Looking Back on a TLP

A controversial observation continues to spur interest 50 years later.

Fifty years ago, lunar cartographers James Greenacre and Edward Barr made the most well-documented observation of transient lunar phenomena (TLPs). A TLP is an unusual coloration, flash, obscuration, or other anomalous observations of the Moon. One of the earliest TLP reports was the 1787 observation by William Herschel of a fluctuating brightness at the crater **Aristarchus,** seen in earthshine. Herschel thought he had witnessed a volcanic eruption, but astronomers with more familiarity observing the Moon under various illumination conditions politely informed him that Aristarchus normally looked like that in earthshine.

This early TLP observation had two things in common with many of the hundreds that followed: it concerned Aristarchus, the brightest large crater on the Moon, and it was erroneous.

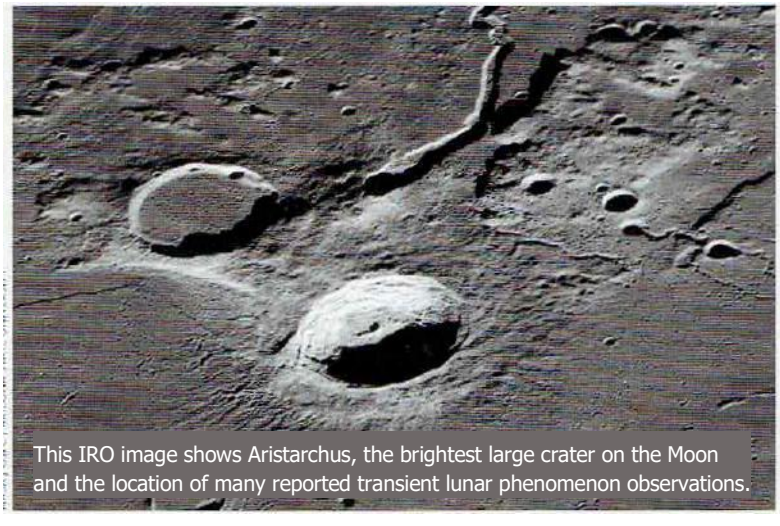
The observation by Greenacre and Barr, professional cartographers, occurred while they were performing routine observations with the Lowell Observatory 24-inch refractor to add details to maps being prepared for the Apollo missions. The pair observed a conspicuous pinkish streak inside the rim of Aristarchus and two red spots near the Cobra Head portion of Vallis Schroteri on the evening of October 29, 1963. Three hours later they saw a bluish glow envelop the northern rim of Aristarchus.

This report attracted considerable publicity at the time —partially due to its appearance in the December 1963 issue of S&T (page 316) — and is still considered the best example of a TLP. The observation has also been widely criticized for being made when the Moon was low in the sky (29°), under poor seeing conditions, and with very high magnification. Additionally, the 24-inch refractor was a poorly corrected achromat, so atmospheric dispersion or chromatic aberration are likely explanations.

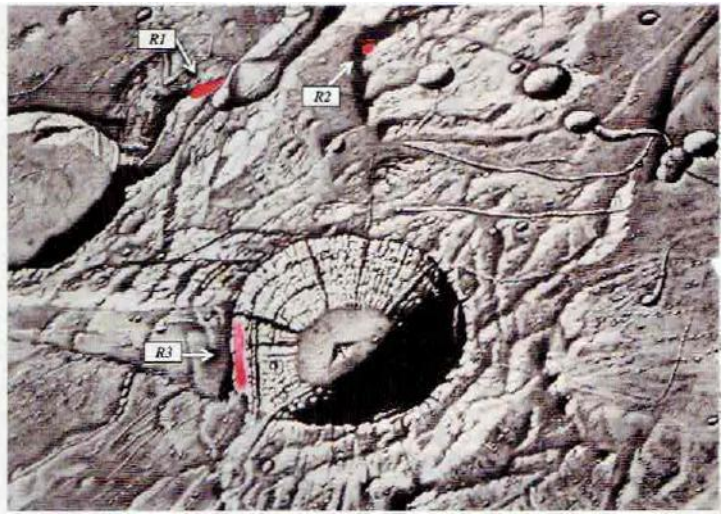
Recently, Bob O'Connell and Tony Cook, members of the British Astronomical Association have gathered together virtually all documents related to this observation, including letters and telegrams previously unpublished. They also interviewed Greenacre's son and others with knowledge of Greenacre and the events. All of this information is presented in an article in the August 2013 *Journal of the* British *Astronomical Association* and online at www.the1963aristarchusevents.com.

Of particular value is the additional documentation. of Greenacre's career, which demonstrates that he was a well-trained scientist and experienced cartographer with two years of background using the 24-inch by the time of the Aristarchus observations. That adds considerable support to the interpretation that what he saw was a true anomalous event; Greenacre was also known to be skeptical about TLP's in general.

At the same time, all the criticisms about the observa-



This IRO image shows Aristarchus, the brightest large crater on the Moon and the location of many reported transient lunar phenomenon observations.



Patricia M. Bridges produced this detailed illustration of the positions of Greenacre and Barr's October **29,1963** observations (marked in red) with a great deal of input from the observers.

tons remain indisputable: observing conditions were quite poor, with terrible seeing, and the Moon was only 29° above the horizon when Greenacre first noticed the red spots. But the spots were visible even through a Wratten 15 yellow filter, used to suppress the telescope's significant chromatic aberration. And the- red spots were first seen in darker areas near the Cobra Head, regions where spurious color should have been less pronounced. Although Greenacre and Barr saw the red glow around the bright western rim of Aristarchus, they did not detect it anywhere else in and around the crater. Based on the limited distribution of red regions and the fact that they were so much more conspicuous than anything Greenacre had observed before, he and Barr felt certain they had observed some kind of lunar activity.

Today we can use the recent high-resolution images from NASA's Lunar Reconnaissance Orbiter (LRO) to look for any possible changes. O'Connell and Cook report that the LRO images don't show evidence for any recent deposits that might be associated with the event. Searching the LRO Narrow Angle Camera images at the location of the observations reveals veneers of dark material in the areas, but they all contain numerous small craters that attest to the deposits being millions of years old. If some physical event on the Moon caused the TLP, it left no detectable deposit. We can thus eliminate the eruption of a lava or ash deposit.

The high-resolution LRO images do not rule out the escape of gases. How gases would cause the colors seen is not completely understood. And four different events scattered across tens of kilometers seems geologically unlikely, though not impossible.

The Lowell observers reported another TLP at Aristarchus one month later under similar observing conditions. That is suspiciously consistent with the TLPs being visible only in certain observing conditions, strengthening the argument that these anomalies were simply artifacts. On the other hand, a monthly recurrence might be expected if gases only can escape during monthly periods of maximum tidal stresses.

Fifty years later, we still don't unequivocally know whether the Aristarchus TLP was something on the Moon or an illusion. The recent discoveries of water buried in shadow-filled south polar craters and in lunar magmas that erupted billions of years ago demonstrate that the Moon still has- secrets — but those ancient hydrous signatures are located far away from Aristarchus. I accept that Greenacre and Barr observed an anomalous event, but in my opinion it most likely was an unusual display of atmospheric dispersion due to poor seeing, augmented by the 24-inch refractor's poor color correction. Other explanations simply must remain speculation.

How does this famous observation and history relate to amateurs? First, the compilation of all relevant information by Bob O'Connell and Tony Cook provides an excel lent model for others to follow in documenting the historical record of unusual observations. Second, at least one prominent amateur observer who doubts that anything happened on the Moon SO years ago fully admits that the excitement about that event inspired his fascination with the Moon that continues to burn brightly today.