

# Gravity and thermodynamics: a new point of view in the analysis of equilibrium and dynamical evolution of globular clusters.

*mercoledì 14 maggio 2014 17:00 (30 minuti)*

In the analysis of the evolution of globular clusters, stellar encounters strongly contribute in phase space mixing of stellar orbits. In this scenario, thermodynamics plays a central role in the gravitational equilibrium and stability of the clusters, being binary relaxation time shorter than the age of such systems. On the other hand, the observations of luminosity profiles of globular clusters, at different values of the central gravitational potential, show self similar curves that suggest a unique distribution function (King DF) with changing thermodynamical parameters during the dynamical evolution, according to the numerical simulations existing in literature. This means that the evolution of globular clusters can be studied by considering small thermodynamic transformations which keep constant the functional form of the velocity distribution of stars like in the framework of Boltzmann statistical mechanics. In this way, new relations for the equilibrium are obtained and a different form of the virial theorem which leads to new conclusions in the application of linear series method of Poincaré for gravothermal instability is developed. The results, applied to the new Harris Catalogue for globular clusters, give an important agreement between theory and observations. Finally, for a better understanding of the evolution of globular clusters in our Galaxy and in extragalactic systems, some observative characteristics are presented and analyzed in order to give some explanations on the origin and primeval features of these systems.

**Relatore:** Prof. MERAFINA, Marco (University of Rome La Sapienza)

**Classifica Sessioni:** Part 3