P.34 Active nematic dynamics in a viscoelastic background

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The term active soft matter describes a fascinating class of materials that are kept out of thermodynamic equilibrium by an internal energy source, normally in a biological context [1]. We present some initial analytical and numerical results from a novel model [2] ideally suited for studying the hydrodynamics of an active gel (such as actomyosin, found in the cell cytoskeleton) which couples active liquid crystal dynamics to a polymeric background. This coupling can lead to exotic rheological properties that strongly effect phenomena such as shear banding and zero Reynolds number "bacterial turbulence": these form just a small part of a rich and varied phase diagram.

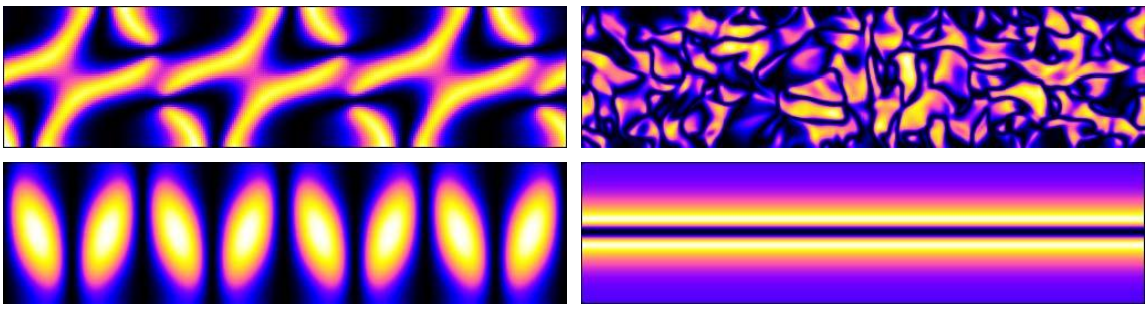

Figure 1: Example of some of the states found in the phase diagram (shown is $n_x n_y$ where $\hat{\boldsymbol{n}}$ is the liquid crystal director).

[1] M. C. Marchetti, J. F. Joanny, S. Ramaswamy, T. B. Liverpool, J. Prost, M. Rao, and R. A. Simha, Rev. Mod. Phys. 85(3), 1143 (2013)

[2] E. Hemingway, S. M. Fielding, M. E. Cates, S. Banerjee, M. Ananyo, M. C. Marchetti, and S. Ramaswamy, Work in progress (2014)