SCHEDULE OF EVENTS

8:00 A.M.
REGISTRATION & CONTINENTAL BREAKFAST
Gallery, W.T. Young Library

8:45 A.M. WELCOME
Dr. Eli Capilouto, University of Kentucky President
Auditorium, W.T. Young Library

9:00 A.M. DR. PHILLIP TINNEFELD
DNA Origami Nanophotonics: from Superresolution to Functional Devices

In recent years, DNA nanotechnology has matured to enable robust production of complex nanostructures and hybrid materials. We have combined DNA nanotechnology with sensitive optical detection to create functional single-molecule devices such as nanoscopic rulers for superresolution microscopy and energy transfer switches. DNA origamis are also used to construct nanoscale force balances with FRET readout or for single-molecule placement in zeromode waveguides using nanoadapters. Especially, self-assembled nanoparticles forming optical antennas can enhance fluorescence and hold great potential for single-molecule detection at higher concentrations for biomolecular assays but also for diagnostic applications. I will discuss recent advancement in fluorescence enhancement and how to disentangle the complex factors that generally influence the fluorescence of single molecules near metallic nanostructures.

10:00 A.M. BREAK AND REFRESHMENTS

10:30 A.M. DR. TAEKJIP HA
Genome Maintenance Up Close and Personal: Eavesdropping on Single Molecular Conversations

Single-molecule detection has opened vast avenues to investigate aspects of biological systems that are inaccessible by any other technique. Research in my lab is focused on pushing the limits of single-molecule detection methods to study biological systems with multiple components to better mimic the cellular conditions. In the first part, I will describe the surprising and deep insights, revealed by multi-color FRET and fluorescence-force spectroscopy, on the dynamics of DNA repair proteins on single stranded DNA. In the second part, I will describe a single-molecule pull-down (SiMPull) assay that combines the principles of a conventional pull-down assay with single-molecule fluorescence microscopy and enables direct visualization of individual cellular protein complexes. SiMPull can reveal how many proteins and of which kinds are present in the in vivo complex and is widely applicable to various signalling proteins found in the cytosol, membrane and cellular organelles, and to endogenous protein complexes from animal tissue extracts.

11:30 A.M. LUNCH

1:30 P.M. POSTER SESSION
Multipurpose Room, B108C, W.T. Young Library

2:30 P.M. DR. CARLOS BUSTAMANTE
Division of Labor and Coordination Among the Subunits of a Nearly Perfect Biological Machine

As part of their infection cycle, many viruses must package their newly replicated genomes inside a protein capsid. Bacteriophage phi29 packages its 6.6 mm long double-stranded DNA using a pentameric ring nano motor that belongs to the ASCE (Additional Strand, Conserved E) superfamily of ATPases. A number of fundamental questions remain as to the coordination of the various subunits in these multimeric rings. The portal motor in bacteriophage phi29 is ideal to investigate these questions and is a remarkable machine that must overcome entropic, electrostatic, and DNA bending energies to package its genome to near-crystalline density inside the capsid. Using optical tweezers, we find that this motor can work against loads of up to ~55 picoNewtons on average, making it one of the strongest molecular motors ever reported. We establish the force-velocity relationship of the motor. Interestingly, the packaging rate decreases as the prohead fills, indicating that an internal pressure builds up due to DNA compression attaining the value of ~6 MegaPascals at the end of the packaging. This pressure, we show, is used as part of the mechanism of DNA injection in the next infection cycle.

Nonprofit
Organization
U.S. Postage
PAID
Lexington, KY
Permit Number 51

Department of Chemistry
500 South Limestone Ave.
University of Kentucky
Lexington, KY 40506-0055

ADDRESS SERVICE REQUESTED

UK UNIVERSITY OF KENTUCKY

NAFF SYMPOSIUM 2015

MARCH 6
W.T. YOUNG AUDITORIUM

SINGLE MOLECULE APPROACHES TO DECIPHERING MOLECULAR INTERACTIONS IN BIOLOGY

CHEM.AS.UKY.EDU/NAFF-SYMPOSIUM