Abstract for GR-TR Conference on Statistical Mechanics and Dynamical Systems

Talk Invited Invited Talk

Statistical and dynamical properties of nonlinear base-pair openings in DNA

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Statistical and dynamical properties of base-pair openings (bubbles) in double stranded DNA will be discussed using the Peyrard-Bishop-Dauxois (PBD) nonlinear dynamical model [1]. A number of successful comparisons with experiments related to base-pair openings will be presented [1, 2, 3, 4].

Theoretical predictions for the position of large thermal openings are compared with experimental results in gene promoter DNA sequences and the most favorable openings occur at transcriptionally relevant sites [5, 6].

Several physical properties of the model will be discussed, like temperature dependent signatures of big bubbles identified in the dynamic structure factor [7], non-exponential decay of base-pair opening fluctuations [8], and the probability distribution of bubble lengths [9].

Finally the structural PBD model will be coupled with a charge propagating along the DNA double helix [10]. Static polaronic solutions and their normal modes related to AC response [11], as well as dynamical charge trapping affecting macroscopic transport parameters [12] will be presented.

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