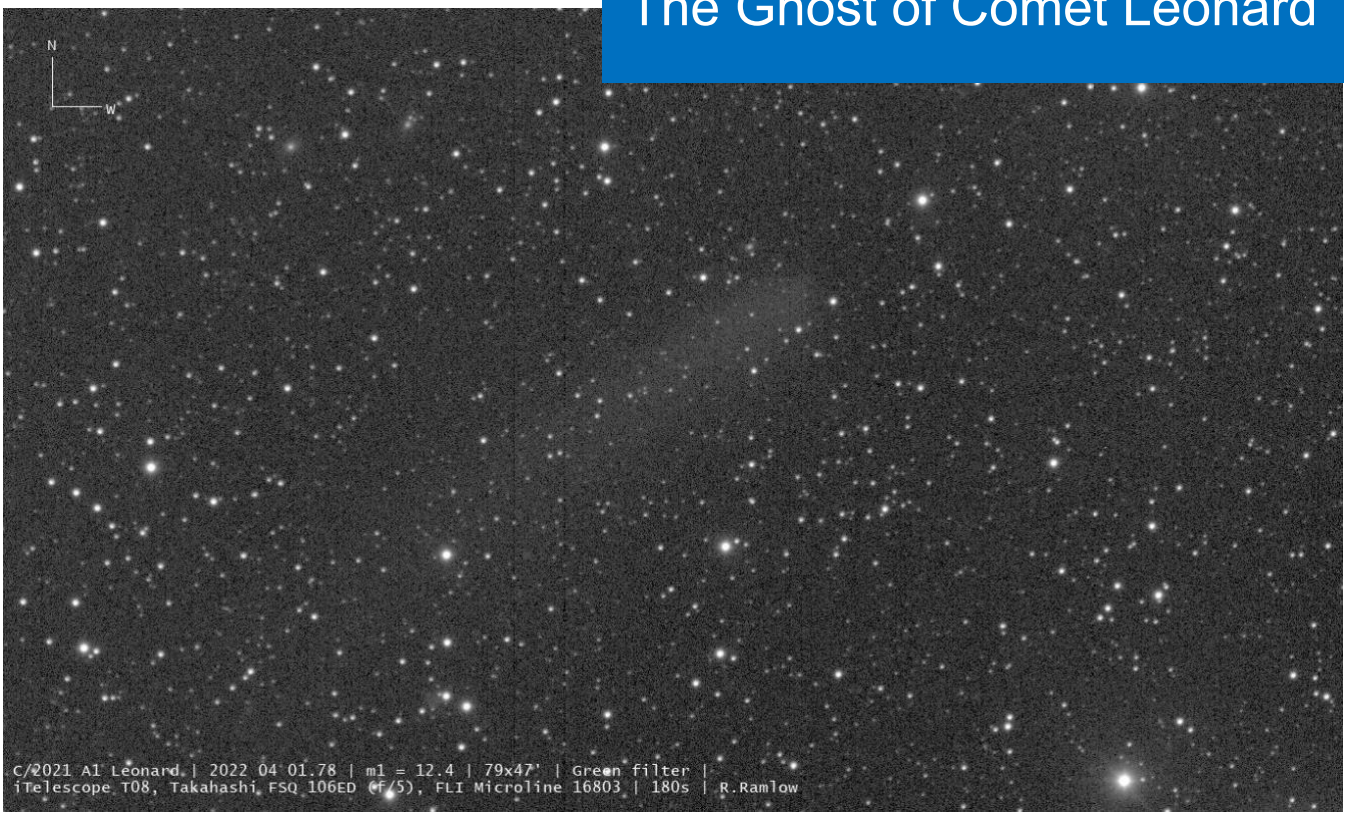
April 2022

ALPO Comet News

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

The Ghost of Comet Leonard



It was not that long ago that C/2021 A1 (Leonard) was shining in the evening sky as a borderline naked eye object with a tail that some imagers were able to follow for 30 degrees or more in length. The comet's string of outbursts may have been a sign of a fragile nucleus. Now that the comet has reappeared in a dark sky, it appears that its nucleus is either in pieces or non-existent. On 2022 April 1, Raymond Ramlow caught the remains of Leonard in a 180s Green image taken with an iTelescopes Takahashi FSQ 106ED refractor.

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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/818637-alpo-comet-news-for-april-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

The big comet question for this month is what's up with C/2021 O3 (PANSTARRS)? Arriving at perihelion on April 21 at a small heliocentric distance of 0.29 au, some predictions have PANSTARRS peaking at 4-5th magnitude. Unfortunately, the comet has a lot working against it. It is intrinsically faint, likely making its first passage through the inner Solar System, and when last observed back in early February was brightening at a very slow rate. All of these point to a comet that may be prone to disintegration as it nears perihelion, if it hasn't already. Since the comet has been located a small solar elongation over the past 2 months, we don't really know how bright it currently is. And to make things worse, it will either be unobservable or only observable deep in twilight in April.

Don't worry if C/2021 O3 disappoints as there are plenty of other comets observable between 9th and 13th magnitude this month. C/2019 L3 (ATLAS) is at 9th magnitude and well placed in the evening sky. C/2017 K2 (PANSTARRS) continues to slowly brighten and may break the magnitude 10 level in the morning sky. Last month's brightest comet, C/2021 F1 (Lemmon-PANSTARRS), will still be around 8th magnitude but will be too close to the Sun for most observers. Unfortunately, another 9th magnitude comet, 45P/Honda-Mrkos-Pajdusáková, will also be too close to the Sun for observation in April.

On the fainter side (between magnitude 10 and 13) we have short-period comets 9P/Tempel, 19P/Borrelly, 22P/Kopff, 29P/Schwassmann-Wachmann, 67P/Churyumov-Gerasimenko, 104P/Kowal, C/2019 T4 (ATLAS), C/2020 (ZTF), C/2021 E3 (ZTF), and C/2021 P4 (ATLAS). A few months ago, C/2021 A1 (Leonard) was dazzling comet watchers. The comet may be in the midst of its own disintegration or in the process of "turning off". Imagers are encouraged to watch as the dusty remnant of Leonard slowly disperses.

Looking ahead to next year, recently discovered C/2022 E3 (ZTF) is currently 16th magnitude but may brighten to 5-6th magnitude next January and February.

Since the last Report was published on February 23, the ALPO Comets Section has received 161 magnitude estimates and 48 images and sketches of comets C/2021 P4 (ATLAS), C/2021 F1 (Lemmon-PANSTARRS), C/2021 E3 (ZTF), C/2020 Y2 (ATLAS), C/2020 V2 (ZTF), C/2020 U5 (PANSTARRS), C/2020 M5 (ATLAS), C/2020 J1 (SONEAR), C/2019 T4 (ATLAS), C/2019 L3 (ATLAS), C/2017 K2 (PANSTARRS), 116P/Wild, 108P/Ciffreo, 104P/Kowal, 67P/Churyumov-Gerasimenko, 29P/Schwassmann-Wachmann, 22P/Kopff, 19P/Borrelly, and 9P/Tempel. Observations were contributed by Dan Bartlett, Michel Deconinck, Stephane Ferier, J. J. Gonzalez, Christian Harder, Eliot Herman, Martin Mobberley, Uwe Pilz, Raymond Ramlow, Tenho Tuomi, and Chris Wyatt.

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. If a sufficient number of visual observations are submitted for a particular comet, we determine personal corrections for each observer for each individual

comet. If the magnitudes shown in the text don't match those plotted in the lightcurves, it is because of the application of aperture and personal bias corrections.

Acknowledgements

In addition to observations submitted directly to the ALPO, we occasionally use data from other sources to augment our analysis. We would like to acknowledge with thanks observations submitted directly to the ALPO as well as those originally submitted to the International Comet Quarterly, Minor Planet Center, and COBS Comet Observation Database. 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.

Comets Calendar for April 2022

Apr 06 - C/2021 F1 (Lemmon-PANSTARRS) at perihelion (q = 5.23 au, V ~ 20-21, at small elongation this month)

Apr 07 - 135P/Shoemaker-Levy at perihelion (q = 2.68 au, 7.4-yr period, V ~ ???, discovered in 1992, observed again in 1999, not seen at returns in 2007, 2014, and the current return, though a suspect observation from January 2020 has been published by the MPC)

Apr 07 - C/2020 U4 (PANSTARRS) at perihelion (q = 5.35 au, V ~ 17)

Apr 08 - First Quarter Moon

Apr 08 - 274P/Tombaugh-Tenagra at perihelion (q = 2.45 au, 9.2-yr period, V ~ 17, discovered in 1931, rediscovered in 2004, 2022 is the 4th observed return)

Apr 12 - 99P/Kowal at perihelion (q = 4.71 au, 15.1-yr period, V ~ 17, discovered in 1976, also seen at returns in 1992, 2007, and the current one)

Apr 14 - C/2020 V2 (ZTF) passes very close to 12th magnitude NGC 3471

Apr 16 - Full Moon

Apr 21 - C/2021 O3 (PANSTARRS) at perihelion (q = 0.29 au, V ~ good question, could be a relatively bright object though at very small elongations, more below)

Apr 23 - Last Quarter Moon

Apr 23 - 44P/Reinmuth at perihelion (q = 2.11 au, 7.1-yr period, V ~ 17, discovered 1947, seen at all returns since discovery, 2022 is 12th observed return)

Apr 25 - A/2021 E4 at perihelion (q = 4.68 au, V ~ 20, apparently inactive object on a long-period comet orbit)

Apr 25 - 45P/Honda-Mrkos-Pajdusakova at perihelion (q = 0.56 au, 5.3-yr period, V ~ 9-10, discovered in 1948, only missed at 1959 return, 2022 is its 15th observed return, too close to Sun for observation when bright this return)

Apr 26 - C/2021 E3 (ZTF) passes very close to 11th magnitude galaxy IC 5105

Apr 27 - C/2020 U5 (PANSTARRS) at perihelion (q = 3.76 au, V ~ 16-17)

Apr 29 - C/2021 E3 (ZTF) passes close to the galaxy pair NGC 7070 & 7072

Apr 30 - New Moon

Apr 30 - C/2021 E3 (ZTF) passes very close to 11th magnitude galaxy NGC 7079

Apr 30 - 67P/Churyumov-Gerasimenko passes near a field full of 13-15th magnitude galaxies

Apr 30 - C/2021 V1 (Rankin) at perihelion (q = 3.01 au, V ~ 19-20, too close to Sun this month to observe)

Comets Brighter Than Magnitude 10

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-F14)

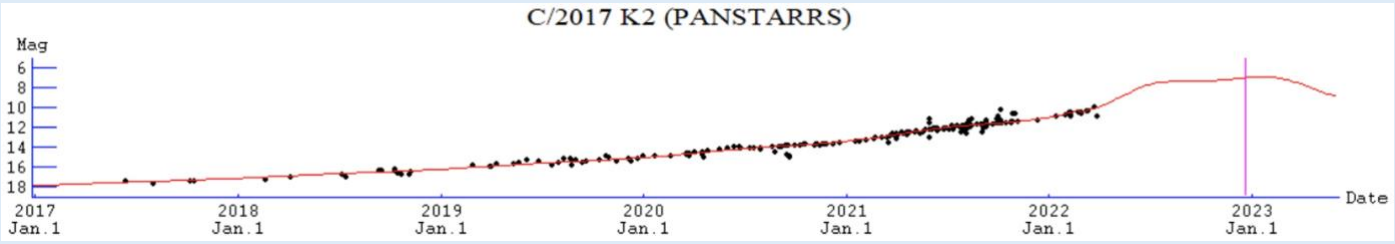
```
    C/2017 K2 (PANSTARRS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Dec. 19.69410 TT                                  Rudenko
q   1.7971098           (2000.0)            P               Q
z  -0.0003870      Peri.  236.19363     +0.01825523     +0.04925431
 +/-0.0000007      Node    88.23676     -0.18101128     +0.98244421
e   1.0006954      Incl.   87.55884     -0.98331158     -0.17993720
From 7332 observations 2013 May 12-2022 Mar. 21, mean residual 0".5.
1/a(orig) = -0.000029 AU**-1, 1/a(fut) = +0.001163 AU**-1.
```

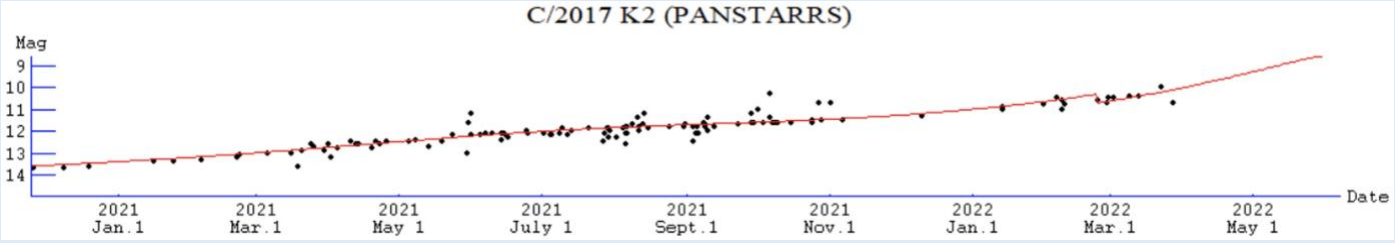
Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

```
C/2017 K2 (PANSTARRS)                                                  Max El
                                                                        (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag    40N  40S
2022-Apr-01  18 54   +11 36    3.584    3.517    85M    Aql   10.0     50   34
2022-Apr-06  18 54   +11 40    3.538    3.401    89M    Aql    9.9     52   36
2022-Apr-11  18 55   +11 44    3.493    3.284    93M    Aql    9.8     53   37
2022-Apr-16  18 55   +11 46    3.448    3.168    97M    Aql    9.7     55   38
2022-Apr-21  18 54   +11 47    3.402    3.052   101M    Aql    9.5     56   38
2022-Apr-26  18 53   +11 46    3.357    2.936   106M    Aql    9.4     58   38
2022-May-01  18 51   +11 43    3.312    2.823   110M    Aql    9.3     59   38
2022-May-06  18 48   +11 35    3.267    2.711   114M    Aql    9.2     60   38
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  2.1 + 5 log d + 7.8 log r [to T-700 days, where T = date of perihelion]
m1 =  3.4 + 5 log d + 6.3 log r [T-700 to T-300 days]
m1 =  3.3 + 5 log r + 7.0 log r [T-300 days and onwards, 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
   2017K2  2022 03 28.15  I 12.0:TK 25.0C10  63   1    2/           ICQ XX DECaa Michel Deconinck
   2017K2  2022 03 02.50  Z 11.5 AQ 10.6R 5a180   2         5.0m345 ICQ XX RAMaa Raymond Ramlow
   2017K2  2022 02 28.09  S 11.6 TI 53.1L   155   1.2  3            ICQ XX HAR11 Christian Harder
```

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 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.

How bright is C/2017 K2? Only 3 magnitude estimates and 3 images were submitted to the ALPO (thanks to Michel Deconinck, Christian Harder, Eliot Herman, Raymond Ramlow and Tenho Tuomi). The COBS site received more observations over the same period. All suggest a comet that might be fainter than the prediction shown above. Part of the problem is that K2 has been brightening at a very slow rate since discovery and the rate might be slowing down. For most of the past year, its rate of brightening was around 2.5n ~ 6.3 which is slow even for dynamically new long-period comets. My prediction speeds the brightening up a bit to 2.5n = 7.0. If it is still falling behind at the end of April, future predictions will stick to the slower rate.

With perihelion months away on 2022 December 19 at 1.80 au, K2 has time to kick it into high gear and brighten at a faster rate. The assumed 2.5n = 7.0 rate has K2 breaking magnitude 10.0 in early to mid-April as it moves through Ophiuchus (Feb 1-March 8) and Aquila (March 8-31) in the morning sky.

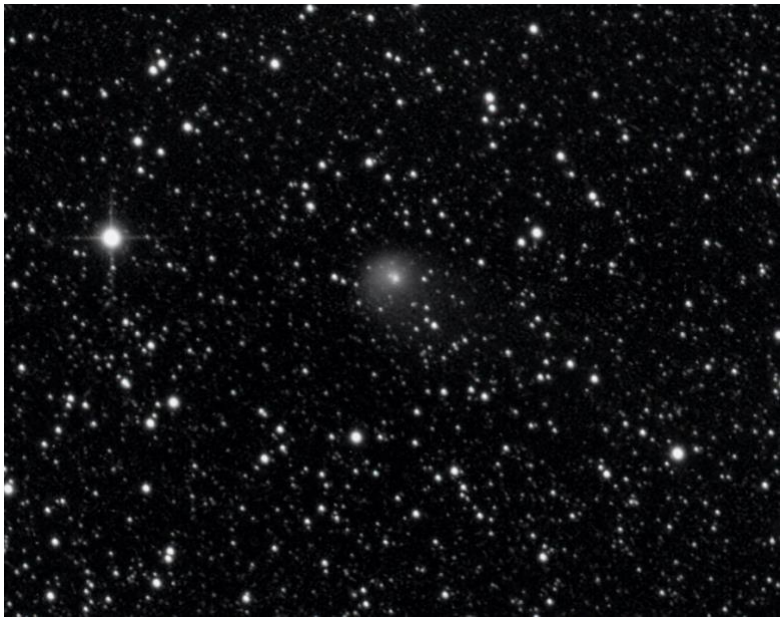


Figure 1 - Eliot Herman imaged C/2017 K2 (PANSTARRS) on 2022 March 16 with the iTelescopes T19 0.43-m reflector in a 4x180 sec exposure.

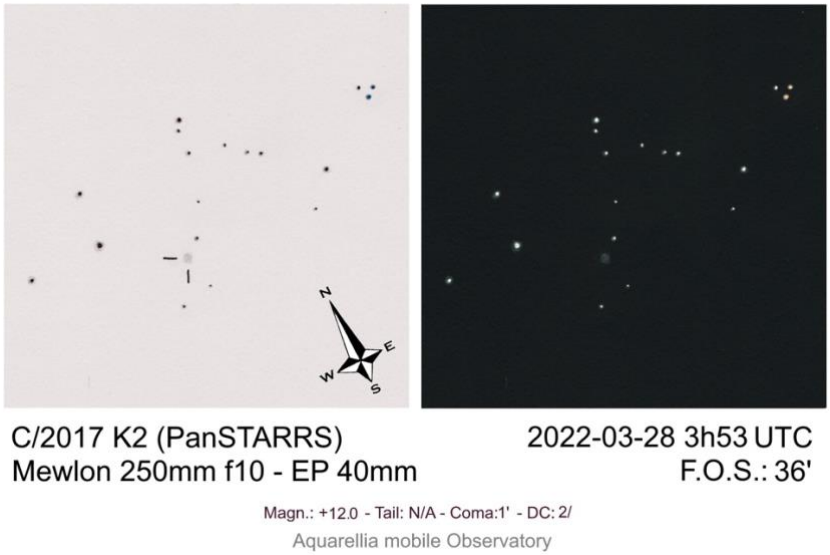


Figure 2 - Michel Deconinck sketched C/2017 K2 (PANSTARRS) on 2022 March 28 with a Takahashi Mewlon 0.25-m f/10 at 62 power.

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-F14)

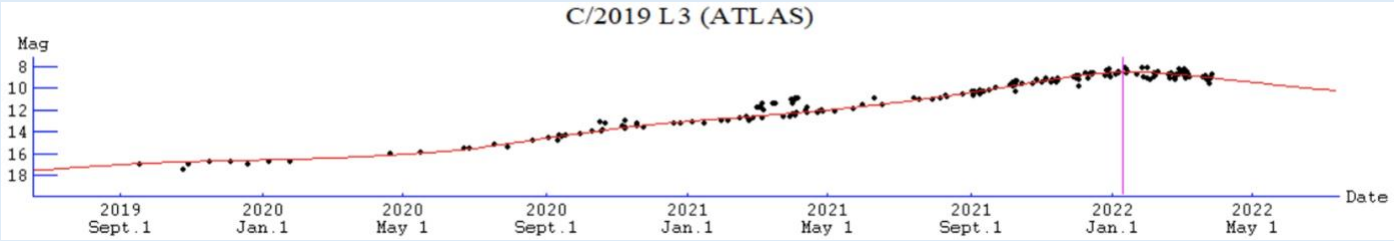
```
    C/2019 L3 (ATLAS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Jan.  9.62475 TT                                  Rudenko
q   3.5544759           (2000.0)            P               Q
z  -0.0004422      Peri.  171.61181     -0.26053002     -0.66630332
 +/-0.0000003      Node   290.78994     +0.83676509     +0.20516489
e   1.0015718      Incl.   48.36123     +0.48161010     -0.71690115
From 4684 observations 2019 June 10-2022 Mar. 21, mean residual 0".4.
1/a(orig) = +0.000113 AU**-1, 1/a(fut) = -0.000870 AU**-1.
```

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

```
C/2019 L3 (ATLAS)                                                    Max El
                                                                      (deg)
    Date       R.A.    Decl.      r        d     Elong  Const  Mag   40N  40S
2022-Apr-01  06 42   +16 38    3.630    3.502     89E    Gem    9.1    57   31
2022-Apr-06  06 45   +15 58    3.640    3.585     85E    Gem    9.2    53   31
2022-Apr-11  06 48   +15 19    3.650    3.669     81E    Gem    9.2    49   31
2022-Apr-16  06 51   +14 40    3.661    3.751     77E    Gem    9.3    44   31
2022-Apr-21  06 55   +14 03    3.672    3.833     73E    Gem    9.4    40   30
2022-Apr-26  06 59   +13 26    3.683    3.914     69E    Gem    9.4    35   30
2022-May-01  07 03   +12 49    3.695    3.993     65E    Gem    9.5    30   29
2022-May-06  07 07   +12 12    3.708    4.070     62E    CMi    9.5    25   29
```

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

```
m1 =  4.6 + 5 log d +  9.0 log r [to T-570]
m1 = -4.9 + 5 log d + 20.5 log r(t - 59) [T-570 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    Mag SC APER FL POW   COMA     TAIL   ICQ CODE Observer Name
              (UT)                   T       Dia  DC  LENG  PA
   2019L3  2022 03 27.83  S 10.0 TI 53.1L   111   2.7  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 26.86  S  9.9 TI 29.8L 4 108   2.5  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 25.82  S 10.8:TI 53.1L   139   1.8  5            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 24.82  S 10.0 TI 29.8L 4 108   2.4  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 24.13  Z  9.4:AQ 10.6R 5a180   8.3       7.7m 24 ICQ XX RAMaa Raymond Ramlow
   2019L3  2022 03 23.86  S  9.5 TK 20.3T10  77   2.5  6            ICQ XX GON05 Juan Jose Gonzalez Suarez
   2019L3  2022 03 23.82  S 10.5 TI 53.1L   139   1.5  4/           ICQ XX HAR11 Christian Harder
   2019L3  2022 03 22.40 xM  9.9 AQ 40.0L 4  59   2.7  5/   4.4m128 ICQ XX WYA   Christopher Wyatt
   2019L3  2022 03 21.83  S 10.1 TI 53.1L   139   2    4/           ICQ XX HAR11 Christian Harder
   2019L3  2022 03 21.41 xM  9.7 AQ 40.0L 4  59   3.5  6            ICQ XX WYA   Christopher Wyatt
   2019L3  2022 03 20.83  S  9.7 TI 29.8L 4  79   3.2  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 19.80  S  9.7 TI 29.8L 4  79   3.5  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 08.87  S  9.6 TI 25.2L 4  92   2.4  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 06.81  S  9.7 TI 53.1L   111   2.8  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 05.81  B  9.1 TK 25.0C10  62   1.1  4            ICQ XX DECaa Michel Deconinck
   2019L3  2022 03 04.86  S  9.5 TK 20.3T10  77   3    6            ICQ XX GON05 Juan Jose Gonzalez Suarez
   2019L3  2022 03 04.83  S  9.5 TI 29.8L 4  92   2.2 S4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 03.81  S  9.5 TI 53.1L   139   2.5 S4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 02.81  S  9.7 TI 53.1L   139   2    4/           ICQ XX HAR11 Christian Harder
   2019L3  2022 02 28.81  S  9.8 TI 53.1L   139   2.2 S4            ICQ XX HAR11 Christian Harder
```

```
2019L3  2022 02 27.81  S  9.5 TI 53.1L   139   2    4/           ICQ XX HAR11 Christian Harder
2019L3  2022 02 26.81  S  9.5 TI 29.8L 4  92   3.2  4            ICQ XX HAR11 Christian Harder
2019L3  2022 02 25.81  S  9.5 TI 29.8L 4  92   3.5 S4            ICQ XX HAR11 Christian Harder
2019L3  2022 02 25.11  Z  9.0 AQ 10.6R 5a180   9.9      10.0m  5 ICQ XX RAMaa Raymond Ramlow
2019L3  2022 02 23.80  S  9.8 TI 29.8L 4  92   2.5  5            ICQ XX HAR11 Christian Harder
2019L3  2022 02 23.78  S  9.8 TK 32.0L 5  48   1.5  7/                  PIL01 Uwe Pilz
2019L3  2022 02 22.94  S  9.9 TI 29.8L 4  79   2.3  5            ICQ XX HAR11 Christian Harder
```

C/2019 L3 (ATLAS) has been among the brightest comets in the sky over the past few months. It is now 3 months removed from its 2022 January 9 perihelion at 3.55 au. The large perihelion distance means C/2019 L3 will slowly move away from the Sun and Earth resulting in a slow rate of fading.

Twenty-seven magnitude estimates and 7 images were submitted to the ALPO since the last report in mid-February. Thanks go out to Michel Deconinck, Stephane Ferier, J J Gonzalez, Christian Harder, Uwe Pilz, Raymond Ramlow, and Chris Wyatt. They found the coma to be moderately condensed (DC ~ 4-6) and between 1.1’ and 3.5’ in diameter. Images by Raymond Ramlow measured a larger coma up to ~10’ in diameter. All observers estimated L3 to be roughly between magnitude 9.0 and 10.5 (aperture corrected to 8.3 to 9.3).

C/2019 L3 (ATLAS) is still an evening object in Gemini this month, well placed for observers in both hemispheres. Starting the month around magnitude 9.1, L3 should only fade to magnitude 9.5 or so by the end of April.

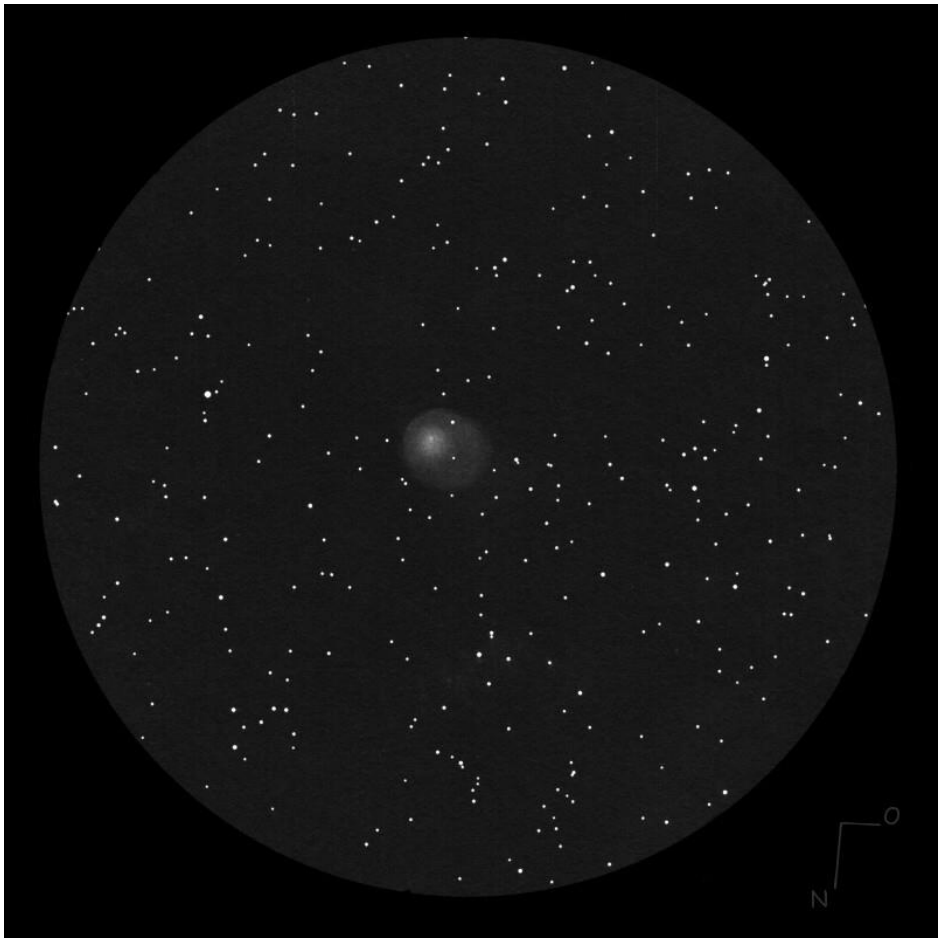


Figure 3 - C/2019 L3 as sketched by Christian Harder with a 0.4-m reflector on 2021 March 1.

C/2021 F1 (Lemmon-PANSTARRS)

Discovered 2021 March 19 by the Mount Lemmon survey
Dynamically old long-period comet with ~2800-year period

Orbit (from MPEC 2022-F14)

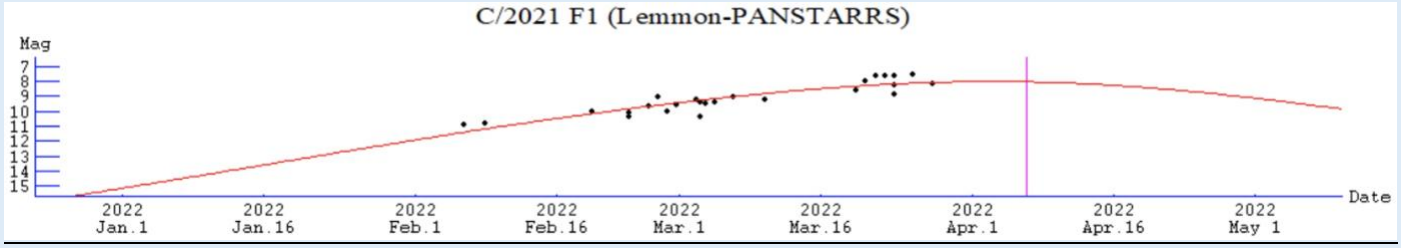
```
    C/2021 F1 (Lemmon-PANSTARRS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Apr. 6.87355 TT                                  Rudenko
q   0.9954876           (2000.0)            P              Q
z  +0.0042363      Peri.  146.82242     +0.70298995     +0.60122231
 +/-0.0000017      Node   203.45142     +0.23496501     +0.30785802
e   0.9957828      Incl.  107.32446     +0.67126490     -0.73739757
From 441 observations 2021 Mar. 19-2022 Mar. 17, mean residual 0".5.
1/a(orig) = +0.004999 AU**-1, 1/a(fut) = +0.004491 AU**-1.
```

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

```
C/2021 F1 (Lemmon-PANSTARRS)                                          Max El     Max El
                                                                       (deg)      (deg)
    Date      R.A.    Decl.     r       d     Elong  Const  Mag    Naut Twil  Astr Twil
                                                                    40N  40S   40N  40S
2022-Apr-01  00 51  +27 23   1.001   1.838    23E    Psc    8.0      6    0     1    0
2022-Apr-06  01 04  +24 47   0.996   1.891    18E    Psc    8.0      3    0     0    0
2022-Apr-11  01 16  +22 14   0.998   1.939    14E    Psc    8.1      0    0     0    0
2022-Apr-16  01 27  +19 46   1.008   1.981     9M    Psc    8.3      0    0     0    0
2022-Apr-21  01 38  +17 20   1.025   2.015     6M    Psc    8.5      0    0     0    0
2022-Apr-26  01 48  +14 58   1.048   2.043     6M    Ari    8.8      0    0     0    0
2022-May-01  01 57  +12 37   1.077   2.063     8M    Ari    9.1      0    0     0    0
2022-May-06  02 06  +10 17   1.112   2.077    12M    Cet    9.5      0    1     0    0
Maximum Elongation is for the start/end of nautical twilight rather than astronomical twilight.
```

Comet Magnitude Formula (based on data submitted to the COBS and the MPC)

```
m1 = 14.6, G = 0.15 [through T-180 days]
m1 =  6.7 + 5 log d + 26.6 log r [T-180 and onwards]
```



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 03 27.81  S  9.1 TI 53.1L   139   3.5  2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 25.81  S  8.5 TI 53.1L   139   3    2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 23.81  S  8.6 TI 53.1L   139   3.5  2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 23.83  S  8.6 TK 20.3T10  77   7    3           ICQ XX GON05 Juan Jose Gonzalez Suarez
   2021F1  2022 03 22.80  S  8.6 TI 53.1L   139   3.5  2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 21.80  S  8.6 TI 53.1L   139   4    2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 20.80  S  8.4 TI 29.8L 4  79   4    2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 19.81  S  9.0 TI 29.8L 4  79   3.7  2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 06.79  S 10.0 TI 53.1L   139   2.5  2/          ICQ XX HAR11 Christian Harder
   2021F1  2022 03 04.83  S  9.7 TK 20.3T10  77   5    2/          ICQ XX GON05 Juan Jose Gonzalez Suarez
   2021F1  2022 03 03.78  S 10.4 TI 53.1L    92   2.3  2           ICQ XX HAR11 Christian Harder
   2021F1  2022 03 02.78  S  9.6 TI 29.8L 4  92   2.5  2           ICQ XX HAR11 Christian Harder
   2021F1  2022 02 28.78  S 10.0 TI 29.8L 4  92   2.5  1/          ICQ XX HAR11 Christian Harder
   2021F1  2022 02 27.78  S 10.4 TI 29.8L 4  79   3.5  1           ICQ XX HAR11 Christian Harder
   2021F1  2022 02 26.78  S  9.5 TI 29.8L 4  79   4    2           ICQ XX HAR11 Christian Harder
   2021F1  2022 02 25.78  S 10.1 TI 29.8L 4 108   3.5  1/          ICQ XX HAR11 Christian Harder
   2021F1  2022 02 23.77  S 10.8 TI 29.8L 4 108   2.4  1           ICQ XX HAR11 Christian Harder
   2021F1  2022 02 23.76  S 10.1 TK  7.0B 6  16                                 PIL01 Uwe Pilz
```

March's brightest comet was C/2021 F1 (Lemmon-PANSTARRS). Unfortunately, it will be located too close to the Sun in April for most observers.

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 ~200 au and orbital period of ~2800 years.

March saw a number of magnitude estimates being made by Christian Harder, J J Gonzalez, and Uwe Pilz. They reported the comet as bright as magnitude 8.4 (brightest aperture corrected estimate was magnitude 7.6). The comet was very diffuse (DC ~ 1-3) with a large scatter of diameter measures (2.3' to 7').

C/2021 F1 arrives at perihelion on 2022 April 6 at 1.00 au. Unfortunately, it is located on the far side of the Sun and moving away from Earth resulting in a fading object at very small solar elongation. If perihelion had occurred around September 23, F1 would be passing 0.08 au from Earth and shining at 2nd magnitude in the opposition sky. But alas, perihelion is almost 6 months away from the optimal time so we are now dealing with a comet starting April around magnitude 8.0 and fading to ~9.0 by month's end. Unfortunately, it will not be visible this month except for the first few days of April and even then, only from the northern hemisphere and only in bright twilight. F1 may be visible in the SOHO C3 field-of-view during the last week or two of April. Lemmon-PANSTARRS should reappear for ground-based observers by mid-May, though only for southern observers and fainter at around 11th magnitude.

Figure 4 – C/2021 F1 observed on 2022 March 11 by Tenho Tuomi in a 21x60 sec exposure taken with a 0.3-m f/5 reflector.

C/2021 O3 (PANSTARRS)

Discovered 2021 July 26 by Pan-STARRS with the 1.8-m Pan-STARRS1 1.8-m on Haleakala
Dynamically new long-period comet

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

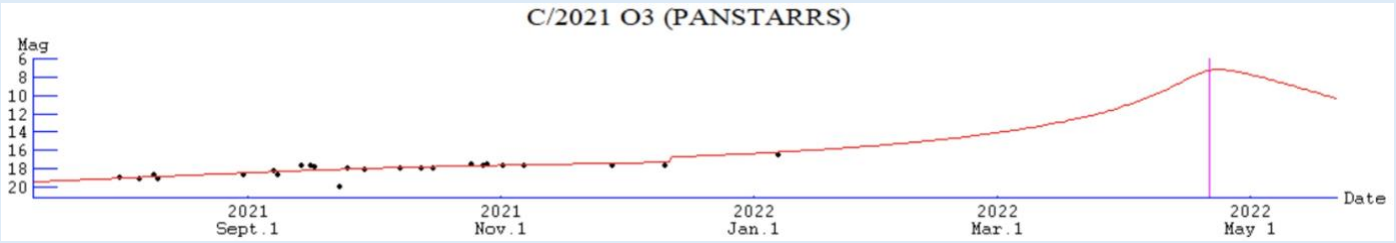
```
    C/2021 O3 (PANSTARRS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Apr. 21.04633 TT                                  Rudenko
q   0.2873237           (2000.0)            P              Q
z  -0.0004079      Peri.  299.98975     -0.56804074     -0.81247970
 +/-0.0000022      Node   189.02021     +0.64621182     -0.53901783
e   1.0001172      Incl.   56.78868     -0.50964694     +0.22211824
From 686 observations 2021 July 26-2022 Jan. 25, mean residual 0".4.
1/a(orig) = +0.000038 AU**-1, 1/a(fut) = -0.000123 AU**-1.
```

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

```
C/2021 O3 (PANSTARRS)                                                  Max El     Max El
                                                                       (deg)      (deg)
    Date      R.A.    Decl.     r       d     Elong  Const  Mag    Naut Twil  Astr Twil
                                                                    40N  40S   40N  40S
2022-Apr-01  01 08  -01 05   0.647   1.615     8E    Cet   11.1      0    0     0    0
2022-Apr-06  01 29  -01 10   0.533   1.483    10E    Cet   10.3      0    0     0    0
2022-Apr-11  01 54  -01 00   0.423   1.333    13E    Cet    9.3      0    2     0    0
2022-Apr-16  02 22  -00 02   0.329   1.160    15E    Cet    8.2      0    4     0    0
2022-Apr-21  02 51  +03 21   0.287   0.964    16E    Cet    7.4      0    5     0    0
2022-Apr-26  03 15  +11 18   0.327   0.784    15E    Ari    7.3      0    2     0    0
2022-May-01  03 33  +23 46   0.420   0.663    17E    Tau    7.8      5    0     0    0
2022-May-06  03 49  +38 39   0.531   0.608    25E    Per    8.4     14    0     8    0
The shown Maximum Elongations are for the start/end of nautical and astronomical twilight.
```

Comet Magnitude Formula (based on data submitted to the COBS and the MPC)

```
m1 = 13.2 + 5 log d + 4.7 log r [through -130 days]
m1 = 11.5 + 5 log d + 7.5 log r [-130 days and onwards, 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
None
```

We are running blind with this comet. Though there is a possibility it could be a reasonably bright small telescope object this month, there are many things working against C/2021 O3 (PANSTARRS). The biggest problem is that it has been located too close to the Sun to have been observed since February 1. As a result, we have no idea how bright the comet currently is. But this may be the least of O3's problems.

The comet was first seen on 2021 July 26 at 19th magnitude by the Pan-STARRS1 1.8-m Ritchey-Chretien on Haleakala. Perihelion will occur on 2022 April 21 at a close distance of 0.29 au from the Sun. From discovery till January, C/2021 O3 brightened at a very slow rate of less than 2.5n ~ 5. Such a slow rate is indicative of an object intrinsically fading (i.e., producing less dust and gas with time). A combination of the slow rate of brightening, intrinsic faintness and small perihelion distance suggest an object that may not survive perihelion

or even reach perihelion. The most recent orbits by the MPC and Seiichi Nakano suggest a dynamically new object which only increases the chance of disintegration.

On the date of perihelion C/2021 O3 will be an evening object located only 16 deg from the Sun. Northern hemisphere observers (for +40N) will not be able to observe it at that time as it will still be 7 deg below the horizon at the start of nautical twilight. It will be observable from the southern hemisphere (-40S) when it will be at an elevation of 5 deg at the start of nautical twilight and 1 deg below the horizon at the start of astronomical twilight.

If its rate of brightening since January was 2.5n ~ 7.5, it may peak at 7th magnitude. The combination of faintness and poor placement near the Sun will make observing this comet very difficult. The comet becomes observable in a dark sky (after the end of astronomical twilight) by the first few nights of May. This is around the time of maximum phase angle (135 deg) which may provide a 1-2 magnitude boost in brightness. Still, we are talking about an object that may only be around 6th-7th magnitude and still located ~20 deg from the Sun. Though it will be fading fast, the comet will quickly move north and become circumpolar by mid-May.

Note, that this all assumes this intrinsically faint comet survives its close brush with the Sun or hasn't disintegrated already. For a few days last month, O3's position was in the field-of-view of the SOHO C3 coronagraph. Though an experienced observer taking part in the Sungrazer Project reported a detection of C/2021 O3, it does not appear to have been confirmed and an inspection by the author of the SOHO C3 data didn't reveal an obvious detection. This suggest the comet was fainter than 8th magnitude. Then again, the comet wasn't expected to be brighter than magnitude 12-13 at the time so a non-detection in SOHO may not tell us much.

9P/Tempel

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

Orbit (from MPEC 2022-F14)

```
   9P/Tempel
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Mar. 4.94894 TT                                  Rudenko
q   1.5442319            (2000.0)            P              Q
n   0.17662679     Peri.  179.34918     -0.37340732     +0.91208365
a   3.1460455      Node    68.71402     -0.85193723     -0.26493156
e   0.5091514      Incl.   10.46998     -0.36711025     -0.31291322
P   5.58
From 1753 observations 2015 Nov. 11-2022 Mar. 16, mean residual 0".5.
     Nongravitational parameters A1 = -0.17, A2 = -0.0931.
```

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-Apr-01  20 17  -22 36   1.567   1.607    69M   Cap  11.9     11   49
2022-Apr-06  20 31  -22 24   1.576   1.583    71M   Cap  11.9     10   51
2022-Apr-11  20 45  -22 10   1.587   1.560    72M   Cap  11.9     10   53
2022-Apr-16  20 59  -21 54   1.599   1.537    74M   Cap  11.9     10   55
2022-Apr-21  21 12  -21 38   1.612   1.514    76M   Cap  12.0     10   56
2022-Apr-26  21 25  -21 21   1.626   1.492    78M   Cap  12.0     10   58
2022-May-01  21 37  -21 05   1.642   1.469    80M   Cap  12.0     10   60
2022-May-06  21 48  -20 49   1.659   1.447    82M   Cap  12.0     10   62
```

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
  9        2022 04 01.77  Z 13.9 AQ 10.6R 5a300   2.1       2.7m259 ICQ XX RAMaa Raymond Ramlow
  9        2022 03 09.77  Z 14.3 AQ 10.6R 5a180   1.2       1.4m272 ICQ XX RAMaa Raymond Ramlow
```

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.

9P/Tempel is 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 study of more pristine 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 debris released by the impact, 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 1967 was an unfavorable return, Dr. Elizabeth Roemer used the 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 confirmed the 1967 recovery. Between the 1955 and 2005 returns, 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.

Few observations were published in March. Michael Lehmann (observation submitted to COBS) reported Tempel at magnitude 13.4 on March 4 with a 2.6' coma and 1.9' long tail. Raymond Ramlow observed 9P on March 9 at magnitude 14.3 with a 1.2' coma and 1.4' long tail and again on April 1 at magnitude 13.9 with a 2.1' coma. These measurements are about two magnitudes fainter than the prediction published by Seiichi Yoshida based on Tempel's previous returns. No visual observations have been submitted to the ALPO or COBS. Perhaps the comet is visually brighter as the above prediction suggests.

This month, Tempel will be moving through the morning constellation of Capricornus. Though observable from both hemispheres it will be a much easier object for southern observers. Its brightness should stay near this return's peak of magnitude 12 all month.

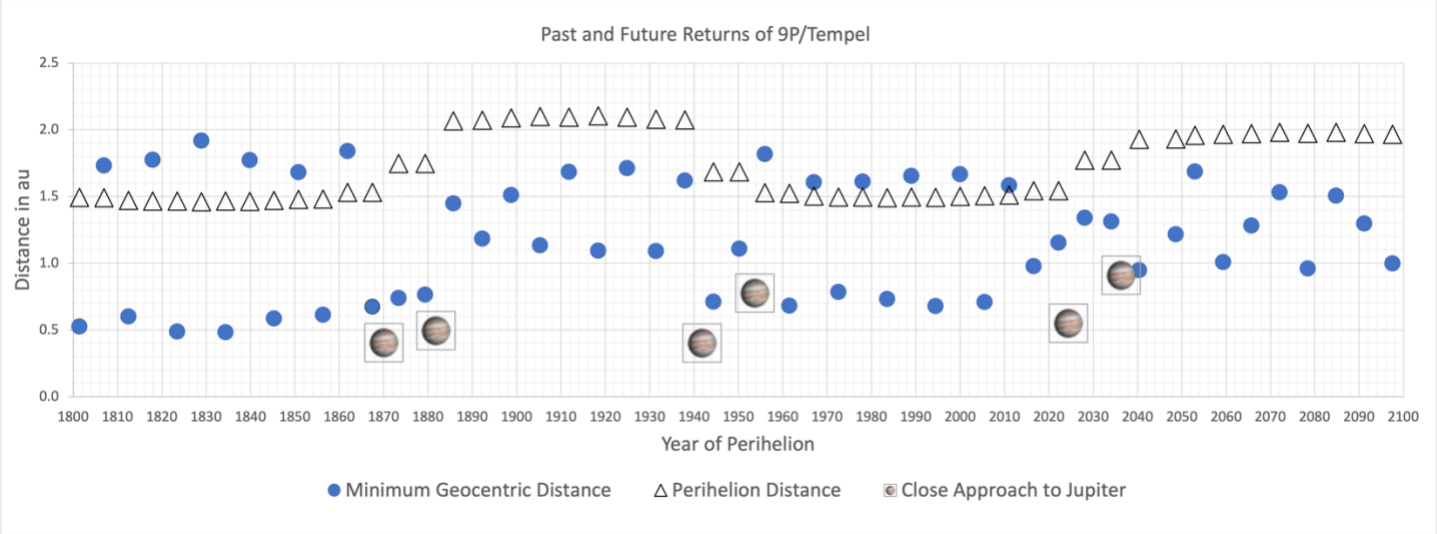


Figure 5 - Orbital evolution of 9P/Tempel from 1860 to 2100.

19P/Borrelly

Discovered 1904 December 28 by the Alphonse Borrelly

Orbit (from Minor Planet Center, MPEC 2022-F14)

```
  19P/Borrelly
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Feb. 1.82469 TT                                    Rudenko
q   1.3062736           (2000.0)            P               Q
n   0.14399965     Peri.  351.91683     +0.38680095     -0.79276598
a   3.6049155      Node    74.24723     +0.87108461     +0.14645437
e   0.6376410      Incl.   29.30463     +0.30264935     +0.59166985
P   6.84
From 1726 observations 2015 Jan. 11-2022 Mar. 21, mean residual 0".7.
     Nongravitational parameters A1 = +0.13, A2 = -0.1728.
```

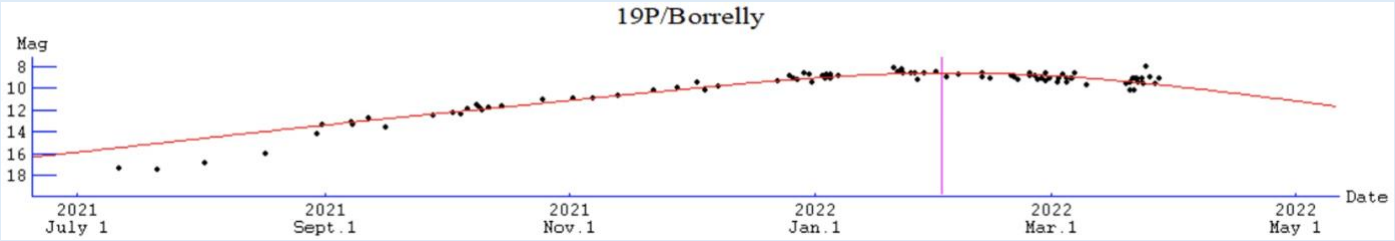
Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

19P/Borrelly

Date	R.A.	Decl.	r	d	Elong	Const	Mag	Max El (deg) 40N	40S
2022-Apr-01	04 23	+36 48	1.476	1.686	60E	Per	9.9	43	0
2022-Apr-06	04 42	+38 20	1.503	1.736	59E	Per	10.1	42	0
2022-Apr-11	05 00	+39 38	1.532	1.787	58E	Aur	10.3	41	0
2022-Apr-16	05 19	+40 43	1.562	1.840	58E	Aur	10.5	40	0
2022-Apr-21	05 39	+41 36	1.593	1.894	57E	Aur	10.7	39	0
2022-Apr-26	05 58	+42 16	1.626	1.950	56E	Aur	11.0	38	0
2022-May-01	06 17	+42 43	1.659	2.007	55E	Aur	11.2	37	0
2022-May-06	06 36	+42 59	1.692	2.065	54E	Aur	11.4	36	0

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

m1 = 5.7 + 5 log d + 20.2 log r(t – 13)
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au



Recent Magnitude Measurements in ICQ format:

Comet Des	YYYY MM DD.DD (UT)		Mag	SC	APER	FL	POW	COMA T	Dia	DC	TAIL LENG	PA	ICQ	CODE	Observer Name
19	2022 04 01.86	S	9.9	TK	20.3	T10	77		3.5	5			ICQ	XX GON05	Juan Jose Gonzalez Suarez
19	2022 03 27.82	S	10.0	TI	53.1	L	111		2.7	3/	3.0m	65	ICQ	XX HAR11	Christian Harder
19	2022 03 26.85	S	10.0	TI	29.8	L 4	108		2.5	3			ICQ	XX HAR11	Christian Harder
19	2022 03 25.81	S	9.9	TI	53.1	L	111		2.7	4	3.0m	60	ICQ	XX HAR11	Christian Harder
19	2022 03 24.81	S	9.6	TI	29.8	B 4	92		2.8	3			ICQ	XX HAR11	Christian Harder
19	2022 03 24.12	Z	9.9	AQ	10.6	R 5a	180		8.4		8.0m	78	ICQ	XX RAMaa	Raymond Ramlow
19	2022 03 23.84	S	9.8	TK	20.3	T10	77		3.5	5			ICQ	XX GON05	Juan Jose Gonzalez Suarez
19	2022 03 23.81	S	10.0	TI	53.1	L	111		2.5	3/	2.5m	60	ICQ	XX HAR11	Christian Harder
19	2022 03 22.80	S	10.5	TK	32.0	L 5	80		3.5	4				PIL01	Uwe Pilz
19	2022 03 22.38	&M	9.8	AQ	40.0	L 4	59		2.5	3/			ICQ	XX WYA	Chris Wyatt
19	2022 03 21.81	S	10.1	TI	53.1	L	111		3	3/			ICQ	XX HAR11	Christian Harder
19	2022 03 21.38	&M	9.8	TK	40.0	L 4	59		2.5	3/			ICQ	XX WYA	Chris Wyatt
19	2022 03 20.81	S	9.9	TI	29.8	L 4	79		3	3			ICQ	XX HAR11	Christian Harder
19	2022 03 19.80	S	10.0	TI	29.8	L 4	79		3.5	3			ICQ	XX HAR11	Christian Harder
19	2022 03 06.80	S	9.5	TI	53.1	L	111		3	4	8.0m	60	ICQ	XX HAR11	Christian Harder
19	2022 03 05.80	B	9.5	TK	25.0	C10	62		1.5	3/			ICQ	XX DECaa	Michel Deconinck
19	2022 03 04.84	S	9.4	TK	20.3	T10	77		4	5			ICQ	XX GON05	Juan Jose Gonzalez Suarez
19	2022 03 04.81	S	9.9	TI	29.8	L 4	92		2	3/			ICQ	XX HAR11	Christian Harder
19	2022 03 03.79	S	9.7	TI	53.1	L	139		2.1	4	4.5m	60	ICQ	XX HAR11	Christian Harder
19	2022 03 02.79	S	10.1	TI	53.1	L	139		1.9	4	4.5m	60	ICQ	XX HAR11	Christian Harder
19	2022 02 28.79	S	10.0	TI	53.1	L	139		1.4	4			ICQ	XX HAR11	Christian Harder
19	2022 02 27.79	S	9.5	TI	53.1	L	111		3	4	7.0m	55	ICQ	XX HAR11	Christian Harder

```
19        2022 02 26.79  S   9.6 TI 29.8L 4  92   3    S4            ICQ XX HAR11 Christian Harder
19        2022 02 25.79  S   9.7 TI 29.8L 4  92   3     5            ICQ XX HAR11 Christian Harder
19        2022 02 25.10  Z   9.2 AQ 10.6R 5a180  11.2       22.0m 76 ICQ XX RAMaa Raymond Ramlow
19        2022 02 23.78  S   9.3:TI 29.8L 4  79   3.2   4            ICQ XX HAR11 Christian Harder
19        2022 02 23.77  S   9.2 TK  7.0B 6  16                              PIL01 Uwe Pilz
```

Alphonse Borrelly discovered 10 or 11 comets and 18 Main Belt asteroids from the Marseille Observatory in southern France. One of his discoveries was 19P/Borrelly which he first saw on 1904 December 28. All of Borrelly's other comet discoveries were of the long-period variety and included C/1873 Q1 (Borrelly), C/1874 O1 (Borrelly), C/1874 X1 (Borrelly), C/1877 C1 (Borrelly), C/1877 G2 (Swift-Borrelly-Block), C/1889 X1 (Borrelly), C/1900 O1 (Borrelly-Brooks), C/1903 M1 (Borrelly), C/1909 L1 (Borrelly-Daniel), and C/1912 V1 (Borrelly). The reason I said Borrelly discovered 10 or 11 comets is because some catalogs (such as JPL) list C/1877 G2 as only discovered by Swift.

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.

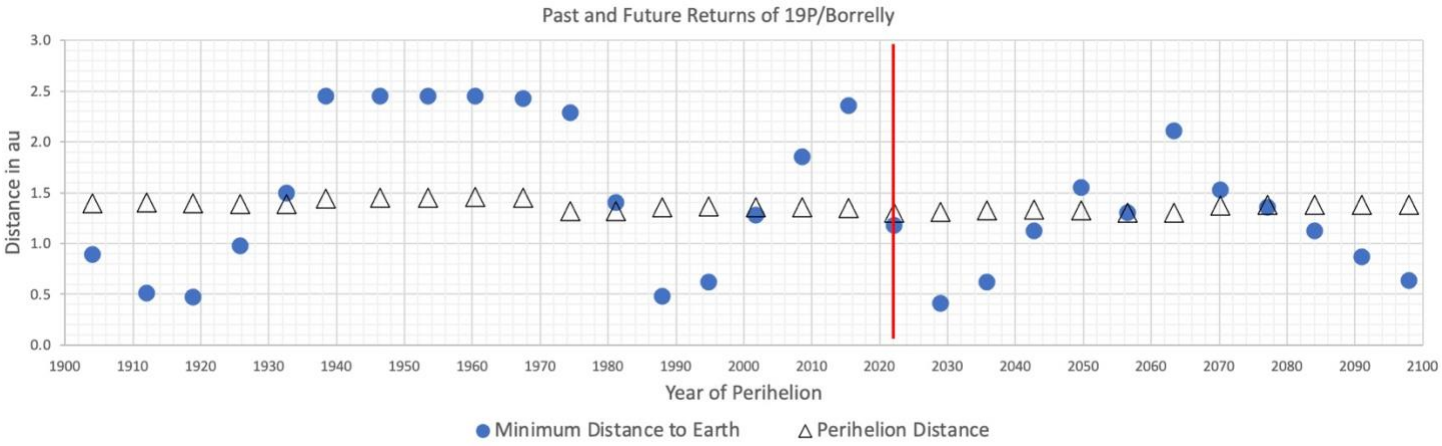


Figure 6 - Orbital evolution of 19P/Borrelly. Red vertical line highlights the current apparition. Ephemeris data from JPL Horizons.

Figure 7 - Dan Barlett of June Lake, CA, USA caught this image of 19P/Borrelly on 2022 March 24 with a Celestron 8" RASA f/2 Schmidt telescope. The image is a median combine of 133 x 30 second exposures.

Borrelly was well observed in late February and March with 9 images and 26 magnitude measurements submitted to the ALPO by Dan Bartlett, Michel Deconinck, J J Gonzalez, Christian Harder, Uwe Pilz, Raymond Ramlow, and Chris Wyatt. Visual observers found the comet to be between 9.2 and 10.5 with a weakly condensed (DC ~ 3-5) coma of diameter 2-4'. The aperture and personal bias corrected lightcurve shows 19P reaching its brightest in mid-February about 2 weeks after perihelion.

Borrelly continues to be well placed for northern observers in the evening sky as its moves through Perseus (Apr 1-8) and Auriga (8-30). Unfortunately, it is no longer observable from the southern hemisphere. Now in retreat from the Earth and Sun, the comet will fade from around magnitude 9.9 to 11.2 during April.

22P/Kopff

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

Orbit (from MPEC 2022-F14)

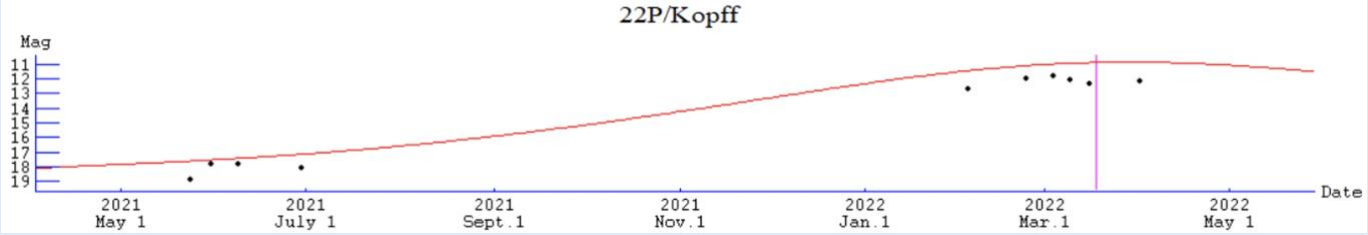
```
  22P/Kopff
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Mar. 18.12926 TT                                  Rudenko
q   1.5524137           (2000.0)            P              Q
n   0.15446378     Peri.  163.02040     +0.24029565     +0.96810075
a   3.4402099      Node   120.83293     -0.89992729     +0.24959058
e   0.5487445      Incl.    4.74203     -0.36385281     +0.02203371
P   6.38
From 3813 observations 2008 Jan. 30-2022 Mar. 17, mean residual 0".7.
     Nongravitational parameters A1 = +0.05, A2 = -0.0395.
```

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-Apr-01  21 35  -13 46   1.559   2.016    49M   Cap  10.9     5   29
2022-Apr-06  21 50  -12 45   1.565   1.997    50M   Cap  10.9     5   30
2022-Apr-11  22 04  -11 43   1.572   1.980    51M   Aqr  10.9     5   32
2022-Apr-16  22 17  -10 39   1.581   1.962    53M   Aqr  10.9     5   33
2022-Apr-21  22 31  -09 35   1.591   1.946    54M   Aqr  11.0     5   34
2022-Apr-26  22 44  -08 30   1.603   1.929    56M   Aqr  11.0     5   35
2022-May-01  22 57  -07 26   1.616   1.913    57M   Aqr  11.1     6   37
2022-May-06  23 09  -06 23   1.630   1.897    59M   Aqr  11.1     6   38
```

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
 22        2022 04 01.79  Z 12.2:AQ 10.6R 5a180   4.2                ICQ XX RAMaa Raymond Ramlow
 22        2022 03 09.78  Z 12.1 AQ 10.6R 5a180   4.4                ICQ XX RAMaa Raymond Ramlow
```

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.

At discovery, perihelion was ~1.7 au and that remained the case till a close approach to Jupiter in 1943. Since then, perihelion has stayed in the 1.48 to 1.59 au range. During that time the best returns occurred in 1983 and 1996 when 22P reached 7th magnitude. Changes for the better are afoot. In 2026, another close approach to Jupiter will lower 22P'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, 22P's perihelion will spend the rest of the 21st century around 1.16 au. Unfortunately,

the 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).

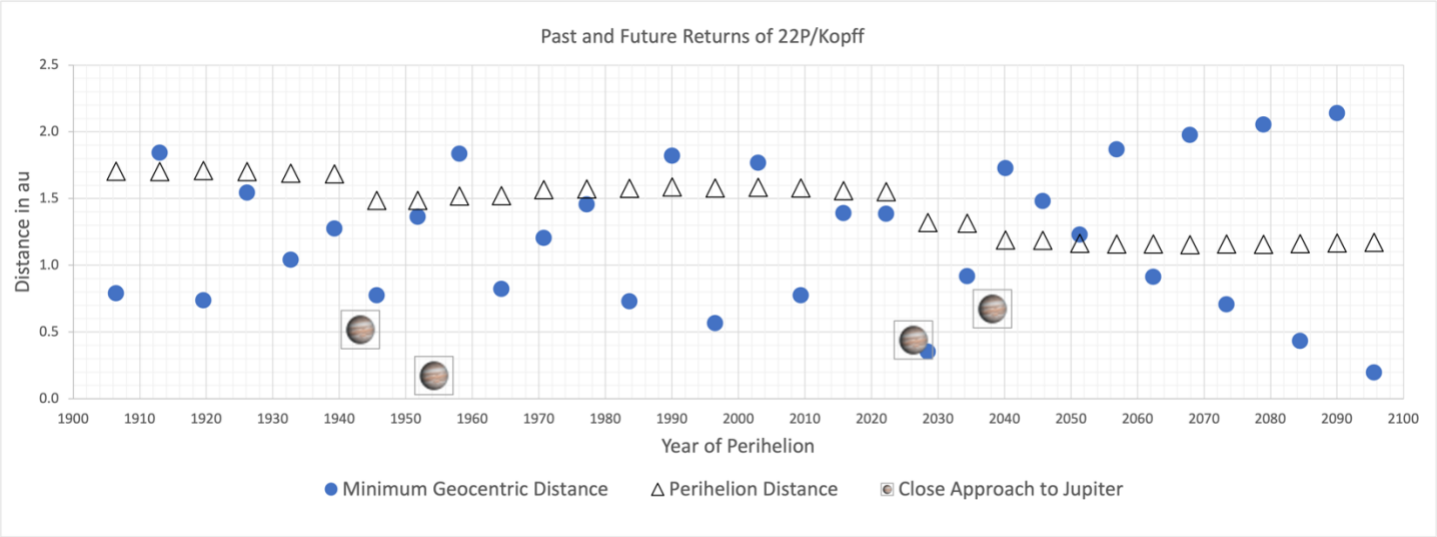


Figure 8 - Orbital evolution of 22P/Kopff between the years 1900 and 2100.

22P/Kopff was 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 around magnitude 11 in April. The comet is observable from both hemispheres though difficult from the northern hemisphere in the morning sky as it moves through Capricornus (Apr 1-9) and Aquarius (9-30).

Raymond Ramlow was able to image Kopff on March 9 at magnitude 12.1 and on April 1 at 12.2 with a 4.2-4.4' coma. Michael Lehmann submitted a series of observations to the COBS site between February 4 and March 16. He placed Kopff between magnitude 11.8 and 12.7 with a coma ranging from 2.4' to 6.3'. Like 9P/Tempel, these measurements are fainter than the prediction published by Seiichi Yoshida based on Kopff's previous returns. So far, no visual observations have been submitted to the ALPO or COBS. Perhaps the comet really is around magnitude 11 as the above prediction suggests if it were observed visually.

Figure 9 - 22P as imaged by Raymond Ramlow on 2022 April 1.

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-F14)

```
  29P/Schwassmann-Wachmann
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2019 Apr. 4.87471 TT                                  Rudenko
q   5.7713440           (2000.0)            P              Q
n   0.06636455     Peri.   49.81639     +0.99174055     -0.04471129
a   6.0419707      Node   312.38185     -0.02056436     +0.86971648
e   0.0447911      Incl.    9.36627     +0.12660091     +0.49152227
P  14.9
From 13297 observations 2018 June 18-2022 Mar. 20, 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-Apr-01  04 35  +29 03   5.972   6.394     60E    Tau   11-15    48   11
2022-Apr-06  04 39  +29 02   5.973   6.464     56E    Tau   11-15    44   10
2022-Apr-11  04 42  +29 02   5.975   6.531     52E    Tau   11-15    40    9
2022-Apr-16  04 46  +29 03   5.976   6.594     48E    Tau   11-15    35    7
2022-Apr-21  04 49  +29 03   5.978   6.654     44E    Tau   11-15    31    6
2022-Apr-26  04 53  +29 04   5.979   6.709     40E    Tau   11-15    27    5
2022-May-01  04 57  +29 05   5.981   6.761     36E    Tau   11-15    23    4
2022-May-06  05 01  +29 07   5.982   6.807     32E    Tau   11-15    19    2
```

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 04 01.89  S 11.2 TK 20.3T10 100   5    1/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 29        2022 03 22.38 xI[14.3 AQ 40.0L 4 261                     ICQ XX WYA   Christopher Wyatt
 29        2022 03 21.38 xI[13.9 AQ 40.0L 4 182                     ICQ XX WYA   Christopher Wyatt
```

Enigmatic, outburst prone 29P was hyperactive between September and November experiencing multiple large outbursts. At that time 29P was as bright as magnitude 10. Since then, it has settled down though a large outburst occurred on February 11 and smaller ones on February 24 and March 17. Chris Wyatt was not able to detect 29P visually in March. A report by J. J. Gonzalez found 29P to be at magnitude 11.2 with a 5' coma. Imagers submitted a number of magnitude estimates to the COBS site in March, some also finding the comet as bright as magnitude 11 though with an even larger ~11-14' coma.

29P is 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).

67P/Churyumov-Gerasimenko

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

Orbit (from Minor Planet Center, MPEC 2022-F14)

```
  67P/Churyumov-Gerasimenko
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2021 Nov. 2.06611 TT                                  Rudenko
q   1.2106353           (2000.0)            P              Q
n   0.15341010     Peri.   22.13742     +0.52344239     -0.85112141
a   3.4559443      Node    36.33339     +0.77128108     +0.45334063
e   0.6496948      Incl.    3.87163     +0.36212367     +0.26471612
P   6.42
From 10294 observations 1995 July 3-2022 Mar. 21, mean residual 0".8.
     Nongravitational parameters A1 = +0.08, A2 = +0.0111.
```

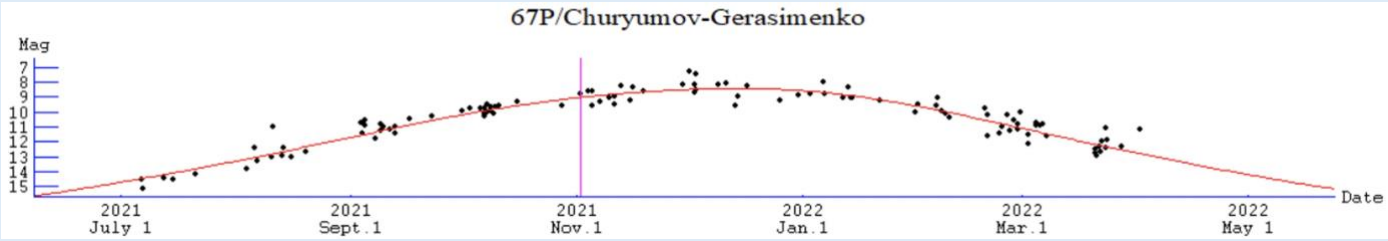
Ephemerides (produced with Seiichi Yoshida's Comets for Windows program)

67P/Churyumov-Gerasimenko

Date	R.A.	Decl.	r	d	Elong	Const	Mag	Max El (deg) 40N	40S
2022-Apr-01	08 43	+23 20	2.092	1.451	116E	Cnc	12.8	73	27
2022-Apr-06	08 48	+22 45	2.132	1.539	112E	Cnc	13.0	73	27
2022-Apr-11	08 53	+22 09	2.171	1.629	108E	Cnc	13.3	71	28
2022-Apr-16	08 59	+21 33	2.210	1.722	105E	Cnc	13.5	69	29
2022-Apr-21	09 04	+20 56	2.249	1.815	101E	Cnc	13.7	66	29
2022-Apr-26	09 10	+20 19	2.288	1.911	98E	Cnc	14.0	62	30
2022-May-01	09 16	+19 41	2.327	2.007	95E	Cnc	14.2	59	30
2022-May-06	09 22	+19 02	2.365	2.105	91E	Leo	14.4	55	31

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

m1 = 9.1 + 5 log d + 12.8 log r(t-54)
where "t" is date of perihelion, "d" is Comet-Earth distance in au, and "r" is Comet-Sun distance in au



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
67	2022 04 01.87	S 11.5	TK	20.3	T10	100		2	3			ICQ	XX GON05	Juan Jose Gonzalez Suarez
67	2022 03 27.84	S 13.2	TI	53.1	L	155		1.5	1/			ICQ	XX HAR11	Christian Harder
67	2022 03 24.13	Z 12.6	AQ	10.6	R 5a	300		3.6		12.0m	283	ICQ	XX RAMaa	Raymond Ramlow
67	2022 03 23.87	S 11.4	TK	20.3	T10	100		2	2/			ICQ	XX GON05	Juan Jose Gonzalez Suarez
67	2022 03 22.83	S 12.9	TI	53.1	L	155		1.3	2			ICQ	XX HAR11	Christian Harder
67	2022 03 22.41	xM 13.3	AQ	40.0	L 4	108		1.7	3/			ICQ	XX WYA	Christopher Wyatt
67	2022 03 21.84	S 13.2	TI	53.1	L	215		1	2			ICQ	XX HAR11	Christian Harder
67	2022 03 21.40	xM 13.5	AQ	40.0	L 4	108		1.5	5/			ICQ	XX WYA	Christopher Wyatt
67	2022 03 20.83	S 13.2	TI	29.8	L 4	132		1	2			ICQ	XX HAR11	Christian Harder
67	2022 03 06.82	S 11.7	TI	53.1	L	111		2.2	1/			ICQ	XX HAR11	Christian Harder
67	2022 03 04.87	S 11.0	TK	20.3	T10	100		2	2/			ICQ	XX GON05	Juan Jose Gonzalez Suarez
67	2022 03 04.80	S 11.3	TI	29.8	L 4	108		1.5	2/			ICQ	XX HAR11	Christian Harder
67	2022 03 02.81	S 13.0	TI	53.1	L	139		1.3	2			ICQ	XX HAR11	Christian Harder
67	2022 02 28.81	S 10.9	TI	53.1	L	139		2.6	2			ICQ	XX HAR11	Christian Harder
67	2022 02 27.82	S 11.7	TI	53.1	L	139		1.6	2/			ICQ	XX HAR11	Christian Harder
67	2022 02 26.82	S 11.0	TI	29.8	L 4	108		2	2			ICQ	XX HAR11	Christian Harder
67	2022 02 25.82	S 11.7	TI	29.8	L 4	108		2.2	1			ICQ	XX HAR11	Christian Harder
67	2022 02 25.12	Z 10.9	AQ	10.6	R 5a	180		5.9	>	33.0m	280	ICQ	XX RAMaa	Raymond Ramlow
67	2022 02 23.80	S 11.4	TI	29.8	L 4	92		2.4	2			ICQ	XX HAR11	Christian Harder
67	2022 02 22.95	S 11.8	TI	29.8	L 4	92		1.6	2/			ICQ	XX HAR11	Christian Harder
67	2022 04 01.87	S 11.5	TK	20.3	T10	100		2	3			ICQ	XX GON05	Juan Jose Gonzalez Suarez

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). 67P is best known as the target of the ESA Rosetta mission.

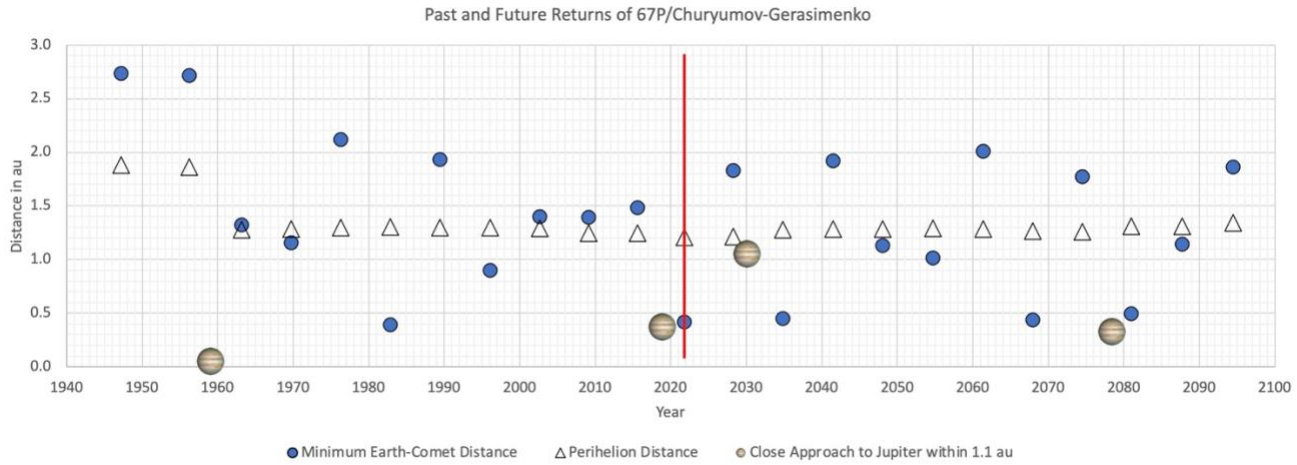


Figure 10 - Orbital evolution of 67P/C-G. Red vertical line highlights the current apparition. Ephemeris data from JPL Horizons.

Like 19P, 67P was well observed in late February and March with X images and 19 magnitude measurements submitted to the ALPO by Dan Bartlett, Michel Deconinck, J J Gonzalez, Christian Harder, Uwe Pilz, Raymond Ramlow, and Chris Wyatt. From late February to the end of March, the comet was observed to fade from around magnitude 11.0 to 13.0 with a small weakly condensed (DC ~ 1-2.5) coma of diameter 1-2.6'. Images found a larger coma up to 6' in diameter. The aperture and personal bias corrected lightcurve found 67P to have reached its brightest at the end of 2021 almost 2 months after perihelion.

This will likely be the last month we highlight 67P as it will start the month only a little brighter than magnitude 13.0 and fade to around 14 by the end of April. Observers in both hemispheres can observe 67P in the evening sky as it slowly moves through the constellation of Cancer.

Figure 11 - 67P was imaged by Dan Bartlett on 2022 February 26 with a Celestron RASA11 Schmidt and ASI2600MC-Pro camera.

104P/Kowal

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

Orbit (from Minor Planet Center, MPEC 2022-F14)

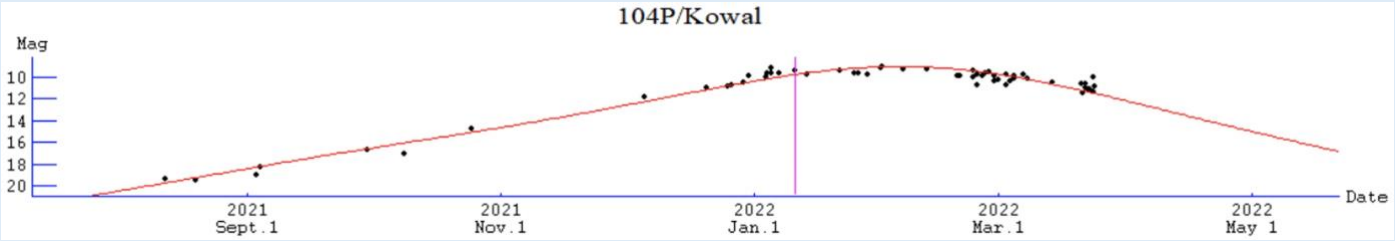
```
104P/Kowal
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Jan. 11.62317 TT                                  Rudenko
q   1.0730562           (2000.0)            P              Q
n   0.17169081     Peri.  227.25264     +0.26946476     -0.96193814
a   3.2060578      Node   207.21375     +0.91002370     +0.26978691
e   0.6653035      Incl.    5.70109     +0.31503272     +0.04347467
P   5.74
From 1323 observations 2016 Jan. 3-2022 Mar. 20, mean residual 1".0.
     Nongravitational parameters A1 = +1.10, A2 = -1.0995.
```

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-Apr-01  07 01   +15 28    1.488    1.035     93E    Gem   11.8     59   33
2022-Apr-06  07 19   +15 25    1.529    1.101     93E    Gem   12.2     58   34
2022-Apr-11  07 35   +15 15    1.571    1.170     92E    Gem   12.7     56   34
2022-Apr-16  07 50   +15 00    1.613    1.242     91E    Gem   13.1     54   34
2022-Apr-21  08 05   +14 41    1.655    1.318     89E    Cnc   13.6     52   35
2022-Apr-26  08 19   +14 18    1.698    1.396     88E    Cnc   14.0     50   35
2022-May-01  08 33   +13 51    1.741    1.477     86E    Cnc   14.5     47   35
2022-May-06  08 45   +13 22    1.784    1.560     85E    Cnc   14.9     44   36
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 9.2 + 5 log d + 26.7 log r(t-33)
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 04 01.84  S 10.5 TK 20.3T10 100   4    2           ICQ XX GON05 Juan Jose Gonzalez Suarez
104        2022 03 22.82  S 11.1 TI 53.1L   139   2.5  1           ICQ XX HAR11 Christian Harder
104        2022 03 22.40 xM 11.2 AQ 40.0L 4  59   3.6  2/          ICQ XX WYA   Christopher Wyatt
104        2022 03 21.81  S 10.6 TI 53.1L   139   2.5  1           ICQ XX HAR11 Christian Harder
104        2022 03 21.40 xM 11.5 AQ 40.0L 4  59   2.7  3/          ICQ XX WYA   Christopher Wyatt
104        2022 03 20.82  S 10.6 TI 29.8L 4 132   3    1           ICQ XX HAR11 Christian Harder
104        2022 03 06.81  S  9.8 TI 53.1L   111   3.8  2           ICQ XX HAR11 Christian Harder
104        2022 03 04.85  S  9.9 TK 20.3T10  77   5    2/          ICQ XX GON05 Juan Jose Gonzalez Suarez
104        2022 03 04.82  S 10.2 TI 29.8L 4 108   3    2           ICQ XX HAR11 Christian Harder
104        2022 03 03.81  S 10.4 TI 53.1L   139   3    2/          ICQ XX HAR11 Christian Harder
104        2022 03 02.80  S 10.7 TI 53.1L   139   3    2/          ICQ XX HAR11 Christian Harder
104        2022 02 28.80  S 10.3 TI 53.1L   139   3.3  2/          ICQ XX HAR11 Christian Harder
104        2022 02 27.80  S 10.4 TI 53.1L   139   3    2/          ICQ XX HAR11 Christian Harder
104        2022 02 26.80  S  9.5 TI 29.8L 4  79   5.2  2/          ICQ XX HAR11 Christian Harder
104        2022 02 25.80  S  9.6 TI 29.8L 4  79   4.8  2/          ICQ XX HAR11 Christian Harder
104        2022 02 25.11  Z  9.9 AQ 10.6R 5a180  11.3       4.5m 80 ICQ XX RAMaa Raymond Ramlow
104        2022 02 23.79  S  9.8 TI 29.8L 4  79   4.8  1/          ICQ XX HAR11 Christian Harder
104        2022 02 23.76  S 10.8 TK 32.0L 5  80   3    3/                PIL01 Uwe Pilz
104        2022 02 22.93  S 10.0:TI 29.8L 4  79   3    2/          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 should become a routine small telescope object in the future.

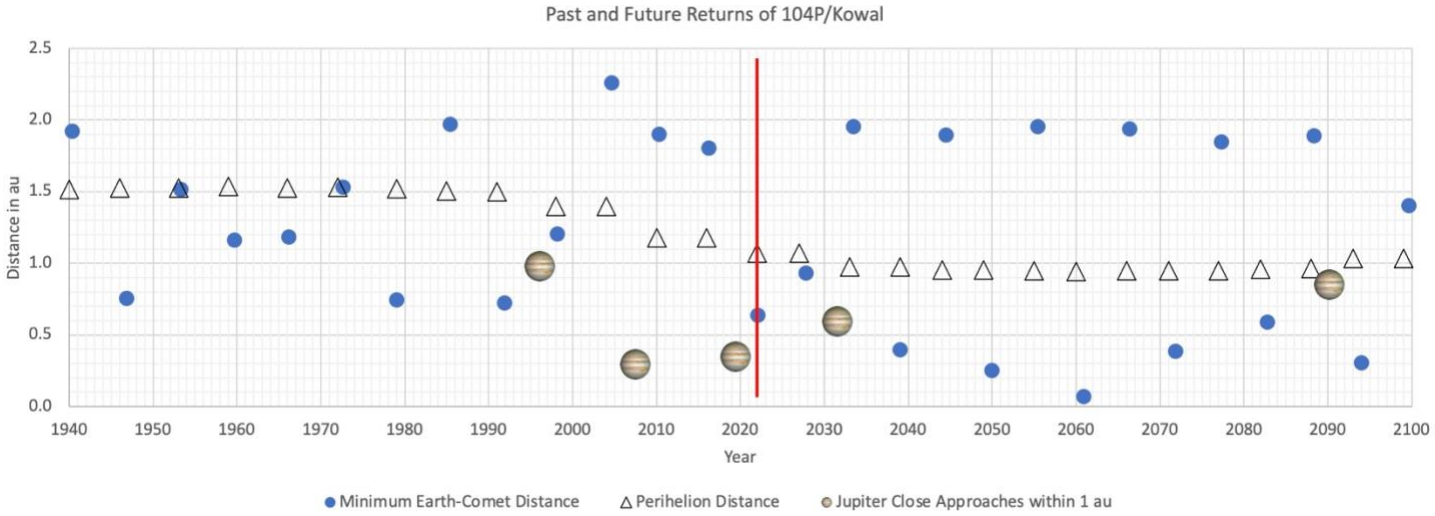


Figure 12 - Orbital evolution of 104P/Kowal. Red vertical line highlights the current apparition. Ephemeris data from JPL Horizons.

104P was at its best in February. Like 19P and 67P, it has an asymmetric lightcurve and reached its brightest after perihelion (in the case of 104P, roughly a month after perihelion). The 18 magnitude estimates by J J Gonzalez, Christian Harder, Uwe Pilz, Raymond Ramlow, and Chris Wyatt found the comet fading from around magnitude 10.0 in late February to 11.1-11.5 in late March with J.J. Gonzalez coming in a bit brighter at 10.5 on April 1. The visual coma was very diffuse (DC ~ 1-2.5) and 2-5' in diameter.

Now nearly 4 months after its January 11 perihelion at 1.07 au, Kowal should fade from magnitude 11.8 to 14.5 during April. It is visible from both hemispheres in the evening sky as it moves through Gemini (Apr 1-18) and Cancer (18-30).

Figure 13 - 104P/Kowal as imaged on 2022-Feb-03 by Tenho Tuomi with a 0.3-m reflector in 19x60s exposures.

Looking forward to the next few returns of 104P, the return in 2028 will be fainter and farther than the current return (10th magnitude and 0.93 au from Earth). The 2033 return will be poor with the comet located on the far side of the Sun at perihelion. The following return in 2039 will be its best-known return with a close Earth approach of 0.40 au. The comet should reach a brightness of 7th magnitude at that return. 2039 also begins a cycle where every other return (roughly every 10-11 years) sees a close approach to Earth. This cycle holds through the remainder of the century with the best return in 2060 when Kowal approaches within 0.07 au of Earth and reaching 4-5th magnitude.

C/2019 T4 (ATLAS)

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

Orbit (from MPEC 2022-F14)

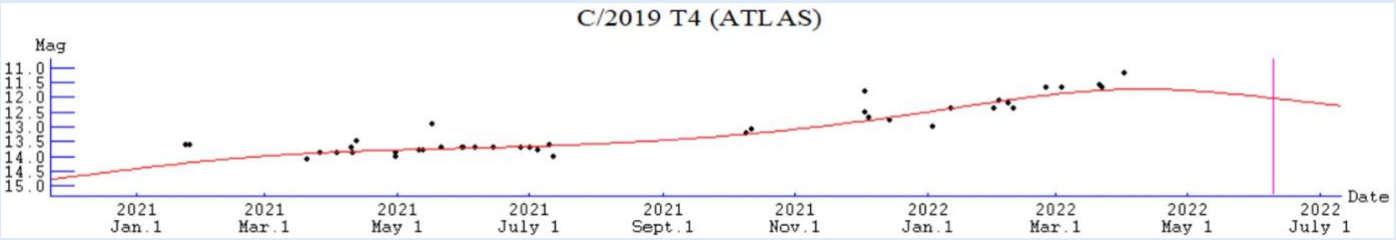
```
    C/2019 T4 (ATLAS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 June  9.17158 TT                                  Rudenko
q   4.2423795           (2000.0)            P               Q
z  +0.0009764      Peri.  351.20610     -0.95991889     +0.05616275
 +/-0.0000007      Node   199.94029     -0.18205884     -0.86982948
e   0.9958576      Incl.   53.62598     -0.21309692     +0.49014531
From 892 observations 2019 Feb. 5-2022 Mar. 18, mean residual 0".4.
1/a(orig) = +0.000623 AU**-1, 1/a(fut) = +0.000962 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-Apr-01  11 51  -21 27    4.281   3.333    159E   Crt  11.7    28   72
2022-Apr-06  11 49  -20 20    4.276   3.331    158E   Crt  11.7    30   70
2022-Apr-11  11 47  -19 12    4.271   3.337    155E   Crt  11.7    31   69
2022-Apr-16  11 46  -18 03    4.266   3.351    152E   Crt  11.7    32   68
2022-Apr-21  11 45  -16 54    4.262   3.373    148E   Crt  11.7    33   67
2022-Apr-26  11 44  -15 45    4.258   3.402    144E   Crt  11.8    34   66
2022-May-01  11 44  -14 38    4.255   3.437    139E   Crt  11.8    35   65
2022-May-06  11 43  -13 32    4.252   3.480    134E   Crt  11.8    36   64
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 2.3 + 5 log d + 10.8 log r
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T         Dia  DC  LENG  PA
   2019T4  2022 04 01.91  S 10.8 TK 20.3T10 100   4    3           ICQ XX GON05 Juan Jose Gonzalez Suarez
   2019T4  2022 03 22.42 xM 12.3 AQ 40.0L 4 108   0.9  6           ICQ XX WYA   Christopher Wyatt
   2019T4  2022 03 21.41 xM 12.2 AQ 40.0L 4 108   1.2  6           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 twice in March. On the 21st and 22nd Chris reported T4 to be at magnitude 12.2 to 12.3 with a small (0.9-1.2') moderately condensed (DC = 6) coma. J. J. Gonzalez's estimate from April 1 was much brighter at 10.8 and with a larger 4' coma. For now, we'll go with the fainter estimate unless other confirming data comes in. The comet should remain around a peak brightness of 11.7-11.8 all month. Being located in the evening sky in Crater, it will be visible from both hemispheres.

C/2020 V2 (ZTF)

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

Orbit (from MPEC 2022-F14)

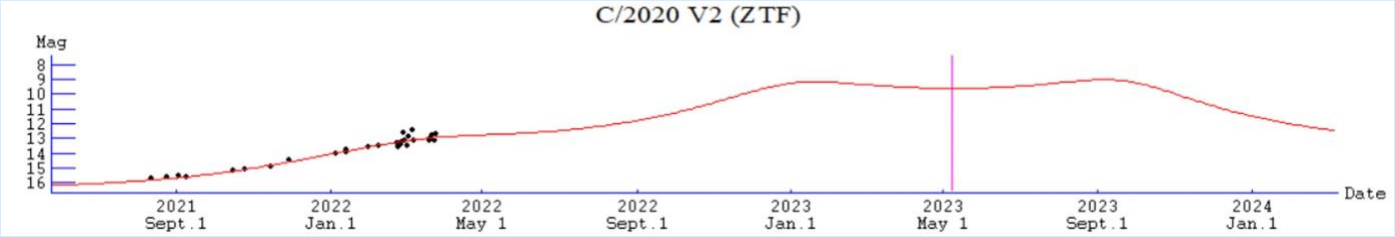
```
    C/2020 V2 (ZTF)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2023 May 8.48766 TT                                  Rudenko
q   2.2282465           (2000.0)            P              Q
z  -0.0005437      Peri.  162.40066     +0.69768688     +0.59419432
 +/-0.0000005      Node   212.36116     +0.53377523     -0.05855701
e   1.0012116      Incl.  131.60879     +0.47782530     -0.80218713
From 1602 observations 2020 Apr. 18-2022 Mar. 21, mean residual 0".4.
1/a(orig) = -0.000147 AU**-1, 1/a(fut) = -0.000385 AU**-1.
```

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

```
C/2020 V2 (ZTF)                                                        Max El
                                                                        (deg)
    Date       R.A.    Decl.      r       d     Elong  Const  Mag    40N  40S
2022-Apr-01  11 28  +60 56    4.768   4.284    113E    UMa   12.9     69    0
2022-Apr-06  11 17  +61 16    4.727   4.296    109E    UMa   12.9     69    0
2022-Apr-11  11 06  +61 28    4.686   4.312    105E    UMa   12.8     69    0
2022-Apr-16  10 55  +61 32    4.646   4.331    102E    UMa   12.8     69    0
2022-Apr-21  10 45  +61 28    4.605   4.354     98E    UMa   12.8     69    0
2022-Apr-26  10 36  +61 19    4.564   4.380     94E    UMa   12.8     69    0
2022-May-01  10 28  +61 04    4.523   4.407     90E    UMa   12.8     68    0
2022-May-06  10 21  +60 44    4.482   4.435     86E    UMa   12.7     66    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 =  1.3 + 5 log d + 12.4 log r [through -400 days]
m1 =  4.3 + 5 log d +  8.0 log r [-400 days and onward, assumed]
```



Recent Magnitude Measurements Contributed to the ALPO Comets Section

```
Recent Magnitude Measurements in ICQ format:
Comet Des  YYYY MM DD.DD     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T         Dia  DC  LENG  PA
   2020V2  2022 03 27.86  S 13.9 TI 53.1L   215   0.45s5    0.8m150 ICQ XX HAR11 Christian Harder
   2020V2  2022 03 25.85  S 13.6 TI 53.1L   215   0.6  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 03 24.84  S 13.5 TI 29.8L 4 170   0.4  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 03 22.87  S 13.7 TI 53.1L   155   0.45 4            ICQ XX HAR11 Christian Harder
   2020V2  2022 03 21.86  S 13.9 TI 53.1L   215   0.35 4/           ICQ XX HAR11 Christian Harder
   2020V2  2022 03 20.85  S 13.5 TI 29.8L 4 132   0.4  4/           ICQ XX HAR11 Christian Harder
   2020V2  2022 03 06.87  S 13.3 TI 53.1L   215   0.8  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 03 03.85  S 13.8 TI 53.1L   242   0.7  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 03 02.84  S 14.4 TI 53.1L   242   0.5  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 02 28.84  S 14.0 TI 53.1L   215   0.35 3            ICQ XX HAR11 Christian Harder
   2020V2  2022 02 27.86  S 13.5 TI 53.1L   215   0.5  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 02 26.82  S 13.6 TI 29.8L 4 170   0.4  3            ICQ XX HAR11 Christian Harder
   2020V2  2022 02 25.84  S 13.8 TI 29.8L 4 170   0.3  4            ICQ XX HAR11 Christian Harder
   2020V2  2022 02 23.81  S 14.0 TI 29.8L 4 170   0.4  3            ICQ XX HAR11 Christian Harder
   2020V2  2022 02 22.96  S 13.7 TI 29.8L 4 132   0.6  4            ICQ XX HAR11 Christian Harder
```

The Zwicky Transient Facility (ZTF) used the 1.2-m Schmidt on Mount Palomar to discover C/2020 V2 (ZTF) on 2020 November 2 at 19th magnitude. At discovery, the comet was approximately 2.5 years from perihelion

and over 8 au from the Sun. As April begins, the comet is still over a year from its 2023 May 8 perihelion at 2.23 au.

Christian Harder observed C/2020 V2 on 15 separate nights between February 22 and March 27. He reported the comet to be between magnitude 13.3 and 14.4. Since he was using relatively large telescopes (0.30-m and 0.53-m), these magnitudes can be aperture corrected to brighter values of 12.4 to 13.5. Not surprisingly for a comet still nearly5 au from the Sun, its coma was observed to be small at 0.3' to 0.8'. Michael Lehmann also imaged V2 on 4 nights in March and found V2 as bright as magnitude 13.0.

C/2020 V2 is currently an evening object at high declinations in Ursa Major. This makes it solely a northern hemisphere object. April should see V2 break the magnitude 13.0 level. Assuming a 2.5n = 8.0 brightening rate (which is actually slower than the 2.5n ~ 12 rate observed over the past few months), V2 may brighten to around magnitude 9.0 in January/February 2023 when it will still be a northern circumpolar object and again in September 2023 when it will be visible from both hemispheres. We may be talking about this comet for many months and years to come.

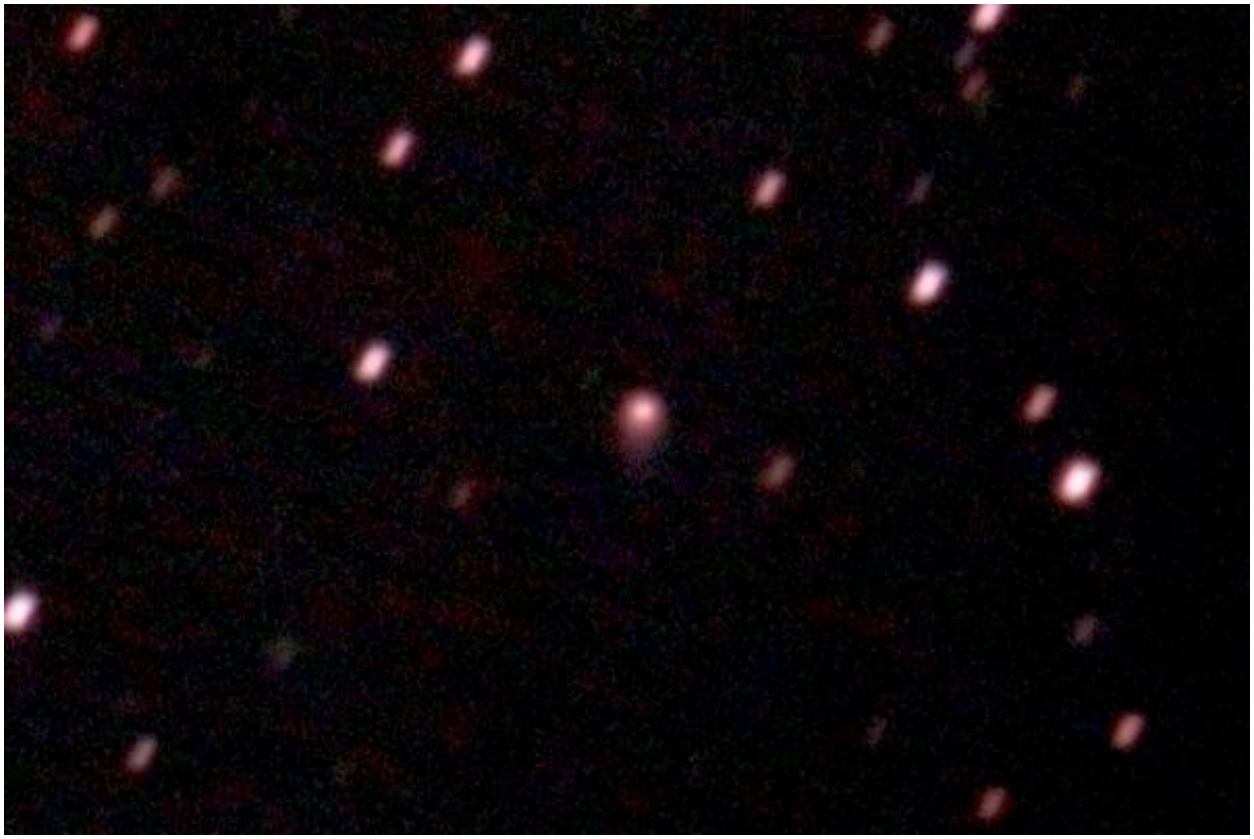


Figure 14 – Image of C/2020 V2 (ZTF) from 2022-Feb-23 by Tenho Tuomi with a 0.3-m f/5 newtonian and Canon 600D at ISO 6400. Image is a co-add of 20x6 sec exposures.

C/2021 A1 (Leonard)

Discovered 2021 January 3 by Greg Leonard of the Catalina Sky Survey with the 1.5-m on Mount Lemmon
Dynamically old long period comet

Orbit (from Minor Planet Center MPEC 2022-C56)

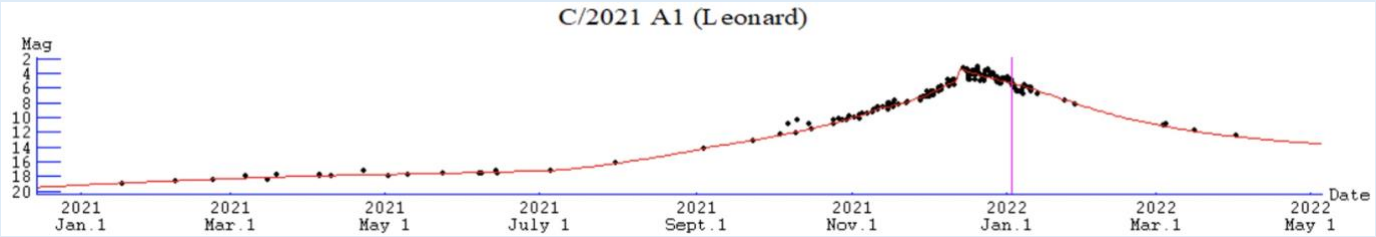
```
    C/2021 A1 (Leonard)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 Jan. 3.29906 TT                                  Rudenko
q   0.6152578           (2000.0)            P              Q
z  -0.0000414      Peri.  225.09246     +0.63773960     +0.29161748
 +/-0.0000008      Node   255.89590     +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) = +0.000520 AU**-1, 1/a(fut) = -0.000086 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-Apr-01  21 03  -35 29   1.760   1.941    64E    Mic   12.6      0   47
2022-Apr-06  20 57  -35 48   1.834   1.910    70E    Mic   12.7      0   53
2022-Apr-11  20 50  -36 11   1.907   1.874    76E    Mic   12.9      0   59
2022-Apr-16  20 42  -36 38   1.979   1.837    82E    Mic   13.1      0   65
2022-Apr-21  20 33  -37 06   2.050   1.799    89E    Mic   13.2      2   72
2022-Apr-26  20 22  -37 36   2.121   1.762    96E    Sgr   13.3      4   79
2022-May-01  20 09  -38 06   2.191   1.727   103E    Sgr   13.5      6   86
2022-May-06  19 55  -38 33   2.260   1.696   110E    Sgr   13.6      7   89
```

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 =  8.1 + 5 log d + 12.3 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     Mag SC APER FL POW    COMA     TAIL    ICQ    CODE  Observer Name
               (UT)                    T         Dia  DC  LENG  PA
   2021A1  2022 04 01.78  Z 12.4 AQ 10.6R 5a180   4.5      35.0m123 ICQ XX RAMaa Raymond Ramlow
```

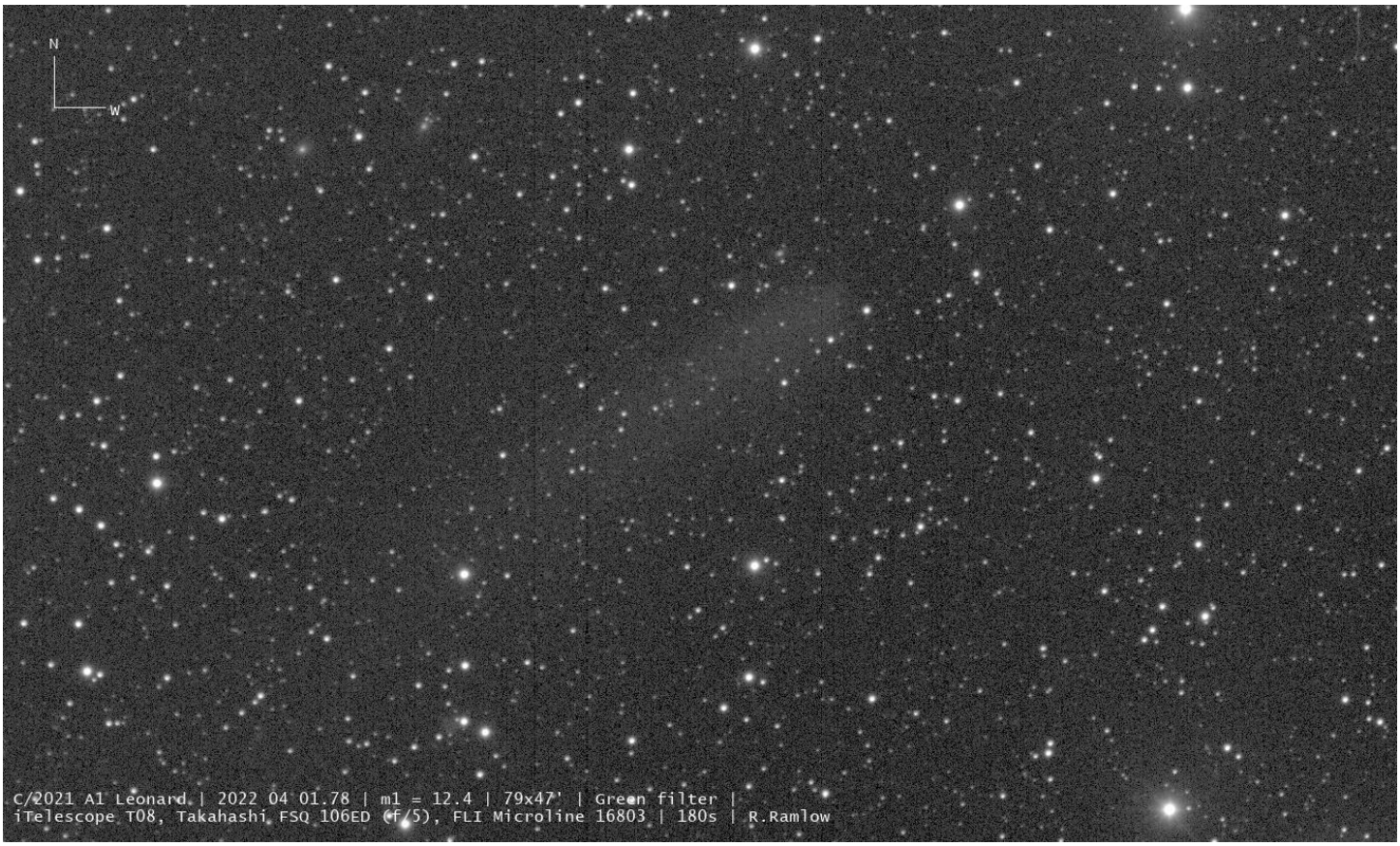
Comet C/2021 A1 (Leonard) was the best comet of 2021 with it reaching 2nd magnitude for a short period of time. Most of us were able to follow Leonard during the end of 2021 and very beginning of 2022 as a borderline naked eye object between 3rd and 6th magnitude. Its brightness at the beginning of January means Leonard may end up being the best comet of 2022 as well as 2021.

After spending most of February too close to the Sun to be observed, imagers were able to recover Leonard starting on February 23 (Martin Masek reporting to COBS). Rather than the spectacular object of December and January, images of Leonard over the past weeks appear to only show a remnant of Leonard. Though the comet's

brightness has been fading steadily at a normal, if little rapid, rate of 2.5n ~ 12, the coma shows no evidence of any central condensation. This suggests the nucleus is has either completely disintegrated or, at the least, is has disrupted into a number of smaller components. Alternately, Leonard's nucleus may have "turned off" as it moves away from the Sun and the dust we see is a remnant of dust released closer to perihelion. Hopefully Hubble or a larger ground-based telescope can examine Leonard's remnant for its inactive nucleus or its smaller remains.

Comet disintegration is a common occurrence. Usually disintegrating comets are dynamically new long-period comets making their first visit to the inner Solar System but dynamically old long-period and even short-period comets have been observed to disintegrate. For an example of a dynamically old disintegrator, we only have to go back to C/2019 Y4 (ATLAS). That comet shared an orbit with the Great Comet of 1844 and is presumed to have been a smaller component of the Great Comet. Perhaps Leonard was also a small component of a larger comet that remains to be discovered.

The remnants of Leonard are well placed for southern hemisphere observers in the morning constellations of Microscopium (Apr 1-23) and Sagittarius (23-30). Since it is located at a southernly declination of -35 to -38 degrees, it will be a difficult object for northern observers. At 40 deg North, observers might be able to observe Leonard starting in mid-May though it won't get much higher than a few degrees above the southeastern horizon in a dark sky.



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-F14)

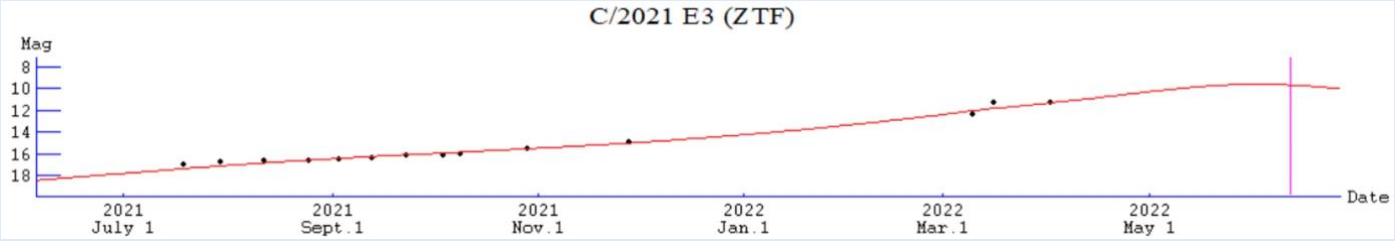
```
    C/2021 E3 (ZTF)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 June 11.90368 TT                                  Rudenko
q   1.7774351           (2000.0)            P              Q
z  -0.0004866      Peri.  228.84450     -0.11524495     -0.43255738
 +/-0.0000014      Node   104.46808     -0.37427240     +0.85277336
e   1.0008649      Incl.  112.55712     -0.92012976     -0.29269729
From 862 observations 2021 Mar. 9-2022 Mar. 20, mean residual 0".4.
1/a(orig) = -0.000041 AU**-1, 1/a(fut) = +0.000610 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-Apr-01  20 48  -26 12   2.001   2.232     63M   Cap  11.4     3   45
2022-Apr-06  20 55  -28 15   1.973   2.116     67M   Mic  11.2     2   50
2022-Apr-11  21 01  -30 35   1.946   2.000     72M   Mic  11.0     1   55
2022-Apr-16  21 07  -33 15   1.921   1.885     76M   Mic  10.8     0   59
2022-Apr-21  21 15  -36 18   1.898   1.773     81M   Mic  10.7     0   64
2022-Apr-26  21 22  -39 48   1.877   1.664     85M   Mic  10.5     0   67
2022-May-01  21 31  -43 50   1.857   1.562     89M   Gru  10.3     0   71
2022-May-06  21 41  -48 26   1.840   1.468     94M   Gru  10.2     0   72
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 4.5 + 5 log d + 16.3 log r [through T-88 days]
m1 = 7.2 + 5 log d +  8.0 log r [T-88 days and onwards, 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
   2021E3  2022 04 01.78  Z 11.3 AQ 10.6R 5a180   5.5              ICQ XX RAMaa Raymond Ramlow
   2021E3  2022 03 09.78  Z 12.4 AQ 10.6R 5a180   2.4       1.3m323 ICQ XX RAMaa Raymond Ramlow
```

The Zwicky Transient Facility used the 1.2-m Oschin Schmidt to detect this object 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). Closest approach to Earth occurs on 2022 May 31 at 1.21 au followed a few days later by perihelion on 2022 June 11 at 1.78 au. Though a dynamically new long-period comet, it appears to have been brightening rapidly since discovery. Three magnitude estimates were made in March which found the comet at magnitude 12.4 on the 9th (Raymond Ramlow), 11.3 on the 16th (Michael Lehmann), and 11.3 on Apirl 1 (Ramlow). Both observers detected a >1' tail and the two recent observations found a coma between 5.5' and 5.9' in diameter.

Based on the most recent magnitude estimate given above and assuming a 2.5n = 8.0 brightening rate, C/2021 E3 should become a nice small telescope object, at least for southern hemisphere observers. As April begins, the

comet is a very low object for northern observers and it only gets worse resulting in a southern hemisphere only object by early in the month. For those who can see it, C/2021 E3 should start April around magnitude 11.4 and brighten to 10.2 by the end of the month as it moves through Capricornus (Apr 1-4), Microscopium (4-29), and Grus (29-30) in the morning sky.

C/2021 E3 may get as bright as magnitude 9.0 to 9.5 in June when 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 could still be a very faint visual object (12-13th magnitude).

Figure 15 - C/2021 E3 (ZTF) sits in the middle of this image taken by Raymond Ramlow on 2022 April 1 with an iTelescopes FSQ106 refractor.

C/2021 P4 (ATLAS)

Discovered 2021 August 10 by the ATLAS survey
Dynamically old long-period comet

Orbit (from MPEC 2022-F14)

```
    C/2021 P4 (ATLAS)
Epoch 2022 Jan. 21.0 TT = JDT 2459600.5
T 2022 July 30.38092 TT                                  Rudenko
q   1.0804753           (2000.0)            P               Q
z  +0.0032044      Peri.  175.82312     -0.96755725     -0.18539256
 +/-0.0000021      Node   348.09488     +0.20092936     -0.15276689
e   0.9965377      Incl.   56.31077     +0.15316774     -0.97071720
From 572 observations 2021 Aug. 10-2022 Mar. 18, mean residual 0".5.
1/a(orig) = +0.003543 AU**-1, 1/a(fut) = +0.003280 AU**-1.
```

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

```
C/2021 P4 (ATLAS)                                                    Max El
                                                                      (deg)
    Date      R.A.   Decl.     r       d    Elong  Const  Mag    40N  40S
2022-Apr-01  01 22  +56 10   2.126   2.581    52E   Cas  13.1     24    0
2022-Apr-06  01 39  +56 53   2.068   2.541    51E   Cas  13.0     24    0
2022-Apr-11  01 58  +57 34   2.010   2.499    50E   Per  12.8     24    0
2022-Apr-16  02 18  +58 12   1.952   2.457    48E   Per  12.7     23    0
2022-Apr-21  02 40  +58 44   1.894   2.414    47E   Cas  12.5     23    0
2022-Apr-26  03 04  +59 09   1.836   2.371    46E   Cas  12.3     23    0
2022-May-01  03 29  +59 23   1.779   2.329    45E   Cam  12.1     23    0
2022-May-06  03 56  +59 24   1.722   2.287    44E   Cam  12.0     23    0
```

Comet Magnitude Formula (from ALPO and COBS data)

```
m1 = 7.8 + 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
   2021P4  2022 03 27.85  S 13.9 TI 53.1L   215   0.6  3           ICQ XX HAR11 Christian Harder
   2021P4  2022 03 25.84  S 14.5 TI 53.1L   155   0.4  4           ICQ XX HAR11 Christian Harder
   2021P4  2022 03 22.84  S 14.2 TI 53.1L   242   0.25 4           ICQ XX HAR11 Christian Harder
   2021P4  2022 03 21.82  S 14.6 TI 53.1L   298   0.45 4           ICQ XX HAR11 Christian Harder
```

The "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) search program found this 19th magnitude comet on 2021 August 10 with their 0.5-m f/2 Schmidt reflector on Haleakala, Hawaii. Perihelion occurs on 2022 July 30 at 1.08 au, though unfortunately, the comet will be located on the other side of the Sun at a geocentric range of ~2 au and low solar elongation.

Christian Harder observed C/2021 P4 as bright as magnitude 13.9 on March 27 with a 0.53-m reflector (aperture corrected magnitude of 13.0. During April, the comet may brighten by an additional magnitude to ~12.0 as it moves through Cassiopeia (Apr 1-8), Perseus (8-19), Cassiopeia (19-28), and Camelopardalis (28-30) in the evening northern circumpolar sky (watch for some nice approaches to the Double Cluster and assorted nebula in the northern Milky Way).

An assumed photometric index of 2.5n = 10 brings C/2021 P4 up to magnitude 10.0 in early July before it is lost in the glare of the Sun. Southern hemisphere observers can start observing P4 in August though it will remain a very low object till October when it may have faded to 11th magnitude. Too bad perihelion wasn't in early March when a close approach to within 0.1 au of Earth would have occurred resulting in a 4-5th magnitude comet racing through opposition. Oh well, perhaps it will be a better object for Earth-based observers when it returns in ~4700 years.

New Discoveries, Recoveries and Other Comets News

Other Comets of Interest

45P/Honda.Mrkos-Pajdusáková – Comet 45P will be at perihelion this month on April 25 at 0.56 au. At that time H-M-P will be close to 9th magnitude. The reason it isn't presented above in detail is because it will spend the entire month within 11 degrees of the Sun. While no Earth-based observers will be directly observing 45P this month, we might be able to watch it in the SOHO C3 field-of-view though at magnitude ~9.0 it might be a little too faint for that instrument. May will see a quickly fading 45P observable in the evening sky. More next month…

New Comet Discoveries

C/2022 E3 (ZTF) – Nowadays most comets are faint at discovery and the majority stay faint. C/2022 E3 (ZTF) promises to be different. It was discovered on 2022 March 2 at 17th magnitude by the Zwicky Transient Facility with the 1.2-m f/2.4 Schmidt on Mount Palomar. Note, that C/2022 E3 (ZTF) is a different object from the similarly named C/2021 E3 (ZTF) described above.

Based on its orbit and current brightness, there is a reasonable chance that it will be a nice object at the end of 2022 and through the first few months of 2023. With a perihelion on 2023 January 13 at 1.11 au and a minimum Earth-comet distance of 0.29 au at the very beginning of February, C/2022 E3 may get as bright as 5-6th magnitude. The current MPC orbit is consistent with the comet being a dynamically old long-period comet suggesting it may brighten at an average to faster than average rate. We'll have to watch and see if new astrometry continues to agree with a dynamically old orbit solution. As for its brightening rate, we'll know more over the coming months.

At its brightest in late January / early February, C/2022 E3 will be well located for northern observers as a northern circumpolar object. Though it will spend the period between October 2022 and early February 2023 invisible from the southern hemisphere, southern observers will be able to pick up the comet again only a week or after closest approach to Earth when it will still be within 0.5-1.0 magnitude of peak brightness. [MPEC 2022-F13, CBET 5111]

C/2022 E2 (ATLAS) – On 2022 March 7, the "Asteroid Terrestrial-Impact Last Alert System" (ATLAS) found C/2022 E2 at 18th magnitude with a 0.5-m f/2 Schmidt at Rio Hurtado, Chile. The ATLAS program has two telescopes in the northern hemisphere in Hawaii on Haleakala and Mauna Kea and now two southern hemisphere telescopes, one in Chile and one in South Africa. All their telescopes are 0.5-m f/2 Schmidts. C/2022 E2 may peak at 13th magnitude around perihelion on 2024 September 16 at 3.67 au. [MPEC 2022-E227, CBET 5109]

P/2022 E1 (Christensen) – Eric Christensen of the Catalina Sky Survey found this 20th magnitude comet on 2022 March 2 with the Mount Lemmon 1.5-m. P/2022 E1 has a 8.5-yr orbital period and perihelion on 2022 October 8 at 2.96 au. It is unlikely to get much brighter than 20th magnitude. [MPEC 2022-E167, CBET 5107]

C/2022 D2 (Kowalski) – Richard Kowalski, also of the Catalina Sky Survey, found a new 18-19th magnitude comet on 2022 February 25 with the Mount Lemmon 1.5-m. C/2022 D2 is already near maximum brightness with perihelion a few days ago on March 27 at 1.56 au. [MPEC 2022-E46, CBET 5105]

P/2022 D1 (PANSTARRS) – A new periodic comet with an orbital period of 20.1 years was found at 20th to 21st magnitude on 2022 February 24 by the Pan-STARRS program. Perihelion was back on 2021 August 28 at 3.35 au. P/2022 D1 has likely already peaked in brightness. [MPEC 2022-E7, CBET 5104]

C/2022 B4 (Bok) – Hannes Groeller discovered a new 19th magnitude long-period comet on 2022 January 29 with the University of Arizona's 2.3-m Bok telescope on Kitt Peak as part of the Bok Survey. This survey is a collaboration between two University of Arizona based asteroid surveys, the Catalina Sky Survey and Spacewatch, and the University of Minnesota. January 29 was not only the discovery date but also the date of perihelion (q = 1.38 au). C/2022 B4 is an intrinsically faint comet due to it being 19th magnitude but only 0.45 au from Earth at perihelion. It has also likely peaked in brightness. [MPEC 2022-D33, CBET 5103]

C/2022 B4 is not the first comet to be recently discovered by the Bok telescope, C/2021 K3 (Catalina) was also a Bok discovery. Naming the C/2022 B4 after the Bok telescope is interesting since it may be the first time a comet was named after a telescope that was named in honor of a comet discoverer. Though Bart Bok is more famously known for his work on the Milky Way and Bok globules, he was a co-discoverer of C/1949 N1 (Bappu-Bok-Newkirk).

C/2022 A3 (Lemmon-ATLAS) – This comet is a dual discovery by the Catalina Sky Survey with their 1.5-m Mount Lemmon telescopes and ATLAS with their Schmidt telescope on Mauna Kea. Both programs reported the object as an inactive asteroid. It was observed from Mount Lemmon on 2022 January 10, 29, 31, and February 22 and by ATLAS on March 1. Based on its comet-like orbit, it was placed on the MPC's PCCP page resulting in cometary activity being observed during the course of follow-up astrometry. C/2022 A3 appears to be a dynamically old long-period comet with a perihelion of 3.70 au on 2023 September 28. At discovery it was a 19-20th magnitude object. By perihelion it may be as bright as 15-16th magnitude when it will be a southern hemisphere object. [MPEC 2022-E107, CBET 5106]

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 P4 (ATLAS)												
2021P4	2022 03 27.85	S 13.9	TI	53.1L		215	0.6	3			ICQ XX	HAR11 Christian Harder
2021P4	2022 03 25.84	S 14.5	TI	53.1L		155	0.4	4			ICQ XX	HAR11 Christian Harder
2021P4	2022 03 22.84	S 14.2	TI	53.1L		242	0.25	4			ICQ XX	HAR11 Christian Harder
2021P4	2022 03 21.82	S 14.6	TI	53.1L		298	0.45	4			ICQ XX	HAR11 Christian Harder
C/2021 F1 (Lemmon-PANSTARRS)												
2021F1	2022 03 27.81	S 9.1	TI	53.1L		139	3.5	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 25.81	S 8.5	TI	53.1L		139	3	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 23.81	S 8.6	TI	53.1L		139	3.5	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 23.83	S 8.6	TK	20.3T10		77	7	3			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2021F1	2022 03 22.80	S 8.6	TI	53.1L		139	3.5	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 21.80	S 8.6	TI	53.1L		139	4	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 20.80	S 8.4	TI	29.8L	4	79	4	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 19.81	S 9.0	TI	29.8L	4	79	3.7	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 06.79	S 10.0	TI	53.1L		139	2.5	2/			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 04.83	S 9.7	TK	20.3T10		77	5	2/			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2021F1	2022 03 03.78	S 10.4	TI	53.1L		92	2.3	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 03 02.78	S 9.6	TI	29.8L	4	92	2.5	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 02 28.78	S 10.0	TI	29.8L	4	92	2.5	1/			ICQ XX	HAR11 Christian Harder
2021F1	2022 02 27.78	S 10.4	TI	29.8L	4	79	3.5	1			ICQ XX	HAR11 Christian Harder
2021F1	2022 02 26.78	S 9.5	TI	29.8L	4	79	4	2			ICQ XX	HAR11 Christian Harder
2021F1	2022 02 25.78	S 10.1	TI	29.8L	4	108	3.5	1/			ICQ XX	HAR11 Christian Harder
2021F1	2022 02 23.77	S 10.8	TI	29.8L	4	108	2.4	1			ICQ XX	HAR11 Christian Harder
2021F1	2022 02 23.76	S 10.1	TK	7.0B	6	16						PIL01 Uwe Pilz
C/2021 E3 (ZTF)												
2021E3	2022 03 09.78	Z 12.4	AQ	10.6R	5a	180	2.4		1.3m	323	ICQ XX	RAMaa Raymond Ramlow
C/2021 A1 (Leonard)												
2021A1	2022 04 01.78	Z 12.4	AQ	10.6R	5a	180	4.5		35.0m	123	ICQ XX	RAMaa Raymond Ramlow
C/2020 Y2 (ATLAS)												
2020Y2	2022 03 22.39	xM 14.1	AQ	40.0L	4	182	0.7	4			ICQ XX	WYA Christopher Wyatt
2020Y2	2022 03 21.39	xM 14.4	AQ	40.0L	4	182	0.7	4			ICQ XX	WYA Christopher Wyatt
C/2020 V2 (ZTF)												
2020V2	2022 03 27.86	S 13.9	TI	53.1L		215	0.45	s5	0.8m	150	ICQ XX	HAR11 Christian Harder
2020V2	2022 03 25.85	S 13.6	TI	53.1L		215	0.6	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 24.84	S 13.5	TI	29.8L	4	170	0.4	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 22.87	S 13.7	TI	53.1L		155	0.45	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 21.86	S 13.9	TI	53.1L		215	0.35	4/			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 20.85	S 13.5	TI	29.8L	4	132	0.4	4/			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 06.87	S 13.3	TI	53.1L		215	0.8	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 03.85	S 13.8	TI	53.1L		242	0.7	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 03 02.84	S 14.4	TI	53.1L		242	0.5	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 02 28.84	S 14.0	TI	53.1L		215	0.35	3			ICQ XX	HAR11 Christian Harder
2020V2	2022 02 27.86	S 13.5	TI	53.1L		215	0.5	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 02 26.82	S 13.6	TI	29.8L	4	170	0.4	3			ICQ XX	HAR11 Christian Harder
2020V2	2022 02 25.84	S 13.8	TI	29.8L	4	170	0.3	4			ICQ XX	HAR11 Christian Harder
2020V2	2022 02 23.81	S 14.0	TI	29.8L	4	170	0.4	3			ICQ XX	HAR11 Christian Harder
2020V2	2022 02 22.96	S 13.7	TI	29.8L	4	132	0.6	4			ICQ XX	HAR11 Christian Harder
C/2020 U5 (PANSTARRS)												
2020U5	2022 03 27.88	S 15.2	TI	53.1L		298	0.2	5			ICQ XX	HAR11 Christian Harder
C/2020 M5 (ATLAS)												
2020M5	2022 03 27.87	S 15.0	TI	53.1L		298	0.4	4			ICQ XX	HAR11 Christian Harder
C/2020 J1 (SONEAR)												
2020J1	2022 02 28.07	S 14.3	TI	53.1B		242	0.4	2/			ICQ XX	HAR11 Christian Harder
C/2019 T4 (ATLAS)												
2019T4	2022 03 22.42	xM 12.3	AQ	40.0L	4	108	0.9	6			ICQ XX	WYA Christopher Wyatt
2019T4	2022 03 21.41	xM 12.2	AQ	40.0L	4	108	1.2	6			ICQ XX	WYA Christopher Wyatt
C/2019 L3 (ATLAS)												
2019L3	2022 03 27.83	S 10.0	TI	53.1L		111	2.7	4			ICQ XX	HAR11 Christian Harder
2019L3	2022 03 26.86	S 9.9	TI	29.8L	4	108	2.5	4			ICQ XX	HAR11 Christian Harder
2019L3	2022 03 25.82	S 10.8:	TI	53.1L		139	1.8	5			ICQ XX	HAR11 Christian Harder
2019L3	2022 03 24.82	S 10.0	TI	29.8L	4	108	2.4	4			ICQ XX	HAR11 Christian Harder
2019L3	2022 03 24.13	Z 9.4:	AQ	10.6R	5a	180	8.3		7.7m	24	ICQ XX	RAMaa Raymond Ramlow
2019L3	2022 03 23.86	S 9.5	TK	20.3T10		77	2.5	6			ICQ XX	GON05 Juan Jose Gonzalez Suarez
2019L3	2022 03 23.82	S 10.5	TI	53.1L		139	1.5	4/			ICQ XX	HAR11 Christian Harder
2019L3	2022 03 22.40	xM 9.9	AQ	40.0L	4	59	2.7	5/	4.4m	128	ICQ XX	WYA Christopher Wyatt
2019L3	2022 03 21.83	S 10.1	TI	53.1L		139	2	4/			ICQ XX	HAR11 Christian Harder
2019L3	2022 03 21.41	xM 9.7	AQ	40.0L	4	59	3.5	6			ICQ XX	WYA Christopher Wyatt

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   2019L3  2022 03 20.83  S  9.7 TI 29.8L 4  79   3.2  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 19.80  S  9.7 TI 29.8L 4  79   3.5  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 08.87  S  9.6 TI 25.2L 4  92   2.4  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 06.81  S  9.7 TI 53.1L   111   2.8  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 05.81  B  9.1 TK 25.0C10  62   1.1  4            ICQ XX DECaa Michel Deconinck
   2019L3  2022 03 04.86  S  9.5 TK 20.3T10  77   3    6            ICQ XX GON05
   2019L3  2022 03 04.83  S  9.5 TI 29.8L 4  92   2.2 S4            ICQ XX HAR11 Christian Harder
   2019L3  2022 03 03.81  S  9.5 TI 53.1L   139   2.5 S4            ICQ XX HAR11 Christian Harder
   2019L3  2022 02 28.81  S  9.8 TI 53.1L   139   2.2 S4            ICQ XX HAR11 Christian Harder
   2019L3  2022 02 27.81  S  9.5 TI 53.1L   139   2    4/           ICQ XX HAR11 Christian Harder
   2019L3  2022 02 26.81  S  9.5 TI 29.8L 4  92   3.2  4            ICQ XX HAR11 Christian Harder
   2019L3  2022 02 25.81  S  9.5 TI 29.8L 4  92   3.5 S4            ICQ XX HAR11 Christian Harder
   2019L3  2022 02 25.11  Z  9.0 AQ 10.6R 5a180   9.9      10.0m  5 ICQ XX RAMaa Raymond Ramlow
   2019L3  2022 02 23.80  S  9.8 TI 29.8L 4  92   2.5  5            ICQ XX HAR11 Christian Harder
   2019L3  2022 02 23.78  S  9.8 TK 32.0L 5  48   1.5  7/                  PIL01 Uwe Pilz
   2019L3  2022 02 22.94  S  9.9 TI 29.8L 4  79   2.3  5            ICQ XX HAR11 Christian Harder
C/2017 K2 (PANSTARRS)
   2017K2  2022 03 28.15  I 12.0:TK 25.0C10  63   1    2/           ICQ XX DECaa Michel Deconinck
   2017K2  2022 02 28.09  S 11.6 TI 53.1L   155   1.2  3            ICQ XX HAR11 Christian Harder
116P/Wild
116        2022 03 27.85  S 14.0 TI 53.1L   215   0.9  4            ICQ XX HAR11 Christian Harder
116        2022 03 23.85  S 14.5 TI 53.1L   215   0.5  4            ICQ XX HAR11 Christian Harder
116        2022 03 22.42 xM 13.2 AQ 40.0L 4 108   1.7  5/           ICQ XX WYA   Christopher Wyatt
116        2022 03 21.85  S 14.3 TI 53.1L   242   0.25 4            ICQ XX HAR11 Christian Harder
116        2022 03 21.42 xM 13.7 AQ 40.0L 4 108   0.9  5/           ICQ XX WYA   Christopher Wyatt
116        2022 03 06.86  S 13.0 TI 53.1L   215   1   s4            ICQ XX HAR11 Christian Harder
116        2022 03 03.83  S 14.1 TI 53.1L   215   0.7  4/           ICQ XX HAR11 Christian Harder
116        2022 02 13.38  Z 13.5 AQ 10.6R 5a180   1.4       5.0m282 ICQ XX RAMaa Raymond Ramlow
116        2022 02 09.72 xM 14.0 AQ 25.0L 5 125   0.9  4            ICQ XX WYA   Christopher Wyatt
108P/Ciffreo
108        2022 01 14.24  S 13.1 AQ 20.3T10 133   1    3            ICQ XX GON05 Juan Jose Gonzalez Suarez
108        2022 01 05.17  Z 14.8 TK 27.5T 6A800   0.7               ICQ xx OLAaa Michael Olason
104P/Kowal
104        2022 03 22.82  S 11.1 TI 53.1L   139   2.5  1            ICQ XX HAR11 Christian Harder
104        2022 03 22.40 xM 11.2 AQ 40.0L 4  59   3.6  2/           ICQ XX WYA   Christopher Wyatt
104        2022 03 21.81  S 10.6 TI 53.1L   139   2.5  1            ICQ XX HAR11 Christian Harder
104        2022 03 21.40 xM 11.5 AQ 40.0L 4  59   2.7  3/           ICQ XX WYA   Christopher Wyatt
104        2022 03 20.82  S 10.6 TI 29.8L 4 132   3    1            ICQ XX HAR11 Christian Harder
104        2022 03 06.81  S  9.8 TI 53.1L   111   3.8  2            ICQ XX HAR11 Christian Harder
104        2022 03 04.85  S  9.9 TK 20.3T10  77   5    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
104        2022 03 04.82  S 10.2 TI 29.8L 4 108   3    2            ICQ XX HAR11 Christian Harder
104        2022 03 03.81  S 10.4 TI 53.1L   139   3    2/           ICQ XX HAR11 Christian Harder
104        2022 03 02.80  S 10.7 TI 53.1L   139   3    2/           ICQ XX HAR11 Christian Harder
104        2022 02 28.80  S 10.3 TI 53.1L   139   3.3  2/           ICQ XX HAR11 Christian Harder
104        2022 02 27.80  S 10.4 TI 53.1L   139   3    2/           ICQ XX HAR11 Christian Harder
104        2022 02 26.80  S  9.5 TI 29.8L 4  79   5.2  2/           ICQ XX HAR11 Christian Harder
104        2022 02 25.80  S  9.6 TI 29.8L 4  79   4.8  2/           ICQ XX HAR11 Christian Harder
104        2022 02 25.11  Z  9.9 AQ 10.6R 5a180  11.3       4.5m 80 ICQ XX RAMaa Raymond Ramlow
104        2022 02 23.79  S  9.8 TI 29.8L 4  79   4.8  1/           ICQ XX HAR11 Christian Harder
104        2022 02 23.76  S 10.8 TK 32.0L 5  80   3    3/                  PIL01 Uwe Pilz
104        2022 02 22.93  S 10.0:TI 29.8L 4  79   3    2/           ICQ XX HAR11 Christian Harder
67P/Churyumov-Gerasimenko
 67        2022 03 27.84  S 13.2 TI 53.1L   155   1.5  1/           ICQ XX HAR11 Christian Harder
 67        2022 03 24.13  Z 12.6 AQ 10.6R 5a300   3.6      12.0m283 ICQ XX RAMaa Raymond Ramlow
 67        2022 03 23.87  S 11.4 TK 20.3T10 100   2    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 67        2022 03 22.83  S 12.9 TI 53.1L   155   1.3  2            ICQ XX HAR11 Christian Harder
 67        2022 03 22.41 xM 13.3 AQ 40.0L 4 108   1.7  3/           ICQ XX WYA   Christopher Wyatt
 67        2022 03 21.84  S 13.2 TI 53.1L   215   1    2            ICQ XX HAR11 Christian Harder
 67        2022 03 21.40 xM 13.5 AQ 40.0L 4 108   1.5  5/           ICQ XX WYA   Christopher Wyatt
 67        2022 03 20.83  S 13.2 TI 29.8L 4 132   1    2            ICQ XX HAR11 Christian Harder
 67        2022 03 06.82  S 11.7 TI 53.1L   111   2.2  1/           ICQ XX HAR11 Christian Harder
 67        2022 03 04.87  S 11.0 TK 20.3T10 100   2    2/           ICQ XX GON05 Juan Jose Gonzalez Suarez
 67        2022 03 04.80  S 11.3 TI 29.8L 4 108   1.5  2/           ICQ XX HAR11 Christian Harder
 67        2022 03 02.81  S 13.0 TI 53.1L   139   1.3  2            ICQ XX HAR11 Christian Harder
 67        2022 02 28.81  S 10.9 TI 53.1L   139   2.6  2            ICQ XX HAR11 Christian Harder
 67        2022 02 27.82  S 11.7 TI 53.1L   139   1.6  2/           ICQ XX HAR11 Christian Harder
 67        2022 02 26.82  S 11.0 TI 29.8L 4 108   2    2            ICQ XX HAR11 Christian Harder
 67        2022 02 25.82  S 11.7 TI 29.8L 4 108   2.2  1            ICQ XX HAR11 Christian Harder
 67        2022 02 25.12  Z 10.9 AQ 10.6R 5a180   5.9    > 33.0m280 ICQ XX RAMaa Raymond Ramlow
 67        2022 02 23.80  S 11.4 TI 29.8L 4  92   2.4  2            ICQ XX HAR11 Christian Harder
 67        2022 02 22.95  S 11.8 TI 29.8L 4  92   1.6  2/           ICQ XX HAR11 Christian Harder
29P/Schwassmann-Wachmann
 29        2022 03 22.38 xI[14.3 AQ 40.0L 4 261                     ICQ XX WYA   Christopher Wyatt
 29        2022 03 21.38 xI[13.9 AQ 40.0L 4 182                     ICQ XX WYA   Christopher Wyatt
22P/Kopff
 22        2022 04 01.79  Z 12.2:AQ 10.6R 5a180   4.2              ICQ XX RAMaa Raymond Ramlow
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 22        2022 03 09.78  Z 12.1 AQ 10.6R 5a180   4.4                ICQ XX RAMaa Raymond Ramlow
19P/Borrelly
 19        2022 03 27.82  S 10.0 TI 53.1L   111   2.7  3/   3.0m 65 ICQ XX HAR11 Christian Harder
 19        2022 03 26.85  S 10.0 TI 29.8L 4 108   2.5  3             ICQ XX HAR11 Christian Harder
 19        2022 03 25.81  S  9.9 TI 53.1L   111   2.7  4    3.0m 60 ICQ XX HAR11 Christian Harder
 19        2022 03 24.81  S  9.6 TI 29.8B 4  92   2.8  3             ICQ XX HAR11 Christian Harder
 19        2022 03 24.12  Z  9.9 AQ 10.6R 5a180   8.4       8.0m 78 ICQ XX RAMaa Raymond Ramlow
 19        2022 03 23.84  S  9.8 TK 20.3T10  77   3.5  5             ICQ XX GON05 Juan Jose Gonzalez Suarez
 19        2022 03 23.81  S 10.0 TI 53.1L   111   2.5  3/   2.5m 60 ICQ XX HAR11 Christian Harder
 19        2022 03 22.80  S 10.5 TK 32.0L 5  80   3.5  4                    PIL01 Uwe Pilz
 19        2022 03 22.38 &M  9.8 AQ 40.0L 4  59   2.5  3/            ICQ XX WYA   Chris Wyatt
 19        2022 03 21.81  S 10.1 TI 53.1L   111   3    3/            ICQ XX HAR11 Christian Harder
 19        2022 03 21.38 &M  9.8 TK 40.0L 4  59   2.5  3/            ICQ XX WYA   Chris Wyatt
 19        2022 03 20.81  S  9.9 TI 29.8L 4  79   3    3             ICQ XX HAR11 Christian Harder
 19        2022 03 19.80  S 10.0 TI 29.8L 4  79   3.5  3             ICQ XX HAR11 Christian Harder
 19        2022 03 06.80  S  9.5 TI 53.1L   111   3    4    8.0m 60 ICQ XX HAR11 Christian Harder
 19        2022 03 05.80  B  9.5 TK 25.0C10  62   1.5  3/            ICQ XX DECaa Michel Deconinck
 19        2022 03 04.84  S  9.4 TK 20.3T10  77   4    5             ICQ XX GON05 Juan Jose Gonzalez Suarez
 19        2022 03 04.81  S  9.9 TI 29.8L 4  92   2    3/            ICQ XX HAR11 Christian Harder
 19        2022 03 03.79  S  9.7 TI 53.1L   139   2.1  4    4.5m 60 ICQ XX HAR11 Christian Harder
 19        2022 03 02.79  S 10.1 TI 53.1L   139   1.9  4    4.5m 60 ICQ XX HAR11 Christian Harder
 19        2022 02 28.79  S 10.0 TI 53.1L   139   1.4  4             ICQ XX HAR11 Christian Harder
 19        2022 02 27.79  S  9.5 TI 53.1L   111   3    4    7.0m 55 ICQ XX HAR11 Christian Harder
 19        2022 02 26.79  S  9.6 TI 29.8L 4  92   3   S4             ICQ XX HAR11 Christian Harder
 19        2022 02 25.79  S  9.7 TI 29.8L 4  92   3    5             ICQ XX HAR11 Christian Harder
 19        2022 02 25.10  Z  9.2 AQ 10.6R 5a180  11.2      22.0m 76 ICQ XX RAMaa Raymond Ramlow
 19        2022 02 23.78  S  9.3:TI 29.8L 4  79   3.2  4             ICQ XX HAR11 Christian Harder
 19        2022 02 23.77  S  9.2 TK  7.0B 6  16                         PIL01 Uwe Pilz
9P/Tempel
  9        2022 04 01.77  Z 13.9 AQ 10.6R 5a300   2.1       2.7m259 ICQ XX RAMaa Raymond Ramlow
  9        2022 03 09.77  Z 14.3 AQ 10.6R 5a180   1.2       1.4m272 ICQ XX RAMaa Raymond Ramlow
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