small elongation this month, discovered in 2007, 5th observed return, multi-magnitude outbursts in 1991 and 2012)
Feb 22/23 - 19P within 1 deg of galaxy NGC 918
Feb 23 - Last Quarter Moon
Feb 23/24 - 19P within 0.3 deg of galaxies NGC 935 and IC 1801
Feb 24 - 19P within 0.6 deg of galaxies NGC 924, 930, and 938
Feb 24 - C/2020 R2 (PANSTARRS) at perihelion (q = 4.69 au, 8400-yr period, V ~ 17)
Feb 26 - 19P within 0.2 deg of galaxy NGC 976
Feb 26 - 9P/Tempel passes within 10' of planetary nebula IC 4732
Mar 02 - New Moon
Mar 04 - 9P/Tempel at perihelion (q = 1.54 au, 5.6-yr period, V ~ 12, discovered in 1867, 14th observed return, target of Deep Impact and Stardust-NEXT missions, more below)
Mar 10 - First Quarter
Mar 12-13 - Mars and C/2021 E3 (ZTF) pass within 10' of each other along our line-of-sight (they are actually 0.74 au apart).
Mar 14-15 - 6P/d'Arrest passes within arc minutes to 0.3 deg of galaxies NGC 941, 955 and 936 (sometimes called 'Darth Vader's Starfighter')
Mar 16 - 19P/Borrelly passes within 0.6 deg of the emission nebula NGC 1333
Mar 18 - Full Moon
Mar 18 - 22P/Kopff at perihelion (q = 1.55 au, 6.4-yr period, V ~ 11, discovered in 1906, 18th observed return, more below)
Mar 18/19 - 104P/Kowal passes half a deg south of the emission nebula Lower's Nebula (Sh2-261)
Mar 19 - 230P/LINEAR (q = 1.57 au, 6.4-yr period, V ~ 16-17, discovered in 2009, 5th observed return including 2 prior to discovery)
Mar 20 - 19P/Borrelly passes within ~0.3 deg of emission nebula IC 348 (omicron Persei cloud)
Mar 21-22 - 6P/d'Arrest passes within arc minutes of galaxy M77 and 0.5 deg from galaxy NGC 1055
Mar 23-24 - 19P/Borrelly passes within arc minutes of PN IC 2003
Mar 24 - Last Quarter

Mar 27 - 19P/Borrelly grazes the southeastern edge of the large California Nebula

Mar 29 - 325P/Yang-Gao (q = 1.43 au, 6.6-yr period, V ~ 16-17, discovered in 2009, should be 4th observed return including pre-discovery observations in 1951, comet has yet to be recovered in 2022)

Mar 29 - 440P/Kobayashi (q = 2.06 au, 25.1-yr period, V ~ 17-19, discovered in 1997, 2nd observed return)

Mar 31 - 319P/Catalina-McNaught at perihelion (q = 1.19 au, 6.7-yr period, V ~ 18, discovered in 2008, should be 3rd observed return, low solar elongation, still awaiting recovery this return

Mar 31 - New Moon

Comets Brighter Than Magnitude 10

19P/Borrelly

Discovered 1904 December 28 by the Alphonse Borrelly

Orbit (from Minor Planet Center, MPEC 2022-C56)

```
  19P/Borrelly
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Feb. 1.82550 TT                                    Rudenko
q   1.3062755            (2000.0)            P              Q
n   0.14400107     Peri.  351.91733     +0.38679754     -0.79276740
a   3.6048918      Node    74.24701     +0.87108458     +0.14644908
e   0.6376381      Incl.   29.30470     +0.30265379     +0.59166926
P   6.84
From 1044 observations 2015 Jan. 11-2022 Feb. 2, mean residual 0".7.
     Nongravitational parameters A1 = -0.00, A2 = -0.2608.
```

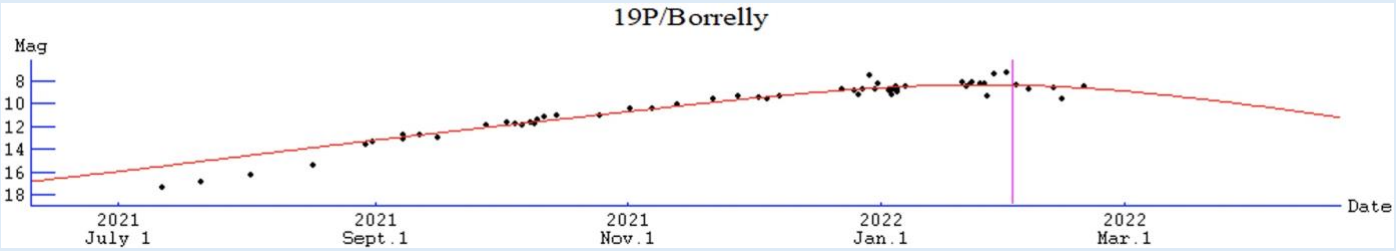
Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

19P/Borrelly

Date	R.A.	Decl.	r	d	Elong	Const	Mag	Max El (deg) 40N	40S
2022-Feb-21	02 18	+17 47	1.326	1.368	66E	Ari	8.7	47	8
2022-Feb-26	02 32	+20 51	1.338	1.401	65E	Ari	8.8	47	6
2022-Mar-03	02 47	+23 45	1.352	1.437	64E	Ari	9.0	46	4
2022-Mar-08	03 02	+26 29	1.368	1.475	63E	Ari	9.1	46	3
2022-Mar-13	03 18	+29 01	1.387	1.515	63E	Ari	9.3	46	2
2022-Mar-18	03 34	+31 22	1.408	1.557	62E	Per	9.5	45	1
2022-Mar-23	03 51	+33 30	1.431	1.601	61E	Per	9.7	44	0
2022-Mar-28	04 09	+35 25	1.455	1.648	61E	Per	10.0	44	0
2022-Apr-02	04 27	+37 07	1.481	1.696	60E	Per	10.2	43	0

Comet Magnitude Formula & Lightcurve (from ALPO and COBS photometry)

m1 = 5.3 + 5 log d + 22.0 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 (UT)		Mag	SC	APER	FL	POW	COMA T	COMA Dia	COMA DC	TAIL LENG	TAIL PA	ICQ	CODE	Observer Name
19	2022 02 19.09	Z	9.2	AQ	10.6R	5a	180	12			22.0m	78	ICQ	XX RAMaa	Raymond Ramlow
19	2022 02 13.75	S	9.9	TK	12.0R	7	50	2.2	3					PIL01	Uwe Pilz
19	2022 02 11.76	S	8.9	TI	25.2L	4	68	3	4				ICQ	XX HAR11	Christian Harder
19	2022 02 05.85	S	9.1	TK	20.3T	10	77	5	5				ICQ	XX GON05	J J Gonzalez
19	2022 01 31.45	xM	8.8	TK	25.0L	5	40	8.0	6				ICQ	XX WYA	Chris Wyatt
19	2022 01 28.44	xM	8.9	TK	25.0L	5	40	5.0	6				ICQ	XX WYA	Chris Wyatt
19	2022 01 26.78	E	9.6	TK	25.0C	10	96	3	6		5.0m	25	ICQ	XX DECaa	Michel Deconinck
19	2022 01 26.08	Z	9.0	AQ	10.6R	5a	180	11.6			30.0m	76	ICQ	XX RAMaa	Raymond Ramlow
19	2022 01 25.08	Z	9.0	AQ	10.6R	5a	180	11.4		>	20.0m	71	ICQ	XX RAMaa	Raymond Ramlow
19	2022 01 23.08	Z	8.9	AQ	10.6R	5a	180	12.2		>	40.0m	69	ICQ	XX RAMaa	Raymond Ramlow
19	2022 01 22.76	E	8.6	TK	25.0C	10	96	4.3	5		8.5	285	ICQ	XX DECaa	Michel Deconinck
19	2022 01 21.84	S	8.8	TK	20.3T	10	77	7	5				ICQ	XX GON05	J J Gonzalez
19	2022 01 20.76	I	8.5:	TK	25.0C	10	62	3	6		7.0m	270	ICQ	XX DECaa	Michel Deconinck
19	2022 01 07.08	Z	9.2	AQ	10.6R	5a	180	10.3					ICQ	XX RAMaa	Raymond Ramlow
19	2022 01 05.12	Z	9.0	U4	7.2R	5A	200	9.8					ICQ	xx HER02	Carl Hergenrother
19	2022 01 03.74	S	9.5	TI	25.2L	4	68	3.4	4				ICQ	XX HAR11	Christian Harder
19	2022 01 03.08	S	9.3	TK	12.5B		30	3	5				ICQ	xx HER02	Carl Hergenrother

This year's apparition of comet 19P/Borrelly is its 16th observed return. Its best recent returns were in 1987 and 1994 with approaches to 0.48 and 0.62 au of Earth when the comet reached magnitude 7.0 to 7.5. 2022 begins a new series of good apparitions. Though still a distant 1.17 au from Earth at its closest this time around, it will come closer in 2028 (0.41 au), 2035 (0.62 au), 2042 (1.13 au), 2084 (1.12 au), 2091 (0.87 au) and 2097 (0.63 au). The next return in 2028 will be Borrelly's best between 1900 and 2100.

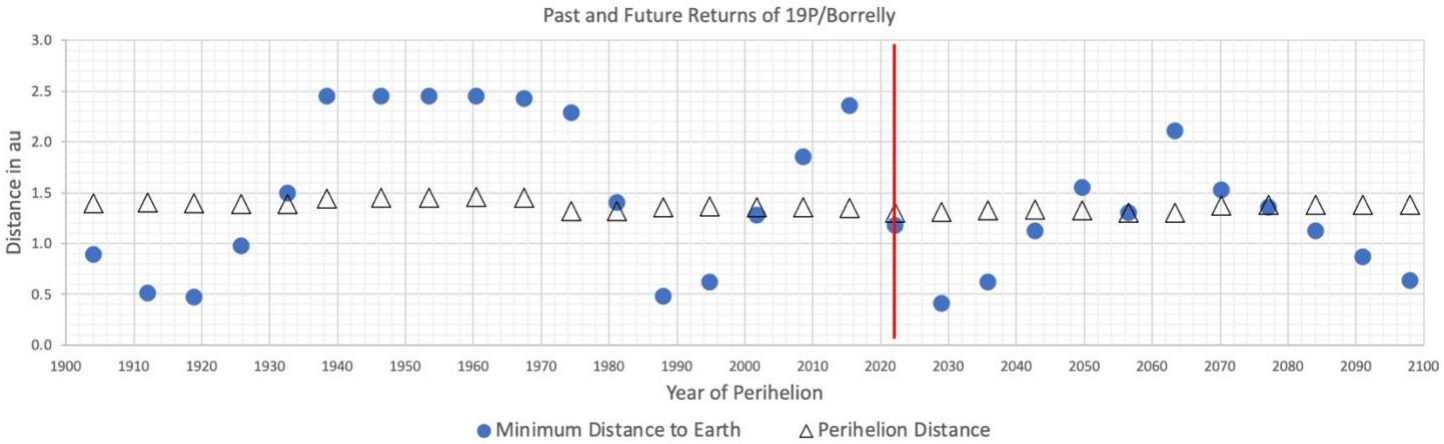


Figure 1 - Orbital evolution of 19P/Borrelly. Red vertical line highlights the current apparition. Ephemeris data from JPL Horizons.

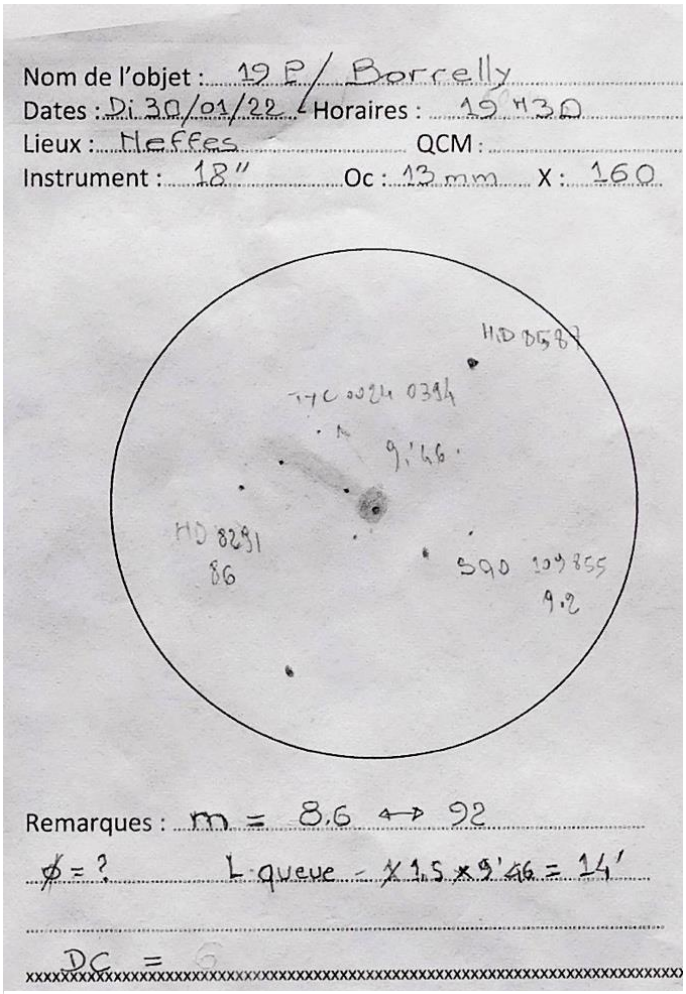


Figure 2 - Sketch of 19P/Borrelly by Ludovic Perbet from January 30 with an 18" at 160 power.

Borrelly is well placed for northern observers in the evening sky as its moves through Pisces (Feb 1-8), Aries (Feb 8-Mar 16), Taurus (Mar 16-17) and Perseus (Mar 17-31). It is a very low object for southern hemisphere observers over the coming weeks.

The comet has spent most of January and February near a peak brightness of around magnitude 8.5. Visual observers have found the comet to possess a moderately condensed coma with a diameter between 2 and 8'. Digital observers such as Raymond Ramlow have measured an even larger 12' coma. Both visual and digital observers have measured a tail with a length up to 8.5' (visual by Michel Deconinck) and >40' (Ramlow).

With perihelion on February 1 at 1.31 au and also past a close approach to Earth back on December 11 at 1.17 au, Borrelly will be fading to magnitude 8.9 on March 1 and 10.1 on April 1.

67P/Churyumov-Gerasimenko

Discovered 1969 September 11 by the Klim Ivanovic Churyumov and Svetlana Ivanovna Gerasimenko

Orbit (from Minor Planet Center, MPEC 2022-C234)

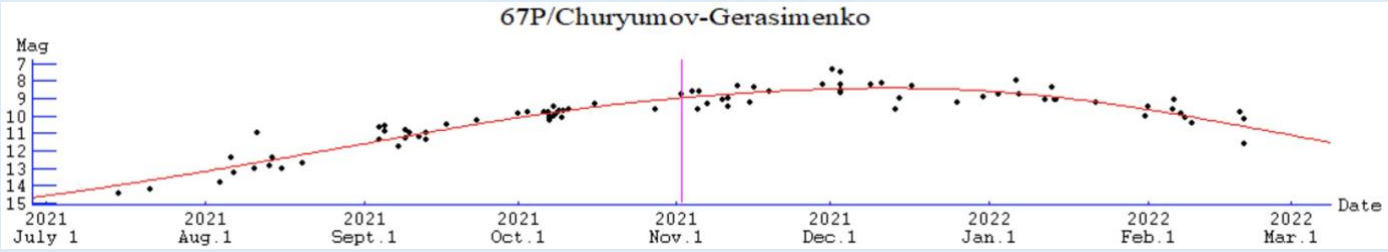
```
  67P/Churyumov-Gerasimenko
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2021 Nov. 2.06610 TT                                  Rudenko
q   1.2106353           (2000.0)            P              Q
n   0.15341013     Peri.   22.13754     +0.52344257     -0.85112130
a   3.4559440      Node    36.33326     +0.77128094     +0.45334084
e   0.6496947      Incl.    3.87162     +0.36212373     +0.26471609
P   6.42
From 9780 observations 1995 July 3-2022 Feb. 13, mean residual 0".8.
     Nongravitational parameters A1 = +0.08, A2 = +0.0111.
```

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

```
67P/Churyumov-Gerasimenko                                          Max El
                                                                    (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2022-Feb-21  08 23   +27 25    1.785    0.864   148E    Cnc   10.7    77   23
2022-Feb-26  08 23   +26 58    1.824    0.927   144E    Cnc   10.9    77   23
2022-Mar-03  08 24   +26 28    1.863    0.994   139E    Cnc   11.2    76   24
2022-Mar-08  08 26   +25 58    1.902    1.065   135E    Cnc   11.5    76   24
2022-Mar-13  08 29   +25 26    1.942    1.139   130E    Cnc   11.8    75   25
2022-Mar-18  08 32   +24 54    1.981    1.217   126E    Cnc   12.0    75   25
2022-Mar-23  08 35   +24 21    2.021    1.298   122E    Cnc   12.3    74   26
2022-Mar-28  08 40   +23 47    2.061    1.382   119E    Cnc   12.6    74   26
2022-Apr-02  08 44   +23 13    2.100    1.468   115E    Cnc   12.8    73   27
```

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

```
m1 = 9.1 + 5 log d + 12.6 log r(t-52)
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
 67        2022 02 19.86  S 10.2 TK 20.3T10  77   3    3            ICQ XX GON05 J J Gonzalez
 67        2022 02 19.76  S 12.1 HS 32.0L 5  80        3                 PIL01 Uwe Pilz
 67        2022 02 19.11  Z 10.5 AQ 10.6R 5a180   6.5      49.0m280 ICQ XX RAMaa Raymond Ramlow
 67        2022 02 09.71 xM 10.4 AQ 25.0L 5  40   3.4  3/           ICQ XX WYA   Chris Wyatt
 67        2022 02 07.54 xM 10.2 AQ 25.0L 5  40   3.4  4            ICQ XX WYA   Chris Wyatt
 67        2022 02 06.24  Z  9.1 AQ 10.6R 5a180   9.8      40.0m280 ICQ XX RAMaa Raymond Ramlow
 67        2022 02 05.90  S  9.9 TK 20.3T10  77   4    4            ICQ XX GON05 J J Gonzalez
 67        2022 01 31.48 xM 10.3 TK 25.0L 5  40   4.3  5/           ICQ XX WYA   Chris Wyatt
 67        2022 01 21.87  S  9.5 TK 20.3T10  77   5    5            ICQ XX GON05 J J Gonzalez
 67        2022 01 14.26  S  9.4 TK 20.3T10  77   4    5   0.1  290 ICQ XX GON05 J J Gonzalez
 67        2022 01 13.45  Z  9.1 AQ 10.6R 5a180  12        39.9m291 ICQ XX RAMaa Raymond Ramlow
 67        2022 01 06.81  S  8.8 TK  7.0B 6  16   4                 PIL01 Uwe Pilz
 67        2022 01 06.38  Z  8.7 AQ 10.6R 5a180  16.3      34.0m292 ICQ XX RAMaa Raymond Ramlow
 67        2022 01 06.11  S 68.0 TI 25.2L 4  68   3.5  4/    9.0m290 ICQ XX HAR11 Christian Harder
```

67P was discovered on photographic plates taken on 1969 September 11 by Kiev University Astronomical Observatory astronomers Klim Ivanovic Churyumov and Svetlana Ivanovna Gerasimenko working at the Alma-

Ata Astrophysical Institute in current day Kazakhstan. The current apparition is 67P's 9th observed return with perihelion occurring back on 2021 November 2 at 1.21 au and closest approach to Earth at 0.42 au on November 12. The close approach makes this the comet's best return since 1982 when it came marginally closer to Earth at 0.39 au. This is also the best apparition throughout the remainder of the century though there will be similar close approaches to Earth in 2034 (0.45 au), 2067 (0.44 au), and 2080 (0.49 au).

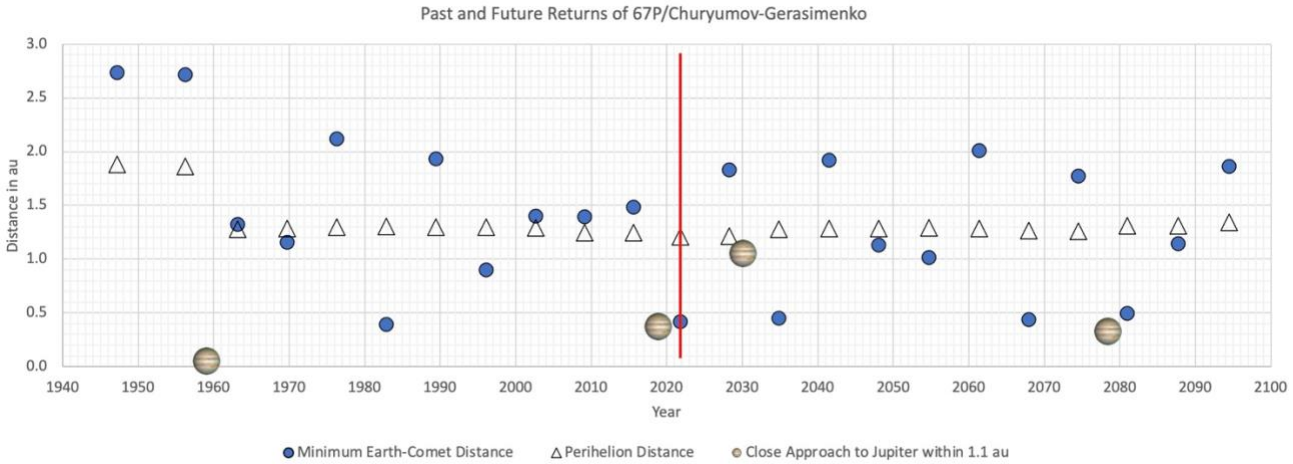


Figure 3 - Orbital evolution of 67P/C-G. Red vertical line highlights the current apparition. Ephemeris data from JPL Horizons.

Now months after its November perihelion, 67P is a fading evening sky object (all month in Cancer). Its peak brightness appeared to have occurred in December around magnitude 8.5. Visual observers recently measured a coma 3 to 5' in diameter with imagers still tracing a tail up to nearly a degree in length. In mid-February it will be around magnitude 10.5, though fading to 11 by March 1 and close to 13 by the end of March.

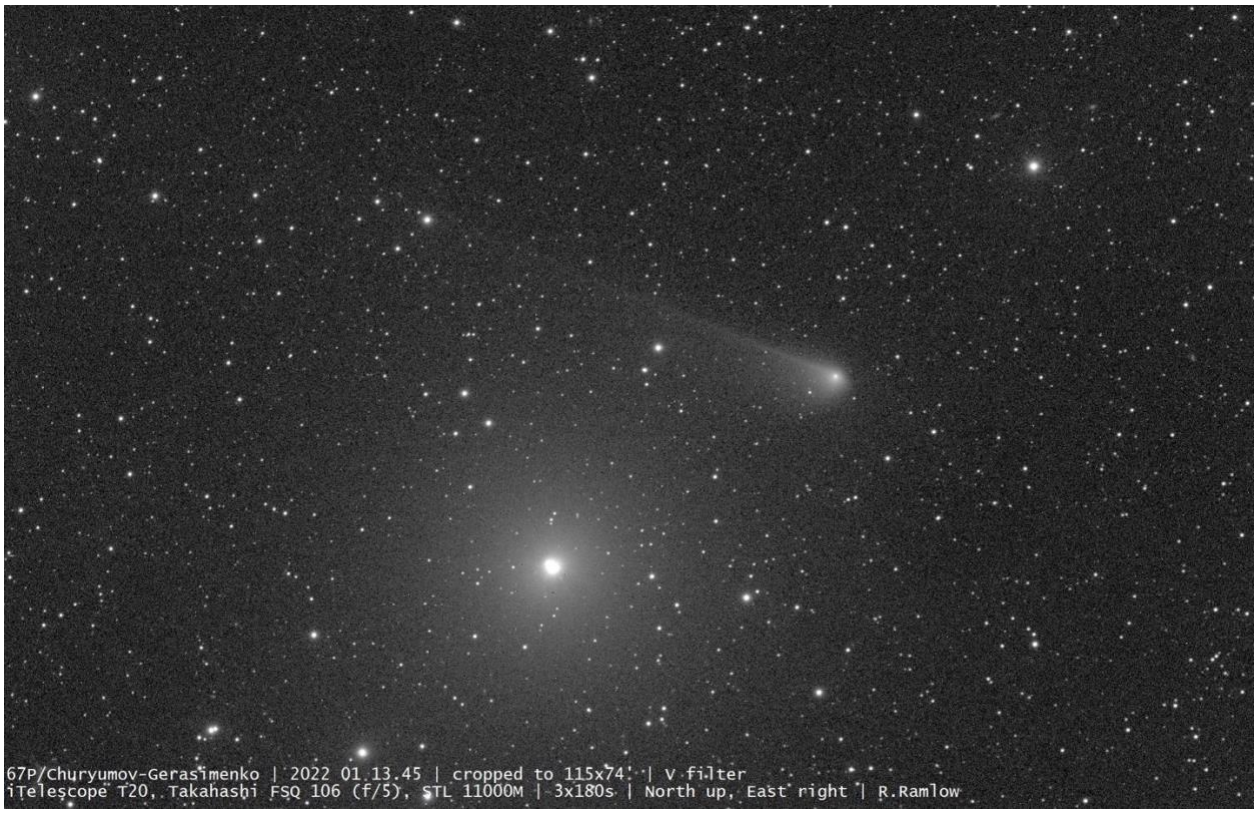


Figure 4 - Raymond Ramlow caught 67P on January 13 with an iTelescopes 0.11-m refractor in a co-added 3x180s V-band images.

104P/Kowal

Photographically discovered on 1979 January 27 by Charles Kowal at Palomar Observatory

Orbit (from Minor Planet Center, MPEC 2022-C234)

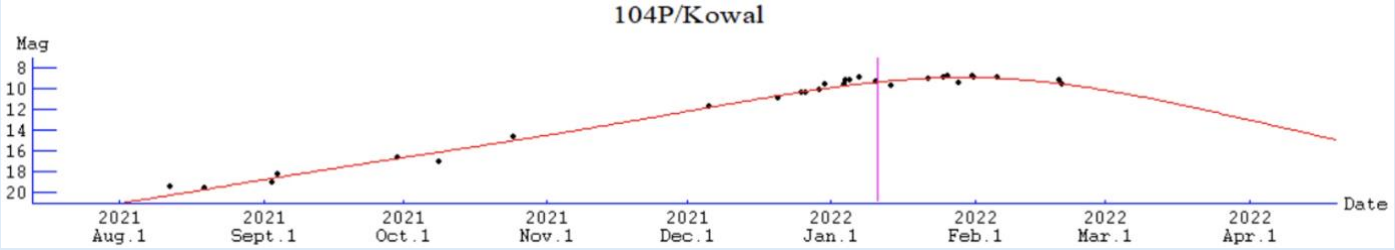
```
104P/Kowal
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Jan. 11.62552 TT                                    Rudenko
q   1.0730252           (2000.0)            P              Q
n   0.17172988     Peri.  227.25577     +0.26936620     -0.96196575
a   3.2055715      Node   207.21647     +0.91004789     +0.26969309
e   0.6652624      Incl.    5.70052     +0.31504712     +0.04344566
P   5.74
From 966 observations 2016 Jan. 3-2022 Feb. 13, mean residual 0".9.
     Nongravitational parameters A1 = -0.18, A2 = -1.9304.
```

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

```
104P/Kowal                                                          Max El
                                                                     (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2022-Feb-21  04 09  +10 40    1.204   0.679     90E    Tau    9.7     58   30
2022-Feb-26  04 35  +11 54    1.234   0.707     91E    Tau   10.0     59   30
2022-Mar-03  04 59  +12 57    1.267   0.740     92E    Ori   10.4     60   31
2022-Mar-08  05 23  +13 49    1.302   0.779     93E    Ori   10.8     60   31
2022-Mar-13  05 45  +14 28    1.339   0.823     94E    Ori   11.3     61   32
2022-Mar-18  06 07  +14 57    1.376   0.873     94E    Ori   11.8     61   32
2022-Mar-23  06 27  +15 16    1.415   0.927     94E    Ori   12.2     60   33
2022-Mar-28  06 47  +15 26    1.455   0.985     94E    Gem   12.7     60   33
2022-Apr-02  07 05  +15 28    1.496   1.048     93E    Gem   13.2     59   33
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 9.1 + 5 log d + 30.7 log r(t-18)
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
104        2022  2 19.82  S  9.6 TK 20.3T10  77   5    3            ICQ XX GON05 J J Gonzalez
104        2022 02 19.10  Z  9.9 AQ 10.6R 5a180  10.5       4.5m 71 ICQ XX RAMaa Raymond Ramlow
104        2022 02 05.87  S  9.3 TK 20.3T10  77   6    3/           ICQ XX GON05 J J Gonzalez
104        2022 01 31.46 xM  9.2 TK 25.0L 5  40   7.5  4            ICQ XX WYA   Chris Wyatt
104        2022 01 28.45 xM  9.8 TK 25.0L 5  40   5.3  4            ICQ XX WYA   Chris Wyatt
104        2022 01 26.09  Z  9.6 AQ 10.6R 5a180  11.1       5.5m 68 ICQ XX RAMaa Raymond Ramlow
104        2022 01 25.09  Z  9.7 AQ 10.6R 5a180  10.8       7.0m 69 ICQ XX RAMaa Raymond Ramlow
104        2022 01 28.45 xM  9.8 TK 25.0L 5  40   5.3  4            ICQ XX WYA   Chris Wyatt
104        2022 01 25.09  Z  9.7 AQ 10.6R 5a180  10.8       7.0m 69 ICQ XX RAMaa Raymond Ramlow
104        2022 01 21.81  S  9.4 TK 20.3T10  77   8    3            ICQ XX GON05 J J Gonzalez
104        2022 01 07.08  Z  9.7 AQ 10.6R 5a180   9.8                ICQ XX RAMaa Raymond Ramlow
104        2022 01 05.15  Z  9.2 U4  7.2R 5A200  10.6                ICQ xx HER02 Carl Hergenrother
104        2022 01 05.10  S  9.6 TK 12.5B    30   4    3            ICQ xx HER02 Carl Hergenrother
104        2022 01 04.08  S  9.6 TK 12.5B    30   5    3            ICQ xx HER02 Carl Hergenrother
104        2022 01 03.75  S 10.0 TI 25.2L 4  68   4.2  3            ICQ XX HAR11 Christian Harder
```

Short-period comet 104P/Kowal was discovered on 1979 January 27, 28, and 29 at 17th magnitude by Charles Kowal on photographic plates taken with the 1.2-m Schmidt on Mount Palomar. 104P was one of 6 periodic comets discovered by Kowal. In addition to 104P, he also found 95P/Chiron, 99P/Kowal, 134P/Kowal-Vavrova, 143P/Kowal-Mrkos, and 158P/Kowal-LINEAR. Visual comet discoverer Reverend Leo Boethin of the Philippines observed an outburst of 104P in 1973 though it faded before his discovery could be confirmed.

The perihelion distance of 104P has decreased since its original sighting in 1973 from 1.53 to its current 1.07 au. An approach to 0.62 au of Jupiter in 2031 will result in another decrease to 0.98 au at its 2033 return. The current return will see 104P's smallest observed distance to Earth at 0.64 au. Even closer approaches are possible during the remainder of the century in 2039 (0.40 au), 2049 (0.25 au), 2060 (0.07 au), 2071 (0.39 au), 2082 (0.59 au), and 2093 (0.31 au). As a result, 104P may become a routine small telescope object in the future.

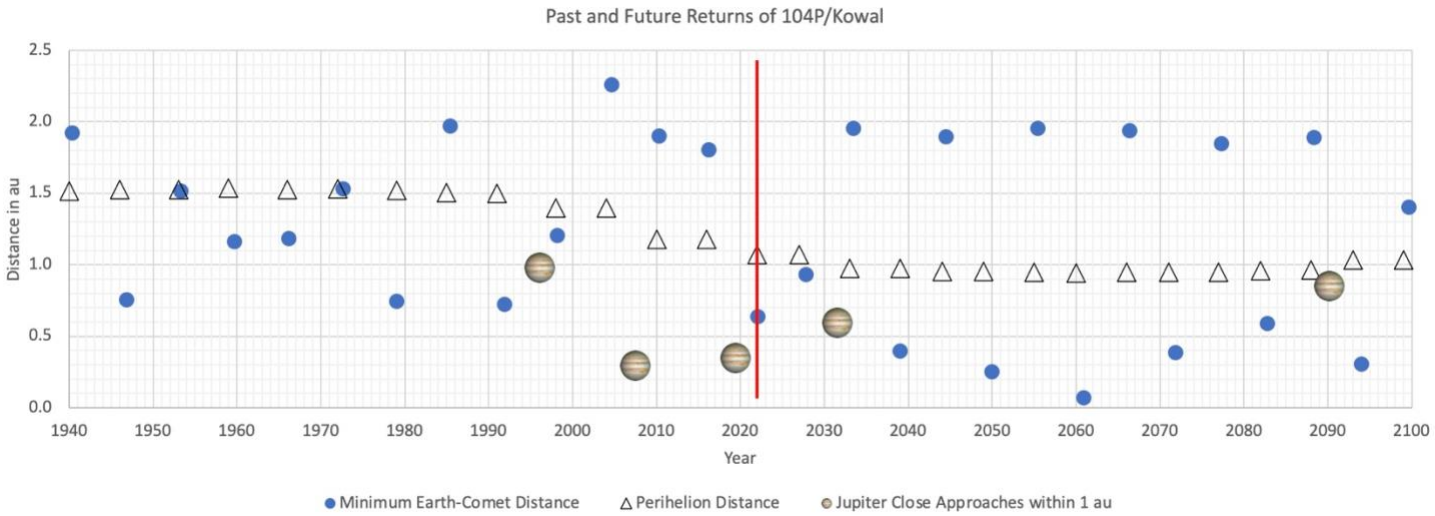


Figure 5 - Orbital evolution of 104P/Kowal. Red vertical line highlights the current apparition. Ephemeris data from JPL Horizons.

104P is also passed its perihelion and has likely started fading. Around magnitude 9.5 in mid-February, it should fade to magnitude 10.0 in late Feb, 11.0 in early March, 12.0 in mid to late March. Kowal is visible from both hemispheres as it moves through Cetus (Feb 1-12), Taurus (12-28), Orion (28-Mar 13), back to Taurus (13-15), Orion again (15-23) and Gemini (23-31) in the evening sky. Observers in January and February found a somewhat condescend coma 5-8' in diameter. Imagers found the coma to be even larger at 11'.

Figure 6 - 104P/Kowal as imaged on 2022-Feb-03 by Tenho Tuomi with a 0.3-m reflector in 19x60s exposures.

C/2017 K2 (PANSTARRS)

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

Orbit (from MPEC 2022-C234)

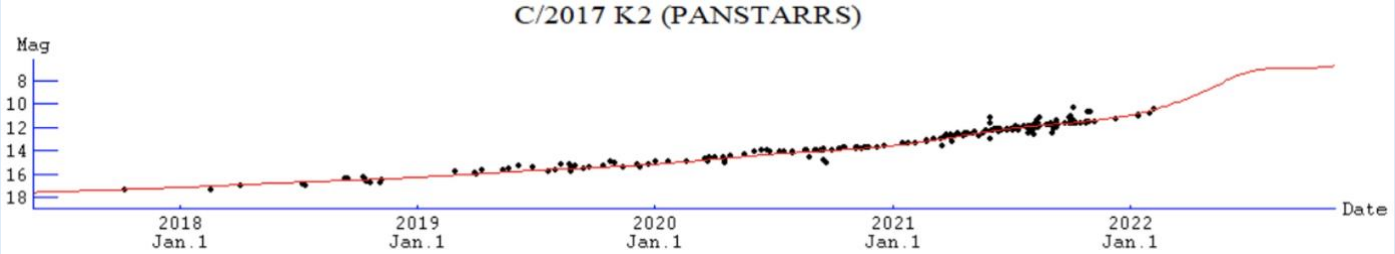
```
    C/2017 K2 (PANSTARRS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Dec. 19.69271 TT                                  Rudenko
q   1.7971148           (2000.0)            P              Q
z  -0.0003888      Peri.  236.19338     +0.01825454     +0.04925455
 +/-0.0000007      Node    88.23673     -0.18101565     +0.98244339
e   1.0006987      Incl.   87.55886     -0.98331079     -0.17994159
From 7179 observations 2013 May 12-2022 Feb. 11, mean residual 0".4.
1/a(orig) = -0.000031 AU**-1, 1/a(fut) = +0.001161 AU**-1.
```

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

```
C/2017 K2 (PANSTARRS)                                                Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag   40N  40S
2022 Feb 21   18 36   +12 20    3.937   4.356    58M   Oph    10.2   38    8
2022 Feb 26   18 39   +11 18    3.892   4.258    61M   Oph    10.2   40   12
2022 Mar 03   18 42   +11 18    3.847   4.156    65M   Oph    10.1   41   16
2022-Mar-08   18 45   +11 20    3.802   4.052    68M   Oph    10.0   43   20
2022-Mar-13   18 47   +11 22    3.756   3.944    71M   Aql     9.9   45   24
2022-Mar-18   18 49   +11 25    3.711   3.834    75M   Aql     9.8   46   27
2022-Mar-23   18 51   +11 29    3.665   3.722    79M   Aql     9.7   48   30
2022-Mar-28   18 53   +11 33    3.620   3.609    82M   Aql     9.6   49   32
2022-Apr-02   18 54   +11 37    3.575   3.493    86M   Aql     9.5   51   35
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  2.7 + 5 log d + 7.3 log r
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL     ICQ    CODE  Observer Name
             (UT)                      T          Dia  DC  LENG  PA
   2017K2  2022 02 06.25  S 10.6 TK 20.3T10  77   3    3            ICQ XX GON05 J J Gonzalez
   2017K2  2022 01 14.22  S 11.1 TK 20.3T10  77   2.5  3/           ICQ XX GON05 J J Gonzalez
```

C/2017 K2 (PANSTARRS) was discovered back on 2017 May 21 by the Pan-STARRS1 1.8-m telescope at Haleakala on the Hawaiian island of Maui. At discovery the comet was around 21st magnitude and located at 16.1 au from the Sun. Pre-discovery observations were found back to May of 2013 when the comet was 23.7 au from the Sun which is further than the distance of Uranus.

Even though it was discovered over nearly 3 years ago, perihelion isn't till 2022 December 19 at 1.80 au. In contrast to some recent comets, C/2017 K2 has brightened at a steady rate back to at least 2018. If that rate continues, it should brighten above magnitude 10.0 by early to mid-March as it moves through Ophiuchus (Feb 1-March 8) and Aquila (March 8-31) in the morning sky.

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-C234)

```
    C/2019 L3 (ATLAS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Jan.  9.62407 TT                                   Rudenko
q   3.5544798           (2000.0)            P                Q
z  -0.0004440      Peri.  171.61167     -0.26052878      -0.66630389
 +/-0.0000003      Node   290.78995     +0.83676453      +0.20516665
e   1.0015781      Incl.   48.36123     +0.48161175      -0.71690011
From 4036 observations 2019 June 10-2022 Feb. 11, mean residual 0".4.
1/a(orig) = +0.000111 AU**-1, 1/a(fut) = -0.000872 AU**-1.
```

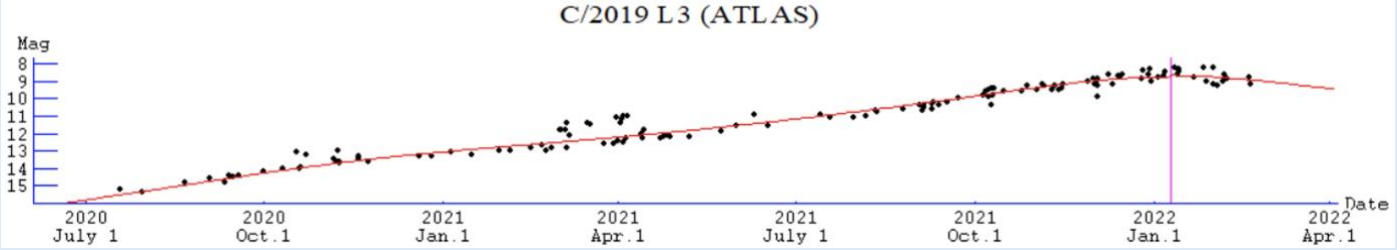
Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

C/2019 L3 (ATLAS)

Date	R.A.	Decl.	r	d	Elong	Const	Mag	Max El (deg) 40N	40S
2022-Feb-21	06 35	+22 50	3.575	2.902	126E	Gem	8.9	73	27
2022-Feb-26	06 34	+21 55	3.580	2.969	120E	Gem	9.0	72	28
2022-Mar-03	06 34	+21 03	3.586	3.040	115E	Gem	9.1	71	29
2022-Mar-08	06 34	+20 12	3.592	3.115	111E	Gem	9.1	70	29
2022-Mar-13	06 35	+19 24	3.599	3.192	106E	Gem	9.2	69	30
2022-Mar-18	06 36	+18 38	3.607	3.272	101E	Gem	9.2	67	30
2022-Mar-23	06 38	+17 54	3.615	3.353	97E	Gem	9.3	64	31
2022-Mar-28	06 40	+17 11	3.623	3.436	92E	Gem	9.4	60	31
2022-Apr-02	06 43	+16 30	3.632	3.519	88E	Gem	9.4	56	31

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

```
m1 = -5.8 + 5 log d + 22.7 log r [T-600 days to T-0]
m1 =  1.1 + 5 log d + 10.0 log r [T-0 and onwards, assumed]
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 (UT)		Mag	SC	APER	FL	POW	T	COMA Dia	COMA DC	TAIL LENG	TAIL PA	ICQ CODE	Observer Name
2019L3	2022 02 19.85	S	9.2	TK	20.3	T10	77	3	6				ICQ XX	GON05 J J Gonzalez
2019L3	2022 02 19.10	Z	8.8	AQ	10.6	R 5a	180	10.1			12.0m	359	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 02 07.53	xM	9.3	AQ	25.0	L 5	40	2.8	5/				ICQ XX	WYA Chris Wyatt
2019L3	2022 02 06.23	Z	8.6	AQ	10.6	R 5a	180	10.3			10.0m	356	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 02 05.88	S	9.3	TK	20.3	T10	77	4	6				ICQ XX	GON05 J J Gonzalez
2019L3	2022 02 02.88	S	9.5	TK	10.5	R 6	37	3			0.05	137		PIL01 Uwe Pilz
2019L3	2022 01 31.47	xM	9.6	TK	25.0	L 5	74	2.5	6				ICQ XX	WYA Chris Wyatt
2019L3	2022 01 28.48	xM	9.4	TK	25.0	L 5	40	2.7	6				ICQ XX	WYA Chris Wyatt
2019L3	2022 01 26.77	E	8.5	TK	25.0	C10	96	1	4				ICQ XX	DECaa Michel Deconinck
2019L3	2022 01 21.86	S	9.1	TK	20.3	T10	77	4	6				ICQ XX	GON05 J J Gonzalez
2019L3	2022 01 14.25	S	8.8	TK	20.3	T10	77	4	6		0.2	320	ICQ XX	GON05 J J Gonzalez
2019L3	2022 01 13.44	Z	8.8	AQ	10.6	R 5a	180	10			16.0m	322	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 01 06.81	S	8.5	TK	7.0	B 6	16	2			0.07	118		PIL01 Uwe Pilz
2019L3	2022 01 06.38	Z	8.9	AQ	10.6	R 5a	180	10.5			16.0m	313	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 01 06.12	S	9.3	TI	25.2	L 4	68	4.8	4		6.5m	280	ICQ XX	HAR11 Christian Harder
2019L3	2022 01 03.75	S	9.4	TI	25.2	L 4	68	3.3	4/		4.0m	310	ICQ XX	HAR11 Christian Harder

C/2019 L3 (ATLAS) is yet another fading comet in the evening sky. Perihelion was at the beginning of the year on 2022 January 9 at 3.55 au. The large perihelion distance means C/2019 L3 will slowly move away from the Sun and Sun and should result in a slow rate of fading.

Observations in January and February caught the comet near its peak brightness with most estimates in the magnitude 8.6 to 9.5 range. While its visual coma was rather small at 2-4' it was consistently seen as moderately condensed with DC values of 4-6. Both visual observers and imagers detected a short tail up to 16' in length.

C/2019 L3 (ATLAS) spends all month in Gemini and is well placed in the evening from both hemispheres. The comet followed a rapid and steady brightening rate (2.5n ~ 22.7) going back to mid-2020. The predicted magnitudes for February and March assume a slowdown in its rate of brightness to 2.5n ~ 10. If not, it may be a bit fainter than the magnitudes given above. Regardless C/2019 L3 should still be a 9th magnitude object throughout the remainder of February and March.

Figure 7 - C/2019 L3 and open cluster NGC 2266 as imaged by Eliot Herman with an iTelescopes 0.15-m refractor on 2021 January 31. Image is a co-add of 5x150s exposures.

C/2021 F1 (Lemmon-PANSTARRS)

Discovered 2021 March 19 by the Mount Lemmon survey
Dynamically old long-period comet with ~3700-year period

Orbit (from MPEC 2022-C234)

```
    C/2021 F1 (Lemmon-PANSTARRS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Apr. 6.87351 TT                                  Rudenko
q   0.9954890           (2000.0)            P              Q
z  +0.0042347      Peri.  146.82231     +0.70298915     +0.60122332
 +/-0.0000020      Node   203.45141     +0.23496395     +0.30785886
e   0.9957844      Incl.  107.32441     +0.67126611     -0.73739639
From 470 observations 2021 Mar. 19-2022 Feb. 13, mean residual 0".4.
1/a(orig) = +0.004927 AU**-1, 1/a(fut) = +0.004345 AU**-1.
```

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

```
C/2021 F1 (Lemmon-PANSTARRS)                                          Max El
                                                                       (deg)
    Date      R.A.    Decl.     r       d    Elong  Const  Mag    40N  40S
2022-Feb-21  21 38  +47 27   1.250   1.432    58M   Cyg   10.2    25    0
2022-Feb-26  22 15  +45 36   1.202   1.462    54M   Lac   10.1    20    0
2022-Mar-03  22 49  +43 16   1.158   1.504    50M   Lac   10.0    16    0
2022-Mar-08  23 18  +40 38   1.118   1.555    45E   And    9.9    14    0
2022-Mar-13  23 43  +37 52   1.082   1.612    41E   And    9.9    13    0
2022-Mar-18  00 04  +35 03   1.052   1.672    36E   And    9.8    10    0
2022-Mar-23  00 23  +32 16   1.028   1.733    31E   And    9.8     7    0
2022-Mar-28  00 39  +29 32   1.010   1.792    26E   And    9.8     4    0
2022-Apr-02  00 54  +26 52   0.999   1.849    22E   Psc    9.8     0    0
```

Comet Magnitude Formula

```
m1 = 8.5 + 5 log d + 10.0 log r (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
   2021F1  2022 02 19.84  S 10.3 TK 20.3T10  77   5    2/           ICQ XX GON05 Juan Jose Gonzalez
   2021F1  2022 02 08.51  Z 11.6 AQ 10.6R 5a300   5                 ICQ XX RAMaa Raymond Ramlow
   2021F1  2022 02 06.24  S 11.2 AQ 20.3T10  77   4    2            ICQ XX GON05 Juan Jose Gonzalez
```

C/2021 F1 (Lemmon-PANSTARRS) was discovered independently by the Catalina Sky Survey with their Mount Lemmon 1.5-m and Pan-STARRS with their Pan-STARRS1 1.8-m on Haleakala on 2021 March 19. At the time, the comet was asteroidal and 20-21st magnitude. Due to the lack of any detected cometary activity, the object was designated as A/2021 F1. Further follow-up observations taken between discovery and August 2021 all reported the object as inactive. A quick analysis of photometry submitted to the Minor Planet Center during that period is consistent with an inactive object with an absolute magnitude of 14.6 corresponding to a diameter of 8 km assuming an albedo of 0.04. It is a dynamically old long-period comet with an original 1/a value of +0.004927 au^{-1}. This means it had (before its orbit was affected by the gravity of the major planets) a semi-major axis of ~203 au and orbital period of ~2800 years.

After reappearing after solar conjunction in December, a number of imagers reported cometary activity and was also 1-2 magnitudes brighter than its inactive absolute magnitude. Since then, the comet has rapidly increased in brightness with the most recent observation by J. J. Gonzalez on February 19 finding the comet at magnitude 10.3. This brightness is confirmed by a CCD brightness of 10.4 reported by Steffen Fritsche to the COBS site. The three observations submitted to the ALPO show the comet to be 4-5' in diameter and very diffuse.

C/2021 F1 is headed towards a perihelion on 2022 April 6 at 1.00 au. Unfortunately, it is located on the far side of the Sun resulting in an apparently fainter object far from Earth and at small solar elongation. Too bad its wasn't occurring around October 18. If that was the case, the comet would be passing 0.084 au from Earth and at magnitude 3.4 or brighter.

The comet is solely a northern object in February and March and not visible from the southern hemisphere. For our brightness predictions we assume the Gonzalez and Fritsche measurements are correct and the comet brightens at a rate of 10 log r (where r is the Sun-comet distance). If its rate of brightening is faster perhaps its will be a few tenths of a magnitude brighter than our predicted observed peak of magnitude 9.8. We say observed because C/2021 F1's solar elongation will steadily fall from around ~60 deg in mid-February to less than 25 deg at the end of March as it moves through Lyra (Feb 1-2), Draco (Feb 2-3), Cygnus (Feb 3-24) Lacerta (Feb 24-March 4), Andromeda (March 4-March 31) and Pisces (March 31). As a result, it will be too close to the Sun for observation by the end of March even for Northern observers. Lemmon-PANSTARRS should reappear by mid-May, though only for southern observers and possible around 11th magnitude.

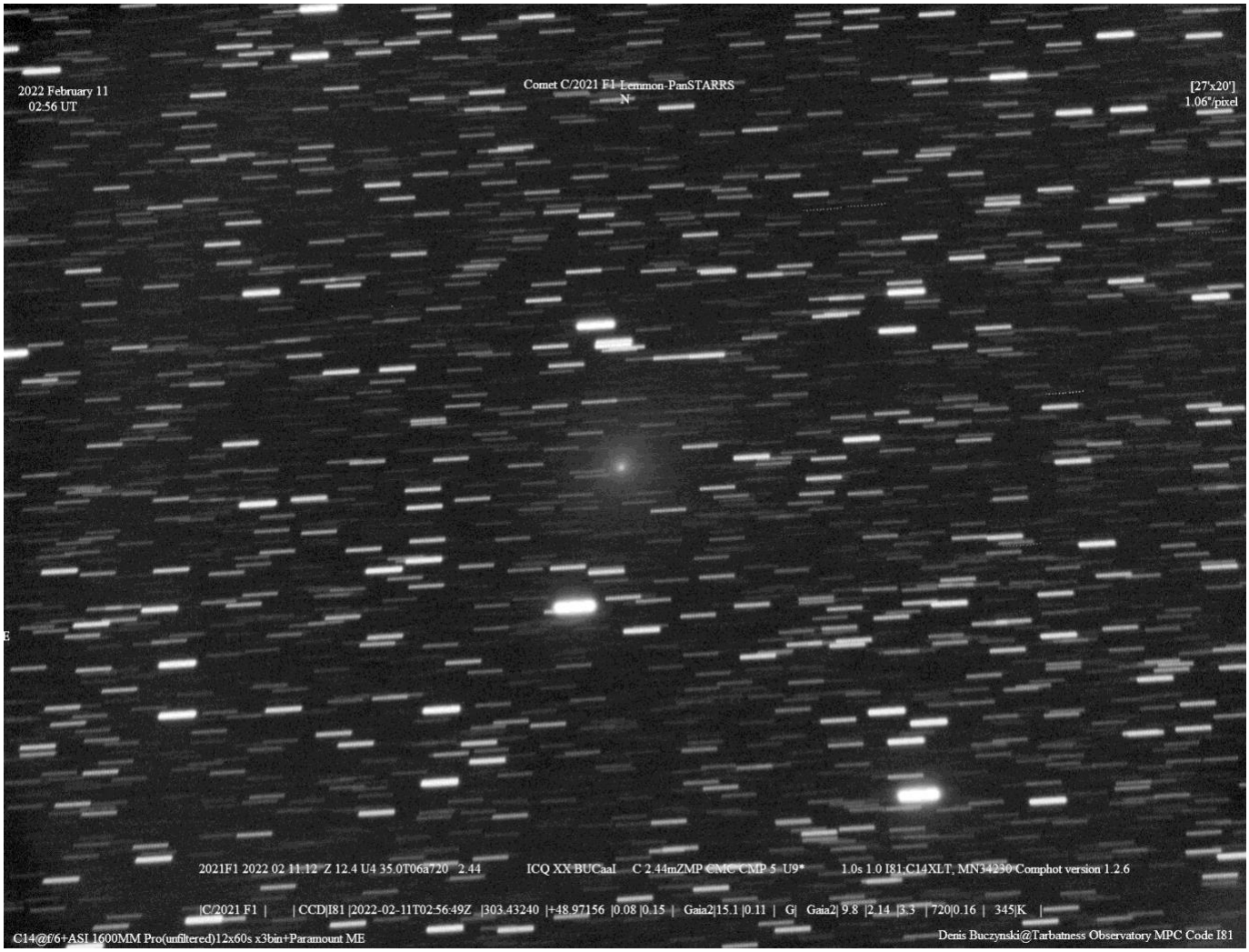


Figure 8 - 12 60s exposures were co-added by Denis Buczynski with his C14 + ASI 1600MM Pro camera on 2022 February 11.

Comets Between Magnitude 10 and 13

4P/Faye

Discovered visually on 1843 November 23 by the Herve Faye

Orbit (from MPEC 2022-C234)

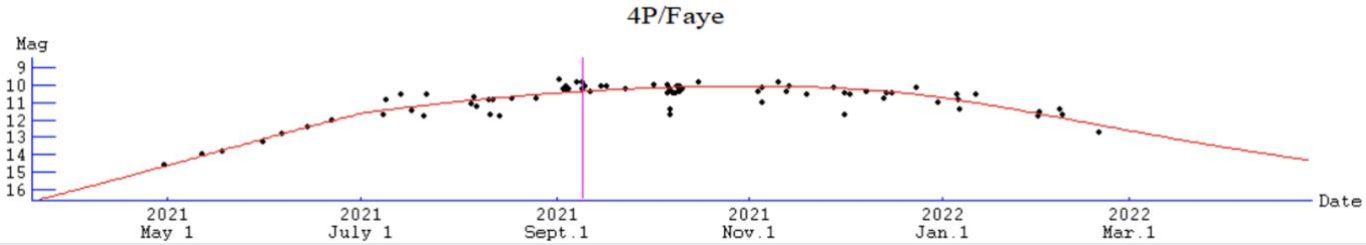
```
   4P/Faye
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2021 Sept. 8.84473 TT                                  Rudenko
q   1.6189103            (2000.0)            P              Q
n   0.13180037     Peri.  207.00527     +0.76775518     -0.63998446
a   3.8240624      Node   192.93052     +0.61016172     +0.74509744
e   0.5766517      Incl.    8.00832     +0.19558798     +0.18774902
P   7.48
From 6438 observations 1998 May 24-2022 Feb. 12, mean residual 0".9.
     Nongravitational parameters A1 = +0.54, A2 = -0.0289.
```

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

```
4P/Faye                                                              Max El
                                                                      (deg)
    Date      R.A.    Decl.     r       d     Elong  Const  Mag    40N  40S
2022-Feb-21  06 24  +12 03   2.267   1.568    123E   Gem   12.3     62   38
2022-Feb-26  06 27  +12 29   2.298   1.646    119E   Gem   12.5     62   37
2022-Mar-03  06 31  +12 54   2.328   1.727    115E   Gem   12.7     63   37
2022-Mar-08  06 35  +13 16   2.359   1.810    111E   Gem   12.8     63   36
2022-Mar-13  06 39  +13 36   2.390   1.896    107E   Gem   13.0     63   36
2022-Mar-18  06 44  +13 54   2.420   1.983    103E   Gem   13.2     63   35
2022-Mar-23  06 49  +14 10   2.451   2.072    100E   Gem   13.3     62   35
2022-Mar-28  06 55  +14 23   2.482   2.162     96E   Gem   13.5     60   34
2022-Apr-02  07 01  +14 34   2.513   2.253     93E   Gem   13.6     57   34
```

Comet Magnitude Formula (from fit to ALPO and COBS data)

```
m1 = 2.2 + 5 log d + 32.5 log r [through T -70 days]
m1 = 7.6 + 5 log d + 10.6 log r [since T -70 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
  4        2022 02 19.75  S 13.2 HS 32.0L 5 144                          PIL01 Uwe Pilz
  4        2022 02 07.53 xS 12.6 AQ 25.0L 5 125   1.0  3           ICQ XX WYA   Chris Wyatt
  4        2022 01 31.47 xS 13.0 AQ 25.0L 5 125   0.7  3           ICQ XX WYA   Chris Wyatt
  4        2022 01 06.81  S 11.4 TK  7.0B 6  16                          PIL01 Uwe Pilz
  4        2022 01 06.38  Z 11.6 AQ 10.6R 5a180   3.2       8.6m284 ICQ XX RAMaa Raymond Ramlow
  4        2021 12 30.88  S 11.2 TK 20.3T10 133   1.5  2/           ICQ XX GON05 J J Gonzalez
```

4P/Faye is slowly becoming a faint object for visual observers. Recent visual observations found a small (0.7-1.0') coma. The comet should fade from around magnitude 12.0 in mid-February to 13.5 by the end of March as it moves through the evening constellations of Orion (Feb 1-20) and Gemini (Feb 20-Mar 31). Faye's next perihelion will be in March 2029 though the comet will get no closer than 1.55 au to Earth. The return after that in September 2036 will be very similar to the current return with an approach to 0.97 au of Earth. We won't see a better return till 2058 with a minimum Earth-comet distance of 0.74 au.

9P/Tempel

Discovered visually on 1867 April 3 by Ernst Wilhelm Leberecht Tempel of Marseille, France

Orbit (from MPEC 2022-C234)

```
   9P/Tempel
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Mar. 4.94891 TT                                  Rudenko
q   1.5442324            (2000.0)            P             Q
n   0.17662663     Peri.  179.34907     -0.37340788     +0.91208337
a   3.1460474      Node    68.71410     -0.85193716     -0.26493204
e   0.5091516      Incl.   10.46999     -0.36710983     -0.31291362
P   5.58
From 1737 observations 2015 Nov. 11-2022 Feb. 9, mean residual 0".5.
     Nongravitational parameters A1 = -0.16, A2 = -0.0838.
```

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

```
9P/Tempel                                                          Max El
                                                                    (deg)
    Date      R.A.   Decl.     r       d    Elong  Const  Mag    40N  40S
2022-Feb-21  18 15  -22 07   1.549   1.818    58M   Sgr  12.3     15   33
2022-Feb-26  18 31  -22 26   1.546   1.787    59M   Sgr  12.2     15   36
2022-Mar-03  18 47  -22 40   1.544   1.758    61M   Sgr  12.2     14   38
2022-Mar-08  19 03  -22 50   1.544   1.730    62M   Sgr  12.1     13   40
2022-Mar-13  19 19  -22 54   1.546   1.702    63M   Sgr  12.1     13   42
2022-Mar-18  19 35  -22 55   1.550   1.676    65M   Sgr  12.0     12   44
2022-Mar-23  19 50  -22 51   1.554   1.651    66M   Sgr  12.0     11   46
2022-Mar-28  20 05  -22 44   1.561   1.626    68M   Sgr  12.0     11   48
2022-Apr-02  20 20  -22 34   1.569   1.602    69M   Cap  11.9     11   49
```

Comet Magnitude Formula (from Yoshida Seiichi's page)

```
m1 = 7.5 + 5 log d + 18.0 log r(t-15)
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
```

William Tempel of Marseilles, France discovered 12 comets visually between 1859 and 1877. 9P/Tempel was his 6th discovery and one of four periodic comets including 10P/Tempel, 11P/Tempel-Swift-LINEAR, and 55P/Tempel-Tuttle. Prior to the IAU's change in comet naming and numbering in the 1990s, 9P was also known as Tempel 1. Note, that some organizations such as NASA and their Planetary Data System still use the old naming scheme so 9P is still cataloged by them as 9P/Tempel 1.

9P/Tempel best known as the target of two spacecraft missions. On 2005 July 4, NASA's Deep Impact mission struck the comet's nucleus with a 100 kg copper impactor. The mission wasn't impacting the comet just for the sake of impacting or even as a hazard mitigation experiment (like the NASA DART mission launched last year to impact a moon of the small near-Earth asteroid Didymos). Impacting a comet results in ejecting material from below surface allowing the main non-impacting part of the Deep Impact mission to study fresher interior material. On 2011 February 15, NASA's Stardust spacecraft (having previously flown by comet 81P/Wild) flew by 9P providing images of the post-Deep Impact crater. Due to the impact and released debris, Deep Impact itself was not able to directly image the post-impact surface before it flew past the comet. Thanks to the two missions, we now know 9P's nucleus is rather large for a short-period comet with dimensions of 7.6 x 4.9 km (4.7 x 3.0 miles).

At discovery, 9P's perihelion was at 1.53 au from the Sun. Close approaches to Jupiter in 1870 and 1881 increased Tempel's perihelion distance out to 1.75 and 2.07 au, respectively. The larger perihelion distance resulted in 9P going undetected for ~88 years after its 1879 return. Though its perihelion dropped from 2.07 au in 1937 to 1.69

au in 1944 and 1.53 au in 1955, it was missed at what should have been a favorable 1961 return and not recovered till 1967. Though an unfavorable return was predicted for 1967, Dr. Elizabeth Roemer used the now named Kuiper 1.54-m reflector north of Tucson to photographically recover a faint 18th magnitude P/Tempel on a single night. Further observations during the next return in 1972 conformed the 1967 recovery. Since its 1955 return, Tempel's perihelion has stayed around 1.5 au and its returns have alternated between very unfavorable and favorable. At its best return in 1994 it reached a maximum brightness of 9th magnitude.

Unfortunately, Tempel's last good return was in 2005 (the same return as the Deep Impact collision) with a minimum Earth distance of 0.71 au. Close approaches to Jupiter in 2024 and 2036 will once again increase the perihelion distance to 1.77 and 1.93 au, respectively. This will result in the comet never getting closer than 0.95 au of Earth through the remainder of this century.

This February and March, 9P will be moving through the morning constellations of Ophiuchus (Feb 1-10), Sagittarius (Feb 10-Mar 28) and Capricornus (Mar 29-31). It should reach a peak brightness of around magnitude 12.0 in April.

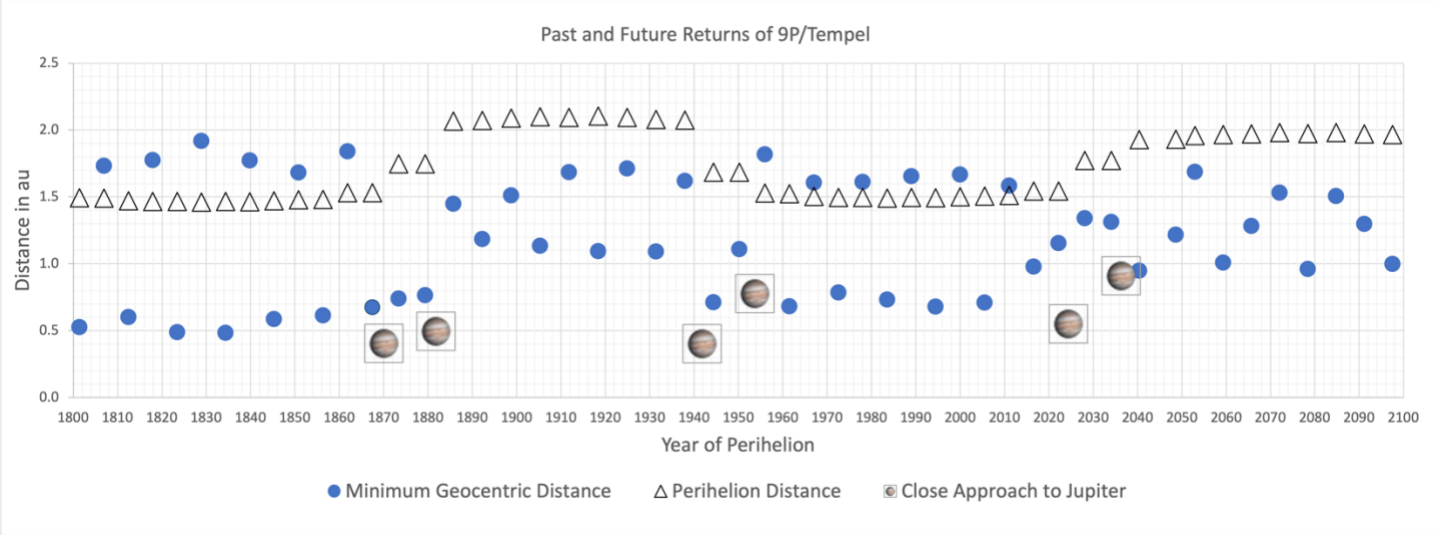


Figure 9 - Orbital evolution of 9P/Tempel from 1860 to 2100.

Figure 10 - 9P/Tempel on 2005 July 4 only moments after the collision of the Deep Impact impactor. Credit: NASA/University of Maryland.

22P/Kopff

Discovered photographically on 1906 August 23 by the August Kopff at the Königstuhl Observatory in Heidelberg, Germany

Orbit (from MPEC 2015-K139)

```
  22P/Kopff
Epoch 2022 Mar. 2.0 TT = JDT 2459640.5
T 2022 Mar. 18.11295 TT                                  MPCW
q   1.5524080            (2000.0)            P              Q
n   0.15445949     Peri.  163.02363     +0.24033534     +0.96809068
a   3.4402736      Node   120.83205     -0.89991689     +0.24962854
e   0.5487545      Incl.    4.74218     -0.36385232     +0.02204593
P   6.38
From 3050 observations 2001 Dec. 19-2015 May 26, mean residual 0".6.
     Nongravitational parameters A1 = -0.06, A2 = -0.0620.
```

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

```
22P/Kopff                                                          Max El
                                                                    (deg)
    Date      R.A.   Decl.     r       d    Elong  Const  Mag   40N  40S
2022-Feb-21  19 33  -19 49   1.574   2.197    40M   Sgr  11.1     6   17
2022-Feb-26  19 50  -19 18   1.566   2.169    41M   Sgr  11.1     5   19
2022-Mar-03  20 06  -18 41   1.560   2.143    42M   Cap  11.0     5   21
2022-Mar-08  20 22  -18 00   1.556   2.118    43M   Cap  11.0     5   22
2022-Mar-13  20 38  -17 14   1.554   2.094    44M   Cap  10.9     5   24
2022-Mar-18  20 53  -16 24   1.553   2.072    45M   Cap  10.9     5   25
2022-Mar-23  21 08  -15 30   1.554   2.051    47M   Cap  10.9     5   26
2022-Mar-28  21 23  -14 34   1.556   2.031    48M   Cap  10.9     5   28
2022-Apr-02  21 38  -13 34   1.560   2.012    49M   Cap  10.9     5   29
```

Comet Magnitude Formula (from Yoshida Seiichi's page)

```
m1 = 5.3 + 5 log d + 21.0 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
```

August Kopff of the Königstuhl Observatory in Heidelberg, Germany discovered 22P/Kopff on 1906 August 23 on a photographic plate. 22P was one of two discoveries by Kopff. The other being long-period comet C/1906 E1 (Kopff). Though 22P was missed at its next return in 1912, it has been seen at ever return since with 2022 marking its 18th observed apparition.

22P/Kopff will be at perihelion on 2022 March 18 at 1.55 au. Closest approach to Earth won't be till 2022 September 14 at 1.39 au though it will be a more distant 2.30 au from Sun at that time. This return is relatively poor with the comet brighter to around magnitude 11 at perihelion. It should still be around magnitude 11 in early April and slowly fade to around magnitude 12 by the end of June. The comet is observable from both hemispheres though difficult from the northern hemisphere in the morning sky as it moves through Sagittarius (Feb 1-March 3), Capricornus (March 3-28), Aquarius (March 28-29) and back into Capricornus (March 29-31). Too bad we aren't observing from Mars as Kopff passed 0.19 au from Mars on February 14. Kopff, Mars and Venus spend most of March within a few degrees of each other (and even a visit by C/2021 E3, more below).

Imagers were able to observe Kopff during the first half of last year when it was still a distant object and faint at 17-18th magnitude. Since June of 2021, no observations of Kopff have been submitted to the ALPO, COBS, or

MPC. This is mainly due to a small solar elongation though the comet has been further than 30 deg from the Sun since mid-January. Its solar elongation will continue to increase in February and March.

At discovery, perihelion was around 1.7 au and that remained the case till a close approach to Jupiter in 1943. Since then, perihelion has stayed in 1.48 to 1.59 au range. During that time the best returns occurred in 1983 and 1996 when Kopff reached 7th magnitude. Changes for the better are afoot. In 2026, another close approach to Jupiter will lower Kopff's perihelion to 1.32 au. That and a close approach of 0.35 au to Earth in 2028 will make the comet's next return its best. 2028 may see the comet brighten to 5-6th magnitude. After another gravitational nudge by Jupiter in 2038, Kopff's perihelion will spend the rest of the 21st century around 1.16 au. Unfortunately, smaller perihelion won't result in close approaches to Earth till late in the century (2084 at 0.43 au and 2095 at 0.20 au).

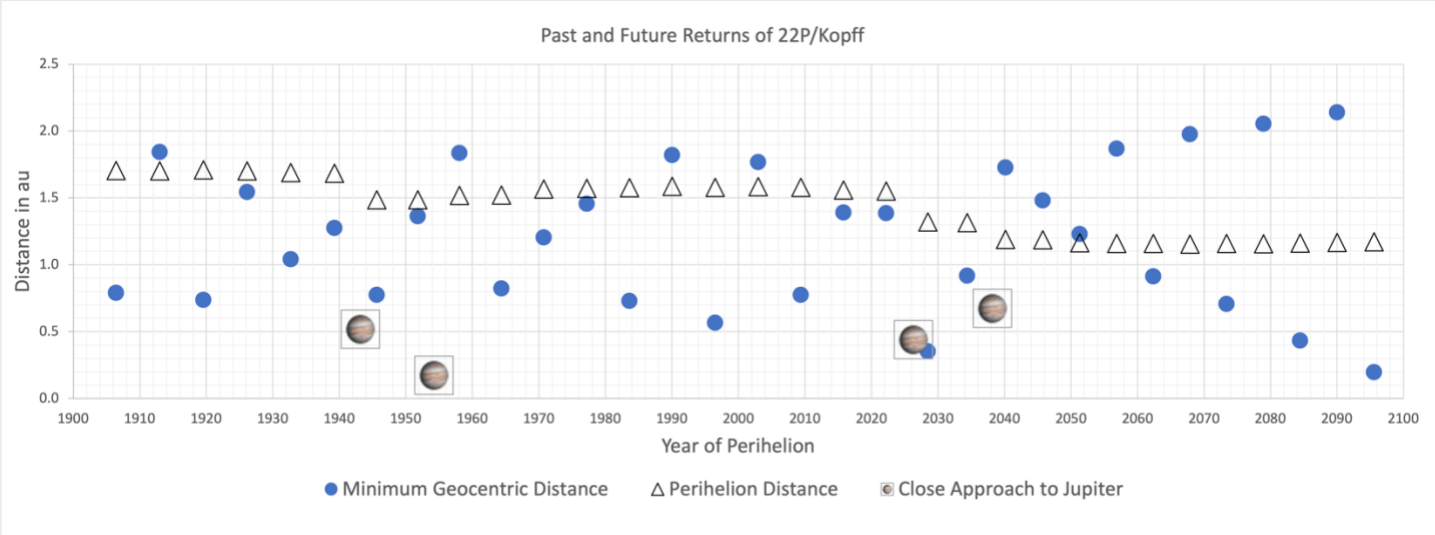


Figure 11 - Orbital evolution of 22P/Kopff between the years 1900 and 2100.

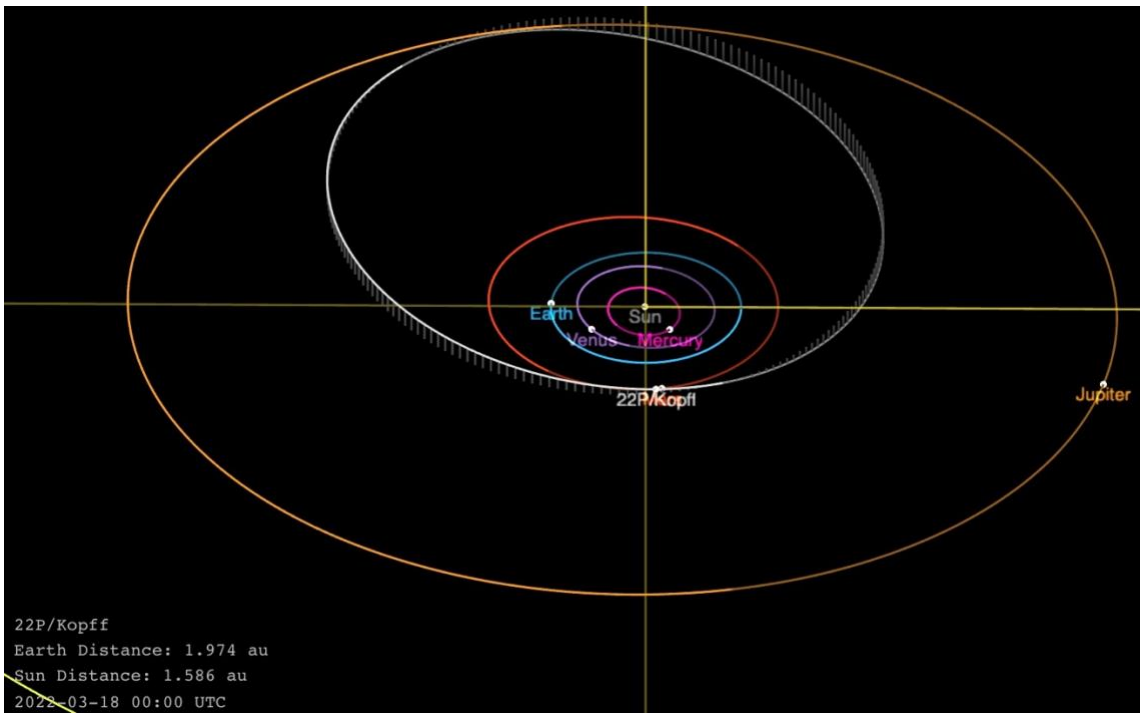


Figure 12 - Orbit of 22P/Kopff and the inner planets and Jupiter for the date of perihelion (2022 March 18). Created with the JPL Small Body Database Orbit Viewer.

29P/Schwassmann-Wachmann

Discovered 1927 November 15 by the Arnold Schwassmann and Arno Arthur Wachmann at the Hamburg Observatory in Bergedorf, Germany
Centaur comet with orbital period of ~14.8 years

Orbit (from Minor Planet Center, MPEC 2022-C234)

```
  29P/Schwassmann-Wachmann
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2019 Apr. 4.86535 TT                                  Rudenko
q   5.7713426            (2000.0)            P             Q
n   0.06636462     Peri.   49.81575     +0.99174106     -0.04469966
a   6.0419665      Node   312.38181     -0.02057459     +0.86971628
e   0.0447907      Incl.    9.36627     +0.12659521     +0.49152368
P  14.9
From 12872 observations 2018 June 18-2022 Feb. 13, mean residual 0".5.
```

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

```
29P/Schwassmann-Wachmann                                              Max El
                                                                       (deg)
    Date       R.A.   Decl.     r       d    Elong  Const  Mag    40N  40S
2022-Feb-21  04 18  +29 25   5.960   5.780    95E    Tau  15.6     75   14
2022-Feb-26  04 19  +29 20   5.961   5.862    90E    Tau  15.6     71   13
2022-Mar-03  04 21  +29 15   5.963   5.943    86E    Tau  15.6     67   12
2022-Mar-08  04 23  +29 12   5.964   6.025    81E    Tau  15.7     63   11
2022-Mar-13  04 25  +29 08   5.966   6.105    77E    Tau  15.7     58   11
2022-Mar-18  04 27  +29 06   5.967   6.184    72E    Tau  15.7     54   10
2022-Mar-23  04 30  +29 04   5.969   6.261    68E    Tau  15.7     50    9
2022-Mar-28  04 33  +29 03   5.970   6.336    64E    Tau  15.8     45    8
2022-Apr-02  04 36  +29 02   5.972   6.408    60E    Tau  15.8     41    7
```

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 02 07.52 xI[14.2 AQ 25.0L 5 125                    ICQ XX WYA   Chris Wyatt
29        2022 01 31.46 xI[14.6 AQ 25.0L 5 125                    ICQ XX WYA   Chris Wyatt
29        2022 01 28.45 xI[14.7 AQ 25.0L 5 125                    ICQ XX WYA   Chris Wyatt
29        2022 01 06.81  S 11.0 TK  7.0B 6  16                           PIL01 Uwe Pilz
```

29P was especially active with multiple outbursts observed between September and November. Though the comet has settled down since last year, it did experience another outburst on February 11. Imaging photometry submitted to COBS through the start of February still found 29P to be around magnitude 10.0 to 10.5 and possess a large (~11-13') coma suggesting the dust released in the late 2021 outbursts was still visible. By the end of February, the reported coma diameters were much smaller (>1') and as a result the comet was once again observed to be fainter than 14th magnitude. Perhaps the 2021 dust coma has finally expanded to the point that it is no longer detectable.

29P is currently an evening object in Taurus and observable from both hemispheres though quickly getting low for southern observers. If you observe 29P, please consider contributing to two pro-am efforts to better understand this 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).

C/2019 T4 (ATLAS)

Discovered 2019 October 9 by the ATLAS survey
Dynamically old long-period comet

Orbit (from MPEC 2022-C56)

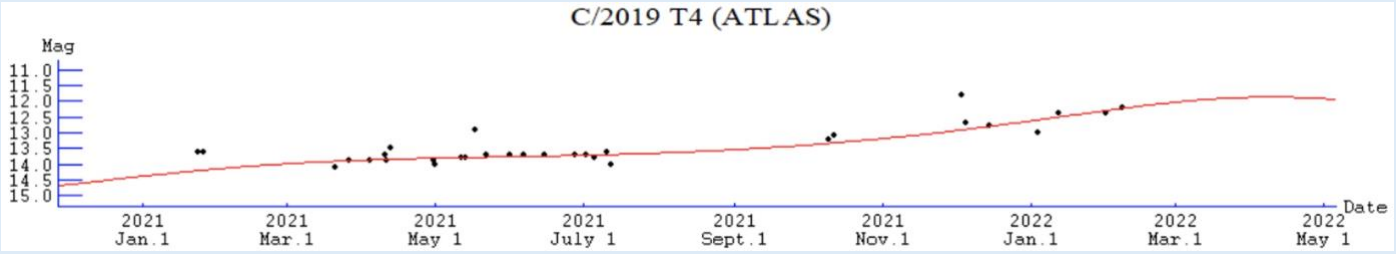
```
    C/2019 T4 (ATLAS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 June  9.17106 TT                                  Rudenko
q   4.2423795           (2000.0)            P              Q
z  +0.0009758       Peri.  351.20606     -0.95991888     +0.05616222
 +/-0.0000008       Node   199.94030     -0.18205844     -0.86982957
e   0.9958603       Incl.   53.62598     -0.21309734     +0.49014521
From 791 observations 2019 Feb. 5-2022 Feb. 12, mean residual 0".4.
1/a(orig) = +0.000622 AU**-1, 1/a(fut) = +0.000961 AU**-1.
```

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

```
C/2019 T4 (ATLAS)                                                    Max El
                                                                      (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2022-Feb-21  12 05   -27 58    4.337   3.601    133M   Hya   12.0     22   78
2022-Feb-26  12 04   -27 24    4.328   3.544    137M   Hya   11.9     23   77
2022-Mar-03  12 02   -26 45    4.320   3.493    142M   Hya   11.9     23   77
2022-Mar-08  12 00   -26 01    4.313   3.448    146M   Hya   12.0     24   76
2022-Mar-13  11 58   -25 12    4.305   3.410    150M   Hya   12.0     25   75
2022-Mar-18  11 56   -24 18    4.299   3.379    154M   Crv   11.9     26   74
2022-Mar-23  11 54   -23 20    4.292   3.356    157M   Crt   11.9     27   73
2022-Mar-28  11 52   -22 19    4.286   3.340    158M   Crt   11.9     28   72
2022-Apr-02  11 51   -21 14    4.280   3.332    159M   Crt   11.9     29   71
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 3.2 + 5 log d + 9.6 log r
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T          Dia  DC  LENG  PA
   2019T4  2022 02 09.72 xM 12.7 AQ 25.0L 5 125   1    5           ICQ XX WYA   Christopher Wyatt
   2019T4  2022 02 07.55 xM 12.5 AQ 25.0L 5 125   0.8  5/          ICQ XX WYA   Christopher Wyatt
   2019T4  2022 01 31.49 xM 12.7 AQ 25.0L 5 125   1.2  5/          ICQ XX WYA   Christopher Wyatt
   2019T4  2022 01 03.52 &M 13.3 AQ 25.0L 5 182   0.9  3/          ICQ XX WYA   Christopher Wyatt
```

C/2019 T4 (ATLAS) was discovered on 2019 October 6 at 19th magnitude with the "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) 0.5-m reflector at Haleakala, Hawaii. At discovery, T4 ATLAS was 8.6 au from the Sun. Perihelion is in a few months on 2022 June 9 at a still distant 4.24 au. The comet is a dynamically old long-period comet last at perihelion ~64,000 years ago.

Chris Wyatt visually observed T4 on four occasions since the start of January finding the comet to be around magnitude 12.5-12.7 with moderately condensed ~1' coma. The comet is brightening to around magnitude 12.0 in the morning sky in Hydra (Feb 1-Mar 13), Corvus (13-19), and Crater (19-31) and is visible from both hemispheres.

C/2021 A1 (Leonard)

Discovered 2021 January 3 by Greg Leonard of the Catalina Sky Survey with the 1.5-m on Mount Lemmon

Orbit (from Minor Planet Center MPEC 2022-C56)

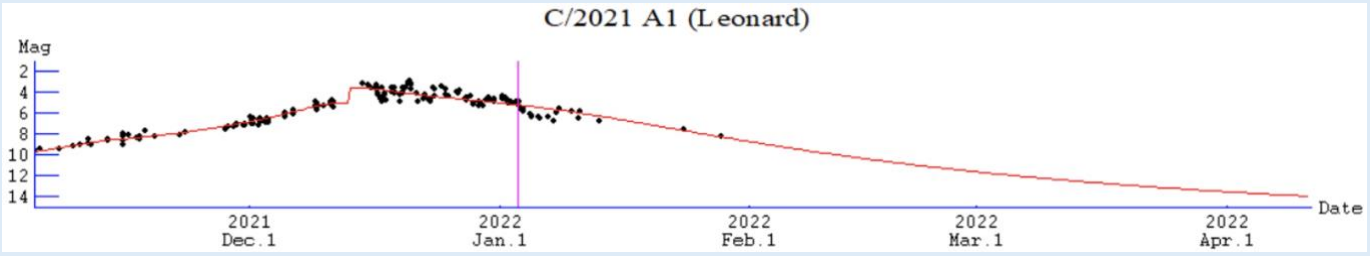
```
    C/2021 A1 (Leonard)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Jan. 3.29906 TT                                  Rudenko
q   0.6152578           (2000.0)            P              Q
z  -0.0000414      Peri.  225.09246     +0.63773960     +0.29161748
 +/-0.0000008      Node   255.89590     +0.72791549     -0.53080564
e   1.0000255      Incl.  132.68654     -0.25184764     -0.79574155
From 2184 observations 2020 Apr. 11-2021 Dec. 23, mean residual 0".8.
1/a(orig) = +0.000519 AU**-1, 1/a(fut) = -0.000087 AU**-1.
```

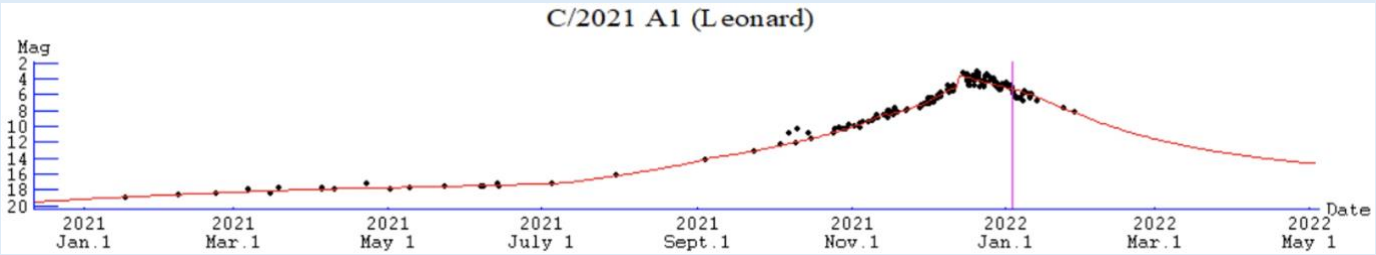
Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2021 A1 (Leonard)                                                  Max El
                                                                      (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2022-Feb-21  21 26   -35 07    1.165    1.958     26M    Mic   10.9      0    8
2022-Feb-26  21 24   -34 59    1.243    1.987     30M    Mic   11.4      0   12
2022-Mar-03  21 22   -34 53    1.320    2.005     34M    Mic   11.8      0   17
2022-Mar-08  21 20   -34 51    1.397    2.013     39M    Mic   12.1      0   22
2022-Mar-13  21 17   -34 51    1.474    2.012     44M    Mic   12.5      0   27
2022-Mar-18  21 14   -34 56    1.550    2.003     49M    Mic   12.8      0   32
2022-Mar-23  21 11   -35 04    1.626    1.986     54M    Mic   13.1      0   37
2022-Mar-28  21 06   -35 16    1.701    1.963     60M    Mic   13.3      0   42
2022-Apr-02  21 02   -35 32    1.775    1.935     65M    Mic   13.5      0   48
```

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

```
m1 =  7.4 + 5 log d + 11.7 log r [to T-370 days, where T = date of perihelion]
m1 = 11.7 + 5 log d +  5.6 log r [T-370 to T-177 days]
m1 =  4.6 + 5 log d + 20.6 log r [T-177 to T-120 days]
m1 =  7.3 + 5 log d + 12.5 log r [T-120 to T-50 days]
m1 =  8.3 + 5 log d +  0.7 log r [T-50 to T-21 days]
m1 =  8.5 + 5 log d + 14.5 log r [T-21 and onwards]
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 (UT)		Mag	SC	APER	FL	POW	COMA Dia	COMA DC	TAIL LENG	TAIL PA	ICQ	CODE	Observer Name
					T									
2021A1	2022 01 28.43	&M	8.5	TK	25.0L	5	40	1.9	4	9.0m	098	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 23.95	S	7.5	TK	5.0B		10	3	5			ICQ	XX SOU01	Willian Souza
2021A1	2022 01 13.45	xM	6.8	TK	7.0B		15	5.6	5/	1.3	103	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 11.07	Z	5.9	TK	5.0R	4a	200					ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 10.07	Z	5.9	TK	5.0R	4a	150					ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 08.44	xM	5.6	TK	7.0B		15	7.5	6	1.3	97	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 08.06	Z	6.0	TK	5.0R	4a	150					ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 07.06	Z	6.4	TK	5.0R	4a	200				93	ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 06.07	Z	6.5	TK	5.0R	4a	200				93	ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 05.07	Z	6.3	U4	7.2R	5a	380	6.2		>0.45	94	ICQ	xx HER02	Carl Hergenrother
2021A1	2022 01 05.07	Z	6.4	TK	2.5R	4		3		>2	93	ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 04.07	aM	5.8	TK	5.0B		10	4	5			ICQ	xx HER02	Carl Hergenrother
2021A1	2022 01 04.07	Z	5.6	TK	5.0R	4		3		>1.2	93	ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 03.44	xM	5.4	TK	7.0B		15	6.0	5/	5.0	098	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 03.44	xM	4.9	TK	0.0E			23.0	5/	1.0	094	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 03.07	aM	4.8	TK	5.0B		10	4	7			ICQ	xx HER02	Carl Hergenrother
2021A1	2022 01 03.06	Z	5.1	TK	5.0R	4a	300	4		>1.2	93	ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 02.45	xM	5.1	TK	7.0B		15	7.0	6/	2.2	094	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 02.46	xM	4.8	TK	0.0E			20.0	5/	1.0	094	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 02.07	aM	4.7	TK	5.0B		10	5	6			ICQ	xx HER02	Carl Hergenrother
2021A1	2022 01 02.06	Z	5.1	TK	5.0R	4		5		>1	95	ICQ	xx OLAaa	Michael Olason
2021A1	2022 01 01.45	xM	4.7	TK	7.0B		15	7.0	6/	3.6	095	ICQ	XX WYA	Christopher Wyatt
2021A1	2022 01 01.45	xM	4.4	TK	0.0E			18.0	6	1.2	095	ICQ	XX WYA	Christopher Wyatt

The Best Comet of 2021 may also turn out to be the Best Comet of 2022 thanks to being a faint naked eye object during the first week or so of January. Since then, C/2021 A1 (Leonard) rapidly faded to magnitude 8.5 by the end of January as it moves away from the Earth and Sun. Chris Wyatt was the last person to report seeing Leonard. On January 28 it was magnitude 8.5 with a 1.9' coma and 9' tail in a 0.25-m f/5 reflector at 40 power. With the comet too close to the Sun for observation since then, no other observations have been reported in February so far.

Observers in the southern hemisphere should pick the comet up again as we near the end of February as it moves away from the glow of dawn in Pisces Austrinus (Feb 1-16) and Microscopium (Feb 16-March 31). If Leonard is still fading at the same rate as observed in January it may only be magnitude 11 in late February and 13 by the end of March. Northern observers will have to wait till late April or early May to get another chance at observing Leonard though it may be a 14-15th magnitude object by then.

C/2021 E3 (ZTF)

Discovered 2021 March 9 by the Zwicky Transient Facility on Mount Palomar
Dynamically new long-period comet

Orbit (from MPEC 2022-A21)

```
    C/2021 E3 (ZTF)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 June 11.90603 TT                                  Rudenko
q   1.7774372           (2000.0)            P               Q
z  -0.0004786      Peri.  228.84485     -0.11524750     -0.43255660
 +/-0.0000021      Node   104.46808     -0.37426706     +0.85277571
e   1.0008508      Incl.  112.55711     -0.92013161     -0.29269160
From 852 observations 2021 Mar. 9-Dec. 14, mean residual 0".4.
1/a(orig) = -0.000033 AU**-1, 1/a(fut) = +0.000618 AU**-1.
```

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

```
C/2021 E3 (ZTF)                                                        Max El
                                                                        (deg)
    Date      R.A.    Decl.     r       d    Elong  Const  Mag    40N  40S
2022-Feb-21  20 05  -15 52   2.262   3.039    32M   Sgr  13.4      3    9
2022-Feb-26  20 11  -16 51   2.225   2.950    35M   Cap  13.2      4   13
2022-Mar-03  20 16  -17 54   2.189   2.856    39M   Cap  13.1      4   18
2022-Mar-08  20 21  -19 01   2.154   2.757    43M   Cap  12.9      4   23
2022-Mar-13  20 27  -20 15   2.120   2.654    47M   Cap  12.8      5   28
2022-Mar-18  20 32  -21 35   2.087   2.547    51M   Cap  12.6      5   32
2022-Mar-23  20 38  -23 05   2.055   2.437    56M   Cap  12.5      4   37
2022-Mar-28  20 44  -24 44   2.024   2.324    60M   Cap  12.3      4   41
2022-Apr-02  20 50  -26 36   1.995   2.209    64M   Cap  12.1      3   46
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 7.4 + 5 log d + 10.0 log r
```

Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T         Dia  DC  LENG  PA
None
```

The Zwicky Transient Facility used the 1.2-m Oschin Schmidt to detect Comet ZTF as an asteroid on 2021 March 9 at 19th magnitude. Follow-up observations detected cometary activity resulting in its announcement as comet C/2021 E3 (ZTF). Perihelion occurs on 2022 June 11 at 1.78 au.

While no visual observations have been submitted to the ALPO or even COBS, digital photometry reported on the COBS site had the comet around 14-15th magnitude in late November. Since then, the comet has been located at small solar elongation and a difficult, if not impossible, object to observe. Though still difficult from the northern hemisphere, it should become a progressively easier object to observe from the southern hemisphere in March. ZTF should be a 12-13th magnitude object for the remainder of February and March as it moves through Sagittarius (Feb 1 – 22) and Capricornus (Feb 22 – Mar 31).

C/2021 E3 may get as bright as 10th magnitude in June when it will be at perihelion (1.78 au) and minimum distance to Earth (1.21 au). At that time, it will be located deep in the southern sky (passing within 10 degrees of the South Celestial Pole). It will be invisible from the northern hemisphere from April till late in the year when it should be too faint to be a visual object.

New Discoveries, Recoveries and Other Comets News

New Comet Numberings (Ref: WGSBN Bull. 2 #2)

440P/1997 B1 = 2021 W2 (Kobayashi)
439P/2008 WZ96 = 2021 W1 (LINEAR)
438P/2005 T2 = 2012 V5 = 2020 OV62 (Christensen)
437P/2021 V3 = 2011 UE215 (PANSTARRS)

New Comet Discoveries

P/2022 C3 (PANSTARRS) - The Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii found this new short-period comet on February 9 at 20th magnitude. This short-period comet has an orbital period of 29.6 years and a perihelion of 4.37 au on 2022 July 2. It should peak around magnitude 19 at opposition in May. [Ref: CBET 5099, MPEC 2022-D02]

P/2022 C2 (PANSTARRS) – Yet another 20th magnitude short-period comet was found by the Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii, this time on February 2. It has an orbital period of 15.3 years and a perihelion of 3.40 au on 2022 July 28. It should peak around magnitude 19 at opposition in April. [Ref: 5098, MPEC 2022-D01]

P/2022 C1 (PANSTARRS) – Let's do this one more time... The Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii found a new short-period comet on February 3 at 20th magnitude. Pre-discovery observations back to 2021 November 6 by Pan-STARRS and the Mount Lemmon Survey were also identified. Perihelion was on 2021 November 4 at 3.99 au. Since we are already past perihelion, P/2022 C1 now fading. [Ref: CBET 5096, MPEC 2022-C74]

2022 BG4 – This asteroid is on a high-eccentricity orbit that takes it from a perihelion at 1.11 au out to near the orbit of Uranus at 18.5 au. Pan-STARRS first saw this object on 2022 January 20 at 21st magnitude. It will pass no closer than 1.19 au from Earth and has already peaked in brightness. With an absolute magnitude of 18.6 and assumed albedo of 0.04, it has a diameter of ~1.3 km.

A/2022 B3 – The Catalina Sky Survey discovered this apparently asteroidal object on a long-period comet orbit on 2022 January 31 at 21st magnitude with the University of Arizona's Bok 2.3-m telescope on Kitt Peak. Perihelion was on 2022 January 17 at 3.70 au. Unless the object becomes active, it has likely reached its maximum brightness. [Ref: MPEC 2022-D24]

P/2022 B2 = P/2017 R1 (PANSTARRS) – Michael Rudenko of the Minor Planet Center identified this returning comet in images taken in January and February of 2022 by Pan-STARRS and Kacper Wierzchos with the Mount Lemmon 1.5-m. The comet was discovered on 2017 September 14 and reached a peak of 20th magnitude. It isn't due back at perihelion till 2025 September 9 at 3.33 au almost 2.5 years from now. Its early recovery suggests either a large nucleus or the comet has experienced a recent outburst. [Ref: CBET 5100, MPEC 2022-D03]

In addition to working on comets at the Minor Planet Center, Rudenko's name is also familiar to comet observers as the visual discoverer of 3 comets in the 1980s: C/1984 V1 (Levy-Rudenko), C/1987 Q1 (Rudenko), and C/1989 Q1 (Okazaki-Levy-Rudenko).

P/2022 B1 (Wierzchos) – Kacper Wierzchos found a new 19th magnitude short-period comet on January 25 with the Mount Lemmon 1.5-m reflector. Pre-discovery observations were found back to 2020 October 30. Perihelion takes place on 2022 February 25 at 1.90 au. Though still moving towards the Sun, the comet is moving away from Earth and is already fading. With a 12.8-year period, the comet will return to perihelion on

2034 December 21. P/2022 B1 is the 4th comet discovery by Wierzchos to bear his name with all discovered since 2020. [Ref: CBET 5094, MPEC 2022-C02]

C/2022 A2 (PANSTARRS) – On January 9, the Pan-STARRS survey discovered a C/2022 A2 (PANSTARRS) at 19-20th magnitude with the Pan-STARRS2 1.8-m Ritchey-Chretien reflector on Haleakala, Hawaii. At discovery, the comet was 4.88 au from the Sun and 4.63 au from Earth. At perihelion on 2023 February 12, the comet will be much closer to the Sun at 1.74 au. Unfortunately, it will still be far from Earth at 1.88 au. Unless it brightens rapidly, it may only reach 13th magnitude at perihelion. Still, this will be one to watch as it could end up in the range of visual observers. [Ref: CBET 5093, MPEC 2022-C01]

C/2022 A1 (Sárneczky) - Krisztian Sárneczky discovered a nearby comet on January 2 with Konkoly Observatory's Piszkesteto Station 0.60-m Schmidt telescope. Sárneczky is the first Hungarian astronomer to discover a comet since Miklós Lovas found 184P/Lovas in 1986. C/2022 A1 is a dynamically old long-period comet with a current orbital period of ~18,000 years. It reached a peak brightness of 16-17th magnitude when it passed 0.32 au from Earth on January 8. Now moving away from the Earth and past its January 31 perihelion at 1.25 au, the comet is rapidly fading from ~19th magnitude to 21st over the course of February. [ref: CBET 5090, MPEC 2022-A59]

C/2021 Y1 (ATLAS) – The "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) survey used their 0.5-m f/2 Schmidt reflector on Mauna Loa in Hawaii to find this 18th magnitude comet on 2021 December 26. A relatively distant find at 5.5 au from the Sun, C/2021 Y1 may reach 12-13th magnitude when it arrives at perihelion on 2023 April 30 at 2.03 au. [Ref: CBET 5089, MPEC 2022-A50]

440P/2021 W2 = P/1997 B1 (Kobayashi) – Observers using a 1.04-m f/1.8 Schmidt telescope at the XuYi Station of the Purple Mountain Observatory reported the discovery on January 11 of a possible near-Earth asteroid. Further observations were identified by the Pan-STARRS survey and the University of Arizona's 2.25-m Bok reflector on Kitt Peak going back to 2021 November 9. The object was reported as cometary in some of the Pan-STARRS observations. The Minor Planet Center identified the "new" object as a recovery of P/1997 B1 (Kobayashi).

Comet Kobayashi was discovered by Takao Kobayashi at Oizumi, Japan on 1997 January 30 with a 0.41-m f/4.3 reflector. During the 1997 apparition, the comet reached a peak brightness of 16-17th magnitude. With a 25-year orbital period, 2022 marks the comet's first return since discovery with perihelion on March 29 at 2.06 au. If the comet is as active as in 1997, it will peak around 17th magnitude, though currently the comet is running about 2 magnitudes fainter than expected. The comet has been officially numbered as 440P/Kobayashi. [Ref: CBET 5092, MPEC 2022-A164]

P/2020 B4 (Sheppard) – Scott Sheppard of the Carnegie Institution for Science in Washington, D.C. was using the Cerro Tololo 4-m Blanco telescope on 2020 January 26 and 27 when he found a faint 22nd magnitude comet on single images taken on each night. Following requests from the Minor Planet Center to search archival images, Sam Deen found an image of the comet from 2020 February 11 taken with the same telescope. Robert Weryk of the University of Western Ontario was also able to find the comet on multiple nights of Pan-STARRS observations (2019 Nov. 5, 25, 29; 2020 Feb. 4, May 12, and a targeted observation on 2021 Feb. 7). [Ref: CBET 5102]

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!

Clear skies!
- Carl Hergenrother

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/2021 O3 (PANSTARRS)												
2021O3	2022 01 07.07	Z 16.5	AQ	43.0C	7a	180	0.5				ICQ XX	RAMaa Raymond Ramlow
C/2021 F1 (Lemmon-PANSTARRS)												
2021F1	2022 02 08.51	Z 11.6	AQ	10.6R	5a	300	5				ICQ XX	RAMaa Raymond Ramlow
2021F1	2022 02 06.24	S 11.2	AQ	20.3T	10	77	4	2			ICQ XX	GON05 Juan Jose Gonzalez Suarez
C/2021 A1 (Leonard)												
2021A1	2022 01 28.43	&M 8.5	TK	25.0L	5	40	1.9	4	9.0m	098	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 13.45	xM 6.8	TK	7.0B		15	5.6	5/	1.3	103	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 11.07	Z 5.9	TK	5.0R	4a	200					ICQ xx	OLAaa Michael Olason
2021A1	2022 01 10.07	Z 5.9	TK	5.0R	4a	150					ICQ xx	OLAaa Michael Olason
2021A1	2022 01 08.44	xM 5.6	TK	7.0B		15	7.5	6	1.3	97	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 08.06	Z 6.0	TK	5.0R	4a	150					ICQ xx	OLAaa Michael Olason
2021A1	2022 01 07.06	Z 6.4	TK	5.0R	4a	200					ICQ xx	OLAaa Michael Olason
2021A1	2022 01 06.07	Z 6.5	TK	5.0R	4a	200					ICQ xx	OLAaa Michael Olason
2021A1	2022 01 05.07	Z 6.3	U4	7.2R	5a	380	6.2		>0.45	94	ICQ xx	HER02 Carl Hergenrother
2021A1	2022 01 04.07	aM 5.8	TK	5.0B		10	4	5			ICQ xx	HER02 Carl Hergenrother
2021A1	2022 01 04.07	Z 5.6	TK	5.0R	4		3		>1.2	93	ICQ xx	OLAaa Michael Olason
2021A1	2022 01 03.44	xM 5.4	TK	7.0B		15	6.0	5/	5.0	098	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 03.44	xM 4.9	TK	0.0E			23.0	5/	1.0	094	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 03.07	aM 4.8	TK	5.0B		10	4	7			ICQ xx	HER02 Carl Hergenrother
2021A1	2022 01 03.06	Z 5.1	TK	5.0R	4a	300	4		>1.2	93	ICQ xx	OLAaa Michael Olason
2021A1	2022 01 02.45	xM 5.1	TK	7.0B		15	7.0	6/	2.2	094	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 02.46	xM 4.8	TK	0.0E			20.0	5/	1.0	094	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 02.07	aM 4.7	TK	5.0B		10	5	6			ICQ xx	HER02 Carl Hergenrother
2021A1	2022 01 02.06	Z 5.1	TK	5.0R	4		5		>1	95	ICQ xx	OLAaa Michael Olason
2021A1	2022 01 01.45	xM 4.7	TK	7.0B		15	7.0	6/	3.6	095	ICQ XX	WYA Christopher Wyatt
2021A1	2022 01 01.45	xM 4.4	TK	0.0E			18.0	6	1.2	095	ICQ XX	WYA Christopher Wyatt
C/2020 V2 (ZTF)												
2020V2	2022 02 08.51	Z 14.4	AQ	10.6R	5a	180	0.9				ICQ XX	RAMaa Raymond Ramlow
2020V2	2022 01 13.44	Z 14.8	AQ	10.6R	5a	180	0.9				ICQ XX	RAMaa Raymond Ramlow
C/2019 U5 (PANSTARRS)												
2019U5	2022 02 08.51	Z 15.1	AQ	10.6R	5a	180	0.7		0.6m	55	ICQ XX	RAMaa Raymond Ramlow
C/2019 T4 (ATLAS)												
2019T4	2022 02 09.72	xM 12.7	AQ	25.0L	5	125	1.0	5			ICQ XX	WYA Christopher Wyatt
2019T4	2022 02 07.55	xM 12.5	AQ	25.0L	5	125	0.8	5/			ICQ XX	WYA Christopher Wyatt
2019T4	2022 01 31.49	xM 12.7	AQ	25.0L	5	125	1.2	5/			ICQ XX	WYA Christopher Wyatt
2019T4	2022 01 03.52	&M 13.3	AQ	25.0L	5	125	0.9	3			ICQ XX	WYA Christopher Wyatt
C/2019 L3 (ATLAS)												
2019L3	2022 02 19.85	S 9.5	TK	20.3T	10	77	3	6			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2019L3	2022 02 19.10	Z 9.0	AQ	10.6R	5a	180	10.1		12.0m	359	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 02 07.53	xM 9.3	AQ	25.0L	5	40	2.8	5/			ICQ XX	WYA Christopher Wyatt
2019L3	2022 02 06.23	Z 8.8	AQ	10.6R	5a	180	10.3		10.0m	356	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 02 05.88	S 9.3	TK	20.3T	10	77	4	6			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2019L3	2022 01 31.47	xM 9.6	TK	25.0L	5	74	2.5	6			ICQ XX	WYA Christopher Wyatt
2019L3	2022 01 28.48	xM 9.4	TK	25.0L	5	40	2.7	6			ICQ XX	WYA Christopher Wyatt
2019L3	2022 01 26.77	E 8.5	TK	25.0C	10	96	1	4			ICQ XX	DECaa Michel Deconinck
2019L3	2022 01 21.86	S 9.1	TK	20.3T	10	77	4	6			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2019L3	2022 01 14.25	S 8.8	TK	20.3T	10	77	4	6	0.2	320	ICQ XX	GON05 Juan Jose Gonzalez Suarez
2019L3	2022 01 06.81	S 8.5	TK	7.0B	6	16	2		0.07	118		PIL01 Uwe Pilz
2019L3	2022 01 06.12	S 9.3	TI	25.2L	4	68	4.8	4	6.5m	280	ICQ XX	HAR11 Christian Harder
2019L3	2022 01 03.75	S 9.4	TI	25.2L	4	68	3.3	4/	4.0m	310	ICQ XX	HAR11 Christian Harder
C/2017 K2 (PANSTARRS)												
2017K2	2022 02 08.53	Z 12.0	AQ	10.6R	5a	180	1.8		4.6m	341	ICQ XX	RAMaa Raymond Ramlow
2017K2	2022 02 06.25	S 10.6	TK	20.3T	10	77	3	3			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2017K2	2022 01 14.22	S 11.1	TK	20.3T	10	77	2.5	3/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
108P/Ciffreo												
108	2022 01 14.24	S 13.1	AQ	20.3T	10	133	1	3			ICQ XX	GON05 Juan Jose Gonzalez Suarez
108	2022 01 05.17	Z 14.8	TK	27.5T	6A	800	0.7				ICQ xx	OLAaa Michael Olason

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104P/Kowal
104        2022 02 19.82  S  9.9 TK 20.3T10  77   5    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
104        2022 02 19.10  Z  9.9 AQ 10.6R 5a180  10.5       4.5m 71 ICQ XX RAMaa Raymond Ramlow
104        2022 02 05.87  S  9.3 TK 20.3T10  77   6    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
104        2022 01 31.46 xM  9.2 TK 25.0L 5  40   7.5  4            ICQ XX WYA   Christopher Wyatt
104        2022 01 28.45 xM  9.8 TK 25.0L 5  40   5.3  4            ICQ XX WYA   Christopher Wyatt
104        2022 01 26.76  E  9.7 TK 25.0C10  62   6    2            ICQ XX DECaa Michel Deconinck
104        2022 01 26.09  Z  9.6 AQ 10.6R 5a180  11.1       5.5m 68 ICQ XX RAMaa Raymond Ramlow
104        2022 01 25.09  Z  9.7 AQ 10.6R 5a180  10.8       7.0m 69 ICQ XX RAMaa Raymond Ramlow
104        2022 01 21.81  S  9.4 TK 20.3T10  77   8    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
104        2022 01 07.08  Z  9.7 AQ 10.6R 5a180   9.8               ICQ XX RAMaa Raymond Ramlow
104        2022 01 05.15  Z  9.2 U4  7.2R 5A200  10.6               ICQ xx HER02 Carl Hergenrother
104        2022 01 05.15  k 11.5 U4  7.2R 5a300   2.0               ICQ xx HER02 Carl Hergenrother
104        2022 01 04.08  S  9.6 TK 12.5B    30   5    3            ICQ xx HER02 Carl Hergenrother
104        2022 01 03.46 xM  9.5 TK 25.0L 5  40   5.0  3/           ICQ XX WYA   Christopher Wyatt
67P/Churyumov- Gerasimenko
 67        2022 02 19.86  S 10.5 TK 20.3T10  77   3    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
 67        2022 02 19.76  S 12.1 HS 32.0L 5  80        3                 PIL01 Uwe Pilz
 67        2022 02 19.11  Z 10.5 AQ 10.6R 5a180   6.5      49.0m280 ICQ XX RAMaa Raymond Ramlow
 67        2022 02 09.71 xM 10.7 AQ 25.0L 5  40   3.4  3/           ICQ XX WYA   Christopher Wyatt
 67        2022 02 07.54 xM 10.2 AQ 25.0L 5  40   3.4  4            ICQ XX WYA   Christopher Wyatt
 67        2022 02 06.24  Z  9.8 AQ 10.6R 5a180   9.8      40.0m280 ICQ XX RAMaa Raymond Ramlow
 67        2022 02 05.90  S  9.9 TK 20.3T10  77   4    4            ICQ XX GON05 Juan Jose Gonzalez Suarez
 67        2022 01 31.48 xM 10.3 TK 25.0L 5  40   4.3  5/           ICQ XX WYA   Christopher Wyatt
 67        2022 01 21.87  S  9.5 TK 20.3T10  77   5    5            ICQ XX GON05 Juan Jose Gonzalez Suarez
 67        2022 01 14.26  S  9.4 TK 20.3T10  77   4    5   0.1  290 ICQ XX GON05 Juan Jose Gonzalez Suarez
 67        2022 01 06.81  S  8.8 TK  7.0B 6  16   4                 PIL01 Uwe Pilz
 67        2022 01 06.38  Z  8.7 AQ 10.6R 5a180  16.3      34.0m292 ICQ XX RAMaa Raymond Ramlow
 67        2022 01 06.11  S 68.0 TI 25.2L 4  68   3.5  4/    9.0m290 ICQ XX HAR11 Christian Harder
 67        2022 01 03.51 &M  9.0 TK 25.0L 5  40   3.4  5   10.0m265 ICQ XX WYA   Christopher Wyatt
29P/Schwassmann-Wachmann
 29        2022 02 07.52 xI[14.2 AQ 25.0L 5 125                    ICQ XX WYA   Christopher Wyatt
 29        2022 01 31.46 xI[14.6 AQ 25.0L 5 125                    ICQ XX WYA   Christopher Wyatt
 29        2022 01 28.45 xI[14.7 AQ 25.0L 5 125                    ICQ XX WYA   Christopher Wyatt
 29        2022 01 06.81  S 11.0 TK  7.0B 6  16                          PIL01 Uwe Pilz
 29        2022 01 03.49 xI[14.1 AQ 25.0L 5 182                    ICQ XX WYA   Christopher Wyatt
19P/Borrelly
 19        2022 02 19.81  S  9.3 TK 20.3T10  77   4    5            ICQ XX GON05 Juan Jose Gonzalez Suarez
 19        2022 02 19.09  Z  9.2 AQ 10.6R 5a180  12       22.0m 78 ICQ XX RAMaa Raymond Ramlow
 19        2022 02 13.75  S  9.9 TK 12.0R 7  50   2.2  3                 PIL01 Uwe Pilz
 19        2022 02 11.76  S  8.9 TI 25.2L 4  68   3    4            ICQ XX HAR11 Christian Harder
 19        2022 02 05.85  S  9.1 TK 20.3T10  77   5    5            ICQ XX GON05 Juan Jose Gonzalez Suarez
 19        2022 01 26.78  E  9.6 TK 25.0C10  96   3    6    5.0m 25 ICQ XX DECaa Michel Deconinck
 19        2022 01 31.45 xM  8.8 TK 25.0L 5  40   8    6            ICQ XX WYA   Christopher Wyatt
 19        2022 01 28.44 xM  8.9 TK 25.0L 5  40   5.0  6            ICQ XX WYA   Christopher Wyatt
 19        2022 01 26.08  Z  9.0 AQ 10.6R 5a180  11.6      30.0m 76 ICQ XX RAMaa Raymond Ramlow
 19        2022 01 25.08  Z  9.0 AQ 10.6R 5a180  11.4    > 20.0m 71 ICQ XX RAMaa Raymond Ramlow
 19        2022 01 23.08  Z  8.9 AQ 10.6R 5a180  12.2    > 40.0m 69 ICQ XX RAMaa Raymond Ramlow
 19        2022 01 22.76  E  8.6 TK 25.0C10  96   4.3  5   8.5  285 ICQ XX DECaa Michel Deconinck
 19        2022 01 21.84  S  8.8 TK 20.3T10  77   7    5            ICQ XX GON05 Juan Jose Gonzalez Suarez
 19        2022 01 20.76  I  8.5:TK 25.0C10  62   3    6    7.0m270 ICQ XX DECaa Michel Deconinck
 19        2022 01 07.08  Z  9.2 AQ 10.6R 5a180  10.3               ICQ XX RAMaa Raymond Ramlow
 19        2022 01 05.12  Z  9.0 U4  7.2R 5A200   9.8               ICQ xx HER02 Carl Hergenrother
 19        2022 01 05.13  k  9.7 U4  7.2R 5a300   3.5               ICQ xx HER02 Carl Hergenrother
 19        2022 01 04.09  Z  9.4 TK  5.0R 4       6       >12  m 59 ICQ xx OLAaa Michael Olason
 19        2022 01 04.08  S  9.2 TK 12.5B    30   4    5            ICQ xx HER02 Carl Hergenrother
 19        2022 01 03.47 xM  9.3 TK 25.0L 5  40   3.8  6            ICQ XX WYA   Christopher Wyatt
 19        2022 01 03.08  S  9.3 TK 12.5B    30   3    5            ICQ xx HER02 Carl Hergenrother
6P/d'Arrest
  6        2022 01 21.80  S 10.5 TK 20.3T10  77   6    1/           ICQ XX GON05 Juan Jose Gonzalez Suarez
  6        2022 01 03.46 xM 11.3 AQ 25.0L 5  40   4.2  4            ICQ XX WYA   Christopher Wyatt
4P/Faye
  4        2022 02 19.75  S 13.2 HS 32.0L 5 144                          PIL01 Uwe Pilz
  4        2022 02 07.53 xS 12.6 AQ 25.0L 5 125   1    3            ICQ XX WYA   Christopher Wyatt
  4        2022 01 31.47 xS 13.0 AQ 25.0L 5 125   0.7  3            ICQ XX WYA   Christopher Wyatt
  4        2022 01 06.81  S 11.4 TK  7.0B 6  16                          PIL01 Uwe Pilz
  4        2022 01 06.38  Z 11.6 AQ 10.6R 5a180   3.2       8.6m284 ICQ XX RAMaa Raymond Ramlow
  4        2022 01 03.48 xM 12.0 AQ 25.0L 5  74   2.4  4/           ICQ XX WYA   Christopher Wyatt
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