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

Talk Invited Invited Talk

Statistical physics of DNA breathing, melting and unzipping

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The cooperative behavior of double-stranded DNA macromolecules can be described in terms of mesoscopic models which identify a single, "relevant" degree of freedom per base pair (Peyrard-Bishop-Dauxois Hamiltonians). This type of modeling has been successful in capturing the essential nonlinear lattice dynamics which underlies thermal and mechanical denaturation phenomena (DNA "melting" and "unzipping", respectively).

I will present the general theoretical framework and report some more recent results obtained by applying the theory to other features of DNA secondary structure, such as hairpin formation and the properties of local openings ("denaturation bubbles") which are known to be instrumental in the process of transcription.