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

POSTER TITLE: Relativistic Orbits around a Massive Black Hole – The statistical Mechanics Approach

PRESENTER: Ben Bar-Or and Tal Alexander (Weizmann Institute of Science, Israel)

Stars around a massive black hole move on nearly fixed Keplerian orbits, in a centrally-dominated potential. The random fluctuations of the discrete stellar background cause small potential perturbations, which accelerate the evolution of orbital angular momentum by resonant relaxation. We present here a formal statistical mechanics framework to analyze such systems, where the background potential is described as a correlated Gaussian noise. We derive the stochastic equations of motion, and obtain the effective Fokker-Planck equation for a general correlated Gaussian noise. We show that the evolution of angular momentum depends critically on the temporal smoothness of the background potential fluctuations. We show that in the presence of smooth noise, the evolution of the normalized angular momentum by resonant relaxation, of a star undergoing Schwarzschild precession is exponentially suppressed. This can results in an effective Schwarzschild precession-induced barrier in angular momentum.