



U N I V E R S I T Y O F
SOUTH CAROLINA

**DEPARTMENT OF
PHYSICS AND ASTRONOMY**

COLLOQUIUM

Speaker:

Dr. Emil Mottola
Los Alamos National Laboratory

Title:

Cosmological Vacuum Energy: A Problem of Some Gravity

Abstract:

Vacuum fluctuations are an essential feature of quantum theory. The attractive force between uncharged metallic conductors in close proximity, discovered and discussed by Casimir more than half a century ago, is due to the vacuum fluctuations of the electromagnetic field in the region between the conductors. These fluctuations should occur at all scales, even very large cosmological scales, and gravity should weigh all sources of energy, including that of quantum vacuum fluctuations. In this framework, cosmological dark energy becomes a phenomenon connected with macroscopic boundary conditions, not ultraviolet cutoffs. The relevance of the quantum trace anomaly to this issue will be discussed. The trace anomaly implies additional terms in the low energy effective theory of gravity, which amounts to a non-trivial modification of the classical Einstein theory, fully consistent with the Equivalence Principle. The new dynamical degrees of freedom the anomaly contains provide a natural mechanism for relaxing Λ to zero on cosmological scales. This leads to a new cosmological model in which the dark energy adjusts itself dynamically to the cosmological horizon boundary, and therefore remains naturally of order the Hubble scale at all times without fine tuning.

Jones Physical Science Center
Rogers Room
PSC 409

Thursday, April 19, 2007
4:00 pm

Refreshments at 3:45 pm

Everyone invited

Hosted by: Pawel Mazur