Mechanisms of Gene Expression

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Mechanisms of Gene Expression

**Structure, Function and Evolution of the
Basal Transcriptional Machinery**

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Preface

The mechanisms underlying the transcriptional control of gene expression are of fundamental importance to many areas of contemporary biomedical research, ranging from understanding fundamental issues (such as regulation of embryonic development) to practical applications in industry and medicine. As a research scientist and university lecturer I was always particularly aware of the sparseness of suitable textbooks, that would allow both undergraduate and postgraduate students to obtain some knowledge about molecular transcription mechanisms in various pro- and eukaryotic systems. True, the fundamental concepts of gene expression are covered in all basic Molecular Biology textbooks, but the depth of coverage is usually rather limited and the material frequently out-of-date. Some of the textbooks still focus extensively on bacterial transcriptional control of gene expression and mostly ignore the wealth of new information about the archael and eukaryotic transcriptional machineries that has recently become available. Other (usually edited) books do contain a lot of specialized and up-to-date information about particular model systems but are often too fragmented, insufficiently comprehensive or assume too much background knowledge to be suitable as undergraduate textbooks.

I therefore set myself the task to write a book that would present much of the current thinking about the molecular mechanisms of gene expression in a form that would be easily accessible for undergraduates with an understanding of basic Molecular Biology concepts. In the end, I probably ended up with more than I bargained for, because I realized very quickly that there were some areas of which I was only rather dimly aware, and of which other transcription experts frequently also knew very little about. On quite a few occasions it became necessary to go beyond the well-trodden reviews and dig up some rather unusual books and magazines from dusty library corners.

I therefore hope that this book will not only serve a function as an undergraduate textbook, but will also give some of my colleagues the feeling after reading it that they have learned something new and interesting.

Another ambitious hope is, that the existence of this book will stimulate the creation of more advanced university courses dealing with the subject area. Especially here in Europe it is very easy to get the impression that many students hear very little about this exciting research area, simply because it is considered as a 'difficult' and 'controversial' subject. The absence of suitable advanced courses on gene expression affects the number of good quality students who are willing to enter the field as PhD and postdoctoral students. Although there are certainly plenty of controversies about details, I believe that during the last few years some of the major concepts have successfully started to emerge and are likely to withstand the test of time. If this book can stimulate an increased level of interest and awareness of transcriptional control mechanisms it will have fulfilled an important task.

I wish to acknowledge the many people who have made direct or indirect contributions to this book. Although it is a single-author publication, it would not have been possible without the participation of many others. Some helped by patiently explaining their ideas to me, others by providing me with preprints of research papers and reviews, photographs and digital computer images. I am especially grateful to Dr. Jeremy Baum for helping me with the design of the high-resolution Silicon Graphics images of transcription factor structures. I owe much of my understanding of the eukaryotic transcriptional machinery to Robert Tjian and numerous ex-members of his laboratory, especially Brian Dynlacht, Tim Hoey, Grace Gill, Lucio Comai, Peter Verrijzer and Joost Zomerdjik. I am also grateful for the numerous discussions and collaborations involving current and past members of my own laboratory, the Department and from other institutions.

Finally, in an age of computers and e-mail it is quite easy for readers to provide feedback, that may help to correct any mistakes and provide fresh ideas for the next edition. I am sure that other people would have chosen different examples, would have put a different emphasis on the various topics or may even disagree with some of the my interpretations. Comments are welcome! (e-mail: r.weinzierl.ic.ac.uk).

Robert O.J. Weinzierl
April 1999

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