

Internal Webinar

From Spirals to Flageller Beating: How Pivot-like Defects Control Semiflexible Filament Dynamics in Motility Assay

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Semiflexible polymers--such as actin filaments, microtubules, and specialised protein assemblies--are central to both biological and synthetic active systems. Their dynamics arise from a subtle interplay between intrinsic stiffness, active forces, and environmental constraints. In this talk, I will discuss how such polymers reorganise when driven far from equilibrium by motor activity and perturbed by localised defects. We focus on semiflexible filaments containing pivot-like motility defects, representing rigor-bound or immobile motor proteins. These internal constraints act as dynamic anchors, inducing sharp transitions between tightly coiled spiral states and extended, flagella-like beating. By systematically varying defect position, activity, and filament stiffness, we uncover how localised pinning reorganises active filament dynamics and governs the emergence of distinct motility modes.

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