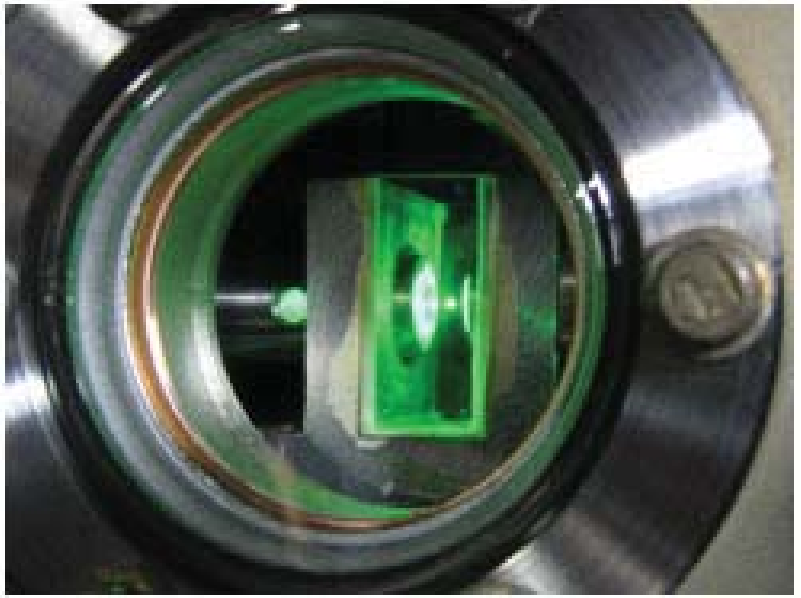
The Institute of OPTICS

Colloquium

UNIVERSITY OF ROCHESTER

Optical Trapping and Cooling of Glass Microspheres



Prof. Mark G. Raizen
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In this talk I discuss recent work on trapping beads of glass in an optical tweezer, in water, air, and vacuum.

Special Day and Time

3:30 pm, Tuesday, Apr 26, 2011

Sloan Auditorium, Goergen 101

Refreshments provided.

HAJIM SCHOOL OF ENGINEERING & APPLIED SCIENCES

Optical Trapping and Cooling of Glass Microspheres

Mark G. Raizen

Center for Nonlinear Dynamics and Department of Physics

The University of Texas at Austin

Abstract

In this talk I discuss recent work on trapping beads of glass in an optical tweezer, in water, air, and vacuum. We observe Brownian motion of a bead in air, and for the first time, resolve the instantaneous velocity of a Brownian particle [1]. This follows a prediction by Einstein from 1907, although he claimed the experiment is impossible! We are now working to repeat the same measurement in water, where the time scale is much shorter. These experiments enable fundamental tests of statistical mechanics.
We have also trapped a bead in vacuum, and have cooled the center of mass motion to mK temperatures in three dimensions [2]. This is a crucial steps towards cooling a trapped bead to the quantum ground state. The longer term goal of this work is to create macroscopic quantum superpositions, and to study their decoherence.

[1] T. Li, S. Kheifets, D. Medellin, and M. G. Raizen, Science 328, 1673 (2010)
[2] T. Li, S. Kheifets, and M. G. Raizen, Nature Physics, DOI:10.1038/NPHYS1952 (March 20, 2011).

Biography

Mark Raizen started his scientific career in theoretical particle physics in 1984 under the supervision of Steven Weinberg at the Univ. of Texas at Austin. In 1985 he decided to move into experimental physics in the group of Jeff Kimble (now at Caltech), and completed his Ph.D. in 1989 under the joint supervision of Kimble and Weinberg. After graduation, Mark took a postdoctoral position in the group of David Wineland at NIST, Boulder. Mark was hired in 1991 as an Assistant Professor at The University of Texas at Austin, was promoted to tenure in 1996 and to full professor in 2000. He has held the Sid W. Richardson Chair in Physics for the past ten years, one of only four such chairs in the physics department. In recent years Mark was recognized by The I. I. Rabi Prize of the APS, the Max Planck Award, and the Willis Lamb Medal in Laser Science. He is a Fellow of the APS and OSA.