Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Phase behavior of charged colloids on spherical surfaces COLM KELLEHER, RODRIGO GUERRA, PAUL CHAIKIN, New York University — For a broad class of 2D materials, the transition from isotropic fluid to crystalline solid is described by the theory of melting due to Kosterlitz, Thouless, Halperin, Nelson and Young. According to this theory, long-range order is achieved via elimination of the topological defects which proliferate in the fluid phase. However, many natural and man-made 2D systems posses spatial curvature and/or non-trivial topology, which require the presence of defects, even at $T = 0$. In principle, the presence of these defects could profoundly affect the phase behavior of such a system. In this presentation, we describe experiments and simulations we have performed on repulsive particles which are bound to the surface of a sphere. We observe spatial structures and inhomogeneous dynamics that cannot be captured by the measures traditionally used to describe flat-space phase behavior. We show that ordering is achieved by a novel mechanism: sequestration of topological defects into freely-terminating grain boundaries ("scars"), and simultaneous spatial organization of the scars themselves on the vertices of an icosahedron. The emergence of icosahedral order coincides with the localization of mobility into isolated "lakes" of fluid or glassy particles, situated at the icosahedron vertices.

Colm Kelleher
New York University

Date submitted: 11 Nov 2016 Electronic form version 1.4