ATLAS: The Great Ghost Comet

An icy visitor flames out in dramatic fashion.

This year started off with a bang, particularly for those in the Southern Hemisphere. That's the consensus among observers after Comet ATLAS (C/2024 G3) emerged from perihelion in mid-January. Many say ATLAS put on the best evening display since the Great Comet of 2007, Comet McNaught (C/2006 P1). Some are even calling it the Great Comet of 2025.

When first swept up by the Asteroid Terrestrial-impact Last Alert System (ATLAS) survey on April 5, 2024, it was a 19th-magnitude object with a diffuse coma and short tail. Within days, scientists calculated its orbital path, which revealed it would pass within 0.09 a.u. (13 million kilometers) of the Sun on January 13, 2025. Its path across the celestial sphere meant it would only be visible in dark skies from the Southern Hemisphere. For skygazers in the Northern Hemisphere, the comet would be briefly visible around perihelion — and only then for those willing to chance daylight observations close to the Sun.

Observers carefully monitored the icy snowball as it plunged toward its rendezvous with the Sun in late 2024, only interrupting while Comet Tsuchinshan-ATLAS (C/2023 A3) put on a wonderful show from September through October (see the March issue, page 34).

Comet ATLAS more or less followed predictions, and by late December it had achieved a respectable brightness of about 5th magnitude while sporting a modest coma and a dust tail some 15 arcminutes long as it passed through Scorpius. Though technically a naked-eye object, the comet hung low on the horizon and was difficult to see without optical aid.

On January 2nd, Australian observer Terry Lovejoy reported that the comet had undergone an outburst, lighting

▶ **FANNING OUT** On January 22nd, headless Comet ATLAS (C/2024 G3) displayed a 20°-long dust tail in addition to several other, fainter tails as it towered over one of the 6.5-meter Magellan Telescopes at Las Campanas Observatory in Chile.

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NORTHERN CHALLENGE Imager Chris Schur of Payson, Arizona, captured this series of images over five days as the comet rounded the Sun at perihelion. Each result was recorded at 10:30 a.m. local time.

YURI BELETSKY

▲ **NUCLEAR SHADOW** As ATLAS became visible in twilight following perihelion, it displayed a long, dark lane in its dust tail emanating from its nucleus. Astronomers thought the lane to be the shadow of the dense part of the coma blocking light along the tail. This image was recorded from the Tivoli Southern Sky Guest Farm in Namibia on January 17th.

▶ **SEASIDE DISPLAY** Low ocean clouds on January 24th parted sufficiently to reveal the comet above sea stacks at Mornington Peninsula in Victoria, Australia.

TWILIGHT CLOSEUP: GERALD RHEMANN / MICHAEL JÄGER; OCEANVIEW: ALEX CHERNEY

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up by a full magnitude to 3.7 in a single day. From that point, ATLAS continued to rapidly brighten. Just two days after his initial report, Lovejoy pegged it at magnitude 1.9. As it approached perihelion it remained visible in binoculars in the morning twilight. Observers began to note a dark "shadow" bisecting the comet's tail that was most pronounced near the nucleus. And by January 3rd, some were able to spot the comet without optical aid.

Another Daylight Display

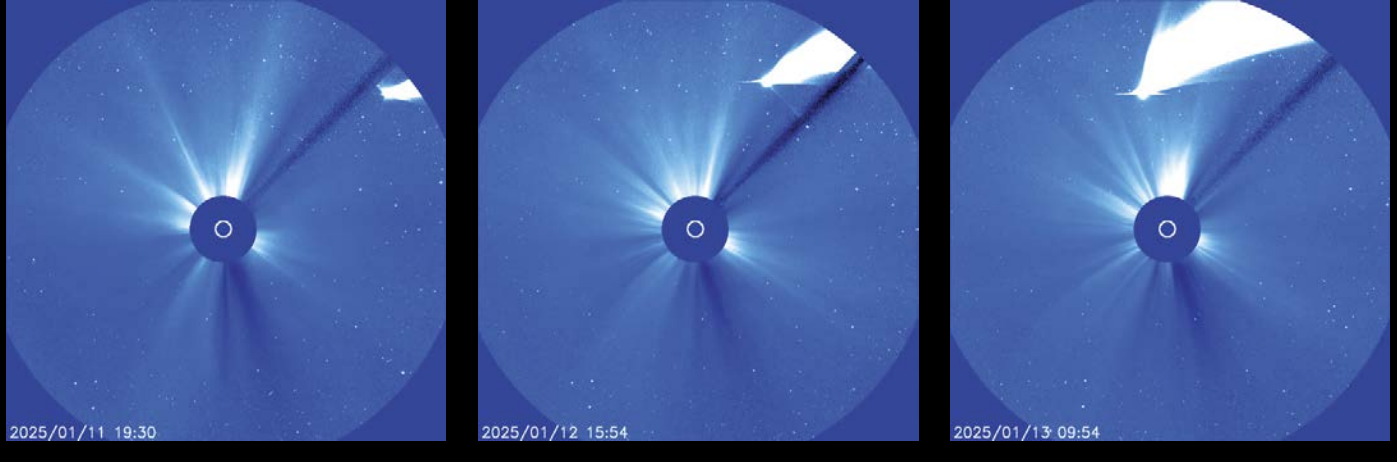
The comet entered the field of the SOHO spacecraft's LASCO C3 coronagraph on January 11th, when it lit up further due to the effect of forward scattering. Astronomers estimate the coma achieved a magnitude of –3.7 on the 13th, the day of perihelion, though it appeared to continue to intensify as it exited the LASCO field (seen below).

As the comet rounded the Sun, intrepid amateurs in the Northern Hemisphere had an opportunity to glimpse it during daylight hours. Chris Schur of Payson, Arizona, managed to image the comet daily from January 12th to the 16th at 10:30 a.m. local time. Northern observers were able to follow the comet with binoculars low on the southwestern horizon until about the 20th, just as the show was getting underway in the opposite hemisphere.

◀ **HEADLESS COMET** By February 1st, little if anything remained of Comet ATLAS's nucleus, producing strange images like this one showing the headless tails drifting off into space.

▼ **SOLAR SWING-BY** As the comet rounded the Sun it crossed the field of the SOHO spacecraft's LASCO C3 camera. Note the growing "blooming spikes" extending from the left and right of the comet's nucleus, particularly after January 13th — an early indication of the disruption of the comet's nucleus. (The white circle in the center of the frame represents the Sun's disk, while the dark silhouette is the telescope's occulting bar and support.)

HEAD SPLITTING: TARAS PRYSTAVSKI; SOLAR SWING-BY: ESA / NASA (6)



As Comet ATLAS emerged in the evening twilight for Southern Hemisphere observers, it appeared slightly brighter than Saturn and sported a 4°-long curved dust tail. The comet had survived perihelion! Or so it seemed. By January 17th it was high enough to see after evening twilight faded. Photographs revealed the comet's wide, curved dust tail extending some 15°. The striations visible within its tail recalled views of Comet McNaught some 18 years earlier. Deep images of ATLAS's tail revealed several additional, fainter tails located between the fan-like dust tail and the direction of the comet's orbital path.

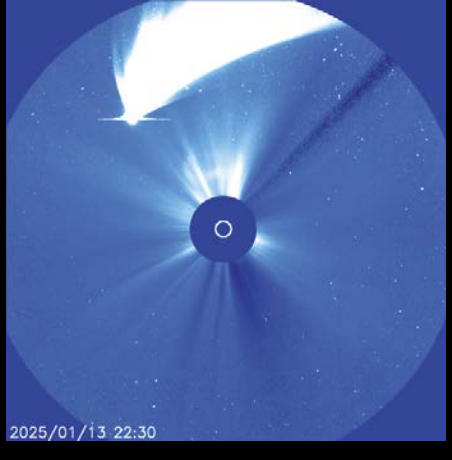
Rapid Changes

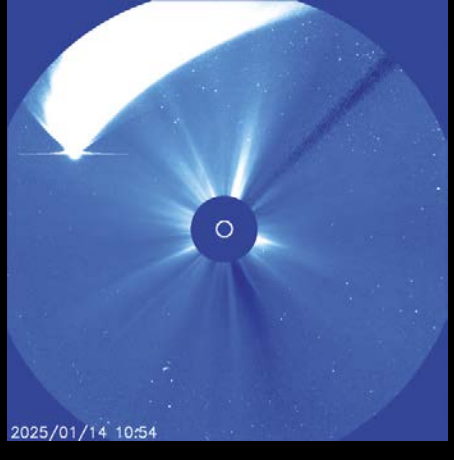
While the comet initially appeared to survive perihelion, that wasn't actually true. Hungarian astrophotographer Lionel Majzik was first to report dramatic changes in the appearance of the comet's head between January 18th and 20th while processing his images of it remotely acquired from Chile. On the 18th the head appeared sharp and bright, but by the next day it had morphed into a long, thin streak that dramatically faded on the 20th.

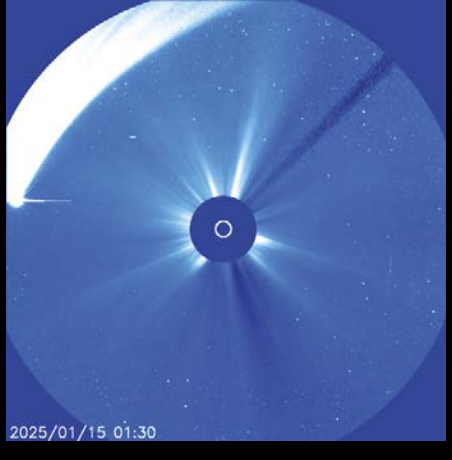
Evidently, immediately following perihelion, the comet began to break apart — the appearance of noticeably larger blooming spikes in the LASCO C3 images (due to excess light spilled onto adjacent pixels when CCD wells become saturated) on the 14th were a telltale sign that something was amiss. The thin "spike" seen for a few days after January 19th were larger dust particles released when the nucleus fragmented. Within days, the nucleus seemed to completely disappear, leaving behind a large, ghostly dust tail that continued to be visible for several weeks.

MARTIN MAŠEK / JAKUB KUŘÁK

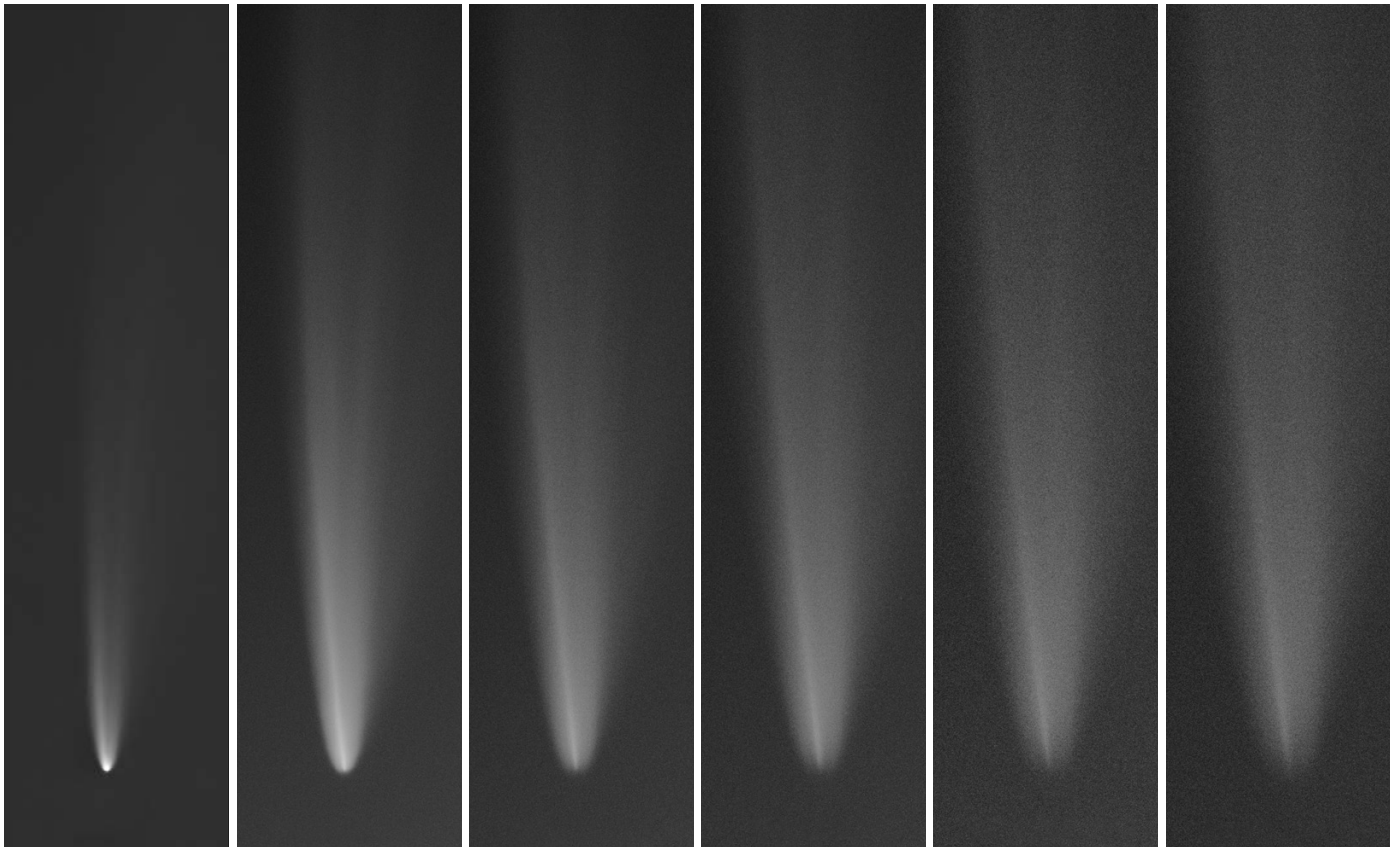
▶ **A TALE OF MANY TAILS** Comet ATLAS displays at least six individual tails in this deep exposure recorded from Paranal Observatory in Chile on January 23rd.







LUC PERROT



▲ **RAPID CHANGES** In the days following perihelion, Hungarian astrophotographer Lionel Majzik was first to note major changes in the appearance of the comet. His images show how the head became elongated on the 19th and drastically faded each day thereafter.

Not Fade Away

Despite its apparent decapitation, Comet ATLAS continued to put on a fine display, slowly fading as its remaining dust and gas were carried downstream by the solar wind. *Sky & Telescope* Contributing Editor Stephen James O'Meara pegged its magnitude at 5.5 on February 4th while observing from his home in Maun, Botswana. He writes ". . . it is rising almost straight up from the horizon by about a degree a day while the stars are lowering by a degree a day, so the comet just sits in almost the exact same spot night after night, staying about 10° above the horizon in late astronomical twilight."

Astronomers believe some of the comet's nucleus survived, though it won't return to the inner solar system for some 600,000 years. By mid-February, the ghost of Comet ATLAS had fallen below naked-eye visibility, though it remained a fine target in binoculars as it drifted through Grus, the Crane.

So, for the second time in just three months, observers were treated to a bright comet. ATLAS was only the fifth daylight comet in the last 60 years, joining the ranks of Comet Ikea-Seki in 1965, Comet West in 1976, McNaught in 2007, and Tsuchinshan-ATLAS last October.

Comet enthusiasts are debating whether or not Comet ATLAS (C/2024 G3) should be considered a "great" comet. Although it achieved a peak magnitude about as bright as Venus, like Tsuchinshan-ATLAS it did so when it was close to the Sun and difficult to observe. By the time it was well placed, it had dimmed to 1st magnitude or fainter — still impressive, but "great"? Renowned comet observer John Bortle considers it the Great Comet of 2025, but others aren't so sure. O'Meara considers it a high achiever, but a little short of the title.

It may be that our definition of what constitutes a great comet is changing with the times, possibly due to the growing popularity of digital photography. It's so easy these days to take a photo that reveals far more than the eye can see, and with the ever-increasing problem of light pollution, observers spend more time behind a camera than they do at an eyepiece. We can ponder the question of greatness as we await the next bright visitor from the outer reaches of our solar system.

■ Associate Editor **SEAN WALKER** hopes to be in the right hemisphere when the next bright comet appears.

◀ **ABOVE THE FRAY** The comet's tails tower above a thunderstorm on January 25th, as photographed from Réunion Island in the Indian Ocean.