

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Membrane Domain Formation on Nanostructured Scaffolds

CHARLES COLLIER, FANGJIE LIU, BERNADETA SRIJANTO, Oak Ridge National Laboratory — The spatial organization of lipids and proteins in biological membranes seems to have a functional role in the life of a cell. Separation of the lipids into distinct domains of greater order and anchoring to the cytoskeleton are two main mechanisms for organizing the membrane in cells. We propose a novel model membrane consisting of a lipid bilayer suspended over a nanostructured scaffold consisting of arrays of fabricated nanopillars. Unlike traditional model membranes, our model will have well-defined lateral structure and distributed substrate attachments that will emulate the connections of cellular membranes to the underlying cytoskeleton. Membranes will be characterized using neutron reflectometry, atomic force microscopy and fluorescence to verify a suspended, planar geometry with restricted diffusion at suspension points, and free diffusion in between. This architecture will allow the controlled study of lipid domain reorganization, viral infection and signal transduction that depend on the lateral structure of the membrane.

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Date submitted: 06 Nov 2015

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