

**Symposium on Undergraduate Nano-Education:
"Addressing the Challenges of Nanoscale Science & Engineering Education"**

Presentation: "Innovative Approaches to Challenges in Undergraduate Nanoscience Education"

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Presenter Biography: Ethan Allen manages education programs for the University of Washington's Center for Nanotechnology (CNT - <http://www.nano.washington.edu/education/index.html>) and the UW's Genetically Engineered Materials Science and Engineering Center (GEMSEC - <http://depts.washington.edu/gemsec/education/RET.html>). Ethan received his doctorate in integrative and systems biology from the Institute for Neuroscience at the University of Oregon. He carried postdoctoral research there on visual system neural plasticity and later at the University of Texas, Austin, on the neuroethological bases of reptile reproduction. During this time, Ethan also served as Content Coordinator for the Smithsonian Institution's international traveling exhibit, *Kaleidoscopes: Reflections of Science and Art*. Subsequently, Ethan developed exhibits for Chicago's Museum of Science and Industry and later designed and implemented science education renewal programs throughout Chicago's public schools, working with the Teachers Academy for Mathematics and Science. He has led science education partnerships at the UW's Department of Molecular Biotechnology and at the Institute for Systems Biology. At both the CNT and GEMSEC, Ethan works with education programs for graduate, undergraduate, and pre-college students, as well as for pre-college teachers and broad public audiences. Ethan is currently writing a book to foster broad public engagement with and understanding of nanoscale science and technology.

Abstract:

Models for undergraduate education in nanotechnology at the University of Washington, one being currently implemented and the other being planned, will address two major challenges in providing undergraduate students with appropriate nanoscale science education. One key challenge is how to provide sufficient hands-on experiences for a regular undergraduate laboratory class of ~30 students, enabling all students to learn first-hand how to use different types of current instrumentation to visualize nanoscale features and characterize nanoscopic samples. This challenge is being met through the NSF-funded NUE (Nanotechnology for Undergraduate Education) UNIQUE (Using Nanoscience Instruments for Quality Undergraduate Education) program (http://depts.washington.edu/nanolab/NUE_UNIQUE/NUE_UNIQUE.htm), where multiple (N=5) portable scanning probe microscopes are simultaneously leased short-term from Nanoscience Instruments. UNIQUE leaders have developed a variety of laboratory modules, enabling entire classes of students to carry out hands-on explorations into multiple aspects of scanning probe microscopy during a one-to-two-week-long session. A second major challenge is how to provide undergraduate students with nanoscale science and technology education that is sufficiently deep so as to be useful, connected to other science learning so as to be meaningful, and broad so as to be applicable for their future learning. Modeled on the highly successful Nanotechnology Ph.D. 'dual degree' option offered by the Center for Nanotechnology at UW (<http://www.nano.washington.edu/education/index.html>), a multi-departmental Nanoscience and Molecular Engineering (MNE) Minor program is being planned at the UW that will enable students majoring in any of 11 departments within the College of Engineering and the College of Arts and Sciences to minor in NME.