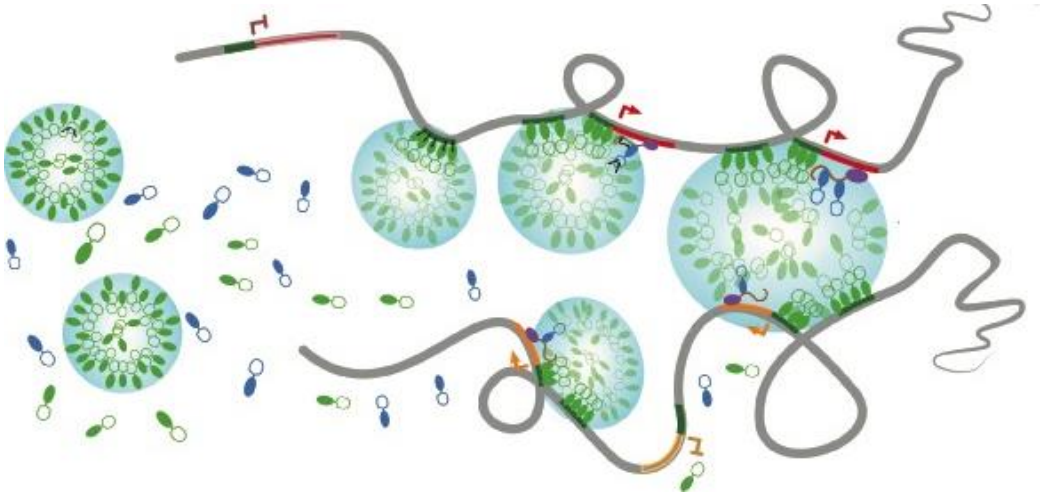
Interdisciplinary thesis offer

Genomic architecture and nuclear bodies: a bit of physics in gene expression

Thesis financed by the Mission for Transversal and Interdisciplinary Initiatives of the CNRS (80prime program). The project combines experimental molecular genetics and theoretical physics of life. The aim is to explore how the association between nuclear bodies formed by phase separation (the droplets in the figure below) and certain regions of the genome (the filament) participates in the expression of the genes that they contain.

*Send applications **before July 15, 2022** on the following link:*
https://emploi.cnrs.fr/Offres/Doctorant/UMR5535-THIFOR-001/Default.aspx?lang=EN



The scientific question: The regulation of gene expression at the right place and at the right time is generally explained by the recognition of DNA sequences by dedicated proteins, under the control of so-called epigenetic regulations. The aim of our project is to better understand an aspect of this regulation, which is still little studied: the role played by the physical properties of the human genome and its immediate environment, constituted by the nucleoplasm and the organelles, or 'nuclear bodies', which are located there. The focus will be on the role of ions and electrostatic interactions in the phase separation mechanisms controlling the formation of 'nuclear bodies'.
The study will rely on various experimental approaches (chromosome conformation capture, high salt insolubilization, fluorescence imaging, etc.) on living cells, normal or genetically modified, by varying the local physical conditions. It will help to understand the mechanisms involved in the predisposition to certain cancers.

Training and environment: the host team is located at the Institute of Molecular Genetics of Montpellier (IGMM). It is directed by **Thierry Forné** (biologist, DR CNRS), who will be the thesis director. **Cosette Rebouissou** (IE CNRS) will ensure the training of specific experimental techniques. The team has a long-standing collaboration with the Laboratoire de Physique Théorique de la Matière Condensée, in Paris, and its team 'Modélisation multi-échelle de la matière vivante' led by **Jean-Marc Victor** (physicist, DR CNRS), on the biological role of the physical properties of DNA and chromatin. with **Maxim Dolgushev** (MCF Sorbonne University) and **Annick Lesne** (DR CNRS, straddling the LPTMC and the IGMM), they will provide the necessary interdisciplinary training for the project.

Thesis offer : The successful candidate will benefit from a 3-year PhD contract, starting in the fall of 2022. It is required that he/she already has a first experimental practice in molecular biology, and an attraction (ideally a basic training) towards physical modeling or biological data analysis. He/she will benefit throughout his/her thesis from regular exchanges and cross visits between the two laboratories.

Some references : Baudement *et al. Genome Research*, 28:1733 (2018)
Lesne *et al. Genes* 10 :1049 (2019)
Carrivain *et al. Soft Matter* 8 :9285 (2012)

For more information, please contact :
Thierry Forné : thierry.forne@igmm.cnrs.fr, tel : 04 34 35 96 82
Jean-Marc Victor : jean-marc.victor@sorbonne-universite.fr, tel : 06 81 46 98 23