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Amateur Gets Dibs on Gamma-ray Burst Afterglow Discovery

An observer in South African becomes the first amateur astronomer to discover the optical afterglow of a gamma-ray burst.

by Vanessa Thomas

An artistic representation of a gamma-ray burst
STScI

It's good to know that when the professionals are out of town, amateur astronomers will keep an eye on things.

On July 25, NASA's High-Energy Transient Explorer 2 (HETE-2) satellite detected a gamma-ray burst (GRB), which normally would have the attention of astronomers around the world. But on that date, thousands of professional observers were away from their telescopes and in Sydney, Australia, for the General Assembly of the International Astronomical Union. Fortunately, amateur astronomer Berto Monard was at his observatory near Pretoria, South Africa, and began looking for the gamma-ray burst's optical afterglow soon after receiving an alert from the GRB Coordinates Network at NASA's Goddard Space Flight Center. Just seven hours after HETE-2 discovered GRB030725, Monard detected the burst's fading optical autograph.

He had become the first amateur astronomer to discover a GRB afterglow.

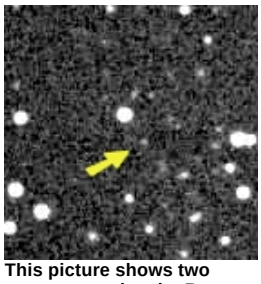
"I have seen a multitude of stars and galaxies and even supernovae, but this gamma-ray burst afterglow is among the most ancient light that has ever graced my telescope," says Monard, who has discovered 10 supernovae. "The explosion that caused this likely occurred billions of years ago, before the Earth was formed."

AAVSO member Berto Monard and AAVSO director Janet Mattei pose for a photograph in December 2002.
AAVSO

Monard belongs to the American Association of Variable Star Observers (AAVSO), an organization that, despite its name, has members in 46 countries. When a space observatory such as HETE-2 detects a gamma-ray burst, the GRB Coordinates Network distributes the estimated location of the rapidly disappearing object to astronomers around the world and to the AAVSO's High Energy Network.

Each alert is sent to pagers, cell phones, and email inboxes because observers have to hurry to catch a GRB afterglow before it disappears, usually within a few hours or days of the initial burst. And if someone can spot it and study it before it fades away, the afterglow can help astronomers pinpoint a GRB's location and help determine what caused it.

When Monard found out that HETE-2 had discovered a 40-second gamma-ray burst on July 25, he waited for nightfall and began using his 12-inch (30-centimeter) Schmidt-Cassegrain telescope to take images and search for a "new star" in the 30-arcminute (full-moon-sized) field provided in the alert. He found an unidentified object near the edge of the field that was fading fast — by the time he stopped observing for the night, it had dimmed by nearly a whole magnitude. Monard reported his observations and went to bed.



This picture shows two exposures taken by Berto Monard of the GRB030725 afterglow before and after it disappeared from view. ***Berto Monard / AAVSO***

Three days later, when Monard tried to observe the object again, it had already faded from his telescope's view. But on the following night, July 29, the Danish 1.5-meter telescope at La Silla Observatory in Chile observed the then-21st-magnitude object, confirming his discovery.

If Monard had not found the afterglow of GRB 030725, it may have never been seen. In addition to astronomers being away for the IAU conference and others being on vacation during summer (or winter) break, this gamma-ray burst was very low (–50° declination), making it impossible for some telescopes to see its afterglow, and an x-ray flare earlier in the week had already consumed the time on some telescopes set aside for professional hunters of gamma-ray-burst afterglows.

"In the past two years, HETE has opened the door wide for rapid follow-up studies by professional astronomers," said the mission's principal investigator, George Ricker of MIT. "Now, with GRB030725, the worldwide community of dedicated and expert amateur astronomers coordinated through the AAVSO is leaping through that door to join the fun."

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