Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Lateral organization of a non-equilibrium membrane model with immobile randomly-distributed impurities ANDREW P. PARADIS, SUSAN R. MCKAY, Department of Physics and Astronomy, University of Maine, Orono, Maine 04469, SAMUEL T. HESS, Department of Physics and Astronomy, Institute of Molecular Biophysics, University of Maine, Orono, Maine 04469 — Cell membranes are dynamic, far-from-equilibrium systems; transport, signaling, and other membrane functions ensure that membrane lateral organization is heterogeneous across several length scales. However, many studies and simulations consider membranes as equilibrium systems. Here, we present a model of cell membranes that includes simplified endo- and exocytosis and immobile randomly-distributed impurities. The impurities take the form of fixed protein sites within the membrane, which act as potential localization zones for micro-domain rafts. We analyze the lateral organization in terms of spatial statistics through a modified Ripley K-test. This model illuminates the role of protein in a 1:1:1 mixture of saturated lipids, unsaturated lipids, and cholesterol. Additionally, this model exhibits a realistic heterogeneity of cluster sizes and shapes, and suggests conditions under which we may observe a partitioning of cholesterol in the membrane. Such simulated observations of the direct interactions between cholesterol, lipids, and protein on the molecular scale can enhance our understanding of all biophysical processes occurring within cell membranes.

Andrew P. Paradis
Department of Physics and Astronomy,
University of Maine, Orono, Maine 04469

Date submitted: 03 Jan 2008 Electronic form version 1.4