

TV CORVI: THE PERSONAL STORY OF THE DISCOVERY OF A HIGH GALACTIC LATITUDE CATAclySMIC VARIABLE

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Özet

Pluto'yu keşfeden ve AAVSO'a ömrü boyunca yakın olan Clyde Tombaugh, hayatının 50 yılını ailesinin yaşadığı Las Cruces'de geçirmiştir. 1931 yılının 23 Mart günü Satürn'ün önünden geçiş yapması halinde gözlemeyi planladığı gezegenlere dair araştırması sırasında nova patlaması olduğunu düşündüğü bir keşif yaptı. Fakat bu keşfe dair olan fotoğraf plağı, Lowell Gözlemevin'de ben Tombaugh'un hayatı ile ilgili bir araştırma yapana kadar unutulmuş olarak kaldı. Sonradan Harvard Üniversitesinde fotoğraf plağı arşivlerinde yapılan bir çalışmada, yüksek galaktik boylamda bulunan bir katalismik değişen olduğu anlaşılan kaynağa dair 9 patlama görüntüsü daha tespit edildi. TV Corvi ismi ile kataloglanan yıldız, patlama anında ilk defa 1990 yılında görsel olarak gözlenmiştir.

2 Şubat 2005 günü güney doğu yönünde yıldızı, parlaklık değişimi sırasında gözledim. Buradaki film o gece elde edilen görüntülerden oluşuyor.

Abstract

Clyde Tombaugh, discoverer of Pluto and a lifelong AAVSO friend, lived in Las Cruces for the last 50 years of his life; his family still lives here. During his search for trans-Saturnian planets he discovered what he thought was a nova in outburst March 23, 1931. Although he reported it to his superior at the time, news of the discovery remained buried in the plate archive at Lowell Observatory until I found it while doing research for his biography. A search of the plate archives at Harvard subsequently revealed 9 other outbursts of what was apparently a cataclysmic variable of high galactic latitude. Now named TV Corvi, the star was first visually observed in outburst on March 23, 1990.

The following is reprinted by permission from David Levy's Guide to Variable Star Observing (Cambridge: Cambridge University Press, 2005):

On April 11, 1963, a group of visitors stood in the small gallery facing the largest telescope at Kitt Peak National Observatory at the time, the 84-inch reflector. After the tour guide explained the operation of the great telescope, he asked if there were any questions. One 14-year old certainly had one. "How does an astronomer get permission to use this telescope?" he asked. "This telescope at the national observatory," the guide hissed, "are available only to qualified personnel."

I was that 14-year old. Two years later, on December 17, 1965, I began my project to search the sky. On that night my goal was to begin a search of the sky that might yield a comet, or possibly a nova. A quarter century later, I found a nova, but it not involve my use of a telescope.

On February 9, 1986—coincidentally the perihelion date of Halley's comet-- I was in the basement archives at Lowell Observatory poring through hundreds of paper envelopes that Clyde Tombaugh used to store his photographic plates. It was a part of a biography I was writing about the man who had discovered Pluto. These plate envelopes had been replaced with modern archival envelopes, but the originals, complete with Clyde's detailed notes of observation, were still stored in a filing cabinet. They were crammed with information relating to the hundreds of hour-long photographs he took during his fourteen-year search of the sky, including data on anything new he found while scanning each pair of plates through the blink microscope.

After a few hours of searching, I found an interesting entry on a plate taken on March 23, 1931: "One nova suspect, 'T 12', near southwest corner of plate, magnitude about 12... No trace of object on plates of March 20 or 17, 1931... Evidently a very remarkable star to rise from 17 or fainter to 12 in 2 days time. This object was discovered on May 25, 1932, at 11:00 AM."

Brian Skiff, an observer at Lowell, and I found the plates that Clyde had taken, and we saw the nova near the edges. Since the 13-inch diameter astrograph that Clyde used in his search was not a Schmidt camera, images near the edges were all deformed somewhat, which actually added proof that the nova was real, and not a defect on the photographic plate. There was no star on the first two images, but the March 23 plate showed a new star, deformed exactly as other stars in its area were. When we checked the position on the Palomar Observatory Sky Survey, we realized that at its faintest, the star was probably about 20th magnitude, which meant that in outburst it underwent at least a seven magnitude increase in brightness.

When I asked Clyde about it, he replied that he did report it to his superiors at the time, and that they expressed much enthusiasm about how much the star had brightened in just one day. However, the reason he probably never followed up on it—and no one reported it beyond the observatory walls at the time—was that he was busy preparing to leave for University. I decided to do something about it. At the next opportunity I traveled to the Harvard College Observatory plate stacks in Cambridge, Massachusetts, to attempt to confirm the nova. I found a patrol plate they had taken at the same place, near the same time, but the nova wasn't there. Depressed at the prospect of having spent a lot of time traveling for nothing, I thought about what to do. The first thing was to examine the other plates from different times. I found such plates covering periods to 12 from 1931 almost to the present. As expected, nothing unusual appeared. On each plate I looked for the familiar pattern of the Corvus field and then at the exact position of the star. Then, I set up the 10th plate, exposed in the late 1970s, many years after the original discovery. I focused in on the right area, and was surprised to see the star as bright as it was in 1931. My assignment now was clear: to check every one of the more than 360 patrol plates of Corvus in the Harvard collection. After three days of searching I found evidence of nine additional outbursts. In all likelihood, this star was not a classical nova, but a "dwarf nova" or repeating cataclysmic variable.

Armed with this evidence, I walked over to Brian Marsden's office in the next building. Then Director of the Central Bureau for Astronomical Telegrams, Marsden has responsibility for announcing new discoveries. I showed him the evidence, but he suggested that now was not the time to make an announcement.

"Why not?" I inquired.

"Because," he smiled, "you are an amateur astronomer."

As I prepared to protest, he waved his hand at me and laughed. "If you were a professional astronomer," he explained, "you would have the ability to monitor this star's behavior only during an observing run. As an experienced amateur astronomer with your own fine 16-inch telescope, you have the ability to monitor the star's field every night. When you next detect the star in outburst, we will then announce the nova, and its history, when it is in outburst and current news." As I left with task in hand, he added, "And a spectrum of the star in outburst would be good as well."

That fall, when Corvus started rising over the southeastern horizon, I began a series of observations. Night after night I observed the position of that star. Each time I looked through the telescope, I could see the surrounding stars, but no sign whatever of the

interloper. Everything was ready for the discovery –I even had made arrangements with Gary Rosenbaum, a friend at the Steward Observatory on Kitt Peak, to use a telescope there to observe the spectrum once it erupted. For almost 70 nights I looked, until the night of March 23 1990. By this time Corvus was rising early in the evening, so I didn't have to wait too long before I pointed the telescope toward the proper field. There, right before my eyes, I saw at last the star Clyde had found exactly 59 years earlier, to the day. "Hello, my new friend!" I greeted it, feeling absolutely terrific. I telephoned Gary, who arranged for the 84-inch telescope on Kitt Peak to obtain a spectrum that very night on the Kitt Peak 84 and 90-inch telescopes. The spectra revealed an unusually hot outburst. The unusual part of the spectrum was that Hydrogen alpha remained strong, whereas in a typical dwarf nova outburst, Hydrogen alpha goes away. On the next night the temperature of outburst was already falling; the evidence of H-alpha dropped by 1.5 times. The next day, the entire history of Tombaugh's star, complete with the ten earlier outbursts and the spectrum, appeared on an IAU Circular, and soon after the star was designated TV Corvi.

TV Corvi appears to be a most unusual binary star system. It is a high galactic latitude cataclysmic variable star, itself unusual since most such stars are at low galactic latitudes; i.e. near the plane of the Milky Way. Astronomer Steve Howell, of the Planetary Science Institute, analysed the March 23 spectra and continued to study TV Corvi. He suggests that the system is two small stars orbiting each other in a space smaller than our own Sun, in a period of under two hours. In this system, hydrogen leaves a brown dwarf star and travels to a spot on an accretion disk orbiting a white dwarf star. When the spot overflows with hydrogen, then a thermonuclear explosion occurs and the system brightens enormously, then fades slowly over a few days.

Tombaugh's star went into outburst again 15 months later, the night I discovered Periodic comet Levy. On any ordinary night either one or the other event would have occupied all my attention, but having both events take place simultaneously was quite an experience. Discovering a comet and then learning that my favorite variable was in outburst made this a truly memorable time. The next day, I learned that the International Ultraviolet Explorer spacecraft was observing it. I felt I had some role in rescuing the few photons of Clyde's star, locked in photographic emotion, and then watching the star from which these photons came observed by a spacecraft in orbit around the Earth.

Clyde Tombaugh was delighted when I told him of the possible astrophysics regarding the star system he discovered so long ago. And I think of our long friendship whenever I turn the telescope toward Corvus to see just how his star is doing. The dates of Clyde's first observation in 1931 and my first visual observation in 1990, March 23, have become unique for me: On March 23, 1993, Gene and Carolyn Shoemaker and I took the photographs that led to our discovery of Comet Shoemaker-Levy 9, our best known comet find. Four years later, on March 23, 1997, Wendee and I were married in an event that included a lunar eclipse. Then on March 23, 2000, TV Corvi erupted again, as if to help celebrate our anniversary. And finally, the question I had asked at Kitt Peak in 1963 was finally answered: The 84-inch was available on the night of March 23, 1990, and it observed Tombaugh's star.

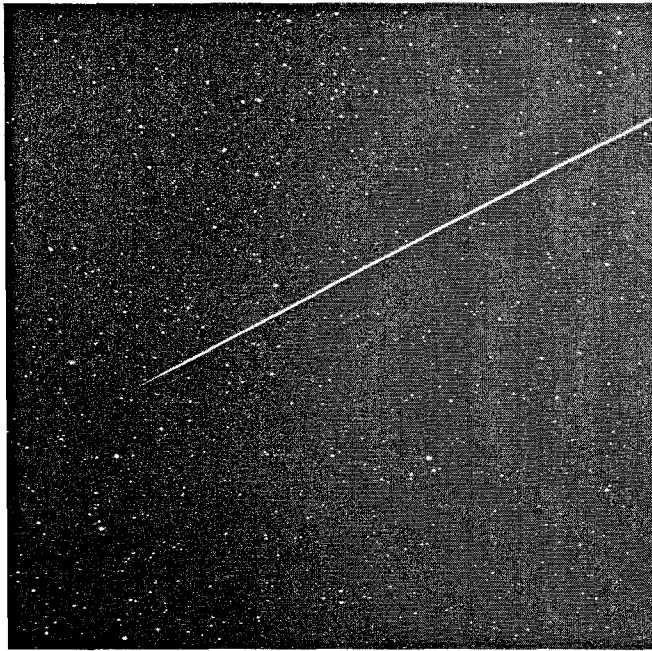


Figure 1: Caption: The field of TV Corvi is intercepted by what is probably an early Geminid meteor, December 1, 2005. To see a movie of one of the outbursts of this star, please visit www.jarnac.org and follow the links to "Project Skywatcher" and then to "stars"