Atomic Force Microscopy for Nanoscale Biophysical Studies and Nanomedicine

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Date: Friday, April 1st, 2011
Time: 11:00 am-12:30 pm
Location: ENB 109

Note: After the talk Dr. Lal will briefly discuss NIH related funding evaluation and reviews

Nanomedicine is intricately linked to nanoscience and technology and spans all areas of human health management. The scope of nanomedicine include learning about the physicochemical properties of biomacromolecules, cells and subcellular structures, investigating molecular machines and their interactions with other machines and its environment, and creating tissues/organs from understanding biological systems at the most basic molecular scale. The aim of my presentation will be to discuss the contribution of scanning probe techniques, especially atomic force microscopy in Nanomedicine and its three components: nanodiagnostics, nanotherapeutics, and bio-nanodevices. Specific areas that I will discuss include:

- Development of Integrated multimodal "SMART AFM" and its application that has provided new paradigms for our understanding of protein misfolding diseases, and to diseases arising from environmental and life choices. The integrated multimodal AFM that we have developed over a years of collaborative research combines AFM, Optical Tweezers, double chamber electrical recording, chip-based TIRF and FRET and microfluidics and provides versatile nanotools for multiscale (nano-to-system), multimodal (structural, physicochemical properties and functional) and multidimensional study of living biological systems.
- Development of integrated cantilevered microarrays, TIRF, microfluidics and nano-electronics-based parallel sensors. This allows high throughput and rapid diagnosis of pathogens, allergens and many biomarkers for cancer, asthma and other diseases as well as for therapeutics design.
- Development and characterization of nanocarrier-based drug delivery, including nano liposomes and nanoparticles. This allows high efficiency in vivo or topical administration of small dosage of therapeutics with low side effects. Multimodal AFM plays a significant role in their characterization.

Jointly Sponsored by: Nanotechnology Research & Education Center & USF Nanomedicine Research Center