Nucleoprotein Template

Chromatin Structure and Gene Expression. SARAH C. R. ELGIN, Ed. IRL (Oxford University Press), New York, 1995. xviii, 224 pp., illus., + plates. $105 or £60; paper, $52 or £29.50. Frontiers of Molecular Biology, 9.

Ever since the advent of cell-free in vitro transcription systems in the early '80s, our view of gene expression has been dominated by the identification of scores of gene-specific DNA binding proteins, general transcription factors, and transcriptional co-activators or co-repressors that facilitate regulation. This myriad of protein-DNA and protein-protein interactions has commonly been modeled on "purified" DNA templates. In the eukaryotic cell, however, DNA is not freely accessible to transcription factors, but approximately 1 meter of DNA is compacted into a eukaryotic nucleus by the nucleosomal histones and other nonhistone proteins. This nucleoprotein structure, chromatin, is of course the physiological template upon which gene expression is regulated. In the past six to eight years there has been a dramatic rebirth of research on and global interest in the role of nucleosomes and higher order chromatin structure in the control of gene expression. Transcription meetings now abound with seminars on chromatin-remodeling enzymes, such as SWI/SNF or NURF, histone-modifying enzymes, such as acetyltransferase complexes, and gene silencing by factors that establish a "bad neighborhood for gene expression" (heterochromatin domain).

In *Chromatin Structure and Gene Expression*, Sarah C. R. Elgin has organized an impressive array of mini-reviews written by leaders in the field. A bonus to each chapter is a short paragraph that discusses questions and comments made by authors of other chapters. The result is a very integrative book that encompasses not only what is known but also what questions remain and where current research may lead. Topics span the breadth of current chromatin research—from the high-resolution x-ray structure of the histone octamer (illustrated dramatically by beautiful color plates) to speculative models for epigenetic regulation of gene expression in yeast, fruit flies, and mammals. A fascinating chapter on epigenetic regulation in mammals, written by Shirley Tilghman and Huntington Willard, discusses recent work on genomic imprinting and X chromosome inactivation. Tilghman and Willard define the term "epigenetic" as referring to the "different stable states of phenotypic expression usually thought to be due to differential effects of chromosome or chromatin packaging." In the case of imprinting, one copy of a gene is transcribed normally while the homologous copy is silenced for many cell generations. Often the parental origin of the chromosome determines which gene will be active and which silenced. How does the cell know which gene should be packaged into a heterochromatin-like state? What initiates inactivation? Are genes marked by DNA methylation patterns that then govern heterochromatin assembly? The goal of obtaining the biochemical answers to these and other questions raised in this timely book ensures that chromatin research will remain in the limelight for many years to come.

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Vignette: Electoral Genetics

Genes are . . . commonly used to characterize the foibles of successful politicians. Journalists described former President George Bush as missing an empathy gene and Presidential candidate Ross Perot as possessing a "frugal gene" (Perot had insisted that his children take their own popcorn to the movies rather than wasting their allowance on overpriced theater concessions). When Pat Buchanan was running as a Presidential candidate, a reporter referred to one of his aides as a "genetic conservative." Before the 1992 election, a political joke suggested that Democratic men in Washington were dating Republican women in order to replenish their gene pool so that they could produce a winner. Describing the role of the wives of Presidential candidates, columnist Anna Quindlen defined the "missing gene theory of political marriages: She must provide something he lacks." Thus, she suggested, Nancy Reagan carried Ronnie's retribution gene; Mrs. Bush carried George's compassion gene. "Mrs. Quayle has more to do; it's said that she carried the brain for the couple. The idea is that spliced together, the husband and wife form a much more perfect union."

—*Dorothy Nelkin* and M. *Susan Lindee*, in *The DNA Mystique: The Gene as a Cultural Icon* (Freeman)

Also Noteworthy

Bioorganic Chemistry. Nucleic Acids. SIDNEY M. HECHT, Ed. Oxford University Press, New York, 1996. x, 500 pp., illus. $59.95 or £35. Topics in Bioorganic and Biological Chemistry.

This volume, part of a series produced "in support of teaching and research," is the first in a trio of works, all edited by Sidney Hecht, aimed at organic chemists interested in biology. The plan of the subseries is that each volume will consist of a "set of chapters whose numbers approximate the number of weeks in a semester" and that will follow the format of lecturers in graduate-level "special topics" courses, beginning with a summary of basic principles and key findings in the field and continuing with general and then more detailed discussions of current research activity. According to the editor, the figures in the chapters will also be available as transparencies for classroom use. The present volume contains 14 chapters by 21 authors, beginning with an account by Eric C. Long of fundamentals of nucleic acids, from the "central dogma" to basic techniques. Chemical synthesis and enzymatic methods for preparation and manipulation are then dealt with, followed by matters of structure, including chemical mapping of conformation, ^{1}H NMR spectroscopy, formation of alternative structures in DNA, and the use of reporter groups in structure analysis. Binding and catalysis by metal ions, interactions between DNA and small molecules and protein, antisense/antigene oligonucleotides, catalytic RNA, and the use of the polymerase chain reaction and in vitro random selection are the subjects of the remaining chapters. The individual reference lists are grouped in the back of the volume, which also includes an index. The other two projected *Bioorganic Chemistry* volumes will deal with peptides and proteins and with carbohydrates. Also listed as part of the "Topics" series are *Enzyme Catalysis* by R. Schowen and *Steady State Enzyme Kinetics* by P. Cook.

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