# TWO BODY CAPTURE IN LARGE N BODY SYSTEMS

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I have considered the rates of formation of binaries in the following processes: two-body tidal encounters, three-body encounters, self-hardening of soft binaries formed in three-body encounters and two-body encounters connected with gravitational wave radiation. I have considered also the cooling and the heating connected with formation of binaries and the subsequent interactions of binaries with single stars. I have found that the rate of formation of heating binaries in two-body tidal encounters differs from that calculated by Ozernoy and Dokuchaev (1982). These differences are connected first of all with the precise calculation of the dissipated energy of two stars passing near-by each other, maximum and minimum binary binding energy and also with the use of the incomplete gamma function instead of gamma function. The processes presently predominat in the globular cluster conditions are the formation of hard binaries in two-body tidal encounters between evolved and unevolved stars and cooling connected with collisions between white dwarfs and main sequence stars and between white dwarfs. In the systems of density greater than $10^9 pc^{-3}$ the binaries formed in three-body encounters (and to a smaller extent self-hardening of soft binaries formed in three-body encounters) predominate the globular cluster evolution. In the globular cluster heating by hard binaries exceedes cooling associated with the tidal interactions and collisions of stars.

In the nuclei of galaxies hard binaries (formed in two-body and three-body encounters) must be contact binaries. So these systems will be probably dominated by dissipative processes. The critical velocity at which cooling and heating are balanced, for stellar density less than $10^9 pc^{-3}$ , slightly depends on the density of stars and is equal to about 20 km/s. If the density increases then the critical velocity grows to about 45 km/s at the density of $10^{14}$ $pc^{-3}$ . The rate of formation of binaries connected



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with gravitational wave radiation is negligibly small even in stellar systems of very great density (of the order $10^{12}$ $pc^{-3}$ ).

The ejection of matter during interactions between stars is important for the evolution of stellar systems. The rough calculations suggest that if 12 percent of mass of colliding stars is ejected from the stellar system, then the cooling associated with collisions between stars is balanced by the heating connected with the ejection of the matter.

I have found also the new analitical formulae for the formation rate of the heating tidal-capture binaries and for effectiveness of cooling and heating processes. The obtained results can be used in the investigation of the evolution of globular clusters and nuclei of galaxies.

REFERENCE

Ozernoy, L.M., Dokuchaev, V.I.: 1982, Astron.Astrophys.111,1

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