University of Texas at San Antonio

Department of Physics & Astronomy

Dr. Montgomery Pettitt

Sealy Center for Structural Biology and Molecular Biophysics

Friday, November 22, 2013

3:15 p.m.-4:15 p.m.

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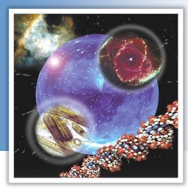
DNA Biophysics in Nanobiology: Advantages of nonlinear behavior

Nucleic acids are an important component of many kinds of bionano technology in devices for detection, analysis, recognition and therapeutics. The nonlinear elastic properties of the nucleic acid molecules are sensitive to environment. DNA is double stranded and occasionally knotted but must open to get replication, repair, transcription and recombination. On opening the elastic persistence length changes by over two orders of magnitude. The interface between high-tech media like silicon or silicon dioxide and nucleic acids changes the properties of DNA. This interface has immense possibilities for the future in the areas of combinatorial detection and synthesis. Interfaces between disparate phases of matter offer large electrostatic fields and density gradients changing the local free energy surface and therefore form a challenging set of problems in current design issues. We show simple analytic models for melting temperature shifts in reasonable agreement with experiment for both DNA and peptide chips. Our coarse grained models show promise for describing aspects of sequence and target length dependence. Sequence dependent discrepancies require theories beyond mean field. Our description includes atomic and coarse grained simulations.



Department Contact Information
Dr. Marcelo Marucho • 210.458.7862 • Marcelo.Marucho@utsa.edu
Mildred Herrera-Rosales• 210.458.5601 • Mildred.Herrerarosales@utsa.edu
physics.utsa.edu/