

Dust grains could be remnants of stellar explosions billions of years ago

March 8 2016



Credit: Michigan State University

Microscopic dust particles have been found in meteoritic material on Earth, particles that were likely formed in stellar explosions that occurred long before the creation of our star, the sun.

Whether some of these particles of stardust, known as "pre-solar grains,"

came from classical nova explosions is the focus of ongoing experimental nuclear physics research at the National Superconducting Cyclotron laboratory at Michigan State University.

That research has led to tantalizing subatomic clues about the origins of these grains. Those findings are now published in the prestigious journal *Physical Review Letters*. The paper's lead author is Michael Bennett, an MSU doctoral student at the NSCL.

The researchers are investigating whether the particles may have formed in a classical nova, a thermonuclear explosion on the surface of a small star which is part of a binary star system - two stars orbiting each other.

This explosion would have ejected stellar material in the form of gas and dust into the space between stars in the galaxy. Some of that material would have been used in the creation of our solar system.

"There is a recycling process going on here," said Christopher Wrede, assistant professor of physics at MSU and spokesperson for the experiment. "When stars die, they spew out material in the form of dust and gas, which then gets recycled into future generations of stars and planets."

To learn more about this 5-billion-year old question, Wrede and his team at the NSCL carried out an experiment in which they created and studied the exotic radioactive nuclei that have the greatest influence on the production of [silicon](#) isotopes in novae.

It turns out that the grains of stardust contain unusually high amounts of the isotope silicon-30, which is made up of 14 protons and 16 neutrons. Silicon-30 is quite rare on Earth (the most common is silicon-28).

Researchers know that silicon-30 is produced in classical novae, but

haven't known enough about the nuclear reaction rates in the explosion to be sure how much silicon-30 was created. This has made the origins of the grains uncertain. The new nuclear reaction path discovered, together with computer models of the explosion, will be used to identify the grains.

"These particular [grains](#) are potential messengers from classical novae that allow us to study these events in an unconventional way," Wrede said. "Normally what you would do is point your telescope at a nova and look at the light.

"But if you can actually hold a piece of the star in your hand and study it in detail, that opens a whole new window on these types of [stellar explosions](#)."

Provided by Michigan State University

Citation: Dust grains could be remnants of stellar explosions billions of years ago (2016, March 8) retrieved 24 April 2024 from <https://phys.org/news/2016-03-grains-remnants-stellar-explosions-billions.html>

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