

**Seminar:**  
**Directed Self-Assembly of Nano-Shrink Wrap  
for Wafer-Scale Fabrication of Soft 3D Metamaterials**

by **Prof. Robert W. Cohn**, University of Louisville

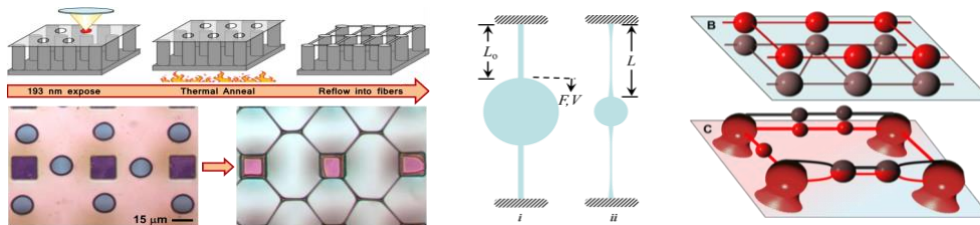
**Location: Birck Nanotechnology Center, BRK 2001**

**Date: Thursday Oct. 6**

**Time: 11:15 A.M.-12:15 P.M.**



**Abstract.** Shape transform lithography (STL) is a new method of forming and integrating suspended soft nanostructures above rigid semiconductor and plastic substrates. Suspended polymer nanofilms are optically patterned at low resolution and then transform (upon heating above the glass transition or crystallite melting temperatures) into 2D and 3D fiber networks. The transforms produce an order of magnitude enhancement in patterning resolution, which makes STL applicable to mass manufacturing of MEMS devices, metamaterials and smart textiles, both in semiconductor front ends and in roll-to-roll processing. The driving forces in film to fiber transform includes surface tension and entropic stresses due to confinement of polymer chains to



**Overview of STL.** Left panel: Shape transformation of an 80 nm thick polystyrene film that forms a lattice of fibers on micropillars. Center panel: Proposed test structure for transforming film disc into a fiber-suspended bead. Right panel: Proposed extension for 3D fabrics. Layers closer than the bead diameters fuse together to create mechanical supports (without using a prefabricated pillar array as in the left panel).

film thicknesses on the order of the chain radius and additional residual stress due to non-equilibrium conformations of chains in prepared films. This talk will review the current status and plans for developing STL into a general fabrication methodology for mass production of 3D microdevices and metamaterials. The talk will compare STL with earlier methods of patterning suspended nanofibers into electronic and MEMS devices.

**Bio:** Robert W. Cohn is Professor of Electrical and Computer Engineering, University of Louisville where he also directs the ElectroOptics Institute and Nanotechnology Center. He received the PhD in Electrical Engineering from Southern Methodist University (1988). As Member of the Technical Staff at Texas Instruments (1978-1989), he studied microwave, acoustic and optical signal processing devices, including surface acoustic wave and deformable mirror devices. Upon joining UofL in 1989 he studied spatial light modulators and real-time computer-generated hologram algorithms with applications to multi-object laser targeting and laser trapping microscopes. Since 1998 his research has increasingly focused on self-assembled fabrication of high aspect ratio nanostructures from both alloys and from soft and polymeric materials. Cohn is Fellow of the Optical Society of America and was a Finalist for the 2017 OSA/SPIE/MRS Congressional Fellowship.

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