Special Guest Lectures

Gravitational waves from small black holes orbiting big ones

Steven Detweiler, University of Florida

Professor of Physics

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Abstract:
Black holes and neutron stars in binary systems emit gravitational waves which ought to be detectable by the LIGO and LISA efforts. This detection depends upon accurate theoretical models of the sources. Numerical relativity has made tremendous progress in the past few years and now tracks black hole binary systems for many orbits and down to the final coalescence and ring down. But a lacuna in the numerical progress remains for binary systems with an extreme mass ratio. A small black hole in a close orbit about a much larger one might be too relativistic for low-speed approximations. And the great difference in length scales for the two black holes causes difficulty for a full numerical-relativity solution. This gap is the natural domain of perturbation theory. I will describe how the small black hole can be replaced, in the numerical analysis, by a carefully constructed source which has no small-scale structure. Then, the combination of efforts from perturbation analysis and numerical relativity will be able to model accurately the inspiral and coalescence of even extreme mass ratio binaries.

Speaker's Bio:
Dr, Steven Detweiler is currently a Professor of Physics at the University of Florida. His primary research Interests are black holes (perturbation analysis, quasi-normal modes), and gravitational waves (radiation reaction in curved spacetime, waveforms from binary systems with an extreme mass ratio).

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2003 Digital Media Center • Telephone: +1 225/578-5890 • Fax: +1 225/578-8957