More on Comet C/2021 A1 (Leonard), for December 2021

On the morning of December 5, from the Coachella Valley (lat. 34° N), the start of morning astronomical twilight occurs 1 hr 28 min before sunrise. Arcturus is then 36° up in the east (Az 90°, Alt 36°. The equatorial coordinates (referred to equinox 2000.0) of Arcturus and Comet Leonard are then approximately as follows:
Arcturus 14h 15.6m, + 19.2°
Comet 14h 13.4m, + 25.2°
So, the comet is then 2.2m in R.A. west and 6.0° in declination north of Arcturus. At that declination, 2.2m amounts to about 0.5°. So, the comet will then be 6.0° north and 0.5° west of Arcturus in differential equatorial coordinates. As the star field is oriented in the eastern sky at that time, that translates to the comet being slightly more than 6° upper left of Arcturus.

From Palm Springs that morning, Arcturus rises at 2:08 a.m. PST (and a few minutes later for places farther west, such as Big Bear), or 4h 28m before sunrise. The comet, farther north and a bit west of Arcturus that morning, will rise before the star by several minutes, but it will definitely not be visible before midnight that morning.

On subsequent mornings, the comet will move sunward with rapidly increasing speed. Here are the daily rates of motion with respect to background stars:
Dec. 5: 3.9° per day
Dec. 6: 4.6° per day
Dec. 7: 5.5° per day
Dec. 8: 6.6° per day
Dec. 9: 7.7° per day
Dec. 10: 8.8° per day
Dec. 11: 9.7° per day
Dec. 12: 10.0° per day (maximum rate, as comet passes 0.233 AU from Earth). On this last morning, the comet will not have risen yet at the start of morning twilight.

If you look for the comet each morning Dec. 1-11 at the start of morning twilight, it will descend almost vertically from one day to the next. However, if you try to catch the comet each morning when it's, say, 10° above the horizon, then you'll be looking closer to the time of sunrise each morning, and farther to the south, as the comet's declination changes from +25° on December 5, to +14° on Dec. 9, to +4° on March 11, to -1.8° on Dec. 12. By Dec. 11, the comet rises about 5° north of east, and it will be twilight by the time the comet climbs to 10° up. On December 12, the comet will rise 2°-3° south of east with twilight already underway. However, if the comet produces a lot of dust, forward scattering of sunlight by the dust may brighten it enough to make it easily visible.

After closest approach to Earth on December 12, Comet Leonard will shift to the early evening sky. On December 13, the comet appears within 15° (its minimum distance) to upper right of the recently set Sun, and the enhancement of the comet's brightness from forward scattering reaches a maximum. By the end of nautical twilight, when the Sun is 12° below the horizon, about one hour after sunset, the comet will be only 1° up, and 13° south of west, as seen from latitude 34° N. From the Coachella Valley, there are plenty of

mountains to block the view, so you would need to choose your site carefully.

On Dec. 14, the comet at the end of nautical twilight is 3° up in WSW, and within 16° almost directly above the Sun, which is 12° below the horizon. Therefore, the comet's tail (at least the ion tail) should point straight upward.

For the next few evenings, the comet shifts a few degrees farther to the south (left) daily, but does not gain much altitude. On Dec. 16, the comet appears 8°-9° lower right of Venus. On Dec. 17, at nautical twilight, about one hour after sunset, the comet appears 8° up, 38° south of west, and 5° below Venus. Be sure to start early, looking soon after sunset if not before, using binoculars to resolve Venus as a crescent.

On Dec. 18 at nautical twilight, the comet is 30° from the Sun, and 6°-7° lower left of Venus.

On Dec. 19 at nautical twilight, the comet is 9° up in southwest, and 9°-10° lower left of Venus.

By Dec. 22, the comet's elevation above the horizon at nautical twilight has leveled off at 10°, as seen from lat. 34° N (Los Angeles, Atlanta). Look 39° west of south and 18° left of Venus.

The observing conditions worsen rapidly for observers in the northern U.S. as the Comet continues moving south.

Two factors causing the comet to fade now are its increasing distance from Earth and the comet's moving farther away from the Sun-to-Earth line, reducing the forward scattering of sunlight from comet dust toward Earth. One factor which could cause the comet to get brighter is its decreasing distance from the Sun. On Jan. 2, the comet will pass perihelion, 0.615 AU from the Sun. The heating of volatiles in the nucleus and outbursts might release much dust.

Best wishes for clear weather!

Bob V.