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JOHANNES GUTENBERG
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Seminar über Theorie der kondensierten Materie / TRR146 Seminar

June 12, 2023 at 2:30 p.m.
Medienraum (IPH, 03-431)

Apratim Chatterji
IISER-Pune, Pune

DNA-polymer architecture orchestrates the segregation and spatio-temporal organization of bacterial chromosomes.

I shall present our recent results where we modify internal-topology of ring polymers (bead-spring model) to obtain localization of polymer segments within cylindrical confinement. We tried out a variety of topologies to establish the entropic principles which lead to localization of polymer segments. Two polymers in a mixed state under cylindrical confinement undergo segregation, and again topology plays an important part in determining the forces which lead to segregation and subsequent localization. We have used this understanding to predict the localization of loci (polymer segments) of bacterial DNA polymers, as the chromosome is replicating and segregating. It is known that some simple bacterial cells do not have the required machinery to separate their chromosomes within the cell. We have matched our model simulation results for two different bacterial chromosomes, moreover, our model simulation match data from two different experimental techniques (HiC and FISH) which are complementary in spirit. I am extending our topology driven organization understanding in a variety of scenarios, some of which will be useful to understand more complex organization of chromosomes within model cells as well in more complex scenarios of multifork replication in bacterial cell.

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