

BLACK HOLES IN DENSE STAR CLUSTERS
Aspen Center for Physics
2015 Aspen Winter Conference January 17-22, 2015

TITLE: Life and Death of Stellar Discs around Supermassive Black Holes

SPEAKER: Michela Mapelli (INAF)

The innermost parsec around a supermassive black hole (SMBH) should be a hostile environment for star formation, because of the SMBH tidal shear. On the other hand, several hundred young stars are observed in the central parsec of the Milky Way: the formation of these stars has been a puzzle for a long time. In this talk, I discuss the results of N-body/smoothed-particle hydrodynamics simulations, which show that a disrupted molecular cloud might spiral towards the SMBH, and form a gas disc sufficiently dense to fragment into stars. Star particles form in a thin disc (with radius ~ 0.5 pc), and have moderately eccentric orbits ($e \sim 0.2-0.4$). The newly born stars are affected by several secular dynamical processes, which alter their initial orbital properties significantly. For example, the precession exerted by a dense gas ring onto the stellar orbits increases their inclinations by a factor of ~ 5 (in 1.5 Myr) with respect to the initial plane of the disc. I present a new scenario for the joint formation of a stellar disc and of dense circum-nuclear rings, which might lead to the fast dismembering of the stellar disc. Finally, I briefly discuss the fate of planets and protoplanets that form near SMBHs.