MPIDS Colloquium

MAX-PLANCK-GESELLSCHAFT

Spontaneous chiral symmetry breaking in active fluids

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Recent experiments show that bacterial and other active suspensions in confined geometries can self-organize into persistent flow structures that exhibit spontaneously broken mirror symmetry. To describe these observations within a minimal theoretical framework, we consider generalized Navier-Stokes (GNS) equations that combine a generic linear instability mechanism with a conventional advective nonlinearity. This phenomenological model is analytically tractable and reproduces several experimentally observed phenomena, including spontaneous flows and viscosity reduction in active suspensions. Direct numerical simulations and triad analysis of the GNS equations predict that 3D active flows can realize chiral Beltrami vector fields that support inverse energy transport from smaller to larger scales.

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MPIDS, Prandtl lecture hall, building AI, Am Faßberg 11, Göttingen

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