Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Emergent tilt order in zigzagging polymer liquids[1] BENJAMIN LOEWE, ANTON SOUSLOV, PAUL M. GOLDBART, Georgia Institute of Technology — We study a liquid of zigzagging two-dimensional polymers that have bending rigidity. These are directed polymers whose conformations lie along the paths followed by pieces on a checkerboard. We observe that in the continuum limit the statistical physics of one such polymer can be described in terms of the Dirac equation for a particle having an imaginary mass. We exploit this observation to investigate a liquid of these polymers by means of quantum many-particle techniques in imaginary-time. We treat hard-core interactions between the polymers via a transmutation of quantum particle statistics, from Bose to Fermi, and we account for additional interactions between polymers by introducing two-body interactions between the fermion particles. A self-consistent approximation predicts a phase of tilted order, i.e., the polymers may develop a spontaneous preference to zig rather than zag (or vice versa). We study this behavior analytically, computing the phase diagram and response functions for the polymer liquid, and comment on the role played by fluctuations.

[1]This work was supported in part by NSF grant DMR 12 07026.

Benjamin Loewe
Georgia Inst of Tech

Date submitted: 13 Nov 2014 Electronic form version 1.4