Galactic Hunt Bags Missing Supernova

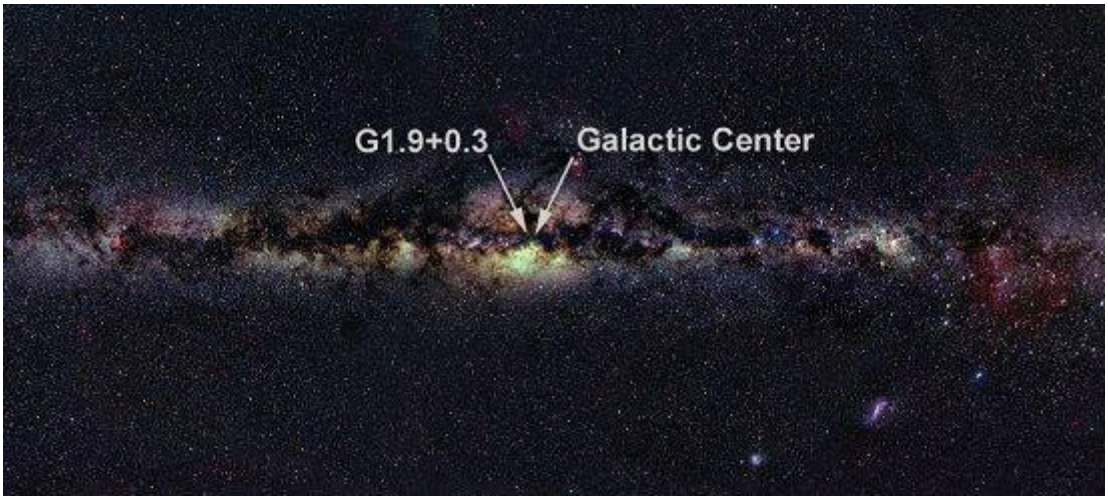
05.14.2008

Editor's preface : *Astronomers have long thought that supernovas explode two or three times a century here in the Milky Way. They arrive at that figure by watching other galaxies similar to our own, and counting the stars as they explode. But this leads to a mystery: The last time anyone actually saw a supernova explode in the Milky Way was the year 1680, almost 330 years ago. So where are the Milky Way's missing supernovas?*

At long last, one of them has been found. Astronomers using NASA's Chandra X-ray Observatory (an x-ray telescope in space) and the NRAO's Very Large Array (a radio telescope in New Mexico) recently located the remains of a young supernova hiding in a dense field of gas and dust near the center of our galaxy. Read today's story to learn how a decades-long "galactic hunt" landed its prey.

May 14, 2008: The most recent supernova in our galaxy has been discovered by tracking the rapid expansion of its remains. This result, obtained by NASA's Chandra X-ray Observatory and the National Radio Astronomy Observatory's Very Large Array, will help improve our understanding of how often supernovas explode in the Milky Way galaxy.

The explosion occurred about 140 years ago, making it the most recent supernova in the Milky Way as measured in Earth's time frame. Previously, the last known supernova in our galaxy occurred around 1680, an estimate based on the expansion of its remnant, Cassiopeia A.



Above: Young supernova remnant G1.9+0.3 is hidden in the dust fields of the galactic center. [more]

The remains of this young supernova are known to astronomers as "G1.9+0.3." The numbers denote the galactic coordinates of the supernova's expanding debris cloud, located deep in the heart of the Milky Way. The explosion itself was not seen because it occurred in a dense field of gas and dust. This made the object about a trillion times fainter, in optical light, than an unobscured supernova. However, the remnant it left behind can be seen by X-ray and radio telescopes.

"We can see some supernova explosions with optical telescopes across half of the universe, but when they're in this murk we can miss them in our own cosmic backyard,"

says Stephen Reynolds of North Carolina State University in Raleigh, who led the Chandra study. "Fortunately, the expanding gas cloud from the explosion shines brightly in radio waves and X-rays for thousands of years. X-ray and radio telescopes can see through all that obscuration and show us what we've been missing."

Astronomers regularly observe supernovas in other galaxies like ours. Based on those observations, researchers estimate about three explode every century in the Milky Way.

"If the supernova rate estimates are correct, there should be the remnants of about 10 supernova explosions that are younger than Cassiopeia A," said David Green of the University of Cambridge in the United Kingdom, who led the Very Large Array study. "It's great to finally track one of them down."

The tracking of this object began in 1985, when astronomers, led by Green, used the Very Large Array to identify the remnant of a supernova explosion near the center of our galaxy. Based on its small size, it was thought to have resulted from a supernova that exploded about 400 to 1000 years ago.

Twenty-two years later, Chandra observations revealed the remnant had expanded by a surprisingly large amount, about 16 percent, since 1985. This indicates the supernova remnant is much younger than previously thought.

Right: The supernova's expanding shell images by Chandra in 2007. The central circle traces the shell's approximate size in 1985. [more]

That young age was confirmed in recent weeks when the Very Large Array made new radio observations. This comparison of data pinpoints the age of the remnant at 140 years - possibly less if it has been slowing down - making it the youngest on record in the Milky Way.

Besides being the record holder for youngest supernova, the object is of considerable interest for other reasons. The high expansion velocities and extreme particle energies that have been generated are unprecedented and should stimulate deeper studies of the object with Chandra and the Very Large Array.

"No other object in the galaxy has properties like this," Reynolds said. "This find is extremely important for learning more about how some stars explode and what happens in the aftermath."

These results are scheduled to appear in *The Astrophysical Journal Letters*.

SEND THIS STORY TO A FRIEND

Editor: Dr. Tony Phillips | Credit: Science@NASA