Book Reviews

Nucleic Acids and Molecular Biology, vol. 6; edited by F. Eckstein and D.M.J. Lilley, Springer-Verlag; Berlin, Heidelberg, New York, 1992; x + 273 pages. DM236.00. ISBN 3-540-55238-3.

Volume 6 in this series continues the tradition of previous volumes with 14 excellent reviews ranging in topic from the breathing of DNA to the structure of the ribosome. These are not reviews for the lay reader but, rather, a collection of essays for the person who is either already in the field or who wishes to delve deeply into a specific topic. Each provides a well-referenced and up-to-date comment on a particular area of research and each ends with a most useful summarising paragraph indicating the areas covered by the review.

The opening three articles deal with the structure of DNA and reflect our changed conception of base pair opening of the DNA double helix and the importance of superhelical tension for both replication and transcription.

There follow four chapters on DNA binding proteins contrasting an abundant DNA-binding protein of prokaryotes (H-NS) which has only an ill-defined function in transcription with a motif (the HMG-box) present in a variety of proteins of widely differing significance. A comparison of the primary sequence of 30 leucine zipper proteins has led to predictions about dimerisation and the conclusion is reached that an α-helix forms in the basic region but only on binding DNA. The helix-loop-helix proteins also have a dimerisation and a DNA binding domain, though quite different from those of the bZip proteins and we get tantalising glimpses of their importance in development.

The linking chapter between DNA/protein and RNA/protein interactions is a thorough and clear review of SV40 replication. Although this covers a variety of topics it does not give too many intimidating details but, rather, gives a broad outline of the various interactions involved.

The final half dozen chapters deal with RNA:protein interactions and include two chapters on snRNAs and two on tRNA synthetases. They illustrate the selection of suppressor mutations in yeast and the use of sequence and evolutionary comparisons to show that the amino acyl tRNA synthetases fall into two distinct classes. The possibilities for structural analysis are very clearly shown by current studies on the glutaminyl-tRNA synthetase–$tRNA^{Gln}$–ATP complex.

All-in-all this compendium of reviews provides an excellent spring-board for a dissertation on any of the subjects covered. The individual chapters will be very useful for senior students and established scientists wishing to get up-to-date in a particular area and they will reassure the field workers about the current state-of-play.

Roger Adams

Information Theory and Molecular Biology; by H.P. Hockey, Cambridge University Press; Cambridge, 1992; xix + 408 pages. £55.00. ISBN 0-521-35005-0.

This monograph is divided into two parts. The first part, occupying about a third of the text and five chapters, provides the appropriate mathematical ideas for the later section: basic ideas, probability theory, entropy in information theory, uncertainty, complexity, maximum entropy, coding theory and transmission and reception of information. The larger part in seven chapters applies the preceding mathematics to: complexity of protein families, evolution of the genetic code, the early earth and the primeval soup, emergence of life from a primeval soup, self-organization as the origin of life, error theories of aging and molecular evolution. The mathematical chapters and some of the biological ones have exercises at the end, but no answers.

This interesting, and sometimes entertaining, book provides a timely summary of the field. The mathematics is formally and systematically presented to a degree not usually found in books aimed at biologists. Those who work in areas of mathematical biology should have no difficulty in understanding and following the presentation, but I have reservations about those whose familiarity with mathematics is less. I doubt that a reading of this section would provide them with the ability to apply mathematics to their own problems, but perhaps the most useful function could be to alert them to the possibilities leading to help from or collaboration with mathematicians.

The chapters on the applications to molecular biology review the areas of current active interest up to about 1991. The order, to me, is illogical; I would have commenced with the origins of the universe and then proceeded through the origin of life to DNA, genetic codes, proteins and finally theories of ageing. Perhaps not everyone would consider the chapter on the origin of the universe to be appropriate, being more in the field of cosmology, but I found it to be informative and it leads on logically to the origin of life on earth. Dr. Yockey's treatment of the subjects within this

---

Information about books for review in FEBS Letters, but **not the books** themselves unless requested by the Book Reviews Editor, should be sent to: Professor H.R.V. Arnstein, FEBS Letters Book Reviews Editor, 15 Hurst Avenue, Highgate, London N6 5TX, UK.

section is comprehensive and rigorous and an important feature is his critical look at the sometimes unsound conclusions of biologists.

Despite the previous reservations, this is an excellent book, well-written and enjoyable to read. It can be read by anyone with an interest in the area of molecular biology and evolution – most of the second section is, in fact, comprehensible without the detailed knowledge of mathematics presented in the first.

Gordon Atkins

Inositol Phosphates and Calcium Signalling (Advances in Second Messenger and Phosphoprotein Research, Volume 26); edited by J.W. Putney Jr., Raven Press; New York, 1992; ix + 404 pages. $119.00. ISBN 0-88167-883-X.

This, the first book on inositol lipid-mediated signalling to focus only on a major sub-field, appeared in late 1992, is referenced to about mid-1991, and mostly still rings true. Readers should realise, though, that the rapidity of progress of this field means that they should search forward from the references herein. Jim Putney edits, so it focusses on control of intracellular [Ca^{2+}] by inositol phosphates – and the tissues most fully explored include endocrine and smooth muscle systems that were pivotal to the development of ideas on how cells signal with Ca^{2+}. The authors work within a good structure, and Jim has persuaded key protagonists of various points-of-view to contribute. This being so, the inevitable unevenness of a multiauthor volume is refreshing rather than a source of concern. There are four sections. history and basics of inositol phosphate generation and metabolism; basics of inositol phosphate-regulated Ca^{2+} mobilization; spatial and temporal complexities of intracellular [Ca^{2+}]; and the ways different tissues use these mechanisms.

Section I opens with Berridge's personal reminiscence of how he became interested first in signalling and then in inositol phosphates. Harden elegantly summarises G protein control of phosphoinositidase C-β (PIC-β) (control of PIC by $G_{\beta\gamma}$ came too late) and Rhee's chapter, which covers the PIC family as a whole, is notable for its discussion of PIC-γ and immune cell signalling. Shears reviews the complex metabolism of inositol polyphosphates, emphasising our ignorance of the functions of inositol polyphosphates other than Ins(1,4,5)P_3 and Ins(1,3,4,5)P_4.

Sections II and III, which are really overlapping subsections that are the guts of the book, explore widely agreed features of Ins(1,4,5)P_3 regulation of cellular [Ca^{2+}] and the arguments that wash around a number of key questions. This being a contentious and rapidly developing field, there is inevitable repetition of key experimental observations, but married to varying interpretations of how they may help to resolve outstanding disagreements. Ferris & Snyder and Colin Taylor summarise the nature and behaviour of the Ins(1,4,5)P_3 receptor/channel, but later chapters by Jacopo Meldolesi, Andy Thomas, Don Gill and Didier Pittet (and their colleagues) emphasise our ignorance of exactly where these receptors reside. Jim Putney and Robin Irvine, side-by-side, fight their corners over the (lack of?) role of Ins(1,3,4,5)P_4 in controlling Ca^{2+} entry into stimulated cells. Berridge summarises the Mark II version of his two-pool Ca^{2+} spiking model, in which both Ca^{2+} pools are Ins(1,4,5)P_3-sensitive. Andy Thomas provides a scholarly summary of crucial questions about spatial and temporal [Ca^{2+}] heterogeneities in intact cells, and some possible answers. And Don Gill focusses on permeabilised cell models for exploring interrelationships between these pools.

The final section is a mixed bag Van Breemen combines the history of smooth muscle Ca^{2+} control with Ins(1,4,5)P_3 control in these favourite tissues of pharmacologists. Muallem succinctly summarises Ca^{2+} control in exocrine cells. And Pittet includes a summary of the 'calciosome' evidence. Kaczmarek's offers a salutory reminder that the nervous system is stuffed with Ins(1,4,5)P_3-dependent signalling apparatus, but we have very little idea what it is used for.

If you want one source that will bring you (almost) up-to-date on this extraordinary field, including its disagreements, you can't do better than this.

Bob Michell

Protein Kinase C: Current Concepts and Future Perspectives; edited by D.S. Lester and R.M. Epand. Ellis Horwood; New York, London, 1992; xii + 365 pages. £59.00, $84.00. ISBN 0-13-720186-9.

The protein kinase C (PKC) family of serine/threonine kinases are conserved from yeast to man and play pivotal roles in the process of cellular signal transduction. Tumour-promoting phorbol esters bind to and activate most PKC isoforms and this has special relevance to the molecular mechanism(s) of carcinogenesis. Over the last decade, a great deal has been learnt about the molecular structure of the PKC family of enzymes and the mechanisms by which they respond to phospholipids, diacylglycerol and Ca^{2+} second messengers. PKC now serves as a model for the investigation of other signal transducing enzymes. A major goal for the next decade will be to try and understand, at the molecular level, how PKC functions in the cellular context. It is therefore timely that D.S. Lester and R M. Epand have invited experts in the field to review the current knowledge of PKC and to highlight research areas important for future investigation.

This multi-authored text is divided into two equal parts (sections I and II), focusing on biochemical and biophysical aspects and on the biological role of PKC, respectively. PKC

A review of Hubert Yockey's 'Information theory and molecular biology' by Gert Korthof 24 Aug 1998 (updated 18 May 2010). "Building a theoretical biology based on mathematical foundations. That is what this book is all about." Hubert Yockey. Hubert Yockey is a physicist who worked under Robert Oppenheimer and worked on the Manhattan Project (production of the first atomic bomb). In the fifties he published about effects of radiation on living systems and started to work on the application of information theory to genetics and evolution. Yockey published 7 articles in Information theory can thus be viewed as a type of non-equilibrium. thermodynamics. Before exploring the uses of these concepts in molecular biology, let me re-. iterate the most important points which tend to be obscured when discussing. information.Â But this entropy per symbol only allows us to quantify our uncertainty about the sequence identity, but it will not reveal to us the function of the genes. If this is all that information theory could do, we would have to agree with the critics that information theory is nearly useless in molecular biology. Yet, I have promised that information theory is relevant, and I shall presently point out how. First of all, let us return to the concept of information.