NANOMATERIALS SPEAKER SERIES

USING NOVEL SUPER-RESOLUTION AND LIVE CELL IMAGING TECHNIQUES TO PROBE PROTEIN TRAFFICKING IN HUMAN CELLS

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A key challenge in modern biology is to understand how cells communicate with one another in order to form functional tissues and organs, and how these mechanisms fail in disease. Some of the key mechanisms governing such multi-cellular organization involve dynamic changes in cell-cell adhesion, a re-wiring of protein trafficking pathways, and rearrangements of the cellular cytoskeleton, in response to signals from surrounding cells. And yet, the regulatory networks coordinating these dynamic processes are far from understood. Consequently, there is a need for novel microscopy techniques capable of investigating the organization and dynamics of sub-cellular architectures with high spatial and temporal resolution. Here, I describe the development and application of novel, multiplexed fluorescence- and STORM super-resolution microscopy procedures based on a new generation of dynamic, nucleic-acid based fluorescence probes that allow for the visualization of tens of proteins within individual cells and tissues. In combination with dynamic live-cell imaging studies, we used these procedures to investigate the roles of the cytoskeletal regulatory protein IQGAP1 in human cells.

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SPEAKER BIO

Volker Schweikhard's research interests are centered around the question of how biological cells communicate to form functional tissues and organs, and how these mechanisms fail in disease. His current work involves the development of highly multiplexed fluorescence- and superresolution microscopy procedures. His future research interests include the development of label-free yet chemically specific imaging platforms, based e.g. on coherent Raman microscopy, to probe biochemical and metabolic processes in cell culture models, in tissues, and in vivo, with high spatiotemporal resolution. Prior to joining Rice University, Schweikhard was awarded a Damon Runyon Postdoctoral Fellowship to develop single-molecule optical trapping assays to study the process of gene transcription by the enzyme RNA polymerase II in real time. This work resulted in the first direct visualization of the synergistic effects of two important regulatory proteins – the transcription factors TFIIF and TFIIS – on the mechanical robustness and fidelity of gene transcription.

Contact Professor Jiming Bao at jbao@uh.edu if you would like to arrange for a time to meet with Dr. Schweikhard.

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