Sunday Afternoon, October 30, 2005

Biomaterials Plenary
Room 312 - Session BP-SuA

Biomaterials Interfaces Plenary Session
Moderator: G.J. Leggett, University of Sheffield, UK

3:00pm **BP-SuA1 Bio-Surfaces: Frontiers and Possibilities***, **B.D. Ratner,*** University of Washington Engineered Biomaterials (UWEB) **INVITED**

What does a real bio-surface look like? Two compelling examples in nature are (1) the basement membrane structures upon which endothelial cells and epithelial cells are adhered to in living creatures and (2) the surface of living cells. The characteristics of these real bio-surfaces are the presence of multiple recognition molecules that are oriented appropriately and conformationally stabilized, considerable molecular mobility used to turn on and off signals, an appropriate mechanical environment, options for repair of degraded components and inhibition of non-specific interactions. How might we, as "biointerface scientists," emulate all or part of the obvious functionality of such complex biosurfaces? This will be the focus of this lecture. The following subjects will be discussed and examples presented: inhibition of non-specific interactions; controlled surface molecular mobility; artificial surfaces with extracellular matrix components; protein orientation for signal delivery.

3:40pm **BP-SuA3 Observing Membrane-Embedded Biological Nanomachines Using the AFM***, D. Fotiadis, P.N.T.L. Frederix, H. Remigy,* ***A. Engel,*** M.E. Mueller Institute, Switzerland **INVITED**

Membrane proteins are membrane-embedded nanomachines at cellular interfaces that fulfill key functions such as energy conversion, solute transport, secretion, and signal transduction. The lack of structural information is related to the instability of membrane proteins in a detergent-solubilized state, making the growth of three-dimensional (3-D) crystals difficult. Direct observation of native membranes using the atomic force microscope (AFM) is therefore of great interest. Alternatively, two-dimensional (2-D) crystals of purified membrane proteins reconstituted in the presence of lipids provides a close to native environment and allows the structure and function of membrane proteins to be assessed. To this end, we use electron crystallography, which provides 3-D information at the atomic level. AFM allows the surface of membrane proteins to be studied at sub-nm resolution, providing information about their conformational variability that cannot be assessed by crystallographic methods. In addition, atomic force microscopy is the tool of choice to study the conformation and molecular arrangements of proteins in native membranes.

4:20pm **BP-SuA5 New Advances in Optical Imaging of Living Cells***, **X.S. Xie,*** Harvard University **INVITED**

The combination of new probes with advanced microscopy allows real time observation of biological processes in living cells at an unprecedented level. In particular, semiconductor quantum dots, coupled with high speed confocal microscopy, make it possible to resolve individual steps of molecular motors with nanometer spatial resolution and millisecond time resolution. By developing a new reporter protein, we are able to observe stochastic events of gene expression, and detecte protein being generated one molecule at a time in E. Coli cells. Advances in Coherent Anti-Stokes Raman Scattering (CARS) microscopy enable us to visualize living cells and tissues based on vibrational spectroscopy without fluorescence labels.

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