

SEMINAR
DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING
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**Surface force spectroscopy of polymeric and biological materials
under extreme conditions: touching spider legs and fish skin**

TIME: Thursday, October 18, 2007

PLACE: MEC 341, Mechanical Engineering Building

Refreshments at 3:30 PM in MAE Faculty Lounge, MEC 305

ABSTRACT

Investigation of some key properties of biological materials relevant to the development of artificial bioinspired micro-flow (air and fluid) sensors is a recent focus of our research group. We utilized surface force spectroscopy (SFS) for direct point-load measurements of the nanomechanical response of the cuticle and pads on the legs and wind-sensing hairs of live wandering. These measurements allowed for calculations of the maximum deflection angle, the spring constant of the hair itself, the torsional constants, the elastic modulus of cuticle and pads, and viscoelastic (frequency-dependent) deformation and adhesion of pads (the damping coefficient). In other related study, superficial sensor cupulae of several fish were compared in terms of size, distribution, morphological differences, and mechanical responses (the elastic modulus and the retardation time) in comparison with the micropatterned, dome-shaped hydrogel structures. The applicability of the AFM and SFS for unambiguous and quasi-quantitative measurements of surface nanomechanical properties is discussed in this talk.



Vladimir V. Tsukruk received his M.S. degree in Physics in 1978 from the National University of Ukraine, Ph.D and DSc in Chemistry in 1983 and 1988 from the National Academy of Sciences of Ukraine (Yu. Lipatov), and was a post-doc with J. Wendorff (U. Marburg) and D. Reneker (U Akron). Currently, he holds a joint appointment as a Professor at the School of Materials Science and Engineering and School of Polymer, Fiber, and Textile Engineering, Georgia Institute of Technology. He has co-authored 250+ refereed articles in archival journals, 18 invited reviews and one book, co-edited three volumes, and holds four patents. He is ranked within top 1% highly cited researchers both in chemistry and materials. His research activities in the fields of surfaces/interfaces, molecular assembly, nano- and bioinspired materials are supported by NSF, AFOSR, ARO, DARPA, and private industry. He is a recipient of the Pioneering Nanotechnology Gold Award (2007), NSF Special Creativity Award (2006), MIT-ISN Visiting Professorship (2005), NSF RIA Young Investigator Award (1994), Humboldt Fellowship (1990), Best Young Investigator Research Prize in Ukraine (1985), among others and serves on the editorial advisory boards of *Polymer* and *Curr. Chem. Biology*. He has organized seven international symposia and workshops at ACS National Meetings, served as a Program Chair for Polymer Materials Division, ACS, and graduated 30+ graduate students and post-docs who continue successful carriers in academia, industry, and national labs.