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Single molecule views of Nature's nano-machines

TAEKJIP HA, University of Illinois at Urbana-Champaign

We are interested in the perturbational analysis of biological molecules to better understand their mechanisms. Our readout is the fluorescence signal from individual biomolecules, mainly in the form of single molecule fluorescence resonance energy transfer (FRET). We are pioneering approaches to perturb and control biomolecular conformations using external force (combination of single molecule FRET and optical trap) or other biological motifs (DNA hybridization, G-quadruplex, aptamers,.). In this talk, I will present our latest results on mapping the conformational energy landscape of the Holliday junction through simultaneous fluorescence and force measurements. In addition, a new nanomechanical device called single molecule nano-metronome will be discussed with an outlook toward controlling protein conformations using nucleic acids motifs.