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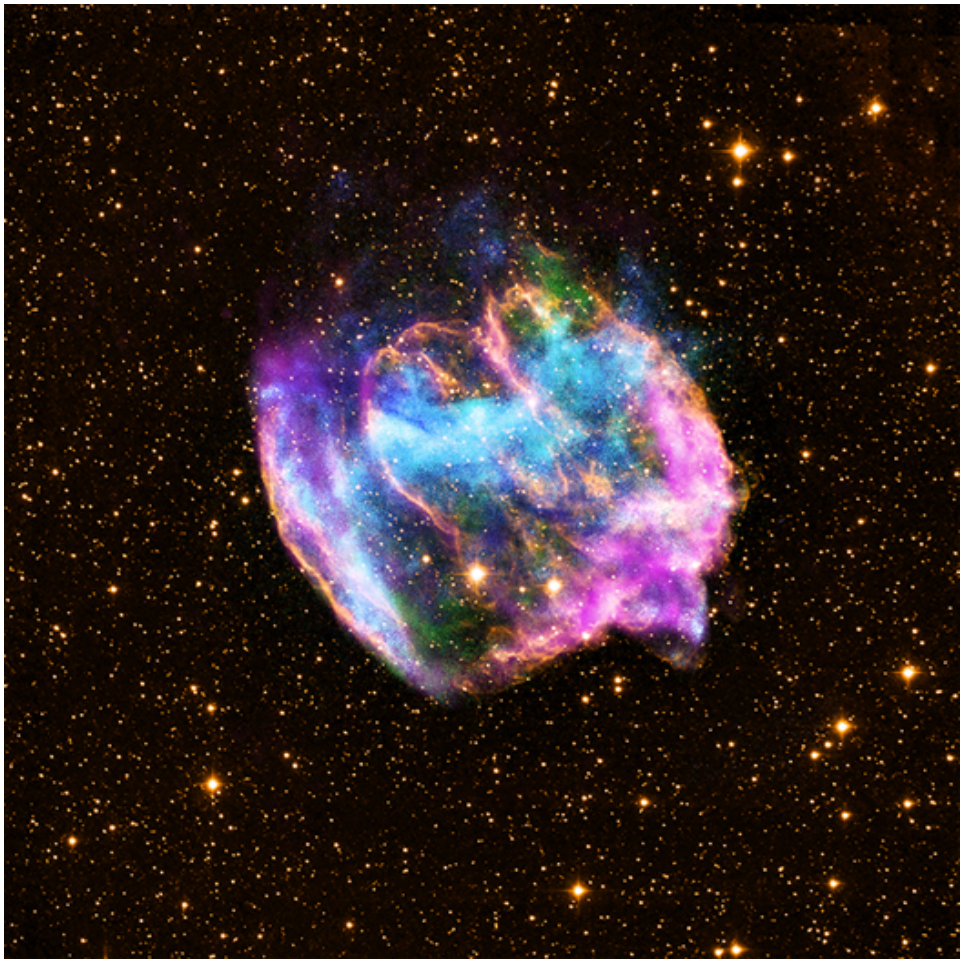
# W49B: Rare Explosion May Have Created Our Galaxy's Youngest Black Hole



View Wavelengths Composite X-ray Infrared Radio

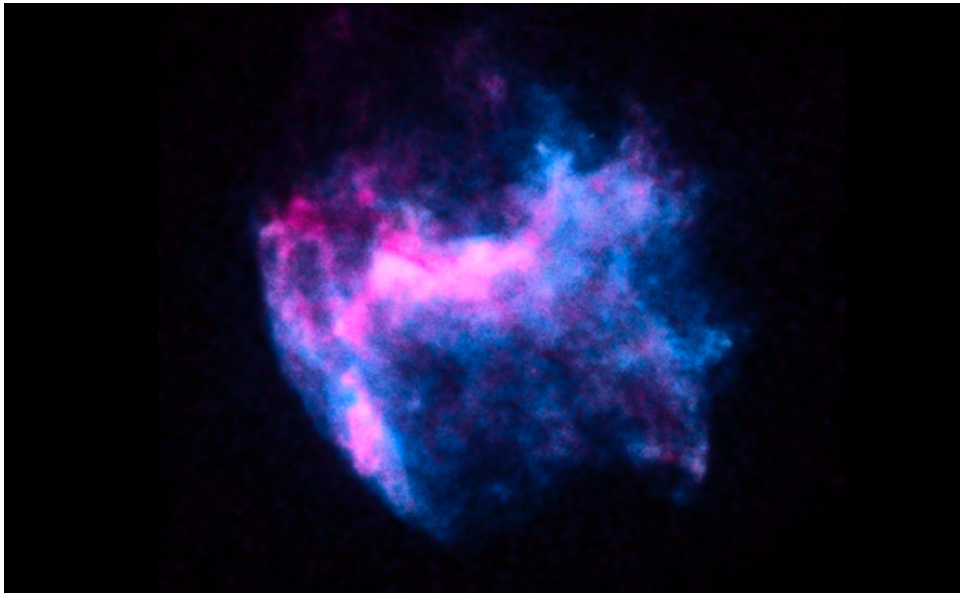
- W49B is a highly distorted supernova remnant, produced by a rare type of explosion.
- Instead of radiating out symmetrically, W49B's exploding star shot more material out from its poles versus from its equator.
- There is evidence that W49B left behind a black hole - not a neutron star like most other supernovas.
- If confirmed, W49B would be the most recent black hole formed in our Galaxy.

The highly distorted supernova remnant shown in this image may contain the most recent black hole formed in the Milky Way galaxy. The image combines X-rays from NASA's Chandra X-ray Observatory in blue and green, radio data from the NSF's Very Large Array in pink, and infrared data from Caltech's Palomar Observatory in yellow.

The remnant, called W49B, is about a thousand years old, as seen from Earth, and is at a distance of about 26,000 light years away.

The supernova explosions that destroy massive stars are generally symmetrical, with the stellar material blasting away more or less evenly in all directions. However, in the W49B supernova, material near the poles of the doomed rotating star was ejected at a much higher speed than material emanating from its equator. Jets shooting away from the star's poles mainly shaped the supernova explosion and its aftermath.

By tracing the distribution and amounts of different elements in the stellar debris field, researchers were able to compare the Chandra data to theoretical models of how a star explodes. For example, they found iron in only half of the remnant while other elements such as sulfur and silicon were spread throughout. This matches predictions for an asymmetric explosion. Also, W49B is much more barrel-shaped than most other remnants in X-rays and several other wavelengths, pointing to an unusual demise for this star.



Chandra X-ray Image of W49B showing just the iron (purple) and silicon (blue).

The authors also examined what sort of compact object the supernova explosion left behind. Most of the time, massive stars that collapse into supernovas leave a dense spinning core called a neutron star. Astronomers can often detect these neutron stars through their X-ray or radio pulses, although sometimes an X-ray source is seen without pulsations. A careful search of the Chandra data revealed no evidence for a neutron star, implying an even more exotic object might have formed in the explosion, that is, a black hole.

This may be the youngest black hole formed in the Milky Way galaxy, with an age of only about a thousand years, as viewed from Earth (i.e., not including the light travel time). A well-known example of a supernova remnant in our Galaxy that likely contains a black hole is SS433. This remnant is thought to have an age between 17,000 and 21,000 years, as seen from Earth, making it much older than W49B.

The new results on W49B, which were based on about two-and-a-half days of Chandra observing time, appear in a paper in the February 10, 2013 issue of the Astrophysical Journal. The authors of the paper are Laura Lopez, from the Massachusetts Institute of Technology (MIT), Enrico Ramirez-Ruiz from the University of California at Santa Cruz, Daniel Castro, also of MIT, and Sarah Pearson from the University of Copenhagen in Denmark.

Fast Facts for W49B:

| | |
|---|---|
| **Credit** | X-ray: NASA/CXC/MIT/L.Lopez et al.; Infrared: Palomar; Radio: NSF/NRAO/VLA |
| **Release Date** | February 13, 2013 |

| | |
|---|---|
| **Scale** | Image is 8.5 arcmin across (60 light years) |
| **Category** | Supernovas & Supernova Remnants |
| **Coordinates (J2000)** | RA 19h 11m 07s \| Dec +09° 06' 00" |
| **Constellation** | Aquila |
| **Observation Date** | August 18-22, 2011 |
| **Observation Time** | 61 hours 7 min (2 days 13 hours 7 min) |
| **Obs. ID** | 13440-13441 |
| **Instrument** | ACIS |
| **Also Known As** | G043.3-00.2 |
| **References** | Lopez, L et al 2013, ApJ 764, 50; arXiv:1301.0618 |
| **Color Code** | X-ray (Green, Blue); Infrared (Yellow); Radio (Magenta) |
| **Distance Estimate** | About 26,000 light years |

Visitor Comments (20)

Harvard showing us the stars.

**Posted by Alumni on Saturday, 04.22.17 @ 17:34pm**

Very very cool. Much information about the stars.

**Posted by Beevus on Tuesday, 05.24.16 @ 13:03pm**

Repulsive reaction is more in W49B supernova by possibility of reversal in magnetic poles in any star
Material near the poles of the doomed rotating star was ejected at a much higher speed than material emanating from its equator. Jets shooting away from the star's poles

mainly shaped the supernova explosion and its aftermath. W49B also is much more elongated and elliptical than most other remnants, Most of the time, massive stars that collapse into supernovas leave a dense, spinning core called a neutron star.

**Posted by Sankaravelayudhan Nandakumar on Thursday, 01.15.15 @ 22:48pm**

How did astronomers arrive at a date of the visual flare around 1,000 years ago? The Chinese recorded the nova responsible for the Crab Nebular in Taurus 1045 A.D. This supernova would have been far brighter. And yet, the Chinese do not appear to have recorded any such object in this time frame.

**Posted by Gordon Brown on Monday, 12.1.14 @ 19:10pm**

Thanks for the information.

**Posted by jose on Wednesday, 05.7.14 @ 12:38pm**

It's odd that the stars emit infrared light but not radio waves. We usually think of these wavelengths as being long and pretty much identical.

**Posted by Gabriel on Wednesday, 03.12.14 @ 21:52pm**

It's funny that the stars emit infrared light, but not radio waves. We usually think that both of these wavelengths are just short and aren't very different from each another

**Posted by Gabriel on Wednesday, 03.12.14 @ 21:51pm**

Very interesting. Quite the intriguer in the sense of astronomy.

**Posted by Aditya on Sunday, 02.2.14 @ 13:49pm**

This magnificent images only confirms that the Universe is in me... Woooaw!!

**Posted by Margarita on Wednesday, 09.25.13 @ 16:42pm**

It is wonderful.

**Posted by abhisek das on Tuesday, 05.21.13 @ 14:02pm**

Formation of black hole at the expense of sudden radiation and then the dimness subsequently controlled by monopoles to dual poles as the case may be.

**Posted by Sankaravelayudhan Nandakumar on Tuesday, 05.21.13 @ 05:14am**

This is actually very cool. Knowing of what scientist can find out, amazing! That is why I am going to be taking astronomy in college.

**Posted by Laura on Friday, 05.10.13 @ 00:00am**

Cool.

**Posted by david on Friday, 04.19.13 @ 11:28am**

This is so great. I would love to go into space one day and see these wonderful images in real life. They are so cool.

**Posted by hannah hope on Tuesday, 04.16.13 @ 14:25pm**

This is amazing! It is also at the same time scary, because if we recently discovered a black hole a thousand years after it was formed. One could form and in danger earth and we wouldn't even realize it for centuries! But still... That is probably not going to happen. It is just so cool how black holes form and how they are such a mystery to man kind.

**Posted by Sam on Saturday, 04.13.13 @ 22:38pm**

Vary cool, it is nice.

**Posted by Megan on Thursday, 04.4.13 @ 14:00pm**

Very nice.

**Posted by sachin on Monday, 03.25.13 @ 06:50am**

Absolutely wonderful images on this site which I visit often. Thank you for the many wonderful photographs I have been able to download and print out.
I am fascinated by everything that occurs in this wonderful universe that we live. Without sites like Chandra, Hubble and NASA, none of this well explained information would be so readily available in the UK. Thanks to you all

**Posted by Simone Williamson on Saturday, 03.23.13 @ 08:13am**

Thank you for sending me information on the most recently formed black hole in our galaxy, W49B! Please send any other photos of this supernova remnant and any confirmation information. Kudos to L.Lopez et.al and all others involved in the observation of W49B!

Billie Jean Gergis

**Posted by Billie Jean Gergis on Friday, 03.15.13 @ 12:30pm**

Man, these stars are so starry! I never thought that stars could look so real until I saw them. It makes me amazed to see stars. Bye!

**Posted by Nicholas on Tuesday, 03.12.13 @ 13:04pm**

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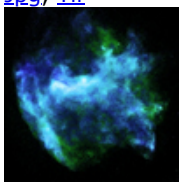

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