

Wormlike Chains in Disordered and Glassy Environments

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The wormlike chain is the standard model of a semiflexible thread-like macromolecule. As such it is the basis for our mathematical understanding of the universal mechanical and dynamical properties of important biopolymers such as DNA, F-actin, microtubules, and their solutions and networks. Biopolymers in cells are argued to exhibit glassy mechanics as a consequence of molecular crowding in the cytoplasm. We estimate glassy conformations along similar lines as for (directed) flexible polymers. Glassy dynamics is discussed within the framework of the recently proposed “glassy wormlike chain model”. Important implications, such as “rheological redundancy” and a generalized time-temperature superposition principle for the soft glassy rheology of cells and polymer solutions and networks are outlined.