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**The structure of immiscible lipid phases as revealed by the Anton special purpose supercomputer** MICHAEL SANDAR, Department of Physics and Astrophysics at the University of Delaware, EDWARD LYMAN, Department of Physics and Astrophysics and Department of Chemistry and Biochemistry at the University of Delaware — We present simulation data for a bilayer composed of a ternary mixture of cholesterol, dioleoyl phosphatidylcholine and dipalmitoyl phosphatidylcholine. The chosen composition is in the two-phase region and the temperature is in the vicinity of the miscibility transition. Using the Anton special purpose supercomputer to generate continuous trajectories longer than ten microseconds— which admits complete lipid mixing —we observe robust liquid-liquid phase coexistence. We characterize the phase separated state by considering the local composition fluctuations. Correlation functions of the position reveal that the structure of the domain is circular on average, but that the boundary is subject to significant fluctuations, as expected in the neighborhood of a critical point. The domain diffuses on a slower timescale than the lipids, but by way of lipid exchange, rather than as a well-defined cluster.

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