1104-82-251 **Stefan M Giovan**, University of Texas at Dallas, Department of Molecular and Cell Biology, 800 West Campbell Rd., FO31, Richardson, TX 75080, **Andreas Hanke**, University of Texas at Brownsville, Department of Physics and Astronomy, 80 Fort Brown, Brownsville, TX 78520, and **Stephen D Levene*** (sdlevene@utdallas.edu), University of Texas at Dallas, Departments of Bioengineering, 800 West Campbell Rd, EC31, Richardson, TX 75080. *DNA looping and knotting in the wormlike limit: normal modes and the harmonic approximation.*

The free-energy cost of forming DNA knots and loops involves a delicate and length-scale-dependent balance of enthalpic and entropic contributions. Although obtaining the enthalpy due to geometrical and/or topological constraints from computational models is generally trivial, computing the entropic term, $T\Delta S$ is a challenging problem in statistical mechanics. For sufficiently small systems it is possible to obtain the entropy by using normal-mode analysis, which reduces the problem to a system of harmonic oscillators. This technique not only gives an exact result for the free energy but also yields the full spectrum of eigenmodes, which in turn may yield insight into the dynamic behavior of the system. We will explore the applicability of this approximation for small DNA loops and circular DNAs along with extensions to systems that cannot rigorously be considered harmonic. (Received September 02, 2014)