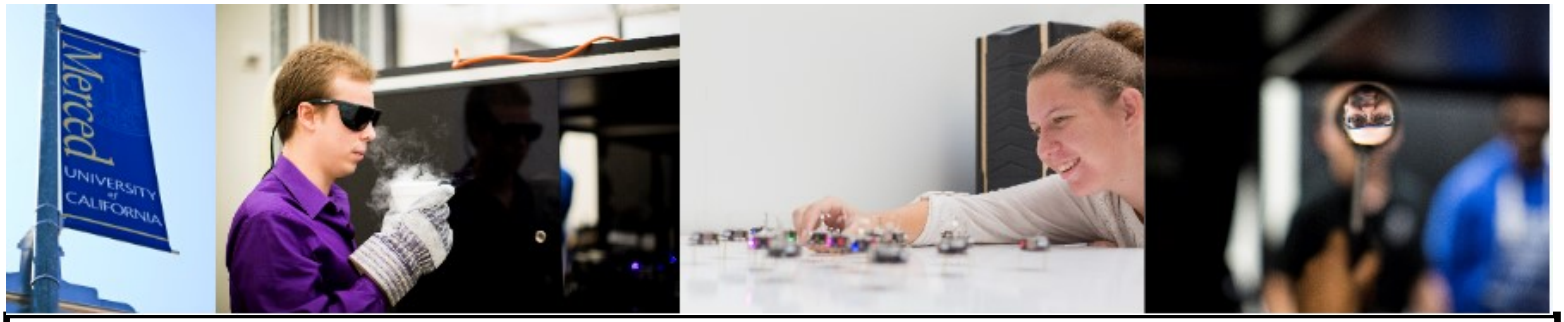

PHYSICS COLLOQUIUM:
The understanding and design of composite soft materials

Date: **12/6/19**

Time: **10:30 AM**

Location: **COB2 140**

Meng Shen
Postdoctoral Scholar
Pritzker School of Molecular Engineering
University of Chicago

For more information, contact : **Daniel Beller**

dbeller@ucmerced.edu

Abstract

The interactions within soft materials are comprised of short-ranged and long-ranged, and bonded and non-bonded interactions, leading to complex design spaces and composite hierarchical structures. Both the physical interpretation and high-throughput design of soft materials require model reduction with decomposition of the complex physics. On the one hand, phenomena such as protein precipitation at a high salt concentration, spontaneous flocculation of rare-earth ions, and pH-induced self-assembly of soluble macrocycles observed in experiments are not well understood. On the other hand, how to design materials with any arbitrary Poisson's ratio to serve for impact mitigation and biocompatibility is elusive. In this talk, I will present our recent works dedicated to addressing the above two problems by physics-based model reduction. First, I will show our recent interpretation of counterintuitive self-assembly behaviors of colloids, emulsions and macrocycles based on coarse-grained models considering electrostatic heterogeneity. Second, I will show how we developed and used a hierarchical simulation framework to design three-dimensional disordered auxetic soft materials (soft materials with a negative Poisson's ratio). The methodologies presented here not only provide fundamental understandings for the interactions in composite soft materials, but also pave the way for the computational guided experiments in the design of composite soft materials.

About the Speaker

Meng Shen is a postdoctoral scholar in Pritzker School of Molecular Engineering at the University of Chicago, working on the computational design of mechanical metamaterials. Before joining the de Pablo group, she worked on electrostatic-mediated self-assembly and polarization effects with Prof. Monica Olvera de la Cruz from the Department of Materials Science and Engineering at Northwestern University. She also collaborated with Prof. William Dichtel from the Department of Chemistry at Northwestern University on self-assembly of organic nanotubes. Before that, she worked on the atomistic filtration mechanisms in reverse-osmosis membranes with Prof. Richard M. Lueptow and Prof. Sinan Keten from the Department of Mechanical Engineering at Northwestern University.

She earned a doctoral degree from the group of Prof. Pawel Keblinski at Rensselaer Polytechnic Institute in 2013. Her phD thesis was on computational understanding of interfacial heat transfer.

She holds a B.S. and M.S. degree in Materials Physics from Fudan University, where she developed a dynamical finite element method to predict the lifetime of semiconductor packaging materials under thermo-mechanical stress.