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Dynamics of Semiflexible Polymers in Solution

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Biopolymers as individual filaments or assembled into solutions and networks are highly versatile materials with a large variety of different mechanical properties. At the same time they are interesting model systems that allow for the test of fundamental concepts of statistical mechanics and soft matter physics. The challenge is to understand how macroscopic material properties emerge from the intriguing interplay between entropy, filament elasticity and topological constraints on a molecular scale. In this talk we review recent progress in our understanding of the conformations and dynamics of single filaments from the single filament level up to the level of complex multi-component networks. We critically review standard theories like the tube model and the reptation idea and show how new concepts like “floppy modes” emerge for stiff biopolymer systems. In addition to their physical relevance these concepts also contribute to our understanding of the functional principles of the cytoskeleton.