

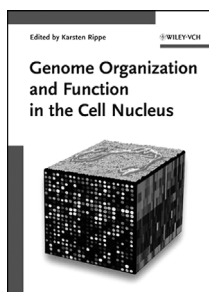
Genome Organisation and Function in the Cell Nucleus

Edited by Karsten Rippe.

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In Ken van Holde's *Chromatin* (Springer, 1989) and Alan Wolffe's *Chromatin: Structure and Function* (Academic Press, 1992), single authors were able to effectively sum up current knowledge on how eukaryotic genes are packaged into chromatin and how this affects their function. This is no longer possible. These early volumes did not include any discussion of histone-modifying enzymes or chromatin remodelers, DNA repair in chromatin, genome-wide patterns of histone modifications or histone variant incorporation, long-range interactions of chromatin, or functions of non-coding RNAs in chromatin function—because there was nothing to discuss. Today, any aspiring author or editor wishing to construct a text on the topic of chromatin structure and function must first decide what topics to cover, what to exclude or gloss over, what depth to strive for, and to what extent to include historical perspective.

With *Genome Organization and Function in the Cell Nucleus*, Karsten Rippe has done a nice job of assembling a volume comprising chapters by a group of distinguished contributors on chromatin-related topics that go outside those usually emphasized in standard textbooks. The book includes chapters on popular areas such as DNA methylation, histone modifications, and chromatin remodeling, but also covers topics less often reviewed in standard texts, such as transcriptional noise, the nucleolus, and higher-order organization of the eukaryotic nucleus. There is rather extensive and welcome coverage of nuclear architecture and subcompartments, with six of 20 chapters devoted to these topics. One particular strength of the book is an



emphasis on biophysical and chemical views of chromosomal processes, and on the relationship between chemical/biophysical measurements made in vitro and physiological measurements. There is also a good number of more gene-centric perspectives, particularly in the book's early chapters, thus providing a nice overall balance.

As with any multi-author volume, chapters vary in style and perspective. A chapter by John Mattick on "RNA Networks as Digital Control Circuits of Nuclear Functions" is the shortest, at 5½ pages plus references, but nonetheless manages to provide an interesting theoretical perspective on the role of non-coding RNAs in the evolution of organismal complexity. At the other end of the scale, the chapter on "Meiotic Chromosome Dynamics" by Kleckner and colleagues presents a thorough and detailed discussion of meiotic recombination and accompanying issues. I enjoyed the historical perspectives included in some chapters, such as those on "DNA Methylation" by Frauer, Spada, and Leonhardt and on "Higher-Order Chromatin Organization and Dynamics" by Strickfaden, Cremer, and Rippe. I particularly liked the informed discussion of experimental and theoretical considerations relevant to nucleosome assembly and positioning in the chapter on "Nucleosomes as Control Elements for Accessing the Genome" by Dechassa and Luger. Hancock provides an interesting and unusual perspective in the chapter on "The Crowded Environment of the Genome"; the author's elaboration of the high macromolecular density found in the cell nucleus causes one to reflect back when reading later chapters on topics such as lamin–chromatin interactions and meiotic recombination. Similarly, the chapter on "Transcriptional Initiation: Frequency, Bursting, and Transcription Factories" by Finan and Cook examines the frequently reviewed area of transcriptional regulation from an unusual point of view. Additional chapters on the characterization of genome-wide sequence and functional elements (Kaganavich and Snyder), three-dimensional architecture of the genome (Dekker), mRNA processing and quality control (Schmidt and Bertrand), DNA repair (Eppink, Essers,

and Kanaar), physical organization and characteristics of the mitotic chromosome (Marko), and quantitative modeling of chromatin folding (Tark-Dame, van Driel, and colleagues) round out the book.

As one might expect, there are quibbles to be made: some sections make rather heavy use of acronyms, thus making it difficult to put the book down and resume where one has left off. Correspondingly, some sections become somewhat mired in "parts lists" that enumerate the many players in specific processes without really providing historical perspective or mechanistic insight. A few slips made it past the editor and proof readers; garbled acronyms (Tfr4 for Trf4, PCR1 for PRC1) might not trouble the aficionado but could confuse the neophyte reader, and Chapter 1 was unfortunately notable in referencing according to a numerical code that needed translation to journal titles. The term "epigenetics" was discussed in four separate chapters, with varying degrees of care and accuracy (best captured in the thoughtful treatments of Nightingale's chapter on "Histone Modifications and Their Role as Epigenetic Marks" and the chapter on "DNA Replication and Inheritance of Epigenetic States" by Corpet and Almouzni), and not accurately indexed. In general, however, chapters make good use of cross-referencing to other chapters as appropriate. Finally, most readers will have their own ideas as to topics that could have received greater attention; I would have liked more discussion of the relationship between chromatin landmarks (such as specific modifications) and function, as gleaned from the ENCODE project and other studies, but as indicated in the first paragraph, a comprehensive survey has become a daunting objective.

In spite of these minor complaints, this volume will make a good addition to lab bookshelves and libraries for those interested in genome organization and function. Chapters can be read in isolation, so students and researchers can learn and review without committing to the entire book, and most chapters have extensive bibliographies that include references from the pre-digital age, where many current students hesi-

tate to venture. The book is most suitable for advanced undergraduates and beyond.

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