National Aeronautics and Space Administration

Supernova 1987A

Supernova 1987A shares its secrets

On Feb. 23, 1987, astronomers spotted one of the brightest exploding stars in nearly 400 years. The titanic blast, called Supernova 1987A (SN 1987A), blazed with the power of 100 million suns for several months following its discovery in the nearby Large Magellanic Cloud, a satellite galaxy of our Milky Way.

Since that first sighting, ground- and space-based telescopes have monitored SN 1987A in different wavelengths of light. These observations have been important for providing new details about the supernova and for helping astronomers piece together a more complete scientific story of stellar life and death.

NASA's Hubble Space Telescope, launched in 1990, has repeatedly made visible-light observations of SN 1987A, tracking the blast wave unleashed by the explosion as it slammed into an inner ring of dust. This collision heated the material, and the ring gradually began to glow. The dust ring had been expelled by the star about 20,000 years before its demise. Hubble also witnessed the initial development of the central remnant — the tattered remains of the star that has been expanding and dimming over time.

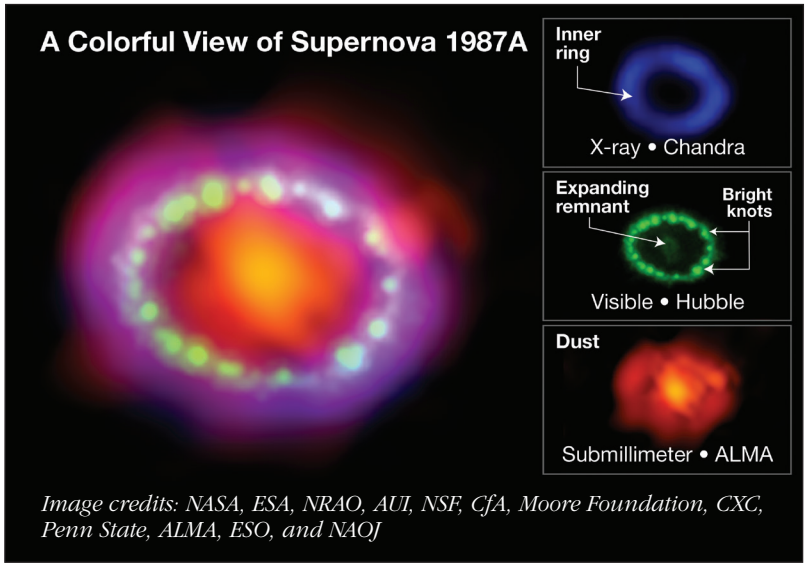
NASA's Chandra X-ray Observatory began observing SN 1987A shortly after its deployment in 1999. Chandra saw little of the supernova's activity until the blast wave heated the inner ring to such high temperatures that X-rays were emitted.

The Atacama Large Millimeter/submillimeter Array (ALMA), a powerful array of radio telescopes in Chile, has been tracking the dusty regions that other telescopes cannot see. Analyzing this material will help astronomers understand how dust forms in the aftermath of these powerful explosions.

Among the many surprises that astronomers uncovered during decades of studying the blast's aftermath was the identity of the progenitor star. Images taken of the supernova's location before it detonated reveal a blue supergiant. Until that discovery, astronomers thought that only red supergiant stars ended their lives as supernovas.

Supernovas such as SN 1987A are important to study because they can stir up surrounding gas and trigger the formation of new stars and planets. This gas will be enriched with elements dispersed by the supernova, such as carbon, nitrogen, oxygen, and iron, which are the basic components of all known life.

Credits: NASA, ESA, R. Kirshner (CfA and the Moore Foundation), and M. Mutchler and R. Avila (STScI)



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Astronomers combined observations from three different observatories in the top image to produce this colorful, multiwavelength view of the intricate remains of SN 1987A.

The green and blue colors reveal where the expanding shock wave from the exploded star is colliding with a ring of material around the supernova. Blue reveals the hottest gas and is based on data from Chandra. Green represents the glow of visible light, captured by Hubble. Red shows newly formed dust in the center of the remnant, taken at submillimeter wavelengths by the ALMA telescope.

VOCABULARY

Supernova(s): The explosive death of a star that ejects the star's outer layers into surrounding space at high velocities.

Millimeter/submillimeter: Electromagnetic waves that include the longer-wavelength region of infrared light and the shorter-wavelength region of microwaves.

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Goddard Space Flight Center
8800 Greenbelt Road
Greenbelt, Maryland 20771

www.nasa.gov

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