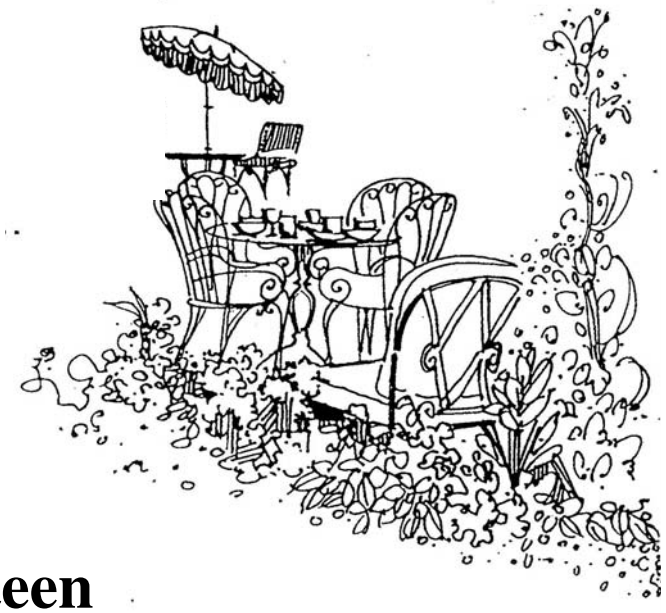
Chez Pierre

Presents ...

Friday, February 6, 2009
12:00pm
MIT Room 4-331



Julie Biteen

Stanford University

"From *in Vivo* Single-Molecule Superresolution Imaging to Plasmon-Enhanced Silicon Quantum Dots"

Nanoscale emitters have a wide range of applications that extend from nanomedicine to device physics. In the first part of this talk, I will demonstrate how we are using single-molecule superresolution techniques to optically image intracellular protein structures in live bacterial cells with 30-40-nm resolution. Based on the photoinduced reactivation of single molecules of the yellow fluorescent protein EYFP, the cell-cycle-dependent structure of the bacterial actin protein MreB in *Caulobacter crescentus* cells is discerned. This study establishes that the commonly used, monomeric EYFP is a useful emitter for superresolution imaging, and it provides a non-invasive, non-perturbative method for *in vivo* imaging.

Nanometer-sized fluorophores enable high-resolution bioimaging, but the photophysics of nanoscale emitters themselves are also of fundamental importance. In the second part of this talk, I will discuss the optoelectronics of silicon nanocrystals coupled to gold and silver nanostructures. Up to ten-fold increases in the silicon quantum dot luminescence intensity are realized, concomitant with enhancements of radiative decay rate, absorbance cross section, and quantum efficiency. Moreover, coupling at the metal plasmon resonance frequency is used to tune the nanocrystal emission spectrum. Finally, a computational exploration of these experimental observations indicates that the enhancement effects can be ascribed to emission in the concentrated local field that results from the excitation of metal particle plasmon modes. Brightened silicon nanocrystals hold promise for use as optical emitters in integrated circuits, and also as non-toxic labels in biological systems.