A Chromatin Retrospective (1871–1989)

Chromatin.
By K. E. van Holde.

This is a very readable book on the structure and function of chromatin, which provokes a personal perspective on the field of chromatin research. Dr. van Holde brings a physical chemical bias to his writing, which is appropriate for a field heavily dependent upon physical techniques and models. In one sense, the purpose of the book is to bring the physical chemistry and molecular biology of chromatin to the biochemist or cell biologist who might have a disrespect for the ambiguities that surround studies of DNA complexed with protein. Another group in critical need of knowledge are those many students of DNA sequences, DNA structures, transcription factors, and in vitro transcription, as well as others who study genes sans nucleosomes. They should be curious about how their studies might relate to genetic material that is subject to the constraints imposed by nucleosomes, chromosome fibers, and nuclear matrix. After reading the book, such readers might have more appreciation for the goals and difficulties of the experiments on chromatin. To devotees of chromatin, the book serves to unify all facets of chromatin knowledge. It is an indespensible reference for anyone who studies the eukaryotic genetic apparatus.


Although van Holde maintains that studies of chromatin are expanding, I don't think this is true. The total number of publications in the area is actually decreasing, and many former chromatin investigators have found productive employment in other fields. The first era of chromatin research is coming to a close, and van Holde's eulogy is pertinent to the understanding of the mechanism of gene regulation, and their shortcomings are described. There are sections on tRNA, SS, and ribosomal genes, as well as on pol II-transcribed genes. The chapter includes a table summarizing the nuclease digestion results from 39
genes and detailed discussions of the hemoglobin, heat shock, and ovalbumin genes. van Holde then weighs the often conflicting evidence that transcriptional activity is correlated with histone stoichiometry, histone modifications, nonhistone proteins, or DNA torsion. The domain model for gene activation is explained. van Holde is aware of the difficulties in designing, performing, and interpreting the experiments. His emphasis is upon the mechanism and theoretical principles, rather than phenomenology and ad hoc explanations. As an experienced chromatineer who has seen the alchemy of new experiments turn fact into forgotten reference, he is cautious in his interpretations.

This book is meant to be read from cover to cover. The style is conversational and very easy to understand. This style is sometimes abused, however, by phrases in the first person, such as "it seems to me" and "recent results from our laboratory." The lack of detail in the table of contents, subtopic headings, and index is a serious problem, which makes the book difficult to use as a reference text.

In addition to omission of obvious index entries (e.g., NMH, histone exchange, magnesium, and nucleoplasm), the page references are often incomplete. The extensive reference list of publications before 1985 is a very useful resource for chromatineers. However, the seventeenfold reduction in the number of references between 1985 and 1986 and the virtual lack of results after 1986 are serious shortcomings of the book. The usefulness of this unified treatment of the diverse subject of chromatin far outweighs the shortcomings.

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Microtubule-Based Motility: Two-Way Traffic Ahead


Edited by F. D. Warner and J. R. McIntosh.

Turning the wrong way onto a one-way street is both embarrassing and dangerous. The typical reaction is to pull into the nearest driveway and turn around, all the while to the sound of honking horns from cars going in the right direction. Until recently, models to explain motile events suspected of being based on microtubules (MTs) were constrained by an analogous one-way sign, because the only protein known to generate force along a MT was axonemal dynein. Because dynein can power movement only toward the (-) end of MTs, interpretation of data that implicated MTs in cellular movements had to heed the one-way sign or face the honking horns of colleagues.

Work in the last five years has led to a series of striking developments that have fundamentally changed our views of MT-based motility. In Cell Movement, a nearly comprehensive collection of articles describes these advances. The book has been divided into two volumes that could be subtitled The Old and The New, depending on when the motor proteins discussed in each were initially discovered. The Dynein ATPases (Volume 1) covers about 20 years of research on axonemal dynein, the archetypal MT-based motor. The topics in this volume range from the largely unanswered questions about dynein's composition, overall structure, and cross-bridge cycle to present concerns about the domain substructure of its heavy chains, the regulation and coordination of its activity in the axosome, and the conversion of linear sliding force into the complicated bending of the axoneme.

Kinesin, Dynein, and Microtubule Dynamics (Volume 2) is a more eclectic mix. While it focuses on the recent work on kinesin and nonaxonemal or cytoplasmic dynein, it also includes sections on MT structure and dynamics and MT movements in mitosis. Although these latter sections stray from the focus of the second volume, their inclusion is warranted. The section on MT structure reminds us of the importance of understanding both the engine(s) and the track(s); that on mitosis provides us with an example of how the discovery of cytoplasmic motors has influenced other fields. It is curious that a section exploring the impact of the discoveries of kinesin and cytoplasmic dynein on other areas was not included, because there is considerable evidence that the intracellular motility of many secretory organelles (e.g., Golgi, ER, etc.) is MT based; although the motor proteins for these organelles have not been identified, it is likely that they will be similar or perhaps identical to kinesin and dynein. A discussion of current research in this area would have extended the general appeal and usefulness of the books.

The chapters of Cell Movement were contributed by top researchers in the field and range from extensive Annual Reviews-type articles to efforts largely concerned with research in the author's lab. Most of the articles are targeted to the general audience of cell biologists, and the short "Perspective" articles that begin each section should be useful in orienting the unfamiliar to a particular topic. The volumes will also appeal to the specialist, because they draw together a body of work previously unavailable in a single reference. This is especially true of the volume on axonemal dyneins, a cover-to-cover reading of which gives one an appreciation for the development of our knowledge about this fascinating protein. However, some of this extensive coverage of axonemal dynein would have benefited from heavier editing reading about which polypeptides belong to outer and inner arm dynein for the fourth or fifth time was an effective yawn inducer.

Although the articles understandably contain little previously unpublished data, there are some new data, as well as a number of novel provocative ideas that make these