Northeastern University
College *of* Engineering

Please join us for a
Special Chemical Engineering & Bioengineering Seminar

Wednesday, September 11, 2013
108 Snell Engineering
11:45 a.m. – 1:00 p.m.

"High Speed Single Cell Analysis"

JOHN P. NOLAN, Ph.D.
La Jolla Bioengineering Institute
San Diego, CA 02121

ABSTRACT

Single cell analysis is recognized as a key tool in understanding how the complex cell systems that form tissues, organs, and tumors operate. Improving this understanding is critically dependent on new methods to analyze single cells with high molecular specificity, multiplexibility sensitivity, and speed. Our lab is developing instrumentation, reagents, and assays to better study and exploit nanoscale phenomenon related to cell function. We use optical methods extensively, especially flow cytometry, and recently developed the first high resolution Spectral Flow Cytometers. These instruments use high efficiency gratings and high speed detectors to measure the complete emission spectra of individual cells at rates of hundreds of cells per second. Spectral flow cytometry produce data comparable or superior to conventional flow cytometers for many common applications, but also opens a door to new applications. As an example, we have developed a set of nanoparticle surface enhanced Raman scattering (SERS) tags that can be used as labels for antibodies or other targeting molecules. As many as 20 distinct SERS tags can be discriminated based on spectral features contained within ~100 nm of the spectrum. Combined with fluorescence probes, the use of SERS tags can significantly increase the level of multiplexing possible compared with conventional instruments. We are also interested in the quantitative analysis of the extracellular vesicles (exosomes, ectosomes, and other microvesicles) released by cells, and have developed a high sensitivity Nanoparticle Flow Cytometer and associated methods that allow us to size and count individual membrane vesicles as small as 50 nm in diameter. These new methods are being applied to the development of biomarkers for cardiovascular toxicity.

BIOGRAPHY: Dr. John P. Nolan received BS degrees in Biology and Chemistry from the University of Illinois, and a PhD in Biochemistry from Penn State. After post-doctoral training at Los Alamos National Laboratory, he was promoted to the Technical Staff and served as Director and Principal Investigator of the National Flow Cytometry Resource. In 2004 he was appointed Professor at the La Jolla Bioengineering Institute where he leads a group developing instrumentation and assays for single cell analysis. Among the current projects in his lab are spectral flow cytometry, highly multiplexed flow and image cytometry using surface enhanced Raman scattering (SERS) tags, and high sensitivity analysis of individual nanoparticles. Dr. Nolan is on the Editorial Boards of Cytometry and Current Protocols in Cytometry, frequently serves on national and international grant review panels, and is currently President of the International Society for Advancement of Cytometry (ISAC).

Refreshments will be served.