"Unifying concepts in nanomanufacturing - Interfacing Molecules with the Macroscopic World"

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ABSTRACT:

For several decades nanotechnology has promised a variety of extraordinary advances, from medical nanorobots to molecule-scale electronics. The basic idea behind this promise is that individual molecules, or precise arrangements of molecules, will have new computational or functional properties that are impossible to achieve by shaping materials with conventional fabrication techniques. Yet despite breakthroughs in our ability to organize molecules into complex devices through the use of self-assembling DNA scaffolds, we are still far from a mature nanotechnology which can deliver on these promises. The question is, what stands in our way? One answer is that it is still very difficult to organize thousands of molecular devices into larger more complex architectures, to get information and instructions into them, and to get results out of them. This talk will examine how to combine conventional silicon microfabrication, the technology used to make everything from computer chips to automobile airbag triggers, with the DNA origami method for making molecular shapes. In particular, we will show that our ability to program the shape of large DNA structures allows us to interface with molecules, to organize them, and to bring access to their extraordinary properties up the everyday human length scale.