

**JOINT INSTITUTE FOR MOLECULAR AND NANOSCALE INNOVATION (IMNI)  
AND DIVISION OF ENGINEERING****“Controlling lipid membranes for biotechnological  
understanding and application”**

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**1:30 PM**

**Abstract**

Lipids are molecules composed of hydrophilic and hydrophobic portions that self-assemble to form a wide variety of phases, including bilayer membranes consisting of two opposed monolayer sheets. In biology, such lipid membranes form the essential structure of the cell membrane and cellular organelles. Model lipid membranes are important in a variety of contexts. In physics, these membranes are widely used as model systems for coupled elasticity, entropy, and phase transitions.

I will discuss several different situations in which physics produces specific structural patterns and transitions:

- (1) The shapes of domains formed by lateral phase separation in different lipid mixtures;
- (2) The promotion and localization of phase separation by membrane adhesion;
- (3) Lipid-specific modification of membrane phase and topology by functional peptides.

Understanding membrane pattern formation and topological changes will yield insight into basic biology. It will also allow the specific, predictive design of "smart," functional lipid-based structures for use in such applications as drug delivery and artificial cells. Similarly, understanding peptide-membrane interactions will allow design of membrane-active agents, such as antibiotics and "smart" drug delivery systems, for a variety of therapeutic uses.