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Dynamical Clustering and the Origin of Raft-like Structures in a Model Lipid Membrane FRANCIS STARR, Wesleyan Univ — We investigate the dynamical heterogeneity of a model single-component lipid membrane using simulations of a coarse-grained representation of lipid molecules. In the liquid-ordered (LO) phase, lipid diffusion is hindered by the transient trapping of molecules by their neighbors, giving rise to two distinct mobility groups: low-mobility lipids which are temporarily "caged", and lipids with displacements on the scale of the intermolecular spacing. The lipid molecules within these distinct mobility states cluster, giving rise to transient "islands" of enhanced mobility having the size and time scale expected for lipid "rafts". These clusters are strikingly similar to the dynamical clusters found in glass-forming fluids, and distinct from phase-separation clusters. Such dynamic heterogeneity is ubiquitous in disordered condensed-phase systems. Thus, we hypothesize that rafts may originate from this universal mechanism, explaining why raft-like regions should arise, regardless of lipid structural or compositional details. This perspective provides a new approach to understand membrane transport.

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