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Near-field interaction of colloid near wavy walls[1] YIMIN LUO, University of Pennsylvania, FRANCESCA SERRA, Johns Hopkins University, DENISE WONG, EDWARD STEAGER, KATHLEEN STEBE, University of Pennsylvania — Anisotropic media can be used to manipulate colloids, in tandem with carefully designed boundary conditions. For example, in bulk nematic liquid crystal, a wall with homeotropic anchoring repels a colloid with the same anchoring; yet by changing the surface topography from planar to concave, one can turn repulsion into attraction. We explore the behaviors of micro-particles with associated topological defects (hedgehogs or Saturn rings) near wavy walls. The walls locally excite disturbance, which decays into bulk. The range of influence is related to the curvature. The distortion can be used to position particles, either directly on the structure or at a distance away, based on the "splay-matching" rules. When distortion becomes stronger through the deepening of the well, the splay field created by the wall can prompt transformation from a Saturn ring to a hedgehog. We combine wells of different wavelength and depth to direct colloid movement. We apply a magnetic field to reset the initial position of ferromagnetic colloids and subsequently release them to probe the elastic energy landscape. Our platform enables manipulation, particle selection, and a detailed study of defect structure under the influence of curvature.

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