MAR16-2015-007386

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Three-Dimensional Topological Solitons in Chiral Liquid Crystals and Ferromagnetic Colloids.

IVAN SMALYUKH[1], University of Colorado Boulder

Three-dimensional knotted solitons - often called "hopfions" - have continuous physical fields classified by the Hopf index topological invariant and behave like particles. These hopfions arise in theories in many branches of physics, but their structure and stability are rarely accessible to direct experimental studies. We realize and characterize such static solitons in the molecular alignment fields of chiral liquid crystals and in the magnetization field of colloids with long-range ferromagnetic ordering. Our experiments agree with predictions of numerical modeling based on free energy minimization. By exploiting facile response of the soft matter host media, we demonstrate exquisite control of structure and tunable self-assembly of such solitonic "particles". This lecture will discuss how liquid crystals and colloids can serve as soft matter model systems in studies of structure, topology and dynamics of three-dimensional topological solitons.

[1]GSoft Early Career