

Micro/Nano Seminar Series
Sponsored by
Electrical and Computer
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Nanostructure Self-Assembly:
Simple bottom up approaches for making MEMS

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Abstract: Recently our group has demonstrated the automated self assembly of individual and arrays of nanostructures. Both processes are remarkable in that they can be performed at room temperature, in room air and with macroscale positioning requirements. Our metal nanostructures are individually crystallized from gallium melts and have been selectively grown on MEMS-like devices including atomic force microscope probes, Bulova quartz crystal tuning forks, and tungsten probe tips of sub micron tip radius. Probes are highly flexible, yet tough, enabling them to be pushed through the membranes of live cells. We also have produced regular arrays of suspended membranes and fiber air bridges by brushing solutions of polymer liquids and or soluble proteins over micromachined substrates. Over 1000 identical membranes have been formed from a single application with zero intervening defects. This process is remarkable in that stable air bridges have been formed down to 4 nanometers in diameter even though the polymer was applied by manual hand-brushing of the solution over the micromachined substrate. I will describe these methods of fabrication and show various advantages of the fabrication process, together with applications that result from these unique structured materials



Biosketch: Robert W. Cohn is Professor of Electrical and Computer Engineering at the University of Louisville where he established (since 1996) and directs the ElectroOptics Research Institute and Nanotechnology Center, a collaboration of 19 UofL and 7 University of Kentucky faculty. He holds a PhD in Electrical Engineering from Southern Methodist University. From 1978 to 1989 he was a Member of the Technical Staff at Texas Instruments where he studied solid state acoustic devices for radio and radar receivers and contributed to the development of micromechanical light modulators referred to as DLP (digital light processing.) Today DLP

(which is used in conference room and movie theater projectors and HDTV) is one of TI's most widely sold products. His current research interests include shaping laser beams for the display of images, trapping and guiding of micron-scale particles such as cells using laser beams, and the development of simple methods of fabricating nanometer scale structures. An example of what is meant by ease and simplicity of Cohn's nanofabrication process is that one can brush liquid plastics or proteins onto a rough surface by hand and within a few seconds fiber bridges of 50 nanometer diameter will form through a process known as self-assembly. A second example is the method of crystallizing ultraflexible freestanding metal alloy nanoneedles at selected locations on and chosen orientations to a solid surface at room temperature. Prof. Cohn has published 50 papers in refereed journals, holds 6 patents and has been principal investigator on 40 grants. He has developed a number of graduate courses and presented a number of general interest talks on topics in nanotechnology. Dr. Cohn is a Distinguished University Scholar at UofL and Fellow of the Optical Society of America.