

Elasticity of Semi-flexible Polymer Networks

(Tutorial #9)

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Semi-flexible polymers, like actin, collagen, and neurofilaments, with persistence lengths less than their physical length are critical components of living matter. When crosslinked, they resist elastic deformations and serve as such important parts of the cell as the cytoskeleton. This lecture will review the non-linear static force-extension curve of semiflexible polymers and show how this curve along with a simple affine network theory provides a surprisingly good fit to experimental non-linear stress-strain data. It will then explore, via effective-medium theory and simulations, the competition between stretching and bending forces and the development of linearized elasticity in various models for these networks, including the two-dimensional Mikado model and two- and three-dimensional lattice models.