Book Reviews

Gene structure and expression. John D. Hawkins. Cambridge University Press, Cambridge. 1985. Pp. xii + 173. Price £20.00 HB; £7.95 PB.

Molecular biological tomes, it would seem, are appearing at an ever increasing rate nowadays. I am thinking not just of the plethora of practical-orientated manuals that are currently available but also of university texts. Of course, in the long term, this can only be a good sign: a pointer, if you wish, of the rapid expansion in the research in this area. In the short term, however, we are subjected to a flood of monographs purporting to serve a role. I am against such unnecessary excesses as a more conscientious approach by publishing houses would benefit both the reading public and authors alike. At the present, books are sold at a price that libraries let alone the public can hardly afford.

The reason for the above diatribe is that *Gene Structure and Expression* does not, as far as I am concerned, serve a useful role.

The thirteen chapters of *Gene Structure and Expression* (173 pages inclusive of index) can be divided up into four main parts. The first three sections (each containing two chapters) introduce nucleic acids, recombinant DNA technology, and prokaryotic gene organisation and its control. The fourth and largest part (seven chapters *in toto*) is concerned with eukaryotic systems: gene organisation and expression; repeated sequences and oncogenesis, haemoglobin; immune system proteins; hormone genes; the mitochondrial genome; and, finally, control and plasticity of the genome.

Gene Structure and Expression professes to be “designed as a text book for honours students in the fields of genetics, biochemistry and microbiology, particularly those followed by medical students” (I quote from the publisher’s blurb). To my mind, it would not be suitable for these courses. First because the depth is too shallow to be used by the honours students mentioned and, second, because medical students can get a large part of the material included in this short monograph from such *magnum opus* as *Molecular Biology of the Cell* (Alberts *et al.*).

In short, *Gene Structure and Expression* attempts to cover too much in too short a space.

ROBERT E. GLASS
Department of Biochemistry,
Queen’s Medical Centre
Nottingham

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There is no doubt that this slim volume is packed from beginning to end with facts—hardly a sentence is wasted. Even by the fifth sentence of the book we are deeply immersed in DNA biochemistry; “One end of a DNA molecule has a phosphoryl radical on the C-5’ of its terminal nucleotide, while the other end possesses a free —OH on C-3’ of its nucleotide” and that’s after explaining Avery’s work (what about poor Macleod and McCarty!) on transforming principle, the four nucleotides required to construct DNA, the way in which the nucleotides are joined and the use of their initials for sequence description. So there’s no paying only half attention when you read this book because the pace never slackens. There are, when necessary, well drawn but simple figures and some very useful tables to illustrate the textual material.

There are thirteen chapters in the book: DNA; Ribonucleic acid (RNA?); Methodology; Vectors used in work with recombinant DNA; Prokaryotic gene organisation and expression; The operon concept; Eukaryotic gene organisation and expression; Repeated sequences and oncogenesis; Haemoglobin; Proteins of the immune system; Hormone genes; The mitochondrial genome, and The control and plasticity of the genome. This may seem an arbitrary choice of topics yet we are disarmed by the author who in his introduction says that this is certainly the case and reflects his own interests and expertise. The feeling I got as I read the book was that each chapter is a very competent, though terse, description of the subject as might be required by a student to complement a lecture on that topic but that the relationship between the topics was by no means clear. For example the chapter on Methodology was justified because “proper appreciation should lead to a better understanding of the work that has been done” but while the chapter was interesting in its own right the description of other topics seldom discussed the methodology used to reach certain conclusions.

Who would find this book useful? I would expect it to be bought by second or third year undergraduates studying genetics or molecular biology and perhaps by postgraduates needing an introduction to gene expression in mammals. In this context the recommended reading list would be very useful indeed and university teachers could well use the topics and recom-

mended reviews as a basis for essays for final year honours students.

On a point of nomenclature I think that there could be some confusion in the way that words having had a specific meaning in molecular genetics for many years are used in quite a different way in this book. Heteroduplex analysis is a standard method for studying the degree of dissimilarity between DNA molecules in which single strands of related DNA are annealed and the DNA:DNA heteroduplexes examined in the electron microscope for non-homologous single-stranded regions. But here the word heteroduplex is used to refer specifically to a DNA:RNA complex to distinguish it from a DNA:DNA homoduplex. Likewise the word transfection which is used to describe the uptake into a cell of the naked DNA of a viral genome is used here to describe what traditionally is called transformation. Teaching genetics is difficult enough without having to cope with shifting definitions. These criticisms apart there is an awful lot of information in this book and I am glad to have a copy.

B. E. B. MOSELEY
Department of Microbiology
University of Edinburgh

Editor's Note

There are two reviews of John Hawkins' book, "Gene Structure and Expression". Dr. Moseley was asked to review the book for "Research and Development in Agriculture", but the editor felt that the subject was not really of interest to the readership of this journal. The review was, therefore, passed on to *Heredity*.

Genetic consequences of nucleotide pool imbalance.

Frederick J. de Serres (ed). Plenum Press, New York and London. 1985. Pp. x+523. Price \$69.50 (US).

Usually there are several good reasons for consigning a symposium-linked volume such as this one to the obscurity of a top shelf or worse. The reasons have to do with lax or non-existent editing, the time elapsed since the actual meeting, and the ephemeral data of many contributions.

However, it is difficult to level such criticisms at this particular volume which consists in the most part of a well-written series of chapters connected by a common theme and placed in wider perspective by contributions from Haynes, Mathews, Drake, Glickman and Holliday.

"Genetic Consequences of Nucleotide Pool Imbalance" arose out of a conference of the same name held in 1983. The theme proves to be an extremely unifying one, bringing together contributions from the fields of DNA precursor production, mechanisms of DNA synthesis and repair and the genetic consequences of pool imbalance in a variety of bacterial, fungal and mammalian cells. It is a general finding that disturbance to DNA precursor metabolism resulting in the presentation

of an inappropriately balanced cocktail of deoxyribonucleotide triphosphates results in cell killing and mutation. Much of the volume is preoccupied with showing that precursor imbalance can arise from the use of anti-metabolites, excess nucleosides or base analogues—all situations that have long been known to generate genetic instability. It is a pity, therefore, that recent data on reinitiation of S phase with consequent gene amplification following precursor synthesis inhibition by hydroxyurea post-dated the meeting. Such information strongly reinforces the view advanced in this book that precursor synthesis is intimately connected with the actual replication mechanism.

Precursor synthesis and the complex role of the key enzyme ribonucleotide reductase are reviewed extensively, and I found these topics especially useful since they underpin many of the other contributions. There are excellent chapters by Reichard, Mathews, and Melamed and Wallace, and despite the still controversial and speculative nature of DNA replicase complexes and facilitated precursor channelling these ideas will stimulate the search for useful mutants with which to dissect mechanism. One personal disappointment was the lack of any information on the possibility that there are distinct precursor pools for DNA repair. Unifying repair and replication demands has not been attempted in this volume except to register that the pool serving repair can be depleted by inhibitors (Snyder) and that pyrimidine auxotrophs of *Ustilago* are UV sensitive and have difficulty in completing repair (Holliday).

DNA repair is, of course, likely to make far fewer demands on precursor production than replication and several excellent contributions on the thymineless state from bacteria to mammalian cells reinforce how important it is to maintain an adequate pyrimidine pool. Failure to do so results in DNA degradation, chromosome aberrations, cell killing, and a wide range of genetic changes. The stressed situation is very complex, however, and the excellent chapter by Little on yeast corrects the impression that the thymineless state is entirely understood. Nevertheless the analysis of useful yeast and mammalian cell mutants promises to open up the field. My experience is with mammalian cells and I particularly appreciated the mutant analysis of Seno and of Meuth and their colleagues which reveal the enormous and complex genetic instability associated with mutations in the DNA precursor pathway.

More than anything else this work should help us to understand that mutation is the result of an extremely complex series of cellular perturbations and that it is not enough to consider simply DNA damage and repair capabilities. Now it is essential to realise that precursor pools can shift dramatically after exposure to genotoxic agents resulting in reduced replication fidelity and increased possibilities of mutation.

This is an enjoyable, thought-provoking and useful volume. Inevitably there is unevenness among the contributions but the general standard is good and most authors have removed blinkers and allowed themselves to relate their work to wider issues. There are several