UNH Materials Science Seminar

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DeMeritt Hall 209B
University of New Hampshire

Quantitative Nanoscale Electronic and Mechanical Characterization

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There are countless efforts to incorporate nanoscale components in modern devices, as particles, circuits, molecular modifications, etc., but still few techniques for measuring their *local* properties. At the University of Connecticut NanoMeasurement Laboratory our research and technique development efforts emphasize quantitative measurements of nanoscale properties. Focusing primarily on variations of Scanning Probe Microscopy as well as theoretical calculations, careful consideration of the contrast mechanisms have revealed new insight into the interpretation, and quantification, of experimental results. For example, in polycrystalline ZnO (surge protecting varistors), the voltage dependence of potential barriers and even the interfacial density of states was locally measured at the grain boundary for the first time through *in situ* measurements. With ferroelectric films, the ferroelectric hysteresis can be mapped and recently was uniquely shown to vary as a function of built in strain due to crystallographic texture. The mechanical compliance of semiconducting thin films less than 10 nm in thickness can be detected through novel ultrasonic-based SPM measurements, even allowing

subsurface defects to be characterized. And in living biological cells, the mechanics of cell membranes can be measured *in vitro*.

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Bryan Huey earned his Ph.D. in materials science from the University of Pennsylvania in 1999 where he was honored with the S. J. Stein prize for the best thesis in materials and electrical engineering. He then worked in the materials department at Oxford, UK, as a post-doctoral scholar supported through two prestigious awards, as an NSF International Research Fellow and as a Marshall-Sherfield Scholar. After a 6 month stint in the physics department at the Swiss Federal laboratory in Lausanne (EPFL), Bryan returned to the US to work in the Ceramics division at NIST on a National Research Council fellowship. In 2004 he joined the materials science faculty at the University of Connecticut. Dr. Huey administers the NanoMeasurement Laboratory in the Institute of Materials Science, where his group focuses on quantitative materials property measurements at the nanoscale.