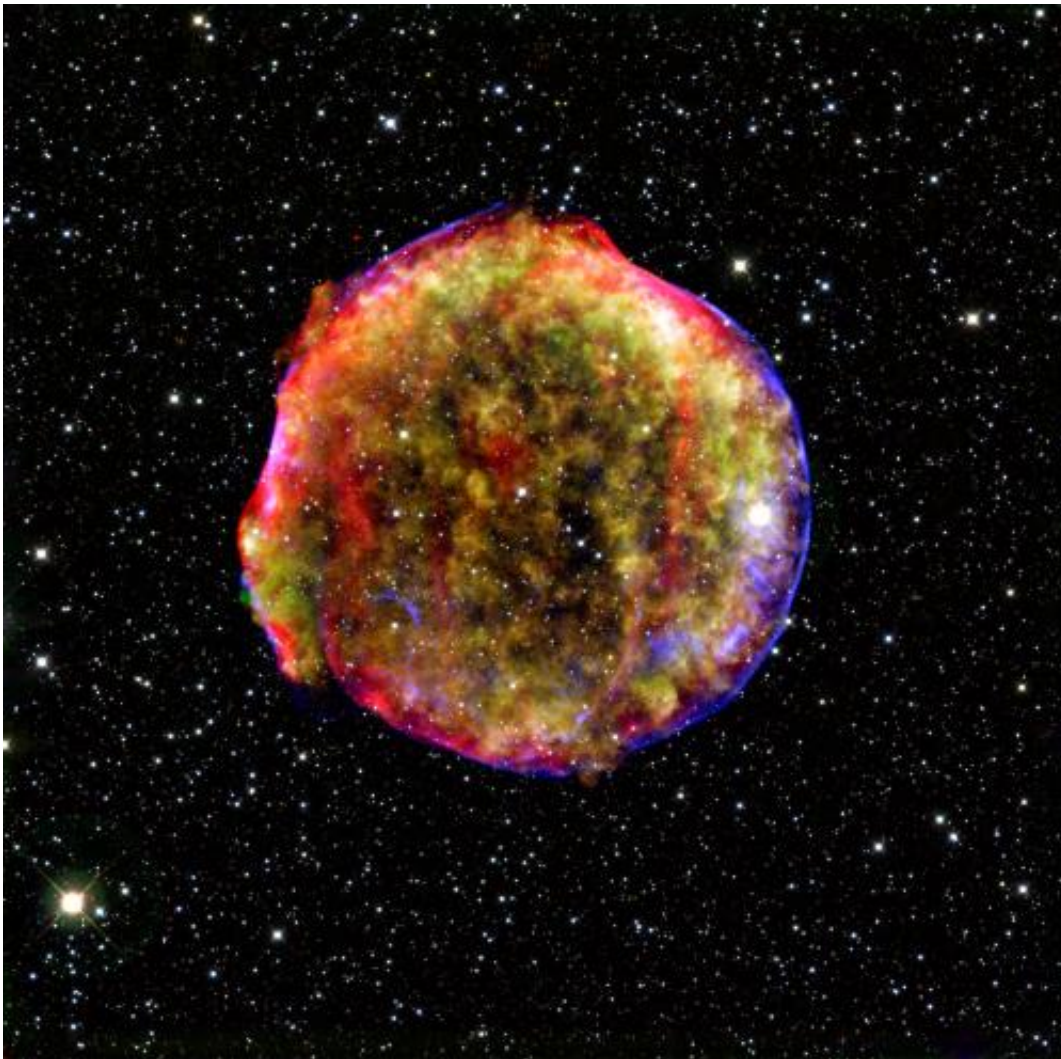


# New study finds stars in metal-rich galactic areas explode more violently

March 8 2013, by Bob Yirka

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This is the remnant of a supernova. Credit: NASA/MPIA/Calar Alto Observatory, Oliver Krause et al.

(Phys.org) —A team of researchers working in China has found evidence to suggest that stars that exist in metal-rich galactic areas tend to explode more violently when they go supernova, than do stars that explode in less metal-rich areas. In their paper published in the journal *Science*, describing their research, the team details how after analyzing data from the remnants of 188 type 1a supernovas, they found that those stars that existed in metal-rich areas and maybe in younger systems, tended to produce more violent explosions and associated diverse spectral features.

Scientists have come to believe that supernovas come about in a process that involves a white dwarf. But because a single white dwarf isn't large enough to set off an explosion, they believe a second star must be involved as well—either another white dwarf as a [binary system](#) or via accretion of material by a companion star. Researchers can't tell using current methods which was involved when studying particular supernovas. In this new effort, the researchers believe they might have found a way to do so.

By studying and comparing the spectral features of 188 type 1a supernovas and the galactic geography of the area in which they exploded, the researchers discovered what they believe is a pattern that they claim hints at the nature of the [progenitor star](#) that led to the explosion—those in metal-rich areas tended to produce more violent explosions. This suggest it's more likely that the more violent explosions are the result of a white dwarf pulling mass from a [companion star](#)—one similar to our own, or perhaps a red giant—than the result of a binary white dwarf system exploding.

Understanding the nature of [supernovas](#) is critical to understanding the universe in general, as they are used to measure distances between objects—such measurements have led to the discovery that the universe is expanding, for example. For that reason, it would be helpful to know

which sorts of stars lead to their creation and why they behave the way they do when they explode. This new research appears to be one more step in that direction.

**More information:** Evidence for Two Distinct Populations of Type Ia Supernovae, *Science* [DOI: 10.1126/science.1231502](https://doi.org/10.1126/science.1231502)

## ABSTRACT

Type Ia supernovae (SNe Ia) have been used as excellent standardizable candles for measuring cosmic expansion, but their progenitors are still elusive. Here, we report that the spectral diversity of SNe Ia is tied to their birthplace environments. We find that those with high-velocity ejecta are substantially more concentrated in the inner and brighter regions of their host galaxies than are normal-velocity SNe Ia. Furthermore, the former tend to inhabit larger and more-luminous hosts. These results suggest that high-velocity SNe Ia likely originate from relatively younger and more metal-rich progenitors than normal-velocity SNe Ia, and are restricted to galaxies with substantial chemical evolution.

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Citation: New study finds stars in metal-rich galactic areas explode more violently (2013, March 8) retrieved 19 April 2024 from

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