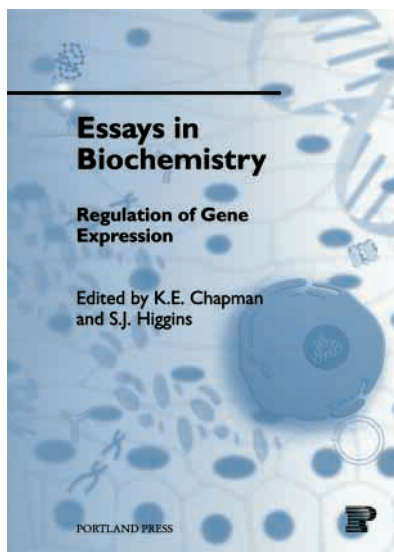


Just another book about transcription?



Essays in Biochemistry, Vol. 37: Regulation of Gene Expression

edited by K. E. Chapman and S. J. Higgins

Portland Press (2001) 200 pages. ISBN 1 85578 138 7
£19

In cells, the execution of complex developmental events such as cell differentiation and body pattern formation, as well as the response to intra- and extra-organismal stimuli, coincides with the precise temporal and spatial expression of genes. Mis-expression of genes has dramatic effects on cell life and has been correlated with several human diseases - for example, cancer. Thus, regulation of gene expression represents a fundamental mechanism to keep cells alive and functional. Eukaryotic cells have to regulate and coordinate the expression of several thousand genes, and the underlying molecular mechanisms are necessarily complex. A huge amount of biological research over the past three decades has been devoted to dissecting the mechanisms that regulate the expression of eukaryotic genes. These efforts have determined that the expression of eukaryotic genes is regulated in response to intra- and extra-cellular signals at the level of chromatin,

transcription initiation/elongation, splicing and translation. The book *Regulation of Gene Expression* (edited by Chapman and Higgins) provides, in ten extraordinary essays, an up-to-date insight into the different mechanisms that regulate the expression of genes in bacteria and eukaryotes.

Initially, the dissection of gene expression focused on transcription at the level of initiation, and abundant literature describes the processes underlying initiation of transcription. This raises a question: is the essay collection *Regulation of Gene Expression* just another book about transcriptional initiation? The answer to this question is fortunately: no. Of course, every book dealing with regulation of gene expression has to cover the basics of transcription initiation, but *Regulation of Gene Expression* devotes only three out of ten chapters to the mechanisms that regulate transcriptional initiation. Mark Ptashne and Alexander Gann discuss the role and function of transcription factors as locators in bacteria and eukaryotes, Georginia Lloyd, Paolo Landini and Steve Busby describe the basic mechanisms of transcriptional control in bacteria, and Grace Gill contributes a lively dissection of transcriptional regulation in eukaryotes. These three essays not only provide the reader with up-to-date information about the mechanisms that regulate initiation of transcription but also point out future goals in this area. Moreover, the articles emphasize the fundamental role of transcription factors during the initiation process of transcription.

The transcriptional activity of many transcription factors is regulated by intra- and extra-cellular signals. The essay by Lee and Goodbourn describes in great detail and with extraordinary figures the functional connection between signal transduction, transcription factors and gene expression. Toward this end, two other essays, one by Chan et al. and the second by Link and Harrison, describe how transcription factors, in response to intra- and extra-cellular signals, control the cell cycle and the life and death of eukaryotic cells, respectively. Both essays demonstrate the complexity of the molecular

mechanisms that control gene expression in eukaryotes.

Extensive studies within the past decade have focused on mechanisms of gene expression other than transcriptional initiation. This book pays tribute to this development and contains essays on different regulatory modes of gene expression: (i) chromatin, (ii) DNA methylation and (iii) translation. Chromatin, in particular, has moved into the limelight of the gene-expression field. Chromatin is formed by the association of proteins, mainly histones, with chromosomal DNA. Chromatin may represent a barrier for the interaction of transcription factors with their target genes and, hence, inhibits the execution of transcription. Thus, dynamic structural changes in chromatin have to occur that open chromatin in order to facilitate transcription. The essay by the late Alan Wolffe provides an extraordinary overview of the recent developments in the chromatin field. His essay highlights the importance of chromatin structure, histone acetyltransferases, and chromatin-remodeling complexes in transcription.

In addition to chromatin, Meehan and Stancheva describe the functional importance of DNA methylation in gene expression. The authors describe, assisted by wonderful figures, the role and function of DNA methylation in development, and in the expression of imprinted genes and X-chromosome inactivation. The authors highlight the role of methylated-DNA-binding-proteins that mediate transcriptional repression by recruiting chromatin-remodeling complexes and histone-modifying enzymes. Thus, the essay describes the functional connection between DNA methylation and chromatin. Proud covers the regulation of gene expression at the level of translation. He describes that translation of mRNA is regulated in response to various intra- and extra-cellular signals and requires specific sequences in the 5'- and 3'-untranslated regions. Moreover, the effect of viral infection and developmental signals on protein translation is discussed.

The essays in *Regulation of gene expression* are well written, contain very

good, easily accessible figures, have a perspective that points out future directions, and have a summary section that contains all the take-home messages. However, the book does not cover all of the hottest areas in gene expression. It is missing essays on, for example, transcription elongation, epigenetics, and DNA-microarray-based gene expression analysis. Nevertheless, several of these areas are covered in the "Future perspective" essay by Hastie that concludes the book. This essay describes future goals in the field of gene expression and the importance of this research for understanding the molecular basis of many human diseases.

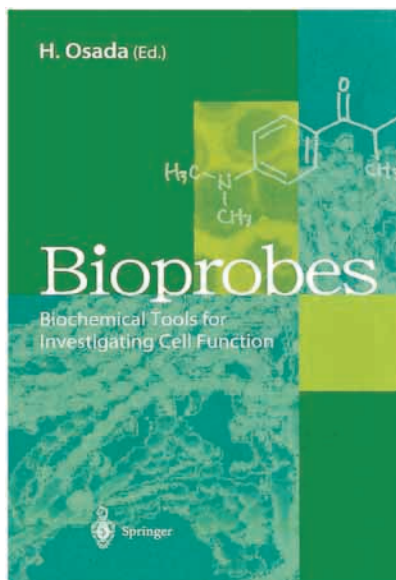
Who should read this book? It will be a useful, comprehensive companion for teachers and students, and covers the newest essentials of gene expression that are missing from many general textbooks. The book is priced at £19 and, although I think that it is at the upper limit of what students should pay for such a book, it is well worth the money.

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**Put a useful book on
the coffee table in your
lab**



Bioprobes: Biochemical Tools for Investigating Cell Function

edited by H. Osada

Springer-Verlag (2000) 319 pages. ISBN 4-431-70247-4
£86/\$149

Bioprobes: Biochemical Tools for Investigating Cell Function, edited by H. Osada, is not the sort of book I have bought in the past. Maybe I was wrong. This review has been an opportunity to test my prejudice.

The 319 pages of this book are divided into two parts. The first part reviews four main fields in which bioprobes have been crucial to our understanding of biological function. The second part, 'Bioprobes at a glance', describes the structure, biological applications and biological activities of ~80 chemicals and gives a bit of historical background: who discovered each product, when and how. I like that.

Discoveries of toxins or small molecules from microorganisms have provided tools that can be exquisitely specific (although you never know...) and have allowed us to decipher complex pathways by hitting specific targets and asking what happens. This has proven to be invaluable, not only in signal transduction but also in addressing basic biological questions - for example, who hasn't learnt about the use of actinomycin D to attribute neosynthesis to transcription or to post-transcriptional mechanisms? Actinomycin D is included here.

The first part of the book covers in four chapters cell proliferation, differentiation, apoptosis and immune cell functions, and the authors give an overview of each field. They point at steps in which the use of microorganism-generated chemicals (bioprobes) have provided a means to define and to understand cellular functions by blocking a specific target(s). Although this is nice and easily readable, the question is who is the book written for. For scientists, the book is definitely not up to date (by definition), not even for someone outside the field. For students, it could not be a textbook. However, the

book does adequately show how, at some crucial stage, microorganisms gave (and still give) us the right tools to answer questions.

The second part of the book is like a (almost) comprehensive Merck index of more than 80 bioprobes and includes very useful information about each product - for example, structure, solubility, IC₅₀ and references. This is nice, but then one needs to buy a subscription for a regular on-line update. Some products, although mentioned in the text (e.g. LY294002 and PD98059), are not described in this second part. Also missing are the bacterial toxins that are so useful in switching on or off overlapping sets of GTPases and have been so widely used in studies of Rho GTPases. In addition, comparing the efficiencies, specificities and handiness of chemicals that target overlapping sets of proteins or the same protein could also have been very helpful.

So, back to the question who is this book written for. My answer is librarians.

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