

MODELING THE 3D CONFORMATION OF GENOMES

Important Dates

Detailed Outline: June 1, 2017
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Edited by

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Description

This book will provide a state-of-the-art summary of physical modeling approaches applied to biological datasets that describe conformational properties of chromosomes in the cell nucleus. Chapters should explain how to convert raw experimental data into 3D conformations, and how to use models to better understand biophysical mechanisms that control chromosome conformation. The coverage will range from basic principles to modeling aspects related to polymer physics, and data-driven models for genomic domains, the entire human genome, epigenome folding, chromosome structure and dynamics, and predicting 3D genome structure.

Technical Level

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Chapter Contents

Please send your contact editor a detailed chapter outline to confirm coverage by the date indicated above.

Contents

I. Overview

1. Introduction
2. Biological data useful for modeling
3. Molecular mechanisms of structure formation

II. Polymer physics

4. Large-scale chromatin architecture
5. Polymer physics of chromosomes
6. Supercoiling of chromosomes
7. Modeling chromosome structure in bacteria
8. Energy landscape of chromosomes

III. Data-driven polymeric models

Restrain-based models

Restraint-based modelling of genomes and genomic domains
Modeling of single-cell Hi-C datasets
Modeling the entire human genome

Direct interactions

Modeling epigenome folding
Maximum-entropy modeling of chromosome structure

Mediated interactions

Chromatin folding captured by the strings and binders model
Predicting the 3d structure of genome

Dynamics

Chromosome dynamics

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Woods, David D. and Erik Hollnagel. 2006. *Joint cognitive systems*. Boca Raton: Taylor & Francis.
• In text: (Woods and Hollnagel 2006)

Book chapter

Wiens, J. A. 1983. Avian community ecology: An iconoclastic view. In *Perspectives in ornithology*, ed. A. H. Brush, and G. A. Clark, 355-403. Cambridge: Cambridge Univ. Press.
• In-text: (Wiens 1983)

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Terborgh, J. 1974. Preservation of natural diversity. *BioScience* 24: 715-22.
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