

MSE-Colloquium@NTU

14 September 2016, 4.00 pm

Lecture Theatre 3, Nanyang Technological University



Catching in the Act: Active, Dynamic, and Programmable Behaviours of Far from Equilibrium Membrane Biointerfaces

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About the Talk

The physical properties of membrane interfaces, quasi two dimensional bilayer lipid membranes, which together with membrane proteins, delimit cellular boundaries, are now largely well understood at thermodynamic equilibrium. But generic descriptions of far from equilibrium membranes – which allow living cells to sense, respond, and adapt to environmental perturbations, while displaying extraordinary stability – are conspicuously lacking. Here, non-equilibrium activities of membrane proteins, underlying cytoskeleton, and osmotic activities of water bathing the membrane all couple with the membrane's physical, chemical, and mechanical degrees of freedom, producing long-lived out-of-equilibrium structures with emergent reconfigurable morphologies and novel collective behaviours. Drawing from recent experiments in our laboratories employing simple models for the cellular chassis (i.e. giant vesicles composed of amphiphilic lipids and polymers), this talk highlights how membranes reconfigure when taken out of equilibrium through addition of exogenous molecules, activities of membrane receptors, and the osmotic activity of water.

About the Speaker

Professor Atul Parikh is Professor and faculty member of the Departments of Biomedical Engineering and Materials Science & Engineering at the University of California, Davis. Since 2013, he is a Visiting Professor in the School of Materials Science & Engineering at Nanyang Technological University in Singapore. He studied Chemical Engineering at the Department of Chemical Technology (UDCT), University of Bombay (B. Chem. Eng., 1987) and Materials Science (Emphasis: Polymer Science) at the Pennsylvania State University (Ph.D., 1993). Between 1996 and 2001, as postdoctoral scholar and then technical staff member in the Chemical Science and Bioscience divisions at Los Alamos National Laboratory (LANL), he explored design of biologically inspired materials and biosensors. His research interests include bio-interfaces, membrane biophysics, synthetic chemical biology, surface chemistry, and soft matter.