Mysterious 'blue lurker' stars likely got a spin boost by absorbing their partners

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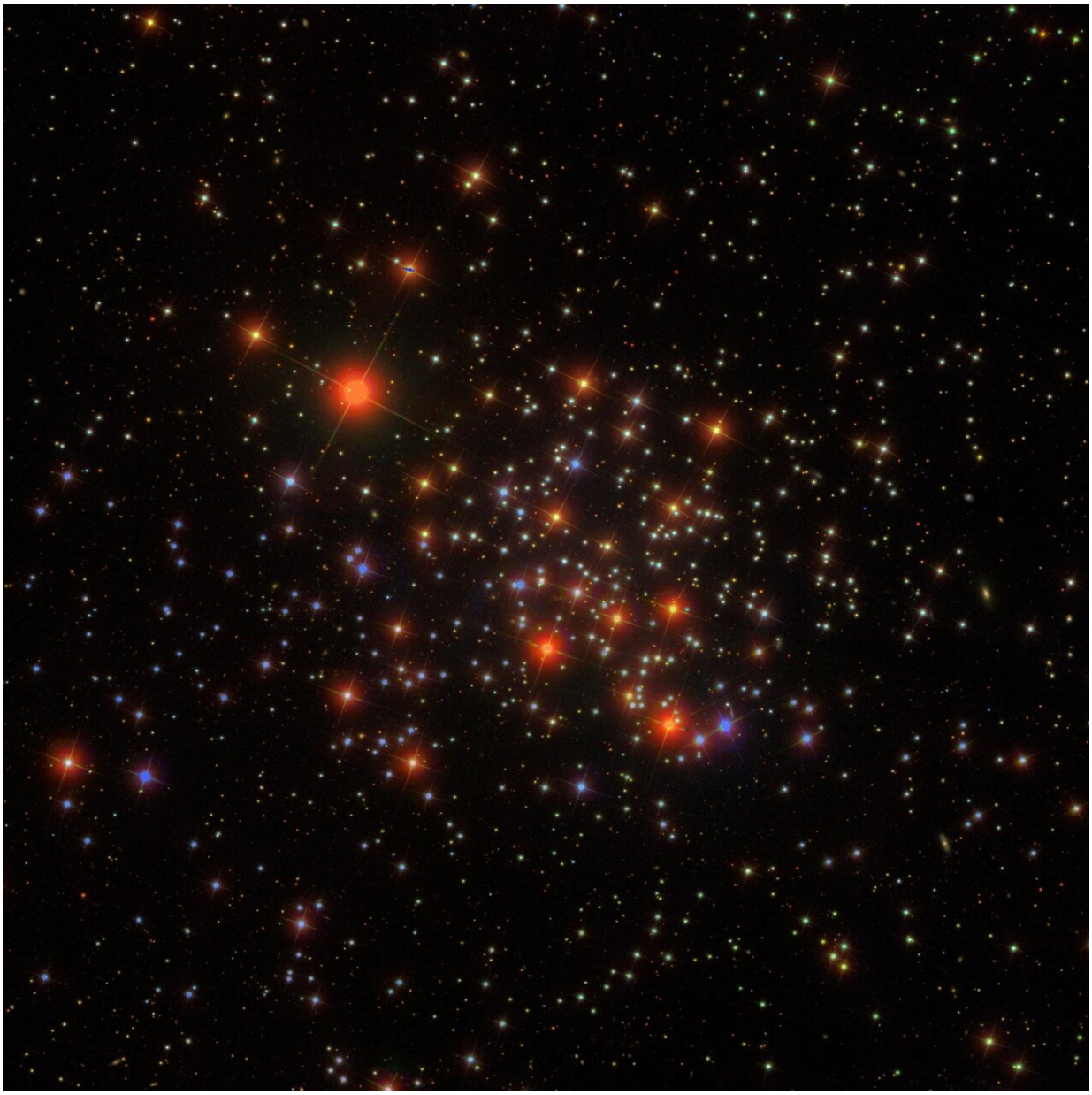

The open cluster M67 hosts a number of so-called blue stragglers, stars that spin far faster than expected. New research suggests the stars got a spin boost by absorbing gas from a dying partner star. Credit: Sloan Digital Sky Survey

When astronomers discovered a new kind of star just a few years ago, they were puzzled: The stars were spinning far too quickly given their age. Nicknamed "blue lurkers," these stars hid for decades within clusters of other stars.

Now, thanks to new data from the Hubble Space Telescope, a group of researchers led by University of Wisconsin–Madison astronomer Andrew Nine has discovered that at least some of the blue lurkers were spun up as they absorbed the gas of dying partner stars.

Nine's team spotted the blue lurkers' partners as hot white dwarfs, which are collapsed versions of former stars still bright enough to be seen from Earth. These hot former stars are young by astronomical standards—just a few hundred million years old.

Not all of the blue lurkers had hot white dwarf companions. But it's likely that the others absorbed their partner stars long enough ago that the remnant white dwarfs are too cold, dim and old to see. This transfer of mass from one star to another also produces the similarly named "blue stragglers."

Nine reported these findings Jan. 12 through the American Astronomical Society's press conferences.

"This is the first systematic survey of this new kind of binary star, the blue lurker. What we're finding is that the blue lurkers can form in the classical way of the blue stragglers, through mass transfer from a donor

star," says Nine, a graduate student in the lab of UW–Madison astronomy Professor Robert Mathieu.

Binary star systems, in which two stars closely orbit around one another, are very common in the Milky Way. The systems account for about half of stars the size of the sun. They provide unique conditions to test models of star formation, even for singular stars like Earth's own.

Discovered in the 1950s, blue stragglers are hotter, brighter and bluer than expected because they've absorbed the mass of their partner stars. In 2019, astronomers reported a new kind of unexpected star: binary stars that rotate about 10 times faster than normal. Because they have hidden in plain sight, the stars earned the moniker blue lurkers.

"They look like any other star in the cluster, but they stand out because they're rotating very rapidly. There wasn't any obvious answer as to why," says Nine.

To discover how the lurkers were sped up, Nine's team turned the Hubble Space Telescope on eight of the stars in the cluster M67, which hosts thousands of binary star systems formed from the same cloud of gas. Two of the eight had hot white dwarf companions nearby, clear evidence that the quickly rotating star had a partner able to donate mass to it. The donated mass spins stars faster as it is absorbed.

As for the other six, "it's plausible there's a white dwarf but the mass transfer happened long enough ago that the white dwarf has cooled down beyond our ability to detect it," says Nine. The boost in rotational speed can last billions of years, far past the time it takes white dwarfs to cool.

It remains possible that some of the blue lurkers got their speed boost from other, yet unknown mechanisms.

Nine is now exploring the chemical components of donor stars to understand how the stars evolve before getting absorbed by their partners. Other members of the team plan to study blue lurkers in other clusters, both younger and older, to uncover how these newly discovered stars change over time.

Provided by University of Wisconsin-Madison

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