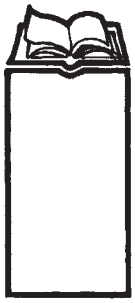
MORE PROTEIN FOR THE MONEY, MAYBE

***Maximizing Gene Expression.* Edited by William Reznikoff and Larry Gold. Pp. 392. ISBN 0-409-90027-3. $49.95. (Butterworths, Boston, MA: 1986).**

The ways in which protein levels are regulated in both procaryotes and eucaryotes have come under increasingly close scrutiny in the past decade. To a large extent this is the result of the rapid development and dissemination of recombinant DNA technology. The opportunity to modify DNA at will has led to an enormous accumulation of data revealing a bewildering variety of mechanisms for every conceivable strategy by which gene expression might be controlled. Among these strategies are gene specific regulation of transcriptional and translational initiation, elongation, and termination, and differential mRNA and protein decay. Knowledge of these diverse methods by which cells determine physiologically ideal protein levels has led to generally valid rules for optimizing the expression of any gene. However, as *Maximizing Gene Expression*, a recent addition to Butterworths' *Biotechnology* series, makes clear, numerous gaps in this knowledge still exist. The book is not, as the title might imply, a guidebook on how to optimize gene expression or even a compendium of studies which are concerned with this task. Rather it is a collection of heavily referenced reviews (some truly excellent) which attempts to place under one roof the literature on most of the better studied aspects of gene expression in *E. coli*, yeast and higher eucaryotes. In some cases the contributors, mindful of the volume's title, offer practical rules or suggestions regarding the problem of getting genes to be protein generous. However, in most cases, generalizations are given in terms of (usually imprecise) mathematical or molecular models, leaving the reader the responsibility of applying these after his own inclinations.

The chapters on transcription initiation which comprise the first third of the book are very good, and are organized in such a way that, perhaps fortuitously, the mechanistic and structural differences between procaryotic and eucaryotic promoters are highlighted. Struhl's detailed account of the methods by which the structures and interactions of yeast promoter elements have been ascertained is especially good, and closes with molecular models of transcription initiation at constitutive and regulated promoters. But perhaps the most fascinating reading in this volume is deBoer and Kastelein's imaginative and comprehensive review of the physiological and evolutionary forces which influence codon selection in *E. coli*, yeast, and the tissues of higher eucaryotes.



"... a collection of heavily referenced reviews (some truly excellent) ..."

Other valuable contributions are reviews of differential mRNA stability in *E. coli*, and the mechanisms and mRNA structural requirements for translation initiation in procaryotes and eucaryotes. Of particular interest to the biotechnologist is a chapter on the sequestration and degradation by *E. coli* of abnormal proteins, of which heterologous proteins are a subset. Unfortunately the chief value of this account is the claim that other than the *lon* system, this aspect of *E. coli* metabolism remains obscure.

The editors have included chapters on *E. coli* and yeast replicons because these are obviously tools which molecular biologists use to obtain the advantages of gene dosage effects. The detail contained in these chapters, especially that on ColE1 plasmid replication, however, seems hard to justify in a book on maximizing gene expression. What seems even more peripheral to the book's mission is a chapter devoted to methods by which a gene can be cloned on the basis of detection of the protein it encodes.

The volume has another obvious shortcoming. As with any multi-authored book, each contribution has its own style and perspective. Chapters cannot be neatly dovetailed into a coherent whole because they are composed independently. In this book the worst consequence of this is a feeling of being somewhat deceived by the title, which not all of the authors appeared to be thinking about while they were writing. The editors, apparently aware of this problem, have included a final chapter which gleans previous material for points which pertain directly to practical aspects of optimizing gene expression.

One topic not included, which would certainly have added interest to this work, has to do with protein secretion. Biotechnologists, many of whom make their living by conjuring cells to make secreted proteins, have a nearly universal interest in this aspect of gene expression. A review of the large and growing literature of secretion in *E. coli*, yeast and perhaps *B. subtilis*, with particular emphasis on its reduction to practice, is badly needed. Another topic omitted from this volume which needs attention is the role of mRNA processing and transport in eucaryotic gene expression. Perhaps a future volume in the series will be devoted to these areas.

Despite its faults, *Maximizing Gene Expression* should be of great value to anyone who wants to familiarize himself with the state of the art regarding promoters, translation initiation, codon usage, the degradation of mRNA and abnormal proteins in *E. coli*, ColE1 and yeast replicon control, and methods of detecting cloned genes. Another real merit of the book is that it points out numerous areas where new investigation is needed. Finally, the vast exposure this volume offers to experimental approaches for uncovering blocks to gene expression makes it a highly usable reference for all of us who need to get functional proteins made.

Gregory Gray is a senior scientist at Genencor, Inc., South San Francisco, CA.