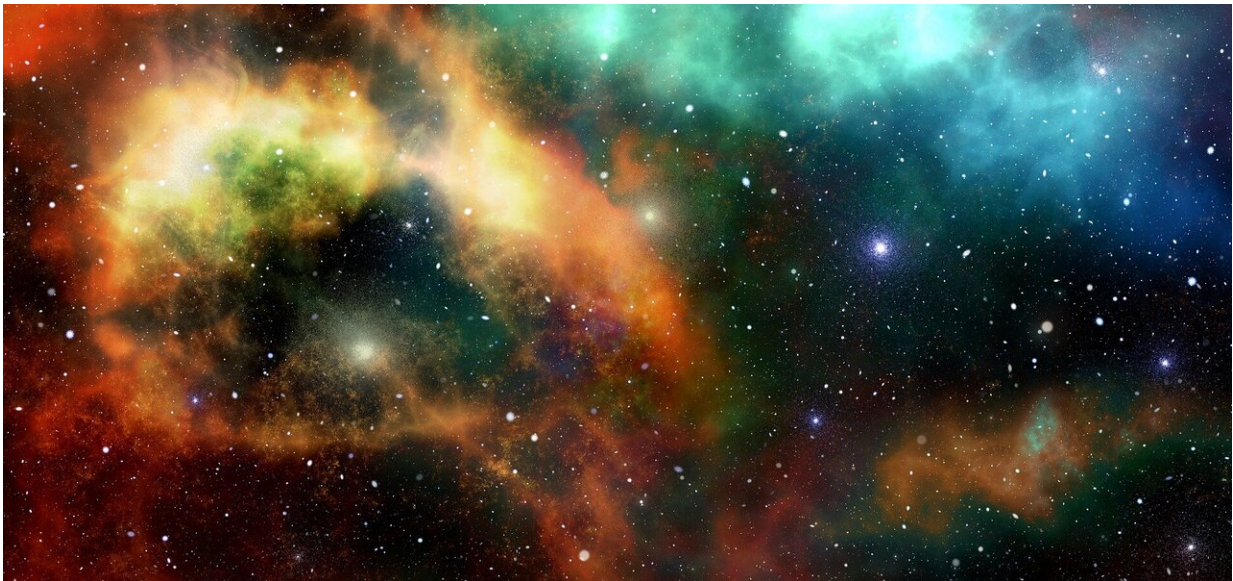


# Three runaway stars believed to be survivors of thermonuclear explosions

July 8 2019, by Bob Yirka

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A team of researchers with members from Germany, the U.K. and the U.S. has found what they describe as three stars that are example remnants of thermonuclear explosions. They have written a paper describing their findings and have uploaded it to the *arXiv* preprint server and onto Oxford's *Monthly Notices of the Royal Academic Astronomical Society*.

One of the ways a supernova occurs is when a white dwarf runs out of

fuel. As fuel begins to run low, hydrogen in the interior shrinks, and pressure and heat increase, causing large elements to fuse together. As the balance of gravity and inner pressure become out of tune, the star begins to collapse and a thermonuclear [explosion](#) occurs, bursting through the star's outer layers. Following the supernova, what is left of the star forms either a neutron star or a black hole. In this new effort, the researchers report finding evidence of a different outcome—a partially burnt stellar remnant.

Prior research has suggested that when some white dwarf stars explode, they do so with less intensity than others—they are known as "type Iax" explosions. And because they are less intense, the star actually survives the blast, albeit with lower mass. Theory suggests that such stars would be pushed across the universe by the force of the blast. Some have suggested that the low-mass white dwarf LP 40-365 is an example of such a star. In this new effort, the researchers report finding three more stars that seem to fit the new category of white dwarf.

While studying data from ESA's Gaia space telescope, the researchers found the three stars, which stood out because they were all smaller than is the norm for a white dwarf. And they all had unique trajectories. Two of the stars were moving at very high speed across the Milky Way on a path that will take them out of the galaxy altogether. The third was found to be traveling in the opposite direction of the other stars in the galaxy. The researchers suggest their findings indicate that it is time to name a new class of white dwarf for those that survive explosion. They also note that future study of such stars could lead to a better understanding of the conditions that lead to [stars](#) exploding.

**More information:** R Raddi et al. Partly burnt runaway stellar remnants from peculiar thermonuclear supernovae, *Monthly Notices of the Royal Astronomical Society* (2019). [DOI: 10.1093/mnras/stz1618](https://doi.org/10.1093/mnras/stz1618)

[arxiv.org/abs/1902.05061](https://arxiv.org/abs/1902.05061)

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