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Particles and curvatures in nematic liquid crystals. FRANCESCA SERRA, YIMIN LUO, SHU YANG, RANDALL D. KAMIEN, KATHLEEN J. STEBE, University of Pennsylvania — Elastic interactions in anisotropic fluids can be harnessed to direct particle interactions. A strategy to smoothly manipulate the director field in nematic liquid crystals is to vary the topography of the bounding surfaces. A rugged landscape with peaks and valleys create local deformations of the director field which can interact with particles in solution. We study this complex interaction in two different settings. The first consists of an array of shallow pores in a poly-dimethyl-siloxane (PDMS) membrane, whose curvature can be tuned either by swelling the PDMS membrane or by mechanical stretching. The second is a set of grooves with wavy walls, fabricated by photolithography, with various parameters of curvature and shapes. In this contexts we study how the motion of colloidal particles in nematic liquid crystals can be influenced by their interaction with the peaks and valleys of the bottom substrate or of the side walls. Particles with different associated topological defects (hedgehogs or Saturn rings) behave differently as they interact with the topographical features, favoring the docking on peaks or valleys. These experimental systems are also ideal to study the "lock and key" mechanism of particles in holes and to investigate a possible route for particle sorting.

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