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Electrostatically driven spatial patterns at supported lipid membrane junctions RAGHUVEER PARTHASARATHY, PAUL A. CRIPE, JAY T. GROVES, University of California, Berkeley — We have recently shown that mobile, membrane-bound proteins sandwiched at simple, cell-free junctions between lipid bilayers can organize themselves into micron-scale spatial patterns. This pattern formation is mechanical in origin, a consequence of the coupling of the lateral mobility of the proteins and inter-membrane adhesion forces. We find that these mechanically driven protein patterns can electrostatically generate patterns of charged membrane lipids. Measuring the magnitude of the electrostatic interaction as a function of lipid composition and ionic strength, and quantitatively analyzing the interplay between thermodynamics and electrostatics via a Poisson-Boltzmann approach, we are able to determine the charge densities and surface potentials of the components of our junctions – properties that are difficult or impossible to measure by other means. Surprisingly, the electrostatic potential of the proteins is a minor factor in the lipid reorganization; the protein size and its modulation of the junction topography play the dominant role in driving the electrostatic patterns.

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