

“Probing Protein Interactions from Molecular to Cellular Scales with Microscale Technologies”

**Virtual Seminar
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Abstract

Biological molecules rarely act alone. For example, in many pediatric cancers, a chromosomal rearrangement results in a fusion protein with altered DNA and protein interactions that yield proliferative and aggressively metastatic cell subpopulations. In this talk, I will describe quantification of molecular interaction properties relevant to fusion oncoprotein biology using microscale tools with distinct forces tailored to each biological question. First, I will discuss measurement of cellular heterogeneity in cytoskeletal protein complex abundance as is needed to uncover ‘rogue’ metastatic and drug resistant cells. I introduced a microfluidic biochemical assay using electrophoretic forces and sieving hydrogels to fractionate dynamic protein complexes from single cells faster than dissociation kinetics. Second, I will describe biophysically probing protein-DNA molecular mechanics to understand how tension plays a role in DNA pairing during DNA damage repair. To reveal forces the Rad51 repair protein exerts on DNA, microscale tweezers apply a magnetic piconewton-scale force to single molecules of DNA. Finally, I will share future directions discerning the biochemical and biophysical roles of multi-component protein complexes in fusion oncoprotein-driven pediatric cancers, such as Ewing’s sarcoma. My group will uncover new targets for ‘molecularly surgical’ Ewing’s sarcoma therapies through interrogation of molecular interactions towards replacing combination chemotherapy and crude tumor removal surgeries.

Bio

Dr. Julea Vlassakis is a postdoctoral scholar in the Herr Lab in the Department of Bioengineering at UC Berkeley, where she also earned her Ph.D. in 2018. Her current research focuses on the design and application of single-cell micro-scale electrophoresis to detect proteins and their complexes. She is a recipient of the Burrough’s Wellcome Fund Career Award at the Scientific Interface. Previously, she conducted single-molecule biophysics research in the Prentiss Lab in the Department of Physics at Harvard University. She earned her bachelor’s degrees in Chemistry and Physics at Smith College, a women’s college that cultivates champions of equity.

CBE Faculty Candidate

