Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Topology of knots and links in chiral nematic colloids
SLOBODAN ZUMER, University of Ljubljana and Jozef Stefan Institute, SIMON COPAR, University of Ljubljana, IGOR MUSEVIC, University of Ljubljana and Jozef Stefan Institute, MIHA RAVNIK, University of Oxford, UROS TKALEC, Jozef Stefan Institute — Nematic braids formed by disclinations entangling colloidal particles in chiral and achiral nematic liquid crystals are geometrically stabilized and restricted by topology. We report how self-linking number enables a classification of entangled defect lines [1, 2] and how a simple rewiring scheme for the orthogonal crossing of two half integer disclinations, based on a tetrahedral rotation of two relevant disclination segments allows us to predict nematic braids and their self-linking numbers. We further describe how using of laser micromanipulation enable the knotting of defect lines in chiral nematic colloids into knots and links of arbitrary complexity [3]. Colloids stabilized by nematic braids based on all knots and links with up to six crossings, including Hopf link, Star of David, Borromean rings are realized. We demonstrate how topology leads to the engineering of complex soft materials.

[1] S. Copar and S.Zumer, Nematic Braids: Topological Invariants and Rewiring of Disclinations, Phys. Rev. Lett. 106, 177801 (2011).
[2] S. Copar, T. Porenta and S. Zumer, Nematic Disclinations as Twisted Ribbons, Phys. Rev. E 84, 051702 (2011).
[3] U. Tkalec, M. Ravnik, S. Copar, S. Zumer and I. Musevic, Reconfigurable Knots and Links in Chiral Nematic Colloids, Science 333, 62 (2011).

Slobodan Zumer
University of Ljubljana

Date submitted: 12 Dec 2011 Electronic form version 1.4