

## Dynamics of conformational changes in DNA.

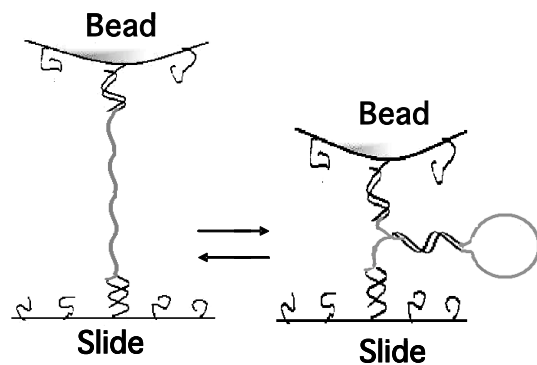
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What we know about conformational changes of proteins and DNA comes mostly from structural studies. The dynamics of these processes is much less explored, because of a lack of experimental techniques. Single molecule methods are in principle the most straightforward way to study dynamics.

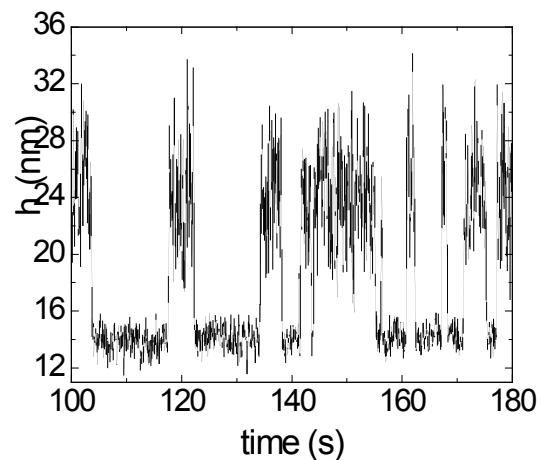
Here we use the single-molecule method based on evanescent wave scattering developed in the lab to study the dynamics of opening and closing of DNA hairpins.

This experiment differs from previous studies of hairpins in that the force field is non-homogeneous in space on the scale of the hairpin, and the ends of the DNA hairpin are coupled to the solid surfaces through very short ( $\sim 5$  nm) arms. This work is in collaboration with the Bishop-Rasmussen group at Los Alamos National Lab, where they study hairpin opening dynamics using a reduced-degrees-of-freedom statistical mechanics model (the Peyrard-Bishop-Dauxois model of DNA melting). This allows informative comparisons between model and experiments.

**The 1 micron diameter bead is tethered to the slide by a single 74 bases long ssDNA molecule containing the 40 bases DNA hairpin. The average position of the bead moves up and down as the hairpin opens and closes.**



**Part of a time series of the bead's position with respect to the slide, showing the DNA hairpin tether repeatedly switching from the open (larger  $h$ ) to the closed (smaller  $h$ ) state.**



- J. Hanne, G. Zocchi, N. K. Voulgarakis, A. R. Bishop and K. Ø. Rasmussen, "Opening rates of DNA hairpins: experiment and model", to appear in *Phys. Rev. E* (2007).