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Plenary: Buckling, mixing, swimming, dissolving: adventures with helices at the microscale

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Title: Buckling, mixing, swimming, dissolving: adventures with helices at the microscale.

Presenter: Lisa Fauci, Tulane University

Abstract: The motion of passive or actuated elastic filaments in a fluid environment is a common element in many biological and engineered systems. Examples at the microscale include bacterial flagella propelling a cell body and engineered helical nanopropellers designed to penetrate mucosal tissue for drug delivery. Complex fluid environments and geometries, such as polymeric networks or confinement, can have dramatic effects upon the dynamics of filaments, whether rigid or flexible. In this talk we will present computational models of a few intriguing systems: actin-like fibers in straining flows that spontaneously buckle into helices, flexible helical filaments whose swimming performance improves when confined to a narrow tube, and explorations of rigid helical filaments that penetrate a polymeric network with the ability to remodel the material properties of the network as it moves through it.