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Non-equilibrium dynamics of heterogeneous lipid membranes[1]
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— Plasma membranes surrounding mammalian cells play a key role in regulating the exchange of information and matter between the cells and their surroundings. The unique properties of these membranes arise from the interactions between amphiphilic lipid molecules, sterols (incl. cholesterol), and proteins. It has been proposed that the plasma membrane displays dynamic heterogeneities (lipid rafts) in the local lipid composition. While such rafts have not yet been observed directly in vivo, there is ample indirect evidence that supports their existence. From a fundamental biophysical perspective, processes which may control the aggregation and stability of these rafts are poorly understood at the moment. Here, we address this issue by introducing a continuum model for the local lipid composition which incorporates non-equilibrium aspects of lipid recycling to and from the membrane. We show that recycling leads to coherent structures with a characteristic size which depends on both the recycling rate and the tendency of the components to phase separate in the absence of recycling. We argue that incorporating non-equilibrium effects is crucial in understanding the biophysical properties of the plasma membrane.

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