Physics of Chromosome Folding and Disentanglement

All biological phenomena depend on genetic information which is encoded into the base-pair sequence along the very long DNA molecules found in all living cells. The DNAs in chromosomes, in addition to being biologically important, are amazing physical objects, being 2 nanometers wide and (in humans) several centimeters in length. I will explain how the cell takes care of these long, fragile chromosomal DNAs and how it uses DNA itself as a key mechanical component of the cell nucleus. Then, during and following DNA replication, our cells face the gigantic challenge of figuring out how to topologically separate those long polymers from one another. I will discuss our current understanding of the "lengthwise compaction" mechanisms underlying this process, focusing on the interplay between "loop-extruding" SMC complexes (mainly condensin) and DNA-topology-changing topoisomerase II.

Biography

1984 B.Sc. Physics, University of Alberta, Edmonton, Canada
1989 Ph.D. Physics, MIT (statistical mechanics, liquid crystals)
1989-91 Postdoc, University of Chicago (statistical mechanics, polymers)
1991-94 Postdoc, Cornell University (statistical mechanics, DNA)
1994-96 Fellow, Rockefeller University, (biological physics, DNA, membranes)
1996-2006 various types of professor, Physics, University of Illinois at Chicago (DNA-protein interactions and chromosome organization) 2006-present Professor, Departments of Physics & Astronomy and Molecular Biosciences (DNA-protein interactions and genome self-organization)

Department of Physics
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Theoretical and Applied Physics

Spring 2020

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Dept. of Physics and Astronomy
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Northwestern University

Wednesday, February 26th

4:00 PM

Innovation Hall

Room E430

Refreshments will be available at

3:30 PM.

In E217

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