

Abstract Submitted
for the TSF11 Meeting of
The American Physical Society

Free energy profile of DNA from single-molecule manipulation experiments¹ ERIC FREY, CHING-HWA KIANG, Rice University — Nonequilibrium work theorems, such as the Jarzynski equality and the Crooks fluctuation theorem, allow one to use nonequilibrium measurements to determine equilibrium free energies. For example, it has been demonstrated that the Crooks fluctuation theorem can be used to determine RNA folding energies. We used single-molecule manipulation with an atomic force microscope to measure the work done on poly(dA) as it was stretched and relaxed. This single-stranded nucleic acid exhibits unique base-stacking transitions in its force-extension curve due to the strong interactions among A bases, as well as multiple pathways. Here we showed that free energy curves can be determined by using the Crooks fluctuation theorem. The nonequilibrium work theorem can be used to determine free energy curves even when there are multiple pathways.

¹We acknowledge support from the Alliance for NanoHealth training fellowship NASA/DOE, NSF DMR0907676, and Welch Foundation C-1632.

Eric Frey
Rice University

Date submitted: 09 Sep 2011

Electronic form version 1.4