



# Chandra Science Highlight

## Bubbles With Titanium Trigger Titanic Explosions



**Caption:** Astronomers using Chandra discovered a stable isotope of titanium in the supernova remnant Cas A. The different colors in this new image mostly represent elements detected by Chandra in Cas A: iron (orange), oxygen (purple), and the amount of silicon compared to magnesium (green). A different isotope of titanium (light blue) previously detected by NASA's NuSTAR telescope is shown. These X-ray data have been overlaid on an optical-light image from the Hubble Space Telescope (yellow).

- Astronomers used Chandra to discover a stable isotope of titanium blasting out from the center of the supernova remnant Cassiopeia A (Cas A).
- The stable titanium was detected in finger-shaped structures. Theory predicts that titanium-filled bubbles travel outwards through the massive star, driven by neutrinos, to trigger the explosion.
- This detection provides strong support for the theory that supernova explosions are driven by neutrinos formed when a massive star collapse.
- The result uses 18 days of Chandra observing time of Cas A taken between 2000 and 2018.

**Distance estimate:** About 11,000 light-years

**Credits:** X-ray: NASA/CXO/RIKEN/T. Sato et al.; NuSTAR: NASA/NuSTAR; Hubble: NASA/STScI.

**Instrument:** ACIS

**References:** [Sato, T. et al.; 2021, Nature, 592, 537](#)

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