BIOMEDICAL ENGINEERING
UNIVERSITY OF MICHIGAN

BME 500 Seminar Series

Thursday, March 5, 2020
4:00 – 5:00 p.m.
1680 IOE

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"Visualizing Biomolecular Interactions at Single-Molecule and Single-Cell Levels"

Abstract:

Biomolecular interactions are at the root of all biological processes and define the molecular mechanisms of how these processes are accomplished in both physiological and pathological conditions. Recent advances in single molecule detection and super-resolution fluorescence microcopy have uncovered previously unknown properties of biomolecular interactions, including multivalency, transiency, and heterogeneity, and revealed the organizational principles governing the compartmentalization of functional biomolecular interactions in cells and how such compartmentalization and organizations become dysregulated in diseases. In this talk, I will first discuss my postdoctoral work, where I used mass-spectrometry-based analysis and super-resolution imaging to dissect the protein-protein interactions at the plasma membrane of neurons, and discovered that a newly identified membrane-associated periodic skeleton (MPS) structure can function as a signaling platform that coordinates the interactions of signaling proteins at the plasma membrane of neurons. In response to extracellular stimuli, G-protein coupled receptors, cell-adhesion molecules, receptor tyrosine kinases can be recruited to the MPS to form signaling complexes at the plasma membrane, and such recruitment is required for downstream intracellular signaling. This work not only reveals an important, previously unknown function of the newly discovered MPS structure, but also provides novel mechanistic insights into signal transduction in neurons. I will then discuss my graduate work, where I developed a hybrid single molecule technique combining single molecule FRET and optical tweezers, and applied this technique to probe the sub-molecular dynamics of protein-DNA interactions in various biological systems involved in DNA replication, repair and recombination.