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Effects of Proteins and Lipids on Each Other in a Simulated Non-equilibrium Biomembrane Model ANDREW P. PARADIS, University of Maine Department of Physics & Astronomy, SUSAN R. MCKAY, University of Maine Department of Physics & Astronomy, SAMUEL T. HESS, University of Maine Department of Physics & Astronomy, Institute for Molecular Biophysics — Lateral organization in biomembranes plays a major role in membrane topology, and is thus implicated in many basic functions of biomembranes such as endocytosis and signal transduction. In this study, non-equilibrium Monte Carlo simulations are used to investigate two related scenarios: 1. the effect of a rigid distribution of proteins on the lateral organization of lipids in a biomembrane, and 2. the degree to which lipid interactions influence the lateral organization of membrane-associated proteins that are free to translate laterally. Our model includes generic saturated and unsaturated lipids, proteins, and cholesterol, and is driven out of equilibrium through simulated endo- and exo-cytosis events. By varying the temperature, the protein mole fraction, and the interaction strengths, we examine the conditions under which various types of lateral organization occur. Simulation results are analyzed with pair-correlation functions and the Ripley K-test. We compare results from simulations of the two scenarios above and from simulations of biomembranes lacking protein.

Andrew Paradis
University of Maine Department of Physics & Astronomy

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