

Observatories combine to crack open the Crab Nebula

May 10 2017, by Ray Villard



An image of the Crab Nebula, a supernova remnant that was assembled by combining data from five telescopes spanning nearly the entire breadth of the electromagnetic spectrum: the Very Large Array, the Spitzer Space Telescope, the Hubble Space Telescope, the XMM-Newton Observatory, and the Chandra X-ray Observatory. Credit: NASA, ESA, NRAO/AUI/NSF and G. Dubner (University of Buenos Aires)

Astronomers have produced a highly detailed image of the Crab Nebula, by combining data from telescopes spanning nearly the entire breadth of the electromagnetic spectrum, from radio waves seen by the Karl G. Jansky Very Large Array (VLA) to the powerful X-ray glow as seen by the orbiting Chandra X-ray Observatory. And, in between that range of wavelengths, the Hubble Space Telescope's crisp visible-light view, and the infrared perspective of the Spitzer Space Telescope.

The Crab Nebula, the result of a bright [supernova explosion](#) seen by Chinese and other astronomers in the year 1054, is 6,500 light-years from Earth. At its center is a super-dense neutron star, rotating once every 33 milliseconds, shooting out rotating lighthouse-like beams of radio waves and light—a pulsar (the bright dot at image center). The nebula's intricate shape is caused by a complex interplay of the pulsar, a fast-moving wind of particles coming from the pulsar, and material originally ejected by the supernova explosion and by the star itself before the explosion.

This image combines data from five different telescopes: The VLA (radio) in red; Spitzer Space Telescope (infrared) in yellow; Hubble Space Telescope (visible) in green; XMM-Newton (ultraviolet) in blue; and Chandra X-ray Observatory (X-ray) in purple.

The new VLA, Hubble, and Chandra observations all were made at

nearly the same time in November of 2012. A team of scientists led by Gloria Dubner of the Institute of Astronomy and Physics (IAFE), the National Council of Scientific Research (CONICET), and the University of Buenos Aires in Argentina then made a thorough analysis of the newly revealed details in a quest to gain new insights into the complex physics of the object. They are reporting their findings in the *Astrophysical Journal*.

"Comparing these new images, made at different wavelengths, is providing us with a wealth of new detail about the Crab Nebula. Though the Crab has been studied extensively for years, we still have much to learn about it," Dubner said.

Provided by NASA's Goddard Space Flight Center

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