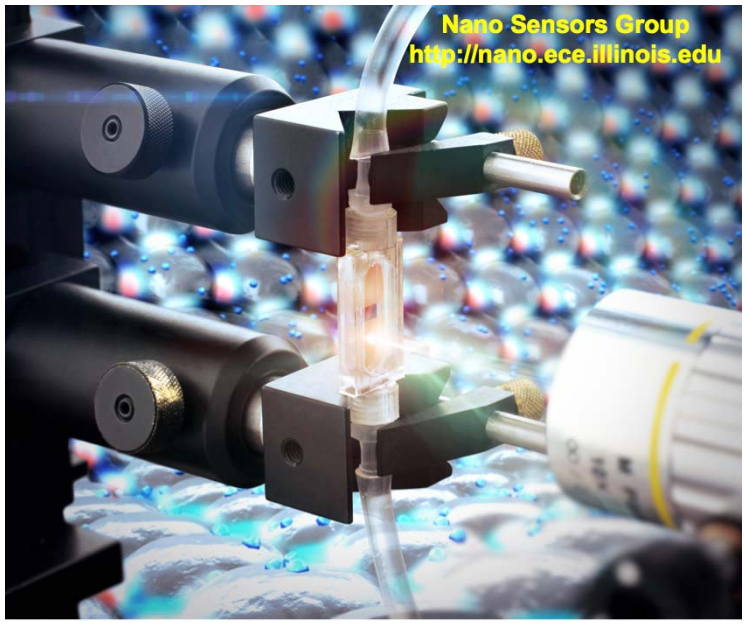
SEMINAR: Getting Molecules to "See the Light": Nanostructures and Instruments for Biomedical Detection



Abstract

Cell membranes, proteins, DNA, fluorescent dye molecules, and drugs are all comprised of atoms, which of course means that they also contain an abundant supply of electrons that can interact with light. Nanophotonics has developed through the design and fabrication of devices that can localize and magnify the interaction between light and molecules. To take full advantage of the capability provided by a nanostructure, one must also design a detection instrument that can optimally couple light in/out of the structure.

This talk will describe nanostructures and detection systems developed by the Nano Sensors Group for applications in pharmaceutical high throughput screening, life science research, gene expression analysis, breast cancer diagnosis, point-of-care monitoring, and pathology/forensics. We have developed Photonic Crystal Enhanced Microscopy (PCEM) and Photonic Crystal Enhanced Fluorescence as techniques for studying apoptosis, chemotaxis, stem cell differentiation, and detection of breast cancer biomarkers at concentrations <1 pg/ml in serum.

While PCs are strictly dielectric-based devices, nanostructured metal surfaces are being used to generate plasmon-based electromagnetic hot spots with enhancement factors >10^9 for Surface-Enhanced Raman Scattering (SERS) detection. SERS "post-cap" nanostructures and "nanodomes" developed by our group are fabricated inexpensively on flexible plastic substrates, and incorporated into biomedical tubing for in-line monitoring of intravenous drug delivery and continuous monitoring of urinary metabolites flowing through a catheter.

Prof. Brian Cunningham

ECE and Bioengineering Departments
University of Illinois, Urbana-Champaign

Brian Cunningham is a Professor in the Department of Electrical and Computer Engineering and the Department of Bioengineering at the University of Illinois at Urbana-Champaign, where he has been a faculty member since 2004. His group focuses on the development of nanophotonic surfaces, plastic-based nanofabrication methods, and novel instrumentation approaches for biodetection with applications in pharmaceutical screening, life science research, environmental monitoring, disease diagnostics, and point-of-care patient testing.

Wednesday
September 28, 2011
11:00-12:00
Baskin Engineering Room #330

CNO

Presented by the
W. M. Keck Center for
Nanoscale Optofluidics

Host: Prof. Holger Schmidt