MAR16-2015-002707

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Patterns in Active Nematics

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Active systems, from bacterial suspensions to cellular monolayers, are continuously driven out of equilibrium by local injection of energy from their constituent elements and exhibit turbulent-like, chaotic patterns. We describe how active systems can be stabilised by tuning a physical feature of the system, friction. We demonstrate how the crossover between wet active systems, whose behaviour is dominated by hydrodynamics, and dry active matter where any flow is screened, can be achieved by using friction as a control parameter and demonstrate vortex ordering at the wet-dry crossover. We show that the self organisation of vortices into lattices is accompanied by the spatial ordering of topological defects leading to active crystal-like structures. The emergence of vortex lattices which leads to the positional ordering of topological defects may be a useful step towards the design and control of active materials.