



STATISTICS DEPARTMENT COLLOQUIUM

MONDAY, APRIL 27, 2009

Talk: 4:00 PM – *Science Center 309*

Reception: 5:15 PM – *Science Center, 7th Floor*

“A Statistical Approach to Quantifying the Elastic Deformation of Nanomaterials”

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ABSTRACT

Quantifying the mechanical properties of nanomaterials is challenged by its small size, difficulty of manipulation, lack of reliable measurement techniques, and grossly varying measurement conditions and environment. A recently proposed approach is to estimate the elastic modulus from a force-deflection physical model based on the continuous bridged-deformation of a nanobelt using an Atomic Force Microscope tip under different contact forces. However, the nanobelt may have some initial bending, surface roughness and imperfect physical boundary conditions during measurement, leading to large systematic errors and uncertainty in data quantification. In this paper, a new statistical modeling technique, called sequential profile adjustment by regression (SPAR), is proposed to account for and eliminate the various experimental errors and artifacts. SPAR can automatically detect and remove the systematic errors and therefore gives more precise estimation of the elastic modulus. This research presents an innovative approach that can potentially have a broad impact in quantitative nanomechanics and nanoelectronics. I will also share some insight regarding our exchanges with a referee who is knowledgeable with material mechanics but not with statistics and how we convinced this referee.

(Joint work with X. Deng, R. Joseph, W. Mai, Z. L. Wang.)