Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Lassoing the Saddle-Splay: Harnessing K_{24} Distortions to Line Up Disclinations LISA TRAN, MAXIM LAVRENTOVICH, Department of Physics, University of Pennsylvania, DANIEL BELLER, School of Engineering and Applied Sciences, Harvard University, NINGWEI LI, KATHLEEN STEBE, Department of Chemical and Biomolecular Engineering, University of Pennsylvania, RANDALL KAMIEN, Department of Physics, University of Pennsylvania — Systems with holes, such as colloidal handlebodies and toroidal droplets, have been studied in the nematic liquid crystal (NLC) 4-cyano-4-pentylbiphenyl (5CB). It was found that point or ring topological defects occur within each hole and around the system, such that the overall topological charge of the system is conserved. However, what has not been fully appreciated is the ability of the hole geometry with homeotropic (perpendicular) anchoring conditions to induce a saddle-like deformation in the NLC bulk. We exploit this by creating an array of many holes suspended in an NLC cell with oriented planar (parallel) anchoring at the cell boundaries. Through simulations and experiments, we study how the bulk saddle deformations of each hole interact to create novel defect structures, including an array of $\frac{1}{2}$ disclination lines, reminiscent of those that occur in LC blue phases. The locations of these disclination lines are tunable via the geometry of the cell and hole array, which has potential for controlled, three-dimensional self-assembly in NLCs.

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Date submitted: 12 Jan 2016 Electronic form version 1.4