



*NEBRASKA CENTER FOR MATERIALS AND  
NANOSCIENCE / NSF-MRSEC  
SEMINAR SERIES PRESENTS*



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### **APPLICATION OF SCANNING PROBE MICROSCOPY IN NANOSCALE BIOPHYSICS RESEARCH**

Scanning Probe Microscopy is a big and growing family of many nanoscale characterization methods which are widely used in many areas including physics, chemistry, biology, biomedical and nano-technology. One of them, Atomic force microscopy (AFM) is a well-known scanning probe microscopy technique which allows imaging and nanomanipulation at the single molecule and nm scale. In this talk I will give introduction to several scanning probe microscopy methods, and focus on Atomic Force Microscopy (AFM), and Kelvin Probe Force Microscopy (KPFM), which is used to address electrostatic interactions, as well as AFM based force spectroscopy, and demonstrate how we use these methods in my laboratory to investigate complex structure and function of lipid films and lipid-protein interactions. Molecular arrangement of lipids and proteins in monolayer or membrane gives rise to complex film morphology as well as an electrical surface potential or non-uniform charge distribution, which rule many biological processes and diseases. In this talk I will discuss the structure and function of pulmonary surfactant (PS). PS is a lipid – protein mixture and forms a monomolecular film, which covers lung epithelia to provide stability to the alveolar structure and reduce the work of breathing. PS films are characterized by a specific molecular architecture and non-uniform surface potential distribution, which define its function and interaction of PS film with nanoparticles and biomolecules. Data on AFM topography, local surface potential distribution, and force measurements correlate well and provide more insight into the understanding of the molecular function of pulmonary surfactant. Effects of surface compression and the presence of cholesterol as well as a presence of surfactant specific protein on the monolayer structure and surface potential distribution will be discussed.

**Host:**  
**Alexei Gruverman**

**Friday, 1 May 2009  
201 Brace Lab  
1:30 p.m.**