PHYSICS AND ASTRONOMY
SEMINAR

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"Modelling Extreme Mass Ratio Binary Black Hole Inspirals"

Abstract

Consider a stellar-mass black hole (mass ~ 10 solar masses) in a close orbit around a supermassive black hole (mass $\sim 10^6$ solar masses). In this talk I'll discuss the challenge of trying to model the orbital dynamics and gravitational-wave (GW) emission of such an "EMRI" system as it evolves under the influence of the gravitational radiation-reaction "self-force". Because of the highly asymmetric mass ratio the orbital-decay timescale is much longer than the orbital period, so a direct "numerical relativity" solution of the Einstein equations would be both impractically expensive and insufficiently accurate. Instead, we can use methods based on black hole perturbation theory, treating the small black hole as a perturbation of a background (Schwarzschild or Kerr) spacetime. I'll outline some of the analytical and computational challenges of these analyses, describe recent progress in surmounting these challenges, and discuss EMRI systems as potential GW sources for the proposed eLISA/NGO space-based GW observatory.

Tuesday, February 21, 2012
11:00 a.m.
Elliott Building
Room 060