European Research Council
Established by the European Commission

Where stars collide

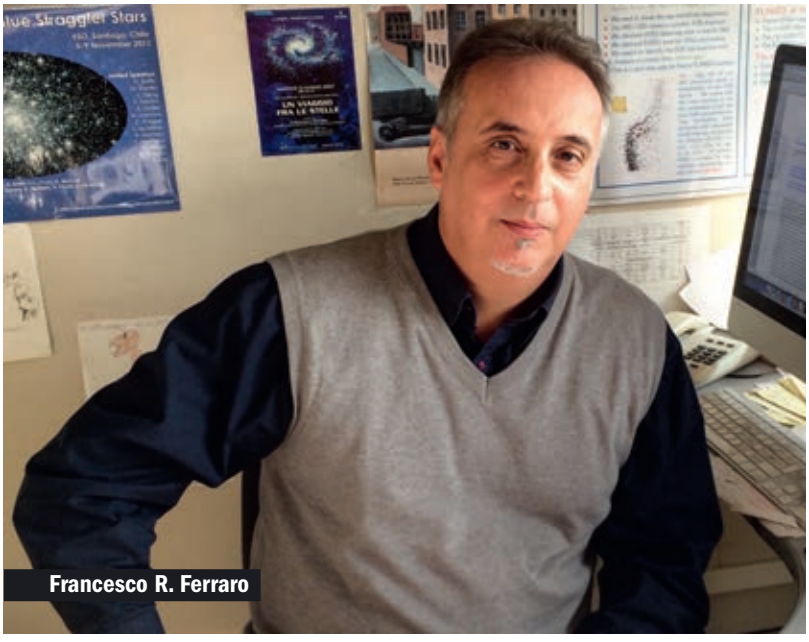
Cosmic-Lab

The Cosmic-Lab project tells the extraordinary story of solar systems through stars collisions

Globular clusters are a spherical collection of hundreds of thousands of stars tightly bound by mutual gravitational pull, constantly moving around a galactic core. Their importance goes far beyond the spectacular appearance. These are in fact real fossils of the galaxy formation era, dating back more than 12 billion years. Also, the stars orbiting in the more central regions of the globular clusters live in extremely packed conditions that favour frequent and repeated collisions. These star collisions can generate "exotic" objects that would not be explainable on the basis of the normal evolution of single stars. As a result of frontal collisions, two stars can merge and share the nuclear energy, thus giving rise to so-called "blue stragglers". Instead, when collisions involve binary systems, consisting of two stars linked by mutual gravity, the distance between the companions may decrease to such a point to allow the transfer of material from one to another. This, besides being an alternative channel for the formation of blue stragglers, can also generate the millisecond pulsar, old neutron stars in fast rotation on themselves, with periods of the order of a thousandth of a second. The rapid succession of collisions between massive stars at the time of formation of the globular clusters may have generated a class of black holes (so-called intermediate mass, between 1,000 and 10,000 times the mass of the Sun) that still have not been revealed. Cosmic-Lab, "Star Clusters as Cosmic Laboratories for Astrophysics, Dynamics and Fundamental Physics" is a five-year project aimed at explaining the complex link between dynamic processes and stellar evolution, through the study of these three classes of exotic objects. With 1.9 million Euro funding from the European Research Council, it is led by Prof. F.R. Ferraro of the Department of Physics and Astronomy, University of Bologna. In 4 years of activity, Cosmic-Lab has produced more than 60 publications, proposing innovative methods for detecting black holes of intermediate mass and presenting evidence that can explain the process of formation of the millisecond pulsars. One of the biggest successes of the project was the definition of so-called "dynamic clock", an instrument capable of measuring the degree of dynamic evolution of solar systems, using blue stragglers and establishing a relationship between their sedimentation rate and the rate of star system ageing. In addition, the project has contributed to the construction of a centre of higher education for Solar Astrophysics at the University of Bologna, which aims to become a reference point for researchers at a global level. **-F.R.F.-**

PH: UNIVERSITA' DI BOLOGNA

Globular Clusters



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