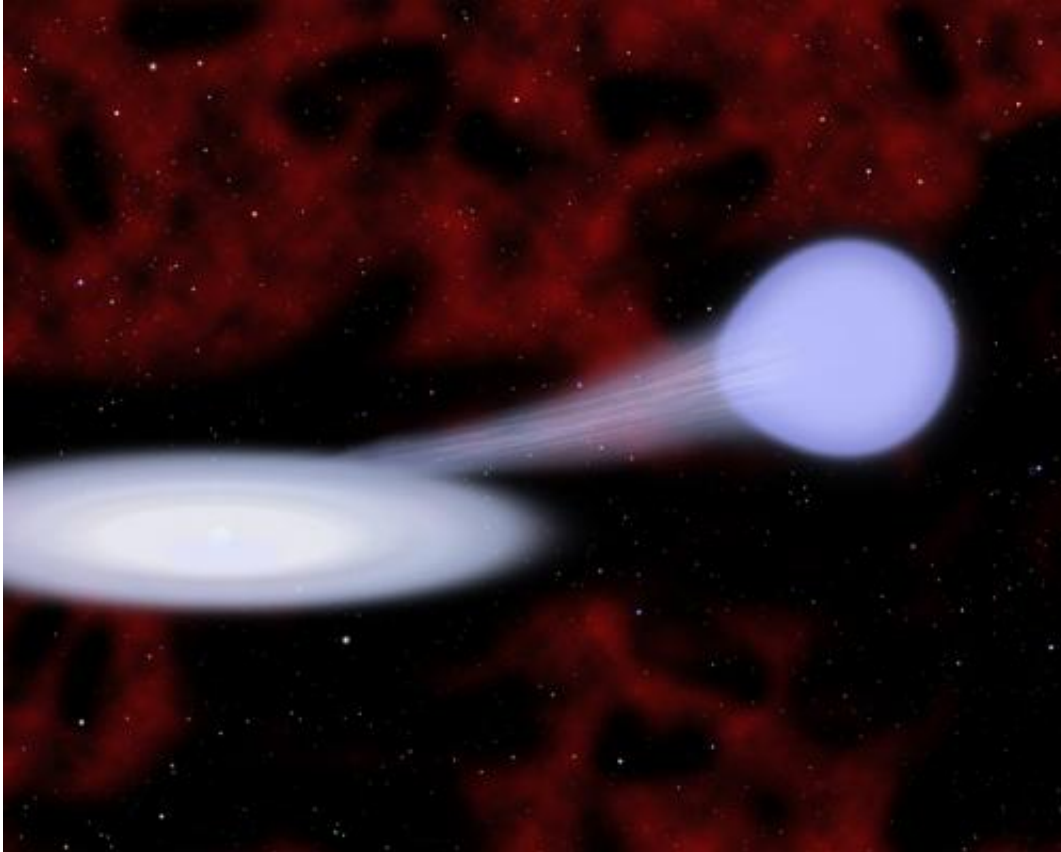


Astronomers discover new kind of supernova

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This artist's conception shows the suspected progenitor of a new kind of supernova called Type Iax. Material from a hot, blue helium star at right is funneling toward a carbon/oxygen white dwarf star at left, which is embedded in an accretion disk. In many cases the white dwarf survives the subsequent explosion. Credit: Christine Pulliam (CfA)

(Phys.org) —Supernovae were always thought to occur in two main varieties. But a team of astronomers including Carnegie's Wendy

Freedman, Mark Phillips and Eric Persson is reporting the discovery of a new type of supernova called Type Iax.

This research has been accepted for publication in *The Astrophysical Journal* and is available [online](#).

Previously, supernovae were divided into either core-collapse or Type Ia categories. Core-collapse supernovae are the explosion of a star about 10 to 100 times as massive as our sun. Type Ia supernovae are the complete disruption of a tiny white dwarf.

This new type, Iax, is fainter and less energetic than Type Ia. Although both types come from exploding [white dwarfs](#), Type Iax supernovas may not completely destroy the white dwarf.

"A Type Iax supernova is essentially a mini supernova," says lead author Ryan Foley, Clay Fellow at the Harvard-Smithsonian Center for Astrophysics (CfA). "It's the runt of the supernova litter."

The research team—which also included Max Stritzinger, formerly of Carnegie—identified 25 examples of the new type of supernova. None of them appeared in [elliptical galaxies](#), which are filled with old stars. This suggests that Type Iax supernovas come from young star systems.

Based on a variety of observational data, the team concluded that a Type Iax supernova comes from a [binary star system](#) containing a white dwarf and a [companion star](#) that has lost its outer hydrogen, leaving it helium dominated. The white dwarf collects helium from the normal star.

Researchers aren't sure what triggers a Type Iax. It's possible that the outer helium layer ignites first, sending a shock wave into the white dwarf. Alternatively, the white dwarf might ignite first due to the influence of the overlying helium shell.

Either way, it appears that in many cases the white dwarf survives the explosion, unlike in a Type Ia supernova where the white dwarf is completely destroyed.

The team calculates that Type Iax supernovae are about a third as common as Type Ia supernovae. The reason so few have been detected is that the faintest are only one-hundredth as bright as a [Type Ia supernova](#).

"The closer we look, the more ways we find for stars to explode," Phillips said. The Large Synoptic Survey Telescope could discover thousands of Type Iax supernovas over its lifetime.

Provided by Carnegie Institution for Science

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