# Topological Colloids

Lucie Baumont

February 13, 2013

## Abstract

Colloids are a kind of soft matter, or matter that is easily deformed from thermal stresses or fluctuations, in which particles of one material are suspended in another. The length scales that determine their physics are on the order of micrometers; much larger than those of atoms but still much smaller than macroscopic scales. Many examples of colloids are familiar everyday substances: fog, jelly, paint, milk and shaving cream, for instance.

In nature, the shape of the suspended particles is typically determined through minimization of interfacial energy, and particles thus exhibit a spherical topology. Senyuk et al.[1]then ask what would happen if the particles had a different topology. Though this sort of question is common in cosmology and particle physics, its application to colloidal systems is fairly novel.

To study the impact of particle topology on colloidal alignment, self assembly and response to fields, Senyuk et al. construct colloids of topologically non-trivial particles suspended in a nematic liquid crystal, a crystal whose molecules are aligned but do not form well defined plane. In the liquid crystal colloid, topological defects then form that depend on the topology of the constituent particles. One can deform these configurations by applying electric fields, laser tweezing, or local melting, but the total topological charge is conserved.

In this talk, I will review some basic topology and then present the details and results of Senyuk et al. I will also discuss possible applications of their work to topological memory devices as well as electro-optic and photonic devices.

[1]B. Senyuk *et al. Nature* 463, 200-205; 2013.