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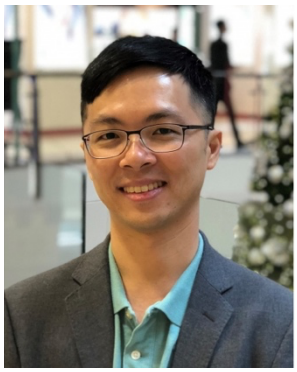

Research interest: Biological Physics, Soft Condensed Matter, Structural and Dynamic Characterizations of Lipid Membranes and Membrane-Protein Interactions.

Education: PhD, Cornell University, 2011; BS, National Taiwan University, 2003

Abstract

We applied elastic and inelastic neutron scattering to the investigations of the conformational changes and multiscale dynamics of biomimetic lipid membranes. Through the contrast-match scheme unique to neutron scattering, we were able to extract the elastic scattering signals from endosome-mimicking lipid membranes interacting with a high-performing delivery vector of nucleic acid drugs/vaccines and thereby uncovered the molecular mechanism underlying the vector's high delivery efficacy. The finding is of great merit to improving the efficiency of nucleic acid-based drugs and vaccines (e.g., the mRNA vaccines against SARS-CoV-2). On the dynamics side, coherent and incoherent inelastic neutron scattering techniques allowed us to investigate biomimetic lipid membranes' intrinsic dynamic behavior at multiple length/time scales. Surprisingly, the dynamic behavior of individual lipid molecules and their collective motions were not always coupled. This suggests that the expected causal relation between the dynamics of the differing hierarchical levels does not exist. The finding provides insight on how cells might individually or concertedly control the multiscale membrane dynamics to regulate their functions.