Loop extrusion as a mechanism of chromosome condensation

Leonid Mirny*[1]

[1]Massachusetts Institute of Technology (MIT) – United States

Abstract

Widespread use of Hi-C technology to map chromosomal interactions has revealed a rich multi-scale domain organization of mammalian chromosomes during interphase. Topological Associating Domains (TADs) serve as building block of such organization. Molecular mechanisms and 3D folding of the chromatin fiber that give rise to such domain organization are largely unknown. Here we propose a biophysical model of loop extrusion that relies of biologically plausible mechanisms and can reproduce major features of TAD organization. We also suggest that in mitosis the same mechanism, while at a different dynamic regime, can lead to segregation of sister chromatids and further chromosome condensation. Our work suggests that loop extrusion, possible performed by SMC complexes, can be a universal mechanism responsible for formation of domains in interphase and chromosome condensation in metaphase.

*Speaker