MONTANA STATE UNIVERSITY | College of LETTERS & SCIENCE

Physics Colloquium

Monday, January 30, 2017
4:10 – 5:00 PM
Barnard/EPS 103

Quantum Nanomechanics for Precision Gravitational Measurements

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Abstract:

We set out to combine a mechanical system in which classical mechanics breaks down and quantum mechanics must be used with a seemingly unlikely application, measurements of the strength and effects of gravity. Our nanomechanical system consists of a silica or diamond particle levitated in ultra-high vacuum. The particle is trapped in a magnetic field gradient created by permanent magnets and ferromagnetic pole pieces using the weak diamagnetism in these particles. With feedback, the mechanical motion can be cooled by several orders of magnitude, ideally reaching the quantum ground state. By measuring the decoherence rate of non-classical motional states of the trapped particle, we may be able to place limits on theories of gravitational decoherence. Furthermore, the extreme sensitivity our nanomechanical system to external forces also makes it a promising approach to a new measurement of the Newtonian gravitational constant.

Host: Randy Babbitt

***** Refreshments served in the Barnard Hall second floor atrium at 3:45 *****
Dr. D'Urso is a candidate for Physics Faculty Position