Eugene Wigner Colloquium

event of SFB 910

Michael Wilczek

Max Planck Institute for Dynamics and Self-Organization, Göttingen

"Self-organized large-scale order in active fluids"

Active fluids, such as dense suspensions of bacteria or microtubules and molecular motors, display a fascinating range of dynamical states. Active stresses exerted by the individual agents, along with their hydrodynamic interactions, generically lead to the emergence of mesoscale vortex patterns reminiscent of two-dimensional turbulence. In this presentation, we discuss how ordered flows emerge in a minimal continuum model of active fluids. In particular, we focus on a novel type of turbulence-driven pattern formation: a self-organized, dynamic vortex crystal. Crucially, this state emerges from an extended disordered transient characterized by an upscale energy transfer. Exploring the transition from active turbulence to the vortex crystal state with a focus on the role of fluctuations and system size, we find surprising analogies to classical phase transitions. For example, we observe locally ordered crystal domains, which share similarities with magnetic domains in ferromagnetic materials, separated by turbulent boundaries. Our results therefore explore one route to self-organization in active flows.

Thursday, 17.01.19 · 16:15h · EW 202

Technische Universität Berlin · Institut für Theoretische Physik · Hardenbergstraße 36 · 10623 Berlin

www.itp.tu-berlin.de/sfb910