Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Patchy particles by self assembly DENNIS DISCHER, DAVID CHRISTIAN, Univ. Pennsylvania — Patchy particles offer novel means for colloidal assembly or clustering of functional groups but are generally made by batch processes rather than self-assembly. Selective binding of multivalent ligands within a mixture of polyvalent amphiphiles provides, in principle, a mechanism for driving domain formation in self-assemblies. Divalent cations are shown here to crossbridge polyanionic amphiphiles, which thereby demix from neutral amphiphiles and form spots or rafts within vesicles as well as stripes within cylindrical micelles. Calcium- and copper-crossbridged domains of synthetic block copolymers or natural lipid (phosphatidylinositol-4,5-bisphosphate) possess tunable sizes, shapes and/or spacings that can last for years. Lateral segregation in these 'responsive Janus assemblies' couples weakly to curvature and proves to be restricted within phase diagrams to narrow regimes of pH and cation concentration that are centred near the characteristic binding constants for polyacid interactions. Remixing at high pH is surprising, but a theory for strong lateral segregation shows that counterion entropy dominates electrostatic crossbridges, thus illustrating the insights gained into ligand-induced pattern formation within self-assemblies. REFERENCES - [1] D.A. Christian, A. Tian, W.G. Ellenbroek, I. Levental, P.A. Janmey, A.J. Liu, T. Baumgart, D.E. Discher. Spotted vesicles, striped micelles, and Janus assemblies induced by ligand binding. Nature Materials 8: 843–849 (2009).

Dennis Discher
Univ. Pennsylvania

Date submitted: 29 Nov 2009 Electronic form version 1.4