

Physical Chemistry Seminar

Tuesday,
September 23, 2014

11:00 am

Room 1315
Chemistry Building

Single-Molecule Imaging and Plasmon-Enhanced Fluorescence: Understanding of Bacterial Function on the Nanoscale



Professor Julie Biteen
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Host: Professor Randy Goldsmith

By beating the diffraction limit that restricts traditional light microscopy, single-molecule fluorescence imaging is a precise, noninvasive way to sensitively probe position and dynamics. We are pioneering super-resolution imaging methods for unraveling important biological processes in live bacteria, and I will discuss how we have understood the mechanism of membrane-bound transcription regulation in the pathogenic *Vibrio cholerae*; demonstrated the dynamic interactions involved in starch degradation in the human gut symbiont *Bacteroides thetaiotaomicron*; and revealed an intimate and dynamic coupling between DNA mismatch recognition and DNA replication in a highly conserved repair pathway. Still, the resolution of single-molecule imaging, and thus our ability to understand subcellular dynamics, is limited by the fluorescent probes. Thus, we take advantage of the localized surface plasmon resonances that result from the interaction of light with small metal nanoparticles to improve the brightness and photostability of nearby fluorescent labels. We have measured the fundamental properties of plasmon-enhanced fluorescence with single-molecule detection, and in particular we have discovered how coupling leads to a predictable shift of the emission position. Finally, we are applying this understanding to biocompatible enhancement of fluorescent protein emission, extending the advantages of metal-enhanced fluorescence to live-cell bio-imaging, and creating a flexible technology for high-resolution, real-time imaging.

Refreshments will be available prior to the seminar at 10:45 a.m. outside room 1315

Graduate Students may meet with the speaker at 1:00 p.m. in Room 8305F