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4D Chromosome Organization: Combining Polymer Physics, Knot Theory and High Performance Computing

Anna Lappala
Harvard University

Abstract:

Self-organization is a universal concept spanning numerous disciplines including mathematics, physics and biology. Chromosomes are self-organizing polymers that fold into orderly, hierarchical and yet dynamic structures. In the past decade, advances in experimental biology have provided a means to reveal information about chromosome connectivity, allowing us to directly use this information from experiments to generate 3D models of individual genes, chromosomes and even genomes. In this talk I will present a novel data-driven modeling approach and discuss a number of possibilities that this method holds. I will discuss a detailed study of the time-evolution of X chromosome inactivation, highlighting both global and local properties of chromosomes that result in topology-driven dynamical arrest and present and characterize a novel type of motion we discovered in knots that may have applications to nanoscale materials and machines.

Date: 03/07/2022

Time: 9:00 AM-10:15 AM (PT)

About the speaker:

Dr. Anna Lappala completed her PhD in Physics at the Cavendish Laboratory, University of Cambridge, in 2015. Shortly after, she worked in the Department of Theoretical Chemistry at Cambridge with Prof. Daan Frenkel FRS as a Newton Trust Fellow, after which she moved to New Mexico where she worked at Los Alamos National Laboratory as a Post Doctoral Center for Nonlinear Studies Research Fellow.

Dr. Lappala is currently an Instructor in Investigation at Harvard University and Massachusetts General Hospital.

For more information, contact: Kinjal Dasbiswas, Fereshteh Memarian
kdasbiswas@ucmerced.edu, fmemarian@ucmerced.edu

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