
Preface

The use of molecular biology and biochemistry to study the regulation of gene expression has become a major feature of research in the biological sciences. Many excellent books and reviews exist that examine the experimental methodology employed in specific areas of molecular biology and regulation of gene expression. However, we have noticed a lack of books, especially textbooks, that provide an overview of the rationale and general experimental approaches used to examine chemically or disease-mediated alterations in gene expression in mammalian systems. For example, it has been difficult to find appropriate texts that examine specific experimental goals, such as proving that an increased level of mRNA for a given gene is attributable to an increase in transcription rates. *Regulation of Gene Expression: Molecular Mechanisms* is intended to serve as either a textbook for graduate students or as a basic reference for laboratory personnel. Indeed, we are using this book to teach a graduate-level class at The Pennsylvania State University. For more details about this class, please visit <http://moltox.cas.psu.edu> and select "Courses." The goal for our work is to provide an overview of the various methods and approaches to characterize possible mechanisms of gene regulation. Further, we have attempted to provide a framework for students to develop an understanding of how to determine the various mechanisms that lead to altered activity of a specific protein within a cell. We expect the reader will have a good working knowledge of basic biochemistry and cell biology, although detailed understanding of molecular biology techniques is not required.

Each of the three parts of *Regulation of Gene Expression: Molecular Mechanisms* is self-contained. Thus the order of reading does not need to follow the order of presentation, although the parts have been arranged in the way that investigators often approach the study of gene regulation. We have thoughtfully selected key references only and included their details in the page margins for ready reference, as this work is intended as a textbook, not a review of the literature. Key points as well have been placed in the margins in order to emphasize important issues.

Part I, written by John P. Vanden Heuvel, presents the experimental approaches that can be utilized to study control of mRNA expression and the determination of target genes for a given transcription factor. Part II, written by Gary H. Perdew, examines the experimental approaches utilized to determine how proteins can regulate each other by mediating synthesis, degradation, protein–protein interactions, and posttranslational modification. Finally, Part III, written by Jeffrey M. Peters, explores how gene targeting techniques in mice can provide insight into protein function. The point of view is that of a molecular toxicologist, but we have kept in mind a wider range of graduate students and professionals in the biological sciences. As toxicologists, however, we are primarily concerned with mammalian systems and with determining how chemicals can modify gene expression. This has clearly influenced

the biological systems utilized in the experimental approaches suggested throughout this text.

We thank those who contributed to the completion of this book, in particular, Marcia H. Perdew and Cheryl Brown for their excellent editorial assistance. Also, thanks go to the many students who have directly or indirectly contributed to the overall concept of this book, and who also read many segments of this book. We are indebted to Dr. C. Channa Reddy for his support and vision in providing an excellent research environment and establishing a molecular toxicology group at The Pennsylvania State University. Finally, we would like to acknowledge all of our mentors who have contributed to our careers and have inspired us to be the best scientists and mentors possible.

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