Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Spontaneous 1 chiral symmetry breaking in model bacterial suspensions REBEKKA BREIER, Max Planck Institute for Dynamics and Self-Organization, ROBIN SELINGER, Kent State University, GIOVANNI CICCOTTI, University of Rome "La Sapienza", STEPHAN HERMINGHAUS, MARCO G. MAZZA, Max Planck Institute for Dynamics and Self-Organization — Chiral symmetry breaking is ubiquitous in biological systems, from DNA to bacterial suspensions. A key unresolved problem is how chiral structures may spontaneously emerge from achiral interactions. We study a simple model of bacterial suspensions in three dimensions that effectively incorporates active motion and hydrodynamic interactions. We perform large-scale molecular dynamics simulations (up to 10^6 particles) and describe stable (or long-lived metastable) collective states that exhibit chiral organization although the interactions are achiral. We elucidate under which conditions these chiral states will emerge and grow to large scales. We also study a related equilibrium model that clarifies the role of orientational fluctuations.

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Date submitted: 13 Nov 2014 Electronic form version 1.4