Unexpected populations in global clusters may unlock secrets of star formation

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(PhysOrg.com) -- Researchers at McMaster University in Hamilton, Ontario, are shedding new light on some of the oldest parts of the Milky Way, suggesting life in the stellar nursery wasn't quite as simple as astronomers had thought.

They are studying globular clusters, which are dense groups of over 100,000 stars, in the outskirts of our Milky Way Galaxy. These clusters are about as old as the galaxy, typically around 10 billion years old.

"We thought we understood these clusters very well", says Dr. Alison Sills, Associate Professor of Physics & Astronomy. She is presenting new findings at this week's CASCA 2011 meeting in Ontario, Canada. "We taught our students that all the stars in these clusters were formed at the same time, from one giant cloud of gas. And since that time, the individual stars may have evolved and died, but no new stars were born in the cluster."

In the middle of the last century, a population of stars called blue stragglers was discovered. These stars are hotter and brighter, and more massive, than they should be for a cluster of this advanced age. The current explanations for these stars involve some kind of stellar interaction. Two normal stars get too close to each other, and the gravity of one can pull material off the surface of the other, causing the two stars to merge.

"Astronomers expect that the stars get too close to each other because of

the complicated dance that stars perform in these dense clusters, where thousands of stars are packed into a relatively small space, and each star is moving through this cluster under the influence of the gravity of all the other stars. Somewhat like a traffic system with no stop lights, there are a lot of close encounters and collisions," explains Sills.

Hubble Space Telescope observations of globular clusters showed evidence for two generations of star formation, not just one. But the second generation is not the same as anywhere else in the Galaxy. Instead of being made of material that came from an earlier generation of exploded stars, the second generation in globular clusters seems to have come from material that was gently shed by the first generation of stars. This link between the two generations is puzzling, and astronomers are still trying to figure out why globular clusters should behave in this way.

"Studying the normal stars in clusters was instrumental in allowing astronomers to figure out how stars lived and died", says Dr. Sills, "but now we can look even further back, to when they were born, by using the oddballs. It pays off to pay attention to the unusual individuals in any population. You never know what they'll be able to tell you."

At the CASCA conference, Dr. Sills is drawing a connection between these two unexpected features of globular clusters. Blue stragglers and the second generation of stars seem to show some of the same properties, including where they are concentrated in the cluster, and that both are bluer than we would expect. She is investigating how the close encounters and collisions could affect the formation of this strange second generation and link the two phenomena we see in these complicated systems.

More information: Alison Sills home page: www.physics.mcmaster.ca/people … ulty/Sills_AI_h.html

Provided by McMaster University