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Fluctuations, Dynamics, and the Stretch-Coil Transition of Single Actin Filaments in Extensional Flows VASILY KANTSLER, RAYMOND E. GOLDSTEIN, DAMTP, University of Cambridge, DEPARTMENT OF APPLIED MATHEMATICS AND THEORETICAL PHYSICS TEAM — Semi-flexible polymers (actin filaments) subject to hydrodynamic forcing play an important role in cytoskeletal dynamics in the cell. The non-equilibrium problem of semi-flexible polymer dynamics is highly challenging due to the coupling between the objects deformations and the flow. This leads to a free-boundary hydrodynamic problem, where the object's shape is not given *a priori*, but determined by an interplay between the fluid stresses, bending energy and the length constrain of the actin filaments. We have investigated experimentally and analytically dynamics of actin filaments in elongational flow. Near hyperbolic stagnation points of the flow filaments experience a competition between bending elasticity and tension induced by the flow, and are predicted to display suppressed thermal fluctuations in the steady regime and a buckling instability under sudden change of the velocity gradient. Using a microfluidic cross-flow geometry we verify these predictions in detail, including a fluctuation-rounded stretch-coil transition of actin filaments.

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