Sunday Afternoon, October 21, 2018

Biomaterials Plenary Session
Room 101B - Session BP-SuA

AVS BIP & AIP IPF Forum Plenary Session

Moderator: Joe Baio, Oregon State University

3:00pm **BP-SuA1 Integrating Single Molecule Devices with Conventional Microfabrication using DNA Origami*, Paul Rothemund,*** California Institute of Technology **INVITED**

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 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 enables the use of lithography to write large-scale patterns of single molecule binding sites. Then the DNA shapes can act as adaptors, slotting molecular devices into micron scale microfabricated devices with yields that are far greater than those achieved by typical Poisson-limited assembly processes. Design of the binding energy landscape enables symmetry-breaking and precise orientation of the shapes. Finally, we demonstrate the technique by positioning and orienting tens of thousands of molecular light emitters within photonic crystal cavities, controlling both the intensity and polarization of emission. Potential application of the technique for the highly multiplexed detection of disease biomarkers will be discussed.

3:40pm **BP-SuA3 High Resolution Cryo-EM Structures of Macromolecular Complexes*, Wah Chiu,*** Stanford University **INVITED**

The advances of cryo-EM have made it possible to determine atomic resolution structures of biochemically purified macromolecular complexes equivalent to those solved by X-ray crystallography. Validation procedure has been implemented to assess the structure accuracy and reliability. We will present biological examples that can be derived from this imaging approach in terms of their functional mechanisms.

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