MAR14-2013-000397

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Mechanics, Structure and Dynamics of Metaphase Chromosome Folding[1]

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During cell division, eukaryote chromosomes are restructured from a relatively dispersed interphase form, into a relatively compact folded metaphase form. I will discuss experiments aimed at analyzing the folding scheme of metaphase chromosomes, where mechanical response and biochemical perturbation are used as tools for diagnosing structure. Experiments with nucleases reveal that the continuity of the metaphase chromosome depends on DNA, i.e., that the metaphase chromosome can be considered to be a "chromatin gel." Experiments with topoisomerases indicate that chromatin entanglements play an appreciable role in determining chromosome mechanical properties, suggesting that they may play a structural role. We further show that perturbation of condensin complexes dramatically changes metaphase chromosome mechanics. Finally we report results of fluorescence visualization of distributions of condensin I and II along metaphase chromosomes.

[1]Supported by NSF Grants MCB-1022117 and DMR-1206868, and by NIH Grants 1U54CA143869-01, 1U54HD076188 and 1R01GM105847-01.