

Fall 2018 Colloquium

Department of Physics & Astronomy, TAMU-Commerce

Oct 11, Thursday, 4-5 PM in Science Building 127

(coffee and cookies will be served at 3:50 PM)

Biophysics, Biochemistry, Biology

Physical Mechanisms of Cell Organization on Micron Length Scales

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Dr. Michael Rosen received undergraduate degrees in chemistry and in chemical engineering from the University of Michigan in 1987. He then spent a year in Alan Battersby's lab in the Department of Chemistry at the University of Cambridge as a Winston Churchill Foundation Scholar. He received his Ph.D. in Chemistry from Harvard University in 1993 under the direction of Stuart Schreiber, where he studied the structure and function of the FK506 binding protein, FKBP12. He was a Damon Runyon-Walter Winchell post-doctoral fellow in the laboratories of Tony Pawson and Lewis Kay at the University of Toronto, where he studied regulation of the signaling adaptor protein, Crk, and developed methods of selective methyl group labeling of proteins for NMR spectroscopy. Dr. Rosen started his independent laboratory in 1996 in the Cellular Biochemistry and Biophysics Program at the Memorial Sloan-Kettering Cancer Center in New York City, and moved to UT Southwestern Medical Center in 2001. He currently is Chair of the Department of Biophysics at UT Southwestern Medical Center, where he holds the Mar Nell and F. Andrew Bell Distinguished Chair in Biochemistry, and is a Member of the Howard Hughes Medical Institute. More information about Dr. Rosen can be found at

<https://profiles.utsouthwestern.edu/profile/53929/michael-rosen.html>

Abstract

Cells are organized on length scales from Angstroms to microns. However, the mechanisms by which Angstrom-scale molecular properties are translated to micron-scale macroscopic

properties are not well understood. We have shown that interactions between multivalent proteins and multivalent ligands can cause liquid-liquid demixing phase transitions, resulting in formation of micron-sized liquid droplets in aqueous solution and micron-sized puncta on membranes. These transitions may occur concomitantly with sol-gel transitions to form large, dynamic polymers within the droplets/puncta. I will discuss how such transitions can control the spatial organization and biochemical activity of actin regulatory signaling pathways. Our data suggest a general mechanism by which cells may achieve micron-scale organization based on interactions between multivalent macromolecules.