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DNA kept under tension reveals mechanochemical properties of protein reaction pathways

GIJS WUITE, Vrije Universiteit Amsterdam

The genetic information of an organism is encoded in the base pair sequence of its DNA. Many specialized proteins are involved in handling DNA, preserving and processing the vast amounts of information on the DNA. In order to do this swiftly and correctly these proteins have to move quickly and accurately along and/or around the DNA. Using model systems such as restriction enzymes and abundant bacterial gene regulators such as H-NS we try to understand the physics (forces, energies, mechanochemistry) behind such DNA processing. We are currently performing single molecule experiments on (non-)specific protein-DNA interactions in general and the organization of the bacterial nucleoid in particular. The experiments aim to elucidate the induced-fit reaction, substrate binding and DNA hydrolysis. Moreover, we are studying the relation between DNA configuration and association rates. The results of these model systems are generalized and though to be applicable to many DNA-protein interactions.