

Leaders in Mechanical Engineering Lecture Series

Assembly at the Nanoscale

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Date: Friday, April 14, 2006, 2pm

Location: Resnick Auditorium (Room 1202) of
the Engineering Building (088)

Abstract: This talk discusses bottom up assembly of nanoscale components. We begin by addressing nanoassembly by manipulation with SPMs (Scanning Probe Microscopes), which is a relatively well established process for prototyping nanosystems. Experimental results are presented which show that SPM manipulation can be used with minimal user intervention to accurately and reliably position molecular-sized components. These can then be linked by chemical or physical means to form subassemblies, which in turn can be further manipulated. Applications in building wires, single-electron transistors and nanowaveguides are presented. Finally, we discuss an emerging paradigm in self-assembly, in which active elements (nanorobots) are used to build nanostructures. These robots have the limited capabilities we expect to find in the nanorobots of the future, and achieve interesting global behaviors through local interactions. Simulation results show that arbitrary shapes can be constructed by swarms of these robots.

Bio: Aristides A. G. Requicha (Life Fellow, IEEE) was born in Monte Estoril, Portugal, in 1939. He received the Engenheiro Electrotécnico degree from the Instituto Superior Técnico, Lisbon, Portugal, in 1962, and the Ph.D. in electrical engineering from the University of Rochester, Rochester, NY in 1970. He was a college and high school Valedictorian.

He is currently the Gordon Marshall Professor of Computer Science and Electrical Engineering at the University of Southern California, where he also directs the Laboratory for Molecular Robotics. He has authored some 170 scientific papers, and has served in numerous conference committees and journal editorial boards. His past research focused on geometric modeling of 3-D solid objects and spatial reasoning for intelligent engineering systems. Currently he is working on robotic manipulation of nanometer-scale objects using scanning probe microscopes; nanorobot components and nanorobotic system integration; fabrication of nanostructures by robotic self-assembly; sensor/actuator networks; and applications in NEMS (nanoelectromechanical systems) and nanobiotechnology. The long-term goals are to build, program, and deploy nanorobots and networks of nanoscale sensors/actuators for applications to the environment and health care.

Dr. Requicha currently co-chairs the Micro and Nanorobotics Technical Committee of the IEEE Robotics and Automation Society. He is also a member of the AAAS, ACM, AAI, AVS and SME.

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