Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Electrostatic Analysis of The Nucleosome Stability ANDREW FENLEY, DAVID ADAMS, ALEXEY ONUFRIEV, Virginia Tech — The wrapping and unwrapping of the DNA around the histone octomer of a nucleosome core particle (NCP) plays a vital role in many cellular processes, such as transcription, replication, and cell differentiation. The exact mechanisms underlying the associated transitions in the NCP are still not well understood. We present a simple, two-state electrostatic model of the NCP that agrees with a number of experiments and suggests mechanisms that could initiate DNA unwrapping *in vivo*. We present and discuss a 2D phase diagram of the system as a function of ambient salt concentration and the net charge of the histone octomer. The model also predicts the free energy of a NCP at physiological conditions. The stability of the system is strongly dependent on the charge of the histone octomer, hinting at possible modes of control in *in vivo* (acetylation and/or pH changes). The model permits analytical solutions in the low and high salt limits. The analysis of these solutions suggests simple physical mechanisms behind the observed folding and unfolding behavior at environmental solvent conditions.

Andrew Fenley
Virginia Tech

Date submitted: 20 Nov 2006 Electronic form version 1.4