

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**Visualization of the Flow Field induced by an Oscillating Post in a Freely Suspended Smectic Liquid Crystal Membrane**<sup>1</sup> ZHIYUAN QI, KYLE FERGUSON, JOHN PAPAIOANNOU, YANCEY SECHREST, TOBIN MUNSAT, CHEOL PARK, MATT GLASER, JOE MACLENNAN, NOEL CLARK, Physics, University of Colorado, TATIANA KURIABOVA, Physics Department, California Polytechnic State University, THOMAS POWERS, Engineering and Physics, Brown University — Thin fluid membranes immersed in a less viscous, bulk fluid are of fundamental interest as approximations of true two-dimensional (2D) fluids and as models of biological membranes. Many previous studies of such fluid membranes have focused on 2D macroscopic hydrodynamic effects such as the diffusion and interaction of inclusions, with fewer experimental investigations of microscopic properties such as the flow field. We have measured the 2D flow field generated by a rigid, oscillating post inserted in a freely suspended smectic liquid crystal film surrounded by air by analyzing the motion of tracer particles in the film. Our experiments confirm Saffman's prediction that the far-field flow velocity decays as  $1/r$  (where  $r$  is the distance from the post) in the longitudinal direction, and as  $1/r^2$  in the tangential direction. The measurements are in good agreement with flow fields computed using a model that generalizes the Levine/MacKintosh point-force response functions. We have also investigated confinement effects when the post is located near the film boundary.

<sup>1</sup>This work was supported by NASA Grant No. NNX-13AQ81G, NSF MRSEC Grant No. DMR-0820579, DE-FG02-08ER54995, DE-SC0008942, and by NSF Grant No. CBET-0854108.

Cheol Park  
Physics, University of Colorado

Date submitted: 14 Nov 2014

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