Picosecond interfacial dynamics in crowded lipid membranes probed with ultrafast 2D infrared spectroscopy

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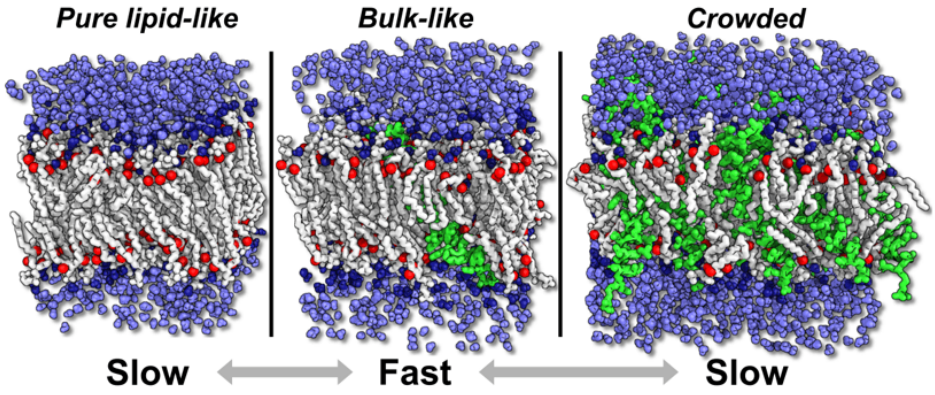

Abstract:

Lipid membranes are much more than barriers between cell compartments, they are integral components of the cell involved in key functions such as signaling, transport, and sensing. Membranes are composed of hundreds of different lipid species and contain thousands of proteins. The biophysical implications of membrane heterogeneity are not fully understood. Our group uses 2D IR spectroscopy to probe the local hydrogen-bond dynamics at the lipid-water interface.

In this talk I will discuss our current work on using transmembrane peptides with backbone isotope labels to probe the degree of water penetration into the bilayer, as well as using a range of peptide concentrations to “crowd” the lipids. Our results show that the presence of polar residues in membrane proteins increase the degree of water penetration within the bilayer. In the second part of the talk, I will discuss new experimental methods developed in our lab, including pH-jump 2D IR spectroscopy, that can be used to probe protein and lipid structural dynamics on timescales ranging from nanoseconds to milliseconds.

Short bio

Carlos Baiz is a W.T. Doherty Associate Professor of Chemistry at the University of Texas at Austin. His lab studies the biophysics of complex systems, including crowded environments, and heterogeneous lipid membranes, membrane proteins, and surfactants, using ultrafast two-dimensional infrared (2D IR) spectroscopy and molecular dynamics simulations.