

used time and time again to generate the diverse array of forms found on our planet today.

Hopefully the next phase of embryology will see a fusion of the more classical embryological and cellular techniques with the new power of molecular biology to unravel even more about how we develop.

Professor Wolpert's book should be fascinating reading for the non-specialist and a good introduction to problems of development for students perhaps going into medical studies. It may also stimulate the appetite for development of those who will study genetics and molecular biology.

MARY BOWNES

ICMB

Division of Biological Sciences
University of Edinburgh

Biochemical Protozoology. Edited by G. H. COOMBS and M. J. NORTH. Taylor and Francis. 1991. 635 pages. Hardback £75; paper back £29.95. ISBN 0 7484 0000 1 and paperback 0 7484 0001 X p.

One of the joys of studying parasitic protozoa is the sheer amount of variety and diversity displayed by organisms which have adapted to highly specialised environments within their hosts. However, this diversity also makes it difficult to deliver a definitive text on the subject of biochemical protozoology. Indeed the last texts devoted wholly to this topic were written in the 1970s. Given the advances over the last decade this volume edited by Graham Coombs and Michael North is very timely and extremely valuable. In line with the increased depth and breadth of the subject, and the need for up-to-date information and referencing of a rapidly developing field, the book is not presented as a single text, but as a collection of 55 well-referenced mini-reviews. Each review forms a separate chapter and is written by a leading expert in his field.

The format works very well. Not only is the reader informed of the latest developments in areas of particular interest, but he is also presented with the viewpoints of individual researchers who themselves will determine the direction of research in the coming years. The result is a highly informative text which should be on the bookshelves of all practising and aspiring parasitologists.

In keeping with the history of biochemical protozoology, and the amount of funds available for research on different protozoa, the book concentrates on parasitic protozoa which pose a significant threat to human and animal health. The overriding aim behind most of the work described is either to define biochemical differences between the protozoa and their mammalian hosts which may be exploited by chemotherapy or to better understand the mechanism of action of important drugs. Much of the work described relates to *Plasmodium* species, responsible for malaria, and the trypanosomatids, responsible for

sleeping sickness, Chagas' disease and leishmaniasis. A third grouping of significance is the anaerobic protists, which include the trichomonads, e.g. *T. vaginalis*, and other parasites such as *Giardia* and *Entamoeba*.

The layout of the book tries to group articles by their biochemical subject matter rather than by the organism being studied. The initial chapters concentrate on overviews of metabolism in different species, highlighting unique aspects of their biochemistry. The diversity observed is perhaps best illustrated by the novel organelles found in certain species; the hydrogenosomes of many anaerobic protists, the glycosomes of trypanosomatids and also the rather unusual mitochondria of erythrocytic stage plasmodia. The occurrence of dihydrofolate reductase and thymidylate synthase as distinct domains on a single bifunctional polypeptide, in all protozoa so far studied, points to the unique significance of folate metabolism in many parasites. Other systems whose study has provided promising 'leads' for new chemotherapies are the amino acid catabolism of anaerobic protists and the trypanothione metabolism of trypanosomatids.

Following on from the initial chapters specific enzyme drug targets and areas of metabolism are described in more depth. By far the largest single grouping of enzymes discussed are the proteinases (13 chapters). This may represent a degree of overkill, and to some extent this work is technology led. Scientists study what they can assay or measure. However there is no doubting the growing interest in this field and its potential value for developing new chemotherapies. In addition this work should also provide new insights into parasite biology. For example malarial proteinases involved in such fundamental processes as erythrocyte invasion and haemoglobin degradation are currently being characterised. The dream of a biochemical protozoologist is to (i) identify a novel pathway in an organism of interest (ii) identify a novel enzyme within this pathway and (iii) obtain structural information on this enzyme so that rational drug design can become a reality. In chapter 44 Alan Fairlamb describes the completion of the first two stages of this process in his study on trypanothione metabolism and trypanothione reductase in trypanosomatids. The successful crystallisation of trypanothione reductase from *C. fasciculata* has now put in process the third and final stage of what has been an invaluable contribution to our understanding of trypanosomatid infections.

It is worth noting that the end goal of such a process as that described above, namely the development of new drugs by rational drug design, depends not only on classical biochemistry techniques, but on the involvement of molecular biology and medicinal chemistry techniques. The editors state in their introduction to this book that they made a decision early on to 'deal solely with biochemistry

rather than molecular biology *per se*'. Given the need to limit the book to a meaningful size and keep the discussions focussed, and also given that the bulk of parasitology research using a molecular genetic approach in the 1980s was linked mainly to the immunological characterisation of parasitic protozoa in the search for vaccines or, in the case of trypanosomes, to novel molecular biology processes such as *trans*-splicing and RNA editing, this is perhaps understandable. However, recently, recombinant DNA techniques and the power of molecular genetics have greatly aided our understanding of classical biochemical problems such as those discussed in this book. Besides the obvious value of gene cloning and recombinant gene expression to the study of particular proteins, for which several examples are described in this book, other 'molecular genetics' approaches have been valuable. For example, the genetic analysis of progeny from a genetic cross has yielded new information on chloroquine resistance in malaria and may lead to a better understanding of this drug's mode of action. Furthermore, the development of a transformation system by which foreign DNA can be targeted to specific regions of trypanosomatid genomes has recently been reported. This could have a huge impact on how we study the operation of biochemical pathways within these organisms.

As stated by the editors, we appear to be moving into an era when the division of protozoologists into biochemists' and 'molecular biologists' is becoming increasingly blurred. It is only through a partnership of people versed in the whole range of scientific techniques available that we will be able to better understand the biology of a particular organism and, if necessary, devise methods of controlling it. I very much hope that there will be future editions of this extremely worthwhile book and that these editions will reflect a synthesis of molecular genetic and biochemical approaches to the study of parasitic protozoa. It is likely also that parasites not mentioned in this volume will find their way into such editions. These might well include the poultry parasite *Eimeria* and the tropical cattle parasite *Theileria* which are now being actively investigated. In addition more recent organisms of biochemical study, such as *Pneumocystis*, *Toxoplasma* and *Cryptosporidia* which are associated with opportunistic infections in AIDS patients, should also have their place.

ROBERT RIDLEY
ICMB King's Buildings
University of Edinburgh

Animal Applications of Research in Mammalian Development. Edited by R. A. PEDERSEN, A. McLAREN and N. L. FIRST. Cold Spring Harbor Laboratory Press. 1991. 334 pages. \$44. ISBN 0 87969 333 9.

During the past 50 years there has been a continuing increase in the research effort directed toward the

recovery, manipulation and storage of mammalian embryos. Initially the need was to be able to recover and transfer embryos, but more recently the emphasis has moved on to revolutionary techniques that introduce genetic changes or produce several copies of the embryo by nuclear transfer. This volume presents a review of the present situation with regard to 8 different topics. The eight specialist contributions are preceded by a general introduction which places the other chapters into context. Although this book is associated with a meeting that took place in October 1989 the chapters were apparently completed during the latter half of 1990.

This volume is one of the series in Current Communications In Cell and Molecular Biology which examine 'topics on which the impact of the techniques and concepts of molecular and cell biology is particularly evident'. In this volume the intention was to review 'cellular and molecular approaches to gametogenesis, embryogenesis, and maternal-fetal interactions in agriculturally important animals'. There is considerable variation in the nature of the chapters and this is reflected in their length, which ranges from 17 to 59 pages (on stem cells and oocytes, respectively). In some chapters there is an evident attempt to review information from a great variety of species, while in others the comparisons are limited.

Although it is now possible to promote the maturation of the oocytes of several species *in vitro*, much remains to be learned of the mechanisms that maintain oocytes in their resting state within the follicle until the final stimulus to mature shortly before ovulation. There is a particularly interesting and comprehensive review of these subjects by Racowsky, which summarises the observations in many different species and contrasts different models that are presently under investigation. Attention is also drawn to the recent studies of primordial follicle culture.

It is also very useful to see a comparative review of the origins of the cell lineages, by Cruz and Pedersen. After summarising embryogenesis in the mouse there is a description of the sequence of events from cleavage through compaction, the formation and elongation of the blastocyst to gastrulation and implantation in domestic species, contrasted with observations in insectivores and metatherians.

Prather and Robl provide an excellent summary of the two procedures of splitting embryos and nuclear transfer, the first of which is well established, but has only limited potential while the other has far greater apparent potential which has yet to be realised. Much remains to be learned of mechanisms that can be harnessed to reprogramme the nuclei of differentiated cells, activate recipient oocytes and control the early development of reconstituted embryos, and these issues are raised in this chapter.

There is an excellent account of the method and potential applications of gene transfer by direct