Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Competition of lattice and basis for alignment of nematic liquid crystals ANDREW DEBENEDICTIS, Department of Physics and Astronomy, Tufts University, CANDY ANQUETIL-DECK, DOUGLAS J. CLEAVER, Materials and Engineering Research Institute, Sheffield Hallam University, DAVID B. EMERSON, MATHEW WOLAK, JAMES H. ADLER, Department of Mathematics, Tufts University, TIMOTHY J. ATHERTON, Department of Physics and Astronomy, Tufts University — Due to elastic anisotropy, two-dimensional patterning of substrates can promote weak azimuthal alignment of adjacent nematic liquid crystals. We consider a periodic square lattice of elliptical motifs to examine ways in which the lattice and motif can combine to favor differing orientations. Using semi-analytic elastic continuum theory and Monte Carlo simulations, we find, for circular motifs, that the coverage fraction controls both the polar anchoring angle and a transition in the azimuthal orientation. If the circles are generalized to ellipses, arbitrary control of the effective easy axis and effective anchoring potential becomes achievable by appropriate tuning of the orientation of the ellipse motif relative to the lattice vectors. To determine the behavior of liquid crystals near the domain boundaries, we additionally formulate and solve the full 3D Euler-Lagrange equations directly. We additionally comment on the role of weak anchoring and saddle-splay elasticity.

Andrew DeBenedictis
Department of Physics and Astronomy, Tufts University

Date submitted: 06 Nov 2015 Electronic form version 1.4