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Physics Colloquium

“Dense Matter and Gravitational Waves”

Dr. Jocelyn Read
Max Planck Institute for Gravitational Physics
Albert Einstein Institute

Friday, March 5, 2010
4:10 – 5:00 PM 108 EPS

Abstract: Neutron stars give us a unique glimpse of physics at extreme scales. The matter in their cores is at densities up to ten times that of an atomic nucleus, in some stable ground state fundamentally described by quantum chromodynamics. There is substantial uncertainty about how matter behaves at this density, however, which rises from different models of composition and interaction. This leads to a wide array of candidate equations of state characterizing the matter.

Several neutron star properties, such as the maximum stable mass, depend primarily on the equation of state. Astronomical observations of such properties can be used to systematically constrain the equation of state. A promising new astrophysical window for observing neutron stars is through gravitational wave observations. For example, close neutron star binaries emit gravitational radiation and spiral in toward each other, eventually colliding. For most of the inspiral, the emitted waveform is indistinguishable from that of a binary black hole system with the same mass. However, as the stars approach each other the presence of matter modifies the dynamics of the system in various ways, which depend on the equation of state.

In this talk, I will discuss methods of systematically exploring and constraining the neutron star core equation of state, focusing on results relevant for the gravitational waves we expect to measure with advanced ground-based detectors.

Host: Neil Cornish

Dr. Read is a candidate for the Gravitational Physics faculty position.

Refreshments
3:45 p.m. EPS - 2nd Floor Atrium

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