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**Hamiltonian formulations in the computation of extremely deformed nano-scale hyper-elastic rods.**

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There has been a recent resurgence of interest in models exploiting elastic filaments and ribbons, motivated in large part by nano-scale applications, including DNA. Such models are frequently nearly inextensible or nearly unsharable. I will describe how such systems can be modelled as a smooth limit within a hierarchy of perturbed Hamiltonian formulations of the governing equations. Examples include a sequence-dependent double-strand birod model of DNA, where a more familiar rod model can be obtained as a smooth limit in which the intra-strand degrees of freedom are frozen..