

Who will the book benefit? Probably the general research worker of postgraduate level and the more serious worker whose main interest is not solely the molecular biology of the papilloma viruses. I say this because even if a book of a meeting were speedily printed, as it was in this case, it is inevitably somewhat out of date by the time of publishing.

What I should have liked to see in the book was the *in situ* hybridization of Crumm's group from Norfolk in which I believe cell types harbouring virus are now identified. As far as general introduction is concerned there is too little of this for the book to be very useful to complete newcomers to the field. Final year undergraduates, however, will find it interesting. Some knowledge of molecular biology is really necessary to understand the more elegant approaches discussed in the sections by Howley, Botchan, Danos and Petterson.

I found the book most useful and where it lacks sections on certain approaches and also lacks an overview of the problems in studying these viruses one may feel more inclined after reading the book to go and look up the current literature.

At a cost of £27 the volume is good value.

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Regulation of Gene Expression – 25 Year On. Edited by I. R. BOOTH AND C. F. HIGGINS. Society of General Microbiology Symposium 39. Cambridge University Press. 1986. 309 pages. £32.50, \$59.50. ISBN 0 521 32201 4.

This book, and the Symposium for which it was produced, celebrate the quarter century since Jacob, Monod and others developed their elegant concepts of the operon, and of the negative regulation of gene expression at the level of mRNA transcription. Since then, the refined simplicity of their model has given way to a far more detailed understanding of the complex underlying realities. Thus, few repressors bind to only single DNA sites; few prevent RNA polymerase from initiating transcription through simple steric exclusion of the enzyme from the promoter; and many promoters and most operons are themselves complex. Nevertheless, the basic ideas presented around 1961 are correct, and remain as splendid examples of successful reductionism. They have also stimulated the discovery of many other unforeseen, and sometimes intricate mechanisms of gene regulation, such as attenuator control in amino acid biosynthetic (and *pyr*) operons, and the feedback repression of translation (and in one case transcription) of ribosomal protein mRNA molecules by one of their own protein products. Despite the long passage of time, and the shift of emphasis towards studies of

eukaryotes, the literature on prokaryotes continually renews the enthusiasm and admiration of even such ancients as myself, by unveiling new and unexpected tricks of molecular genetical magic. Many are described in this book. One which is not, but which 'wowed' me recently, is the ability of some plasmids to leave a lethal time-bomb behind in erstwhile host bacteria rash enough to lose them. Mechanisms such as RNA splicing, discovered in eukaryotes and initially thought exclusive to them, frequently turn out to be used also by prokaryotes or their viruses. It is difficult to escape the impression that any molecular mechanisms of which we can dream, in our long articulation of the double helix and genetic code paradigms, will turn out to have been exploited by some organism. Indeed, molecular biology comes more and more to resemble the biology of whole organisms in the variety of elegant, intricate or astonishing modes and mechanisms of life it is revealing.

At such a stage of development of a subject, the great danger for writers is that they may bury their readers under a welter of detail, and fail to elicit the essentially simple, coherent and inspiring realities which lie beneath. The present book has, I think, largely avoided this failing. The organizers chose an excellent set of contributors, who produced 14 chapters which, while varying considerably in style and depth of coverage, are in general clear and concise reviews. These are up to date and of high standard, and mostly thoroughly referenced, but are much quicker and easier to read than typical Annual Reviews. They should therefore be particularly useful for final year undergraduates and their teachers, and for postgraduates and researchers wishing to maintain breadth without excessive expenditure of time. I dare to predict that most of these articles will still be very useful at least five years hence. The Editors are to be congratulated on producing an enjoyable and valuable book (and meeting); and incidentally on proving, in these days of galloping Metropolitanization, that there is vigorous intellectual life North, not only of Watford Gap, but even at the Antonine Wall.

Typographical errors are present, but few if any that are misleading; and what book or paper lacks them, despite repeated proof-reading? My own copy betrayed defective binding, with pages coming loose shortly after I first opened it; it remains as useful as before. Needless to say this book does not completely cover even the field of prokaryotic gene regulation. Most chapters deal with *E. coli* and its close relatives or satellites, with only one and a half centred on Gram-positive bacteria, and one on *Dictyostelium*. It is easy to discover minor but interesting mechanisms of gene regulation in *E. coli* which are nowhere mentioned: for example, gene expression dependent on such rare translational aberrations as frameshifting, or read-through of stop codons.

Rather than dwell on omissions, it may be useful to

the potential reader to comment briefly on the subjects included. Cohen discusses clearly and in moderate detail the regulation of biosynthesis in *E. coli* of three amino acids derived from aspartate, especially their common pathway and the details of *thr* and *met* gene control (interesting examples respectively of attenuation and repressor mechanisms). Postma neatly summarizes the difficult subject of catabolite repression in enterobacteria and yeast, which still resists full understanding. Busby presents clearly our detailed but incomplete picture of how positive regulators of transcription (especially the CRP.cAMP complex) function in *E. coli*. Rosenberg and his colleagues follow with a lucid account of their multi-faceted study of coliphage lambda *cII* protein, and the three promoters whose activity it stimulates. Lilley provides an uncomplicated summary of DNA supercoiling, its genetics and enzymology, and its effects on transcription. The main impression, with a strong *caveat* that it is yet early days, is that DNA topology is unlikely to play a major role in the physiological regulation of most genes (aside from feedback on the gyrase genes). Grossman and Losick give a very useful review on the occurrence and role of alternative RNA polymerase sigma subunits encoded by *E. coli*, *B. subtilis*, and some of their phages. Sometimes production or activation of a new sigma turns on a new set of genes; in other cases the situation is more complex, with regulation requiring further activators. Kustu and her colleagues detail such a case in their admirably concise and lucid discussion of nitrogen regulation in enteric bacteria. Galloway and Platt provide a stimulating and well referenced review on the control of transcriptional termination, although this concentrates mainly on *rho*-dependent termination and (to a lesser extent) anti-termination. Higgins and Smith give a

most useful introduction to mRNA processing and degradation, and their possible roles in gene regulation; an area which is under-explored because of its technical difficulty. The intriguing REP sequences are also discussed. Nomura reviews the regulation of ribosome biosynthesis, summarizing the well-established evidence for translational feedback control in the co-ordination of ribosomal protein gene expression, and newer and perhaps less definitive experiments indicating that this mechanism also ensures growth-rate and stringent control of these genes. Overall regulation would therefore rest solely on the rate of rRNA production; he presents the evidence that this may be governed simply (though probably not directly) by the concentration of idle ribosomes in the cell. Kleckner contributes an exemplary review, crisp, lucid and authoritative, on the mechanism and regulation of Tn10 and IS10 transposition. She describes the elegant and intricate tricks evolved by these 'selfish genes', and offers logical explanations of their possible survival values. Sherratt's summary of the known and unknown mechanisms of replication, segregation, and conjugational spread of plasmids is more an appetiser than a detailed or explicatory review, but nonetheless stimulating. Finally, Hopwood and Williams and their colleagues present very readable introductions respectively to the molecular genetics of *Streptomyces*, and the regulation of differentiation in *Dictyostelium discoideum*; topics which surely have bright futures, as well as now very considerable pasts.

I enjoyed reading this book, and warmly recommend it to others.

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