

Distinguished Lecture Series
presents
“Bottom-Up Biology: Building Synthetic Cells”
Associate Professor Allen Liu

University of Michigan

Abstract

Biological membranes are involved in many cellular processes including cell migration, membrane trafficking, and cell signaling. Significant amount of work has elucidated the molecular machineries that regulate dynamic membrane-based processes. In parallel, there are growing interests in recent years in trying to understand how mechanical state of the cells are utilized as a regulatory input to control cellular processes. My lab is broadly interested in studying the mechanochemical responses and force generation of biological systems, both in cells and in cell-like systems. In this talk, I will present two directions in building cell-like systems referred to as synthetic cells. In the first part of the talk, I will describe self-organization of reconstituted actin network, with crosslinker proteins and molecular motor myosin, in synthetic cells. Depending on the confinement size and concentrations of actin crosslinkers, distinct actomyosin patterns emerge in the form of asters and rings and could constrict the synthetic cell. In the second part of the talk, I will describe a general synthetic cell platform that makes use of encapsulation of mammalian cell-free expression reactions to reconstitute membrane proteins for generating membrane-active synthetic cells. I will share our work on building mechanosensitive synthetic cells and ongoing work on building synthetic neurons.

Biography

Allen Liu received a B.Sc. degree in Biochemistry (Honors) from the University of British Columbia, Vancouver, Canada, in 2001. He obtained his Ph.D. in Biophysics in 2007 from the University of California-Berkeley and received his post-doctoral training at The Scripps Research Institute-La Jolla. He started his group in 2012, and he is currently an Associate Professor in Mechanical Engineering, Biomedical Engineering, and Biophysics at the University of Michigan. His current research interests lie in cellular mechanotransduction and uses tools from quantitative cell biology, synthetic biology, biophysics, and microfluidics. He is a recipient of the NIH Director’s New Innovator Award, a Young Innovator by Cellular and Molecular Bioengineering (CMBE), a Rising Star from CMBE-BMES, and Future of Biophysics Burroughs Wellcome Fund Symposium speaker. He is a recipient of the Endeavour Executive Fellowship (Australia) and the Alexander von Humboldt Fellowship for Experienced Researcher (Germany).



November 8, 2022
4:00P.M.
Location: ZHS 352