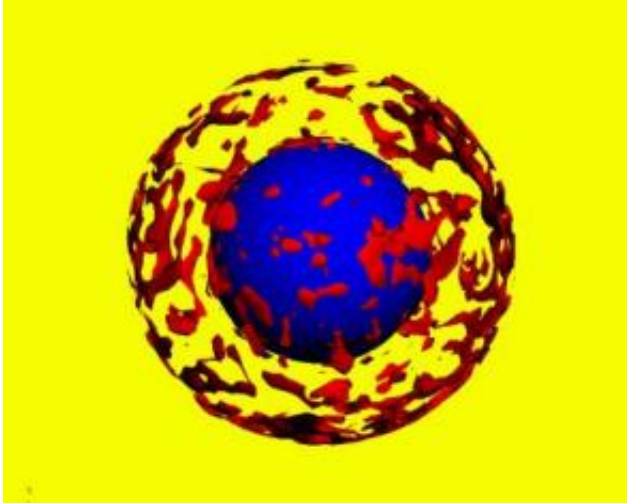


Big Bang theory saved

October 26 2006



Deep in the interior of a red giant star, hydrogen rich clouds (red) are seen to float above the hydrogen burning shell (blue). In this three-dimensional simulation, the energy production rate in the burning shell exceeds that of the sun by a factor greater than 100. It heats the previously homogeneous region around it converting 3He to 4He and hydrogen, producing a hydrogen rich region that is buoyant and fragments into rising clouds. This previously unrecognized mixing mechanism resolves the problem of 3He overproduction in low mass stars. Credit: Lawrence Livermore National Laboratories

An apparent discrepancy in the Big Bang theory of the universe's evolution has been reconciled by astrophysicists examining the movement of gases in stars.

Professor John Lattanzio from Monash's School of Mathematical

Sciences and Director of the Centre for Stellar and Planetary Astrophysics said the confusion surrounding the Big Bang revolved around the amount of the gas Helium 3 in the universe.

"The Big Bang theory predicts a certain amount of Helium 3 in the universe," Professor Lattanzio said. "The trouble is, low mass stars (about one to two times the size of our sun) also make Helium 3 as a side product of burning the hydrogen in their cores.

"It's been thought that when the star becomes a giant it mixes the helium 3 to its surface and, near the end of its life, spews the helium 3 into space just before it becomes a planetary nebula.

"But there are inconsistencies with the amount of Helium 3 predicted to be in the universe and the amount that's actually there; there's much less than expected."

Some scientists have theorised that the rapid rotation of low mass stars destroys the helium 3 they produce. But computer models that have included this rotation, while showing some destruction of helium 3, have not been able to reconcile the Big Bang theory.

Professor Lattanzio, in collaboration with Dr Peter Eggleton and Dr David Dearborn from the Lawrence Livermore National Laboratories in the US, ran 3D computer models of a red giant's life on some of the world's fastest computers to investigate whether there was some sort of gaseous mixing occurring in stars that destroyed Helium 3.

Their findings have been published in today's issue of the international journal *Science*.

Near the end of a star's life there is a 'core flash' and it was at around this time that the computer models revealed a small instability in the

movement of the gases in the star. "When we looked at this in 3D we found this hydrodynamic instability caused mixing and destroyed the helium 3 so that none was released into space," Professor Lattanzio said.

"This apparent problem with the Big Bang has been solved – the helium 3 in the universe comes from the Big Bang and low mass stars, although they produce helium 3, do not release any into the universe because they destroy it."

Source: Monash University

Citation: Big Bang theory saved (2006, October 26) retrieved 24 April 2024 from <https://phys.org/news/2006-10-big-theory.html>

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