SACRAMENTO STATE

Department of Physics and Astronomy

Physics & Astronomy Colloquium

Spring 2012

Fiber-Based Dual-Beam Optical Trapping System for Studying Lipid Vesicle Mechanics

In the 1970s, Alan Ashkin first demonstrated optical trapping of suspended dielectric particles manipulated by radiation pressure forces. Subsequently, a simple fiber-based dual-beam system with two unfocused, counter-propagating beams from single-mode standard fibers has become popular. In the dual-beam scheme, a micron-sized particle is trapped by a combination of optical scattering and gradient forces due to interactions with the incident electromagnetic radiation on the dielectric particle. The dual-beam configuration provides a non-contact technique that permits stretching of the bulk volume of a trapped cell or vesicle. The membrane of a trapped biological cell experiences stress forces that are normal to a given surface element and dual-beam traps, it turns out, can produce deforming stresses up to 400 times greater than optical tweezers, with significantly lower light intensity due to unfocused beams.

I will discuss the fundamental physics and calibration of a dual-beam trapping system using 6-μm diameter polystyrene microspheres in water. I will then present preliminary observations of trapping and stretching of lipid vesicles.

Jay E. Sharping

College of Natural Science
University of California, Merced

Thursday, February 16, 2012
4:00-5:20 PM - MND 1015

Open & Free to all Students, Faculty & Public