

Phase behavior of multicomponent lipid membranes: rafts on a sea of uncertainty

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There is enormous interest in the proposed model of the plasma membrane that describes it as inhomogeneous, characterized by aggregates of cholesterol and saturated lipids, like sphingomyelin, which float, like rafts, in a sea of unsaturated lipids. Because the rafts and sea have different areal densities, proteins attached to the plasma membrane either by acyl chain anchors or by transmembrane regions would partition preferentially into one region or the other, thereby performing their functions more efficiently than if they were randomly distributed. Hence physical organization would lead to organization of function. We first review a simple phenomenological model that clarifies the mechanism by which such rafts could come about. Then we discuss a more microscopic model and calculation of the relative partition of proteins by the different aggregates. Finally we consider the effect of the very different compositions of the two leaves on this picture; the nature of the rafts in the two leaves, the question of whether such rafts are aligned or not, and their relative dynamics.