Workshop on Nanomechanics of Biomolecules

August 20-25 2006
Center Stephano Franscini

List of Posters

Arnaud Amzallag
EPFL – FSB – IMB – LCVMM
Lausanne, Switzerland

"3-D reconstruction and comparison of shapes of DNA minicircles observed by cryo-electron microscopy"

We use cryo-electron microscopy to compare shapes of 158 bp long DNA minicircles that only differ in the sequence of 18 bp block containing either TATA box or CAP site. We present a sorting algorithm that autocorrelates the reconstructed 3-D shapes of analyzed DNA minicircles and groups them into distinct categories. We observe that the presence of TATA box sequence, that is believed to be easily bendable, does not significantly affect the shape of the analyzed minicircles.

Marc Baaden
Laboratoire de Biochimie Théorique, CNRS UPR9080
Institut de Biologie Physico-Chimique
Paris, France

"Probing mechanical properties of molecular motors and fusion proteins"

Exocytosis involves the transport of molecules stored within lipid vesicles from the inside of a cell to its environment. Several steps are required, one of which is transport along microtubules powered by kinesin molecular motors and subsequently fusion of the vesicles with the cell membrane mediated via SNARE (soluble N-ethylmaleimide sensitive factor attachment protein receptor) fusion proteins. The function of these proteins likely requires specific mechanical properties adapted to their task, which we aim to characterize. We present first exploratory results on the kinesin motors and on the four-helical SNARE complex using a theoretical approach and atomistic or bead-scale models.

Nils Becker
Max Planck Institute for the Physics
of Complex Systems
Dresden, Germany

"Comparing Dinucleotide Elastic Potentials for DNA"

Andrey Cherstvy
Max Planck Institute for the Physics
of Complex Systems
Dresden, Germany

"DNA-DNA and DNA-protein electrostatic interactions"

Davide Demurtas
UNIL LAU
Lausanne, Switzerland

"Characterization of 94 bp long DNA minicircles by cryo-Electron Microscopy"

Mohammadreza Ejtehadi
Institute for research in Theoretical Physics and Mathematics (IPM)
Tehran, Iran

"Anisotropic Elastic Model of DNA Loops"
and
"Viral stability against the pressure fluctuations"

Hernan Garcia
California Institute of Technology
Pasadena, USA

"Transcriptional Regulation and Action at a Distance: Using cells as test tubes to probe DNA in vivo"

DNA mechanics plays a central role in gene expression. Transcriptional control is realized through the interaction of the transcriptional machinery with DNA-bound transcription factors which can loop the DNA between two distant sites. DNA mechanics influences the gene expression readout of a wide variety of transcriptional networks.
We develop a statistical mechanical model to quantify the in vivo energy cost of different DNA conformations in bacteria, which allows us to extract mechanical properties of DNA and to compare completely different regulatory systems such as the lac operon and the arabinose operon. Based on this quantitative understanding of DNA looping in the lac operon we propose to use an artificial lac system as a tool to probe DNA mechanics in vivo. In particular, we use this system to determine if sequence dependent flexibility of nucleosomal positioning sequence is a measurable effect in bacteria in the complete absence of nucleosomes. This work demonstrates that a careful interplay between quantitative data and quantitative models leads to a consistent picture of transcriptional regulation which yields falsifiable predictions.

Illya Horenko
Free University of Berlin
Scientific Computing
Berlin, Germany

"Data-based dimension- and model- reduction: inverse modelling in molecular dynamics"

Prof. John E. Johnson
Department of Molecular Biology
The Scripps Research Institute
La Jolly,
USA

"A quorum of covalent crosslinks in HK_{97} bacteriophage capsids spring-loads a conformational switch"

Filip Lankas
EPFL – FSB – IMB – LCVMM
Lausanne, Switzerland

“Atomistic molecular dynamics simulations of DNA minicircles”

Boris Marcone, Francesco Zonta
Padova University
Department of Physics “Galileo Galilei”
Padova, Italy

"Knots in proteins"

Chantal Prevost
Laboratoire de Biochimie Théorique, CNRS UPR9080
Institut de Biologie Physico-Chimique
Paris, France

"DNA deformations in homologous recombination"

Prashant K. Purohit
Dept. of Mechanical Engineering and Applied Mechanics
University of Pennsylvania,
Philadelphia, USA

"Elasticity of DNA loops"

Eugene Starostin
Department of Civil and Environmental Engineering
University College London
London, UK

"DNA Condensation: From Toroids To Hollow Spheroids"

Antonio Trovato
INFM - UDR PADOVA
Padova, Italy

"Computation of accessible surface area for self-avoding tubes"

Prof. Ir. Gijs J.L.Wuite
Vrije Universiteit
Division of Physics & Astronomy / FEW
Amsterdam, The Netherlands

"Unraveling the H-NS-mediated organization of bacterial chromatin using a dual DNA manipulation assay"