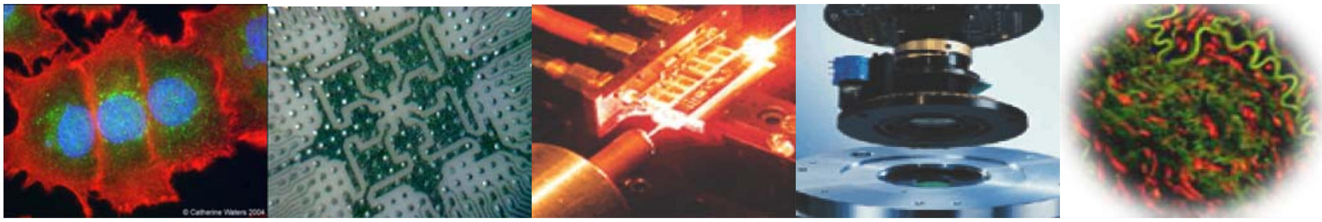

Optical Society of America
UC Irvine Student Chapter
Presents:

"Frontiers in Photonics" Seminars

Professor Elliot Botvinick

Beckman Laser Institute

"Biophotonic Tools for Studying Cellular Mechanotransduction"

WHEN: Friday, April 20, 2007, 2:00 - 3:00 PM

WHERE: 2201 Natural Sciences 2

(Refreshments will be provided)

ABSTRACT

Cells use biomolecules to transduce mechanical stress. External stresses are transmitted through the cell cytoskeleton (load-bearing macromolecules) to adhesion molecules that join cells to the extracellular space. Subsequent changes in cell internal energy activate specific signaling molecules that the body uses to control physiological functions including bone maintenance, wound healing, blood pressure, and hearing. As a new faculty member of the Department of Bioengineering and the Beckman Laser Institute, I am constructing photonic systems to both apply mechanical stresses and to study subsequent cell signaling. One system probes the transduction of ligand-coupled stresses. Laser tweezers apply known stresses to microspheres, which are adhered to cell surfaces through specific cell receptor proteins. Reactive cell signaling is observed in real time through genetically encoded FRET biosensors. Examples will be given of real-time cell signaling in response to localized stresses, and how this signaling pathway is altered in disease. A second system probes the transduction of ultra-localized fluid shear applied to sub regions of the cell surface. Spherical vaterite crystals, trapped by laser tweezers, are rotated near the cell surface. Crystal rotation is achieved by applying measurable optical torques with circularly polarized light. Monitoring of crystal rotation rate and changes in circular polarization allows measurement of apparent viscosity near the crystal surface. The fluid flow field is generally confined to the length scale of the crystal (a few microns) allowing ultra-fine viscosity measurements. It is my immediate goal to map the fluid environment near the cell surface as the crystals' flow field interacts with the glycocalyx and with the plasma membrane. Since the rotating crystals apply physiological-magnitude shear stress to local regions of the cell surface, the transduction of flow by endothelial cells can be studied. In this way fluid shear mechanotransduction of the glycocalix can be measured independently from that of the plasma membrane.

*

Questions and comments: Vahan Senekerimyan, 1210 Natural Sciences 2, Department of Chemistry

Email: vseneker@uci.edu

For schedule of seminars visit: http://osa.ps.uci.edu/Seminars.html