

funded PhD position in biological physics or computational biology:

Understanding how condensin folds genomes during mitosis

Our group is looking for a PhD candidate in biological physics or computational biology to work on chromosome folding in close collaboration with experimentalists.

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 the spatio-temporal organization of the genome 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. In particular, a conserved principle is the folding of the genome into loops by active translocating motors such as condensin and cohesin. However, the nature and the consequences of the interplay between such DNA-binding motors and chromatin remain largely unknown. In this project, we aim to address that question by focusing on the condensin complex during mitosis using an interdisciplinary approach.

Objectives: The student will develop a research activity on the modeling of chromosome folding and dynamics in eukaryotes to better characterize the role of histones and other chromatin-binding proteins in regulating the condensin loop extrusion activity. 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 the group of Pascal Bernard for experimental biology (LBMC, ENS de Lyon) and Olivier Cuvier (CBI, Toulouse) for data analysis.

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. Our innovative

research is conducted in close interaction with top-leader experimental partners. The group is integrated within the Laboratory of Biology and Modeling of the Cell 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