



Colloquium
Friday December 8, 2006
3pm Room 08-2355

“OPEN PROBLEMS IN NUMERICAL RELATIVITY”

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I will review the latest dramatic developments in numerical relativity that, for the first time, have allowed for stable evolution of orbiting binary black holes on supercomputers. These breakthroughs notwithstanding, there remain several mathematical problems that need to be understood. Among them are the determination and proper imposition of the spatial boundary conditions, the initial value problem, and coordinate choices for the systems of ten coupled nonlinear PDEs of General Relativity. The resolution of these issues would in turn be used to improve the efficiency and accuracy of the numerical codes as well as extending the realm of their applicability.

I will also briefly mention a set of open mathematical problems arising in the perturbative approach to binary black holes with extreme mass ratio. A particle orbiting a black hole represented by a Dirac-delta benefits from the mathematical simplicity of its description, but requires careful treatment of the potential divergences that need to be regularized. I will then discuss an accurate numerical integration of the wave equation with a Dirac-delta-like source term that arises in this approach.

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