



Master internship/PhD thesis in 3D Genomics:

Polymer models of chromosomes: from mechanisms to functions

Our group is looking for a Master student and/or PhD candidate in Biological Physics or Computational Biology to work on chromosome folding.

Context: Inside the cellular nucleus, DNA is tightly packed into a polymer-like structure called chromatin. Characterizing how chromatin self-organizes is one of the major challenges faced in recent years by biology. During the last decade, thanks to the development of advanced experimental techniques, major progresses have been realized in our understanding of the multi-scale chromosome organization during interphase. An increasing number of experimental evidences has suggested that genome 3D organization may play a decisive role in the regulation of gene expression and in diseases. It is therefore of high importance to better characterize the mechanisms driving such organization and to provide the biological and genome engineering communities with tools to define, predict, perturb and interfere with cell fate using genome structural information.

Objectives: The student will develop a research activity on the modeling of chromosome folding and dynamics in eukaryotes to better characterize the role of fundamental processes like, for example, loop extrusion or homologous pairing. It will involve the development of original models coupling statistical and polymer physics, of efficient simulation schemes, and of statistical tools to analyze experimental data. The project will be realized in close collaboration with experimental biology groups working on various systems and species (human, drosophila, worms, yeast, etc.).

Environment: The candidate will integrate our group 'Physical Biology of Chromatin' that mainly focuses on understanding the fundamental bases of chromatin and gene regulation using physical modeling and computational approaches. This entails understanding chromosome organization and dynamics, and epigenomic regulation in normal and cancer cells. Our innovative research is conducted in close interaction with top-leader experimental and clinical partners. The group is integrated within the institute 'LBMC' ('Biology and Modeling of the Cell', ENS de Lyon, France) that aims to characterize the molecular bases underlying the organization and functioning of cellular processes in normal and pathological conditions. It is based at Ecole Normale Supérieure de Lyon, a French top-leading research and educational institute.

Profile of the candidate: We are looking for a creative and highly motivated candidate with a background in statistical or polymer physics, in computer science or in computational biology. Advanced skills in programming is required and a previous interdisciplinary experience in connection with biological issues would be a plus.

To apply, please send your CV and a motivation letter to Daniel Jost at daniel.jost@ens-lyon.fr