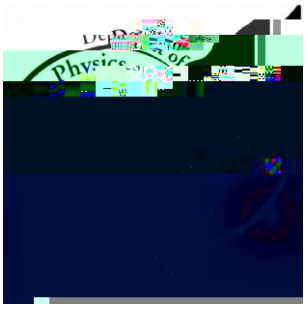

PHYSICS AND ASTRONOMY
COLLOQUIUM

Dr. Isaac Li

University of Illinois at Urbana-Champaign, Department of Physics

Single-molecule biophysics in live cells: seeing molecular adhesion force

Abstract

Biophysics is a highly interdisciplinary field bridging physics and biology. In particular, techniques such as single-molecule fluorescence and force spectroscopy enabled direct observation and perturbation of individual molecules. Such single-molecule studies have greatly enhanced our understanding of molecular behavior by revealing the heterogeneity and inner dynamics of biological molecule inaccessible at the ensemble level. However, current single-molecule assays are largely performed in isolated *in vitro* systems. One of the biggest questions and challenges in the field is: How do individual molecules behave in the context of live cells, and how do we measure them? In this colloquium, I will describe our approach towards tackling this problem by combining single molecule techniques and engineered DNA-based probes.

Our model system is the highly dynamic rolling adhesion of white blood cells (WBC) on blood vessel walls. This is the homing process by which WBCs locate inflammation and fight infections. Understanding the biophysics, and in particular, the mechanical forces involved in the process across length scales is crucial towards decoding immunity and inflammatory diseases. I will focus on our research progress towards quantitatively understanding of rolling adhesion from the whole cell level to the single-molecule level under physiological conditions in 3 interrelated parts:

1. Creating adhesion map on the whole cell level
2. Visualize adhesion force at the molecular level
3. Engineering DNA-based single molecule mechanical memory for perturbation-free adhesion recording

Friday, March 27, 2015
3:00 p.m.
Engineering/Computer Science
Room 116