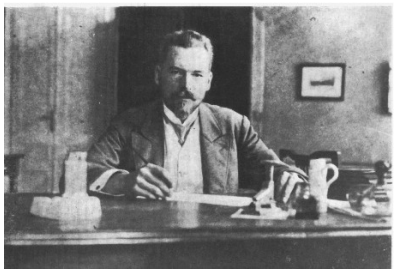

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Obstacle facilitated control of active nematics

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Active nematics are active fluids composed of elongated constituents in which force dipoles at the micro scale generate macroscopic flows. As in other active systems, bulk active nematics exhibit chaotic flows known as active turbulence. Unique to active nematics, however, is the existence of local orienational order, allowing the prescription of topological defects from various boundary geometries. In this work, motivated by recent experiments, we numerically model an active nematic in the presence of an array of obstacles of various shape and size. We show that the shape of obstacle induces defects of particular topology and that defects may be pinned by the obstacles. We use this, and the fact that positive defects are motile in active nematics, to realize control over the defect trajectories and flows in the system. We demonstrate various dynamical phases that depend on the strength of active force and geometry of the obstacles.

Primary author: SCHIMMING, Cody (Los Alamos National Laboratory)

Co-authors: Dr REICHHARDT, Cynthia (Los Alamos National Laboratory); Dr REICHHARDT, Charles (Los Alamos National Laboratory)

Presenter: SCHIMMING, Cody (Los Alamos National Laboratory)

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