Meeting: 1002, Pittsburgh, Pennsylvania, SS 6A, Special Session on Mathematical Modeling of Nonlinear Phenomena in Biology and Mechanics

1002-74-110 **Bernard D Coleman*** (bcoleman@jove.rutgers.edu), Rutgers University, Department of Mechanics and Materials Science, 98 Brett Road, Piscataway, NJ 08854-8058. *On long range electrical interactions in DNA elasticity.*

DNA elasticity is a branch of non-linear mechanics in which one studies the (often intrinsically curved) nanoscale rod-like structures that serve as models of the familiar double helix form of DNA. This talk is intended to give an overview of research done in collaboration with Yoav Biton (Rutgers) and David Swigon (University of Pittsburgh) on a theory of the equilibrium configurations of nonhomogeneous DNA molecules in solution. The theory takes into account not only the dependence of elastic and geometric properties on nucleotide sequence, but also the electrostatic forces exerted by the (negatively charged) phosphate groups and the screening of those forces by positively charged ions in the solution. In this naturally discrete theory the equations of equilibrium for a DNA molecule with N nucleotide base pairs form a system of $6N$ nonlinear algebraic equations for which the Jacobian matrix is completely full. Examples will be given of bifurcation diagrams obtained when one calculates the dependence of equilibrium configurations on the ionic strength or (equivalently) the concentration c of salt in the solution. Cases will be shown in which a DNA molecule has two remarkably different, but yet both locally stable, equilibrium configurations at the same value of c. (Received September 09, 2004)