Recent progress in free energy recovery from irreversible pulling experiments

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Fluctuation theorems establish relations governing energy exchange processes in systems in contact with thermal sources, providing new methodologies to obtain equilibrium information from non-equilibrium experiments[1,2]. In this talk I will show new applications to free energy recovery of DNA structures in single molecule experiments using an extended version of Crooks fluctuation relation[3]. New applications extend to free energy recovery of kinetic molecular structures such as intermediate states or misfolded states[4] and protein/peptide nucleic acid binding.

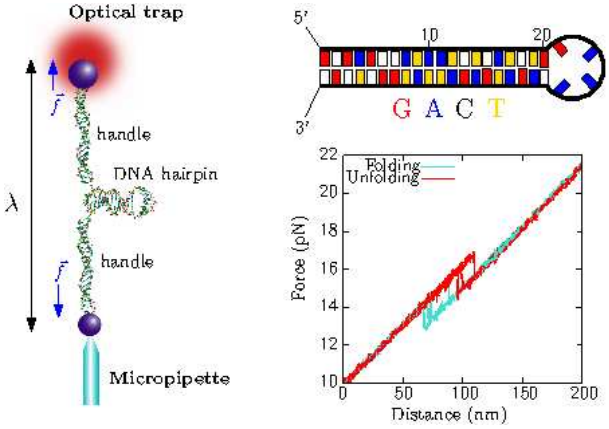

FIG. 1. A 20-bp DNA hairpin is pulled from its 5' and 3' ends using optical tweezers. From the measured irreversible force-distance curves and using the Crooks fluctuation relation it is possible to extract the free energy of formation of the native folded structure. Recently we have extended Crooks relation to extract free energies of more complex molecular structures exhibiting kinetic states[3,4].

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