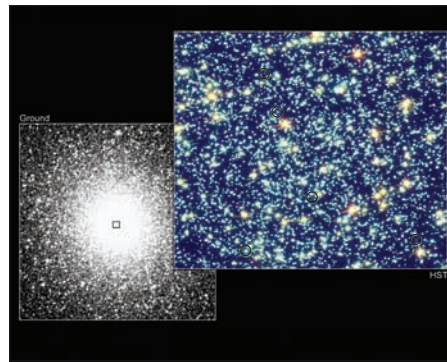


The primary mechanism of blue stragglers is stellar cannibalism

The long-standing mystery of the origin of blue stragglers in globular clusters has been solved. Researchers have found that these overweight stars do not result primarily from collisions between stars but from stellar “cannibalism” in binary star systems where plasma is gradually pulled from one star to the other to form a more massive, bluer star.

A globular cluster is a spherical body composed of about 100 000 stars tightly bound by mutual gravity (*CERN Courier* July/August 2006 p10). Several tens of these clusters orbit our galaxy. They are usually composed of old stars all born at the same time in a giant star-formation region (*CERN Courier* June 2006 p14). In an old cluster, the most massive stars should have exhausted their hydrogen fuel a long time ago and should have died in supernova explosions. Only low-mass stars, shining redder light, should remain. However, globular clusters do contain several stars that are much too blue and too massive to have survived until now.

The origin of these “blue stragglers” that still fight for life has been a puzzle of stellar evolution for 55 years. As normal stellar formation cannot continue in globular clusters, owing to the quasi-absence of gas, there must be a different mechanism in their



The globular cluster 47 Tucanae (left) and its central core (right) imaged by the Hubble Space Telescope revealing several blue stragglers highlighted by yellow circles. (Courtesy NASA Goddard Space Flight Center (NASA-GSFC).)

dense central cores that can continuously form massive stars. Two main theories emerged over time: that blue stragglers were created through collisions of two stars; or that one star in a binary system was “reborn” by pulling matter off its companion.

The new research by Christian Knigge from the University of Southampton, in the UK, and colleagues from McMaster University, in Canada, allows them to favour one of these scenarios. They compared the observed

number of blue stragglers in 56 globular clusters with the predicted single–single stellar-collision rate based on the inner density of the clusters. They found no clear correlation, dispelling the theory that blue stragglers are created through collisions with other stars. On the other hand, they did find a strong relationship between the total mass contained in the core of the globular cluster and the number of blue stragglers observed within it. Because more massive cores also contain more binary stars, they inferred a connection between blue stragglers and binaries in globular clusters (Knigge et al. 2009).

This research provides strong evidence that the primary mechanism for the formation of blue stragglers is “stellar cannibalism” by the most massive star in a binary system as it pulls material from its lighter companion. What remains to be investigated is whether the binary parents of blue stragglers evolve mostly in isolation, or whether close encounters – failed collisions – with other stars in the cluster are required to form these binaries.

Further reading

C Knigge et al. 2009 *Nature* **457** 288.

Picture of the month



This colour composite image of Centaurus A reveals the powerful jets ejected by the supermassive black hole at the heart of the galaxy. The image is composed of submillimetre data shown in orange, an X-ray view from the Chandra satellite shown in blue and a true colour image from the 2.2 m telescope of the European Southern Observatory at La Silla, Chile. At a distance of 13 million light-years, Centaurus A is the closest giant elliptical galaxy to Earth. The violent central activity is hidden behind a dust lane, but is betrayed by the extended jets ending in radio lobes imaged for the first time in the submillimetre (870 μm) by a camera mounted on the Atacama Pathfinder Experiment (APEX). This 12 m dish is a prototype antenna for the Atacama Large Millimetre/submillimetre Array being assembled on the 5000 m high plateau of Chajnantor, Chile. (Courtesy ESO/WFI (Optical); MPIfR/ESO/APEX/A Weiss et al. (Submillimetre); NASA/CXC/CfA/R Kraft et al. (X-ray).)