CCSU
DEPARTMENT OF MATHEMATICAL SCIENCES

COLLOQUIUM

Friday, March 4
2:00 – 3:00 pm in MS 101

NEGATIVE ENERGY, WORMHOLES, AND WARP DRIVE

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Abstract

The laws of quantum field theory allow the existence of "exotic matter", i.e. states of a quantum field in which the energy density (energy per unit volume) can become negative. Some of these states have even been produced in the laboratory, such as squeezed states of light and the Casimir effect. On the other hand, if the laws of physics impose no limits on negative energy, then one could use it to produce bizarre macroscopic effects. Such effects might include violations of the second law of thermodynamics (e.g., refrigerators with no power sources), traversable wormholes (shortcuts through space and time), warp drive (faster-than-light travel), and time machines for backward time travel. This talk will review some of the work that has been done on these topics over the last two decades. The central focus will be on "quantum inequalities" - constraints on the magnitude and duration of negative energy which are derived from quantum field theory. The talk is designed for a fairly general audience, and will emphasize concepts and physical ideas rather than mathematical details.

For further information:

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