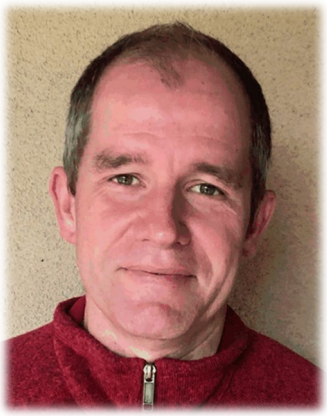
Colloquium

MAX PLANCK INSTITUTE
FOR DYNAMICS AND
SELF-ORGANIZATION

Morphogenesis of Soft Matter



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Biological morphogenesis is driven by inscribing patterns of in-plane strains into elastic epithelial sheets, causing them to fold into complex tissues, organs, and entire organisms. Translating such complex yet highly robust self-organizing processes into the realm of materials science presents a largely unexplored opportunity to generate structural and dynamical materials that are not accessible using established paradigms of self-assembly and materials processing. We use the chaotic flows generated by a microtubule-based active fluid to assemble self-binding actin filaments into thin elastic sheets. Starting from a uniformly dispersed state, active flows drive the motion of actin filaments, inducing their bundling and formation of bundle-bundle connections that ultimately generate an elastic network. The emerging network separates from the active fluid to form a thin elastic sheet suspended at the sample midplane. The active fluid drives large in-plane and out-of-plane deformations of the elastic sheet which are driven by low-energy bending modes. Self-organized sheets eventually exhibit centimeter-sized global spontaneous oscillations and traveling waves, despite being isotropically driven on micron lengths by the active fluid. Self-organized mechanical sheets pose a challenge for understanding how hierarchical structures and dynamics emerge from a largely structureless initial suspension of active and passive microscopic components.

Wednesday, April 9th, 2025 at 2:15 pm

Prandtl lecture hall and
Zoom Meeting ID: 959 2774 3389
Passcode: 651129, direct link

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