# * NOVA *

## N. 2010 - 21 AGOSTO 2021

## ASSOCIAZIONE ASTROFILI SEGUSINI


# COMETA LEONARD (C/2021 A1)

La cometa C/2021 A1 (Leonard) è stata scoperta il 3 gennaio 2021 da Gregory J. Leonard al Mount Lemmon Observatory quando si trovava a 5 AU (750 milioni di km) dal Sole ed era di 19ª magnitudine. A quella distanza – pari all'orbita di Giove – il metanolo ($CH_3OH$) e l'acqua presenti sulla cometa iniziavano la sublimazione. È stata la prima cometa scoperta nel 2021 e ha un'orbita retrograda con un periodo orbitale di circa 70mila anni.
Il 12 dicembre 2021 la cometa sarà a 0.233 AU (34.9 milioni di km) dalla Terra e, pochi giorni dopo, il 18 dicembre 2021 a 0.028 AU (4.2 milioni di km) da Venere, per poi passare al perielio il 3 gennaio 2022, a una distanza di 0.6 AU.
La cometa Leonard ad ottobre sarà nell'Orsa Maggiore nel cielo mattutino, intorno alla 13ª magnitudine, poi nel crepuscolo serale a dicembre bassa nel cielo sud-occidentale. Sarà poi visibile solo dal cielo dell'emisfero meridionale fino a febbraio 2022. C'è molta incertezza su quanto la cometa potrà diventare luminosa a metà dicembre: potrebbe raggiungere la 4ª magnitudine, secondo Seiichi Yoshida, oppure soltanto la 8ª, secondo il Jet Propulsion Laboratory (JPL).

Ecco le effemeridi della cometa C/2021 A1 (Leonard), calcolate dal JPL per il nostro Grange Observatory per le ore 5 CET da novembre a inizio dicembre 2021, poi sarà troppo bassa sull'orizzonte per essere osservata.

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*******************************************************************************
Ephemeris / WWW_USER Wed Aug 18 22:55:41 2021 Pasadena, USA      / Horizons
*******************************************************************************
Target body name: Leonard (C/2021 A1)             {source: JPL#10}
Center body name: Earth (399)                     {source: DE441}
Center-site name: Grange Observatory, Bussoleno
*******************************************************************************
Start time      : A.D. 2021-Nov-01 04:00:00.0000 UT
Stop  time      : A.D. 2021-Dec-10 04:00:00.0000 UT
Step-size       : 1440 minutes
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 Date__(UT)__HR:MN     R.A._____(ICRF)_____DEC Azi_(a-appr)_Elev   T-mag   N-mag            delta      deldot    S-O-T /r
*******************************************************************************************************************************

 2021-Nov-01 04:00  m  11 51 20.86 +34 51 50.7  75.1113  36.8204  13.421  15.442 1.55939790896845 -55.9168162  61.2758 /L
 2021-Nov-02 04:00  m  11 52 41.45 +34 47 07.8  75.5665  37.2203  13.347  15.396 1.52713271783918 -56.3076934  61.8421 /L
 2021-Nov-03 04:00  m  11 54 04.10 +34 42 25.7  76.0184  37.6154  13.270  15.348 1.49464238821806 -56.6945703  62.4044 /L
 2021-Nov-04 04:00     11 55 28.96 +34 37 44.0  76.4669  38.0053  13.192  15.299 1.46192934380948 -57.0770070  62.9622 /L
 2021-Nov-05 04:00     11 56 56.23 +34 33 02.2  76.9116  38.3891  13.113  15.249 1.42899627376487 -57.4545348  63.5145 /L
 2021-Nov-06 04:00     11 58 26.13 +34 28 19.5  77.3523  38.7662  13.031  15.198 1.39584614187959 -57.8266826  64.0607 /L
 2021-Nov-07 04:00     11 59 58.88 +34 23 35.2  77.7885  39.1356  12.948  15.146 1.36248218166470 -58.1929979  64.5997 /L
 2021-Nov-08 04:00     12 01 34.75 +34 18 48.5  78.2200  39.4965  12.862  15.092 1.32890788366902 -58.5530510  65.1306 /L
 2021-Nov-09 04:00     12 03 14.04 +34 13 58.2  78.6462  39.8476  12.775  15.037 1.29512698651084 -58.9064178  65.6523 /L
 2021-Nov-10 04:00     12 04 57.09 +34 09 03.3  79.0666  40.1879  12.685  14.982 1.26114348281422 -59.2526475  66.1634 /L
 2021-Nov-11 04:00     12 06 44.27 +34 04 02.2  79.4807  40.5159  12.593  14.924 1.22696164648627 -59.5912227  66.6625 /L
 2021-Nov-12 04:00     12 08 36.01 +33 58 53.5  79.8878  40.8302  12.498  14.866 1.19258608233512 -59.9215228  67.1481 /L
 2021-Nov-13 04:00     12 10 32.79 +33 53 35.2  80.2872  41.1288  12.401  14.806 1.15802179603439 -60.2427907  67.6183 /L
 2021-Nov-14 04:00     12 12 35.18 +33 48 05.1  80.6781  41.4099  12.301  14.744 1.12327428240559 -60.5541020  68.0712 /L
 2021-Nov-15 04:00     12 14 43.78 +33 42 20.7  81.0597  41.6712  12.198  14.681 1.08834963178392 -60.8543330  68.5044 /L
 2021-Nov-16 04:00     12 16 59.31 +33 36 18.9  81.4308  41.9101  12.092  14.616 1.05325465659529 -61.1421225  68.9154 /L
 2021-Nov-17 04:00  m  12 19 22.60 +33 29 56.2  81.7903  42.1235  11.983  14.550 1.01799704253927 -61.4158243  69.3011 /L
 2021-Nov-18 04:00  m  12 21 54.58 +33 23 08.2  82.1369  42.3080  11.871  14.482 0.98258553085503 -61.6734471  69.6580 /L
 2021-Nov-19 04:00  m  12 24 36.33 +33 15 49.9  82.4690  42.4595  11.755  14.412 0.94703014025939 -61.9125773  69.9822 /L
 2021-Nov-20 04:00  m  12 27 29.11 +33 07 55.2  82.7851  42.5735  11.635  14.340 0.91134243965598 -62.1302800  70.2689 /L
 2021-Nov-21 04:00  m  12 30 34.37 +32 59 16.7  83.0832  42.6444  11.511  14.266 0.87553588605312 -62.3229718  70.5128 /L
 2021-Nov-22 04:00  m  12 33 53.82 +32 49 45.3  83.3612  42.6657  11.383  14.190 0.83962624681789 -62.4862551  70.7075 /L
 2021-Nov-23 04:00  m  12 37 29.44 +32 39 10.0  83.6167  42.6298  11.250  14.113 0.80363213205768 -62.6147009  70.8452 /L
 2021-Nov-24 04:00  m  12 41 23.60 +32 27 17.1  83.8469  42.5276  11.112  14.033 0.76757567237130 -62.7015604  70.9171 /L
 2021-Nov-25 04:00  m  12 45 39.06 +32 13 49.6  84.0487  42.3480  10.969  13.951 0.73148339057019 -62.7383780  70.9123 /L
 2021-Nov-26 04:00  m  12 50 19.14 +31 58 26.3  84.2189  42.0778  10.820  13.867 0.69538733487816 -62.7144675  70.8177 /L
 2021-Nov-27 04:00  m  12 55 27.79 +31 40 40.0  84.3533  41.7009  10.665  13.781 0.65932656800803 -62.6161947  70.6177 /L
 2021-Nov-28 04:00  m  13 01 09.75 +31 19 56.5  84.4479  41.1976  10.503  13.693 0.62334914499943 -62.4259895  70.2928 /L
 2021-Nov-29 04:00  m  13 07 30.73 +30 55 31.2  84.4977  40.5433  10.334  13.604 0.58751476804831 -62.1209697  69.8193 /L
 2021-Nov-30 04:00  m  13 14 37.63 +30 26 26.7  84.4974  39.7078  10.158  13.514 0.55189838624185 -61.6710148  69.1678 /L
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 Date__(UT)__HR:MN     R.A._____(ICRF)_____DEC Azi_(a-appr)_Elev   T-mag   N-mag            delta      deldot    S-O-T /r
 ***************************************************************************************************************************

 2021-Dec-01 04:00  m  13 22 38.80 +29 51 27.4  84.4412  38.6532   9.973  13.423 0.51659512222350 -61.0360530  68.3015 /L
 2021-Dec-02 04:00     13 31 44.33 +29 08 53.7  84.3226  37.3316   9.780  13.332 0.48172706854254 -60.1622355  67.1745 /L
 2021-Dec-03 04:00     13 42 06.39 +28 16 33.1  84.1349  35.6828   9.578  13.243 0.44745271407482 -58.9765687  65.7290 /L
 2021-Dec-04 04:00     13 53 59.49 +27 11 29.7  83.8707  33.6306   9.368  13.159 0.41398002935564 -57.3795131  63.8924 /L
 2021-Dec-05 04:00     14 07 40.58 +25 49 50.2  83.5225  31.0795   9.149  13.081 0.38158449435207 -55.2352064  61.5747 /L
 2021-Dec-06 04:00     14 23 28.87 +24 06 30.3  83.0829  27.9114   8.922  13.016 0.35063336326208 -52.3597661  58.6661 /L
 2021-Dec-07 04:00     14 41 44.72 +21 55 06.1  82.5446  23.9860   8.692  12.969 0.32161659756551 -48.5105765  55.0393 /L
 2021-Dec-08 04:00     15 02 47.26 +19 08 06.8  81.9015  19.1490   8.464  12.949 0.29518171337687 -43.3854200  50.5610 /L
 2021-Dec-09 04:00     15 26 49.91 +15 37 56.2  81.1486  13.2566      8.     13. 0.27216167331330 -36.6515817  45.1243 /L
 2021-Dec-10 04:00     15 53 53.53 +11 19 22.9  80.2836   6.2287      8.     13. 0.25356941411824 -28.0378490  38.7166 /L

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Column meaning:

**TIME**

Times PRIOR to 1962 are UT1, a mean-solar time closely related to the prior but now-deprecated GMT. Times AFTER 1962 are in UTC, the current civil or "wall-clock" time-scale. UTC is kept within 0.9 seconds of UT1 using integer leap-seconds for 1972 and later years.

Conversion from the internal Barycentric Dynamical Time (TDB) of solar system dynamics to the non-uniform civil UT time-scale requested for output has not been determined for UTC times after the next July or January 1st. Therefore, the last known leap-second is used as a constant over future intervals.

Time tags refer to the UT time-scale conversion from TDB on Earth regardless of observer location within the solar system, although clock rates may differ due to the local gravity field and no analog to "UT" may be defined for that location.

Any 'b' symbol in the 1st-column denotes a B.C. date. First-column blank (" ") denotes an A.D. date. Calendar dates prior to 1582-Oct-15 are in the Julian calendar system. Later calendar dates are in the Gregorian system.

NOTE: "n.a." in output means quantity "not available" at the print-time.

**SOLAR PRESENCE (OBSERVING SITE)**

Time tag is followed by a blank, then a solar-presence symbol:

- '*' Daylight (refracted solar upper-limb on or above apparent horizon)
- 'C' Civil twilight/dawn
- 'N' Nautical twilight/dawn
- 'A' Astronomical twilight/dawn
- ' ' Night OR geocentric ephemeris

**LUNAR PRESENCE (OBSERVING SITE)**

The solar-presence symbol is immediately followed by a lunar-presence symbol:

- 'm' Refracted upper-limb of Moon on or above apparent horizon
- ' ' Refracted upper-limb of Moon below apparent horizon OR geocentric ephemeris

**'R.A._____(ICRF)_____DEC' =**

Astrometric right ascension and declination of the target center with respect to the observing site (coordinate origin) in the reference frame of the planetary ephemeris (ICRF). Compensated for down-leg light-time delay aberration.

Units: RA in hours-minutes-seconds of time, HH MM SS.ff{ffff}
DEC in degrees-minutes-seconds of arc, sDD MN SC.f{ffff}

**'Azi_(a-appr)_Elev' =**

Airless apparent azimuth and elevation of target center. Compensated for light-time, the gravitational deflection of light, stellar aberration, precession and nutation. Azimuth is measured clockwise from north:

North(0) -> East(90) -> South(180) -> West(270) -> North (360)

Elevation angle is with respect to a plane perpendicular to the reference surface local zenith direction. TOPOCENTRIC ONLY.
Units: DEGREES

**'T-mag N-mag' =**

Comets' apparent visual total magnitude ("T-mag") and nuclear magnitude ("N-mag") using the standard IAU model:

T-mag= M1 + 5*log10(delta) + k1*log10(r)
N-mag= M2 + 5*log10(delta) + k2*log10(r) + phcof*beta
Units: MAGNITUDES

**'delta deldot' =**

Apparent range ("delta", light-time aberrated) and range-rate ("delta-dot") of the target center relative to the observer. A positive "deldot" means the target center is moving away from the observer, negative indicates movement toward the observer.
Units: AU and KM/S

**'S-O-T /r' =**

Sun-Observer-Target apparent SOLAR ELONGATION ANGLE seen from the observers' location at print-time.

The '/r' column provides a code indicating the targets' apparent position relative to the Sun in the observers' sky, as described below:

Case A: For an observing location on the surface of a rotating body, that body rotational sense is considered:

- /T indicates target TRAILS Sun (evening sky: rises and sets AFTER Sun)
- /L indicates target LEADS Sun (morning sky: rises and sets BEFORE Sun)

Case B: For an observing point that does not have a rotational model (such as a spacecraft), the "leading" and "trailing" condition is defined by the observers' heliocentric ORBITAL motion:

- * If continuing in the observers' current direction of heliocentric motion would encounter the targets' apparent longitude first, followed by the Sun's, the target LEADS the Sun as seen by the observer.
- * If the Sun's apparent longitude would be encountered first, followed by the targets', the target TRAILS the Sun.

Two other codes can be output:

- /* indicates observer is Sun-centered (undefined)
- /? Target is aligned with Sun center (no lead or trail)

The S-O-T solar elongation angle is numerically the minimum separation angle of the Sun and target in the sky in any direction. It does NOT indicate the amount of separation in the leading or trailing directions, which would be defined along the equator of a spherical coordinate system.

Units: DEGREES

**Computations by ...**

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     Solar System Dynamics Group, Horizons On-Line Ephemeris System
     4800 Oak Grove Drive, Jet Propulsion Laboratory  -  Pasadena, CA  91109   USA
     Information  : https://ssd.jpl.nasa.gov/
     Documentation: https://ssd.jpl.nasa.gov/?horizons doc
     Connect      : https://ssd.jpl.nasa.gov/?horizons (browser)
                    telnet ssd.jpl.nasa.gov 6775 (command-line)
                    e-mail command interface available
                    Script and CGI interfaces available
     Author       : Jon.D.Giorgini@jpl.nasa.gov
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