Computer Science, Math, and Physics Seminar at CSU Stanislaus

Presents:

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

Professor Jay E. Sharping
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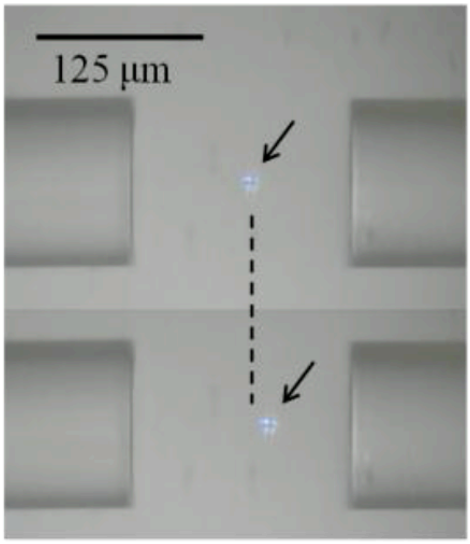
Talk location and time:
Friday, March 22, 2013 from 3:30pm to 4:30pm
Room N104 in Naraghi Hall of Science Building

Abstract

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.

About the speaker: Jay Sharping received his Ph.D. from Northwestern University in 2003 under the direction of Professor Prem Kumar and served as a postdoctoral scientist at Cornell University in Professor Alexander Gaeta's Quantum and Nonlinear Optics research group. Jay is currently an Assistant Professor at the University of California – Merced where his research plans include the development of novel pulsed light sources for applications in signal processing and biophotonics.