

Physical Mathematics Seminar

Liquid crystals with p -fold rotational symmetry on cones: curvature- and boundary-induced geometric frustration

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ABSTRACT:

Geometric frustration of orientational order in two dimensions (2d) can arise due to both substrate curvature and geometric boundary constraints. We examine the interplay of these two ingredients in 2d liquid crystals with p -fold rotational symmetry (p -atics) on the surfaces of cones, under either free or tangential boundary conditions at the base. We study both ground and metastable liquid crystal textures as a function of both the cone angle and the liquid crystal symmetry p . Under free boundaries, we find that ground states, generally frustrated due to effects of parallel transport along the azimuthal direction of the cone, are characterized by a variety of fractional defect charges at the apex. Under tangential boundary conditions, we find additional frustration signified by the presence of defects on the cone flanks, and a series of defect absorption and emission transitions by the apex as the cone angle varies. We confirm our predictions numerically for a set of commensurate cone angles, whose surfaces can be polygonized with perfect triangular or square meshes.

TUESDAY, APRIL 19, 2022

2:30 PM – 3:30 PM

Building 2, Room 449

<https://math.mit.edu/sites/pms/>

ZOOM Link: <https://mit.zoom.us/j/95597721876>

(for those who cannot attend in person)