

Book review

Chromatin and Gene Regulation

Bryan M Turner
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paperback. ISBN 0-865-42743-7

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The book of Bryan Turner '*Chromatin and Gene Regulation. Molecular Mechanisms in Epigenetics*', published by Blackwell Science, appears at a time of resurrection of interest in chromatin structure and function. It certainly fills a void for a comprehensive text on the subject, written for a broad audience.

The concepts and ideas are introduced in a highly logical succession. Reading this text is almost as intriguing as reading a mystery novel: as soon as you finally figure something out, a new question pops up, you are trying to solve it, and as soon as you do, the next question emerges. As soon as you understand what it takes to regulate gene expression in a simple bacterial cell, you are taken into the realm of the eukaryotic cell, which poses its own demands on the regulatory machinery. Not only would the eukaryotic cell need to respond to an enormous range of intra- and extra-cellular stimuli, but its genome is organized in an entirely different way, complexing with proteins to form chromatin. Chromatin packages the huge amount of DNA into the tiny confines of the cell nucleus, and this packaging allows genes to be regulated in a highly specific spatial and temporal manner; more than that, chromatin is a part of the regulatory machinery itself. How can chromatin do all this? Is all information needed for setting up, maintaining, and inheriting the specific expression patterns of specific genes encoded in the DNA, or are there additional 'epigenetic' mechanisms involved? The answer to this question is what this book is all about.

The book contains 12 chapters that cover our entire present knowledge of chromatin structure and how this structure participates in regulation of transcription: the nucleosome, the higher-order structures, the distinguishable chromatin features of actively transcribed genes, the binding of the transcriptional machinery to chromatin DNA, and the action of chromatin remodeling factors. Nothing of importance has been left out and the concepts are illustrated with numerous well-conceived and well-executed figures.

I was particularly impressed with the last four chapters that happen to reflect the scientific background of the author. The introduction into heterochromatin and its complexities dispel some oversimplified notions of this chromatin as just being condensed, and, hence, transcriptionally inactive. Although the molecular understanding of its structure and function remains elusive, the phenomenology of facultative and constitutive chromatin, of α and β heterochromatin in *Drosophila* is very well described. Equally informative is the chapter on long-

term silencing through DNA methylation and on the specific silencing at telomeres and mating type loci in yeast. The chapter on cellular memory of expression patterns of specific genes during ontogenic development and on imprinting of a small number of genes (ie, the inheritance of their expression status through the germ line) is also enlightening. Finally, the chapter on dosage compensation introduces the reader into a whole new world, that of sexual reproduction, sex determination and the ways Nature has come up with to deal with the unwanted presence of two copies of a large, gene-rich chromosome (chromosome X) in female cells. The biology of these processes is fascinating, and the author leads us through the molecular labyrinths of how mammals, flies, and worms solve the redundancy problem.

While a lot of this information is readily available from other sources, the book brings the individual elements together into a global view that finds, or attempts to find, logical connections among the known facts. More than that, whenever possible, biological and evolutionary perspective is being sought: why certain things are needed, why they are the way they are, etc. Such a broad biological perspective is to be highly praised, since it is a rare occurrence in the writings of most molecular biologists and geneticists.

As in all human endeavors, there are grounds for improvement. I would recommend that more original work be cited to increase the value of the presented information. Some of the views on chromatin structure, especially about higher-order structure, need to be updated. And finally, there are a couple of terminology errors that need to be corrected. I would like to stress that these slight imperfections cannot, in any way, diminish the value of the book, which I see as a momentous and highly successful effort. I can only congratulate the author for his accomplishment.

In summary, Turner's book is probably the most informative, carefully thought-out, and well-written book on the subject. Its numerous illustrations are extremely helpful in leading the reader through the complexities of chromatin structure and in unraveling its recently acknowledged role in epigenetic regulation and inheritance. The book will be invaluable not only to the undergraduate and postgraduate level students for whom it was written, but also for the chromatin community at large. In a fast-growing and ever-expanding field such as the field of chromatin research, such a book will be a rich source of reference for years to come.

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