ESAM SEMINAR SPEAKER

Symmetry Breaking and Pattern Formation in Soft Matter and Active Fluids

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Geometric constraints affect pattern selection and topological defect formation in a wide range of non-equilibrium processes, from crystal growth to morphogenesis. In the first part of this talk, I will summarize recent experimental and theoretical work that aims to understand how curvature controls symmetry breaking and topological defects on the wrinkled surfaces of elastic bilayer materials. Specifically, we will present a higher-order PDE model that captures essential characteristics of the experimental data. In the second part, we will generalize the underlying ideas to obtain an analytically tractable description of bacterial and other active suspensions. The resulting generalized Navier-Stokes equations reveal an unexpected chiral symmetry-breaking mechanism, and offer insight into the triad dynamics of classical turbulence by uncovering a previously unknown cubic invariant.

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