# Hydrodynamics of Active Liquid Crystal Materials

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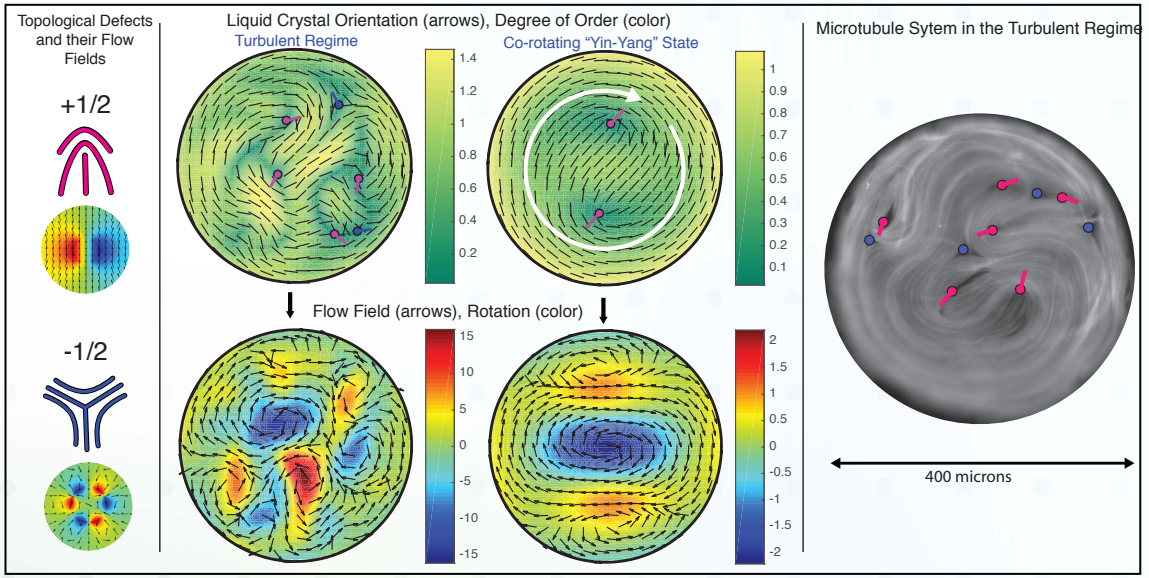
Active materials are dense collections of self- or mutually-propelling particles. When the particles are elongated (such as microtubules), they align with their neighbors when packed together. However, this order is punctuated by localized regions of disorder known as topological defects. Defects are categorized by their topological "charge" (+/- ½, labeled in pink/blue), as shown in the left panel.

The behavior of an active material confined within a two-dimensional disc -shaped corral was studied experimentally and theoretically. It was found that topological and hydrodynamic constraints resulting from confinement dramatically change its behavior as compared to an unconfined system.




There is a critical domain size (dependent on the amount of active stress that can be created by the material) beyond which the system transitions from an ordered state consisting of two co-rotating defects (right column) to a disordered turbulent state (left column). An image from the experiment (far right) shows the turbulent regime.