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S E M I N A I R E

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« On the role of chromatin geometry in epigenetic domain formation »

Establishment and inheritance of distinct genetic patterns that are not encoded in DNA sequence is strikingly obvious in multicellular organisms that maintain distinct cellular identities throughout cellular divisions. Proteins, identified as mediators in the establishment and maintenance of epigenetic domains, are homologous in eukaryotes, which indicates that a common principle underlies these processes. The role of chromatin polymer properties and three-dimensional genome organization and its consequences to the process of spreading is key to understanding the epigenome. For the purpose of studying epigenetic spreading, we develop a polymer-based model with histone modification recoloring implemented through the principles of stochastic kinetics. The model captures geometric considerations of the chromatin thread through the physical determinants of the polymer model, as well as the biochemical mechanism of spreading, implemented through distinct rules under which the reaction takes place. It requires a minimal number of parameters and exhibits epigenetic switching behavior over a narrow parameter range. We focus on inspecting whether the spreading process occurs linearly along the chromatin thread or through a three-dimensional spreading process. We show that polymer geometry can drive the formation of stable domains without the presence of barrier elements. Using S. pombe as an experimental model for comparison, we show that the three-dimensional spreading qualitatively reproduces fluorescent-signaled position-dependent spreading observed in experiments.

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14h00

Salle de conférence