Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Curvature and defects in soft membranes with orientational order[1] THANH SON NGUYEN, JUN GENG, JONATHAN V. SELINGER, Liquid Crystal Institute, Kent State University — Previous research has demonstrated that soft membranes have a coupling between curvature and in-plane orientational order. Defects in the orientational order can induce curvature, and conversely, curvature leads to an effective geometrical potential acting on defects [1]. Recently, our group has done simulations which show that the interaction between curvature and defects depends on several important issues, including the baseline curvature of the membrane (flat, cylinder, sphere, torus), the phase of the defects (radial or tangential), and the relative contribution of in-plane (intrinsic) vs. out-of-plane (extrinsic) variations of the director [2]. To understand the simulations, we develop a theoretical approach that can address those issues. Using this approach, we calculate the energy of defect structures in curved geometries, and determine how the energy varies as a function of the defect position and separation and the membrane distortions. The interaction energy depends on the relative magnitude of intrinsic vs. extrinsic couplings, and on the mechanical properties of the membrane. This approach provides opportunities to design membranes that will relax into selected shapes. [1] AM Turner et al, Rev Mod Phys 82, 1301 (2010). [2] RLB Selinger et al, J Phys Chem B, in press.

[1]This work was supported by NSF DMR-1106014.

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Date submitted: 11 Nov 2011 Electronic form version 1.4