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TIME: Wednesday 3:00 PM, Nov. 23, 2011 **LOCATION: A601 NAOC**

Mergers and ejections of black holes in globular clusters



Dr. Sverre Aarseth (Cambridge)

Sverre Aarseth is a research worker, and he has been involved in developing N-body codes at the Institute of Astronomy (University of Cambridge) for the past 50 years. Since 1992 he has been studying the gravitational N-body problem using special-purpose GRAPE supercomputers. In early 2008 he began investigating the use of GPUs for this application. His research into numerical simulations of many-body (N-body) gravitational interactions spans over 40 years, and is reported in several publications and his book ("Gravitational N-body Simulations: Tools and Algorithms"). He has developed a set of FORTRAN codes which describe the dynamics very closely, and these are regarded by many as the de facto standard.

Abstract

I report on results of fully consistent N-body simulations of globular cluster models with $N = 100\text{--}000$ members containing neutron stars and black holes. Using the improved algorithmic regularization method of Hellstrom and Mikkola for compact subsystems, the new code NBODY7 enables for the first time general relativistic coalescence to be achieved for post-Newtonian terms and realistic parameters. Following an early stage of mass segregation, a few black holes form a small dense core which usually leads to the formation of one dominant binary. The subsequent evolution by dynamical shrinkage involves the competing processes of ejection and mergers by radiation energy loss. Unless the binary is ejected, long-lived triple systems often exhibit Kozai cycles with extremely high inner eccentricity ($e > 0.999$) which may terminate in coalescence at a few Schwarzschild radii. A characteristic feature is that ordinary stars as well as black holes and even BH binaries are ejected with high velocities. On the basis of the models studied so far, the results suggest a limited growth of a few remaining stellar mass black holes in globular clusters.



All are welcome! Tea, coffee, biscuits will be served at 2:45