Book Reviews


This book consists of 20 chapters starting with an introductory section on principles and concepts, plant disease losses, disease development and disease forecasting. It then moves on to individual chapters covering all aspects of disease control. The book is comprehensive in its treatment of the subject overall, but I felt that the detail in some chapters reflected neither the significance of control measures nor the wealth of pertinent literature available. For example, the chapter on soil fumigation which in the UK is a comparatively rare and specialised method of control was as long as the chapter on genetic resistance to disease. The prospects for the incorporation of new DNA-based technologies in plant breeding was one area treated rather superficially. I was also disappointed not to find references to cost/benefit analyses of control measures in the book, particularly in the two otherwise good chapters on fungicides.

When reading the text from cover to cover, something which perhaps was not intended by the author, I was slightly confused by the progression in the chapters. For example the chapter on Seed Treatments precedes the chapter on Pathogen Free Seed and the two chapters on Fungicides. This could lead to problems for the student reader particularly when confronted with fungicide seed treatments before fungicide groups and modes of action are explained fully. In addition, there was some repetition between chapters. The effects of flooding, drainage, irrigation and fertilization on disease were covered both in chapters on Modifying the Environment and Altering Cultural Practices.

In the preface to the book, the author explains why most of the examples used in the text are from forest pathology, the area of the author’s expertise. On many occasions the author’s depth of knowledge provides some very pertinent examples to explain the practice of plant disease control. For example in the chapter on Eradication, there are some excellent examples of case studies of eradication programmes for stem rust, apple rust and white pine blister rust. However, on some occasions examples from forest pathology are less appropriate and it would have been more useful to have much more widely practised examples from arable farming.

The author has produced a generally sound comprehensive text. The reader’s interest is maintained by the frequent historical references to land-marks in disease control through the ages. There are also useful clear and well presented explanatory diagrams and tables which the student reader in particular will benefit from.

The author defines his market as ‘students and practitioners of plant disease control in plant pathology, entomology, agronomy, horticulture, forestry and related fields’. All these parties will indeed find something useful in this text. With regard to the student market, financial constraints often lead to the purchase of only a single more general plant pathology text to complement their teaching. Students will occasionally purchase a more specialist text if it is cheap enough. In this particular context, Bill Carlile’s paper back entitled ‘Control of Crop Diseases’ springs to mind (£7.50, Institute of Biology series). I feel that at £49.50 Otis Maloy’s will be beyond most students budgets. The book may, however, find a market in university and college libraries and on advisory plant pathologists’ shelves as a reference text.

David W. Parry


The second edition of David Lawlor’s well-known and comprehensive text on photosynthesis follows only 6 years from the first. The reason for the relatively short lifetime of the first edition is stated in the preface to be due to the advances made in some fundamental aspects of the subject since 1987: crystallization of the photosynthetic reaction centres of a purple bacterium and high resolution X-ray analysis of these structures; elucidation of the molecular structure of ribulose bisphosphate carboxylase-oxygenase; and the description of the genetic map of chloroplast DNA.

Macroscopically, the book appears very similar to its predecessor. However, the typeface is larger, which means that the book would contain more pages even without the additional material; but there are some deletions, notably the brief history of photosynthesis research. The chapter headings are identical, but there is one new chapter. The progress of topics is in the same logical sequence that occurs in most books on photosynthesis: introduction (overview); the nature of light; the light harvesting process; the architecture of the photosynthetic apparatus; electron and proton transport; photophosphorylation; the chemistry of the photosynthetic carbon reduction cycle; C4 photosynthesis and Crassulacean acid metabolism; the metabolism of photosynthetic products. The new chapter on the molecular biology of the photosynthetic system is placed next; and finally three chapters on more physiological, rather than the preceding biochemical and metabolic, themes: carbon dioxide supply, which includes an account of the diffusion pathway; whole leaf photosynthesis, which includes the effect of environmental factors on photosynthesis; and a short final chapter which examines the role of photosynthesis and plant productivity in the contemporary environment.

Microscopically, the new book is very different from the
old in many places. Although most of the diagrams have been retained, much text has been re-written to incorporate new material, fresh perspectives, and different emphases. However, we still have the same clear and detailed accounts of structures and processes as in the first edition, and still the same comprehensive coverage from molecule to environment. The balance of topics remains similar, and not always even. For example, I would like to have seen more on Crassulacean acid metabolism; the fact that many aquatic species adopt this pathway is not even mentioned. Indeed, this is probably the only section of the book that has survived unchanged! However, this kind of quibble is very minor. As with the first edition, here is a book which presents a survey of all aspects of photosynthesis, written and illustrated in such a way that students with a basic knowledge of biochemistry will benefit greatly from reading.

David Causton


‘Plant Mitochondria’ includes a compilation of 42 articles covering RNA editing, gene and genome organization, gene expression, protein synthesis and transport and mitochondrial mutants and male sterility. The title of the book hides the fact that a significant proportion of the articles are not devoted to plants. However, it is this mixture that makes this book interesting and worthwhile. On the minus side it is very evidently a compilation of research articles and short reviews produced at the request of the organizers of the meeting on ‘RNA Editing and Plant Mitochondria’ which was held in Berlin in 1993. Like many such books with origins in meetings the quality of the submissions and their content is varied. This book is no exception, however I do find that the non-plant mitochondrial articles are significantly better and provide excellent reviews of their subject matter which will benefit students and researchers alike.

The articles discussing RNA editing are on the whole excellent both in content and presentation. The four known editing mechanisms in Trypanosomes, Physarum polycephalum, Acanthamoeba castellani and higher plants are described. The mechanism of RNA editing in these four groups of organisms are quite distinct, research into the mechanism being by far the most advanced in the trypanosomes, Trypanosoma brucei and Crithidia fasciculata, where the guide RNAs and the proteins with which they interact to form the mRNA–RNP (the editosome) are now being described and identified. A fascinating process is revealed—where although only a single nucleotide, namely uridine is involved, hundreds of uridines may need to be added and many tens removed from a single mRNA in order for the mRNA to become translatable. The guide RNAs acting as both template and source for the insertion of uridines and may themselves undergo editing. In contrast the science of RNA editing in the mitochondria of Physarum polycephalum, Acanthamoeba castellani and higher plants and chloroplasts of higher plants is still in the descriptive phase, the mechanism remaining elusive and provoking a good deal of speculation.

Six articles concern themselves with protein import into plant mitochondria and one reviews import into chloroplasts. These articles provide a comprehensive background to the subject area. Two articles describe one of the more recent and interesting discoveries, namely that the mitochondrial protease (processing peptidase plus the processing enhancing protein), which cleaves off the target peptide of nuclear encoded proteins, are components of the cytochrome c ubiquinol reductase complex. This raises the possibility that import and electron transport are intimately linked; import being dependent on respiratory function. This is of course quite unlike the situation in yeast where both components of the protease are located in the matrix and import and respiratory function are separate processes. In addition to protein import; plants as well as many of the lower eukaryotes import tRNAs into their mitochondria, precisely how this is achieved remains enigmatic though the role of the amino-acyl tRNA synthetases is considered central. Not only do plant mitochondria need to import tRNAs, they also require tRNA species which are encoded in captured chloroplast DNA fragments. Given that plant mitochondrial genomes are the largest known it appears unusual that they have lost many of their own tRNA genes and have now become dependent on recruited genes and gene products for translating the endogenous mRNAs.

There are a number of articles covering the fields of genome organisation, gene structure and expression, and RNA splicing. Of particular interest are those describing and comparing introns and their mechanism of splicing. The articles are not wholly concerned with mitochondria. One article describes splicing in the chloroplasts of Chlamydomonas. Here psaA is transspliced but unlike many of the other transspliced genes the central part of the intron is separately encoded by tscA. This situation appears not to be limited to the chloroplasts of Chlamydomonas as a similar mechanism of transsplicing, involving three RNA species, is postulated for one of the introns of nad5 in Oenothera. As a number of genes are transspliced the opportunity for exon shuffling exists. However it would appear that if it does exist it is below the level of PCR detection. This indicates that the process of trans-splicing is extremely specific; suggesting that each transsplicing reaction requires its own specific protein components. These presumably are all nuclear encoded as appears to be the case in Chlamydomonas chloroplast where at least 14 nuclear loci have been identified in the transsplicing of psaA. Was transsplicing ancestral to cis-splicing or vice versa? This question and the role of genome rearrangements in the evolution of splicing provokes interesting arguments.

Cytoplasmic male sterility (CMS) is one of the major themes of the book. It is a nuclear-cytoplasmic incompatibility which is reminiscent of human mitopathies which manifest themselves relatively late in development. CMS, although not obviously affecting vegetative development, causes development aberrations which affect pollen formation either directly or indirectly. It appears from the research described that mitochondrial ORFs encoding unique hydrophobic polypeptides are the causative factors in the absence of nuclear genes which can suppress expression of the ORF or eliminate it from the mitochondrial. How these mitochondrial genes cause cell
ablation at a critical time during floral or pollen morphogenesis still remains to be discovered.

Despite the short comings of one or two articles the book provides a wealth of information, references to pertinent literature and reviews of subject areas that is not found in any other single compilation. Overall, the articles reveal not only the diversity of organelle processes but also a perversity in the way organelle processes have evolved and adapted to suit the ecological niche of their ‘host organism’.

David M. Lonsdale


The first volume on sexual plant reproduction, comprising 23 chapters, is based on a series of lectures given by experts in the field of reproductive biology to students attending a course on Sexual Plant Reproduction at the University of Siena. Chapters are varied in content but 13 of the 23 include all the major aspects of the process of sexual reproduction in vivo—male and female development (including gene expression), stigma morphology, the pollen-stigma interaction, pollen tube growth and fertilization. In addition, there are chapters on sporophytic and gameto-phytic self-incompatibility, in vitro aspects of pollination and fertilization, pollen quality, gametophytic selection, pollution monitoring, the confocal laser scanning microscope in reproduction research, and a chapter on the impact for pollination of animal acoustic communication. Notwithstanding the inclusion of the occasional somewhat bizarre topic, whose connection with sexual reproduction is tenuous at best, the volume will be useful to those wishing to catch up on current aspects of sexual reproduction in plants. However, the reader should not expect excessive detail in such a slim volume and, indeed, in some papers there is certainly too little detail.

The hard cover, together with illustrations, suggest the book ought to contain more than camera-ready copy. At times, proof reading appears to have been minimal. For example, the titles of the papers by H. G. Dickinson (1) and by M. A. Zaki and H. G. Dickinson (page 17) have been transposed, references quoted in the text are occasionally missing from the reference lists at the end of papers, and several line drawings are of poor quality.

Sexual reproduction in plants is surely the correct English and ought to have been used in the title.

The atlas is the result of collaboration between the Universities of Lyon, Reading, Siena and Wageningen within the framework of the European Community ERASMUS scheme. The British Museum (Natural History) became involved during the volume's preparation and hence the inclusion of Dr. Blackmore in the list of authors. The authors are widely recognized as experts in their fields of research. Professor Hugh Dickinson (Oxford) wrote the foreword. The atlas comprises three major parts—another development, pistil development and the progamic phase and fertilization. One additional useful feature is that the introductory comments to each section also list recommended literature. There are 101 mainly high quality plates predominantly comprising scanning and transmission electron micrographs. Several are spectacular. The photomicrographs are accompanied, generally on a facing page, by explanatory diagrams and an explanation of figures. On some occasions, the same diagram or a similar one is used to help the reader pin-point the feature under observation e.g. during pollen tube growth down the style various areas in the pollen tube are marked on the diagram and relate precisely to the micrograph on the facing page. This is of great benefit to the reader.

The aim of the atlas, which is set out in the general introduction, is to present a broad survey of the current state of knowledge of sexual reproduction and to demonstrate the ultrastructural aspects of the basic structures and processes. While the book fulfills this function, it is likely to require a revision fairly rapidly following a revival, with the help of new technologies, of the light microscope. However, it will be a useful complement to more wordy texts particularly for undergraduates who wish rapidly to obtain a superficial understanding of the sexual process and for post-graduates as an aide-memoire. There is a plant index and a short subject index.

Simon Owens


With review serial publications there is always a worry that the difficulty of getting top flight researchers to take time off to indulge in contemplation of their subject will result in second rate authors and unauthoritative reviews. However, it is pleasing to see that Progress in phycological research, Volume 9, the latest in a serial which appears about once a year, has kept up the high standard of its predecessors. Also, like them, it covers a wide spectrum of topics and in no way simply represents the interests of the energetic editors.

In this volume the first chapter, by D-P Häder deals with the very topical subject of enhanced solar ultraviolet radiation. Here the emphasis is on aquatic ecosystems with special reference to phytoplankton. There is an extensive section on the author's own interests in experimental studies on mortality, particularly as it affects vertical migration of flagellates. The chapter concludes with the suggestion that decrease in the ozone layer can be expected to have indirect detrimental effects on aquatic ecosystems through loss of productivity.

Next follows a review of peroxisomes in algae, by W Gross. All the main groups of algae have now been shown to possess microbodies as defined by their function, rather than by reference to the small single-membrane vesicles seen in electron micrographs, used in earlier work. One of the interesting findings of the past few years has been the way in which microbodies are often associated with other cell organelles. The enzymes present and functions of microbodies in various algal groups are described in detail and the conclusion is reached that the function, and therefore the
particular enzymes present, depends on the tissue in which they are formed.

Chapter 3 on the biology of desmids by JF Gerrath is very different both in its approach and scope. Effectively, this is a comprehensive review of the work of the past 10 years with a massive 450 references. It seems to cover every aspect of these lowly but fascinating green algae and shows that, for example in research on microtubules and actin filaments, such organisms can provide wonderful models for experimentation.

Still with the green algae, Chapter 4 by A Musgrave deals with mating in the alga which has probably been more studied in this respect than any other, *Chlamydomonas*. As with the previous chapter this is really an update of an earlier review by a different author a decade before. In the intervening years much has been discovered about signalling, about agglutinins and factors affecting them, as well as more details of the behaviour of the flagella as they unite together at the start of gamete fusion. This topic has now left the realm of microscopy and is firmly into the front-line of molecular biological techniques. As the author states: ‘In the green plant world, it is the best described system of cell recognition, signalling and response forming.’

The next chapter, on plant hormones in the algae by PE Jameson, is probably the one section of this volume of most obvious interest to higher plant physiologists. Indeed it soon becomes clear that in this area work on algal hormones lags decades behind that on Angiosperms. In that sense the review provides an excellent starting point for anyone wishing to venture into an almost untapped field.

The volume concludes with a magnificent review of the Prasinophyceae by SO Sym and RN Pienaar. This is a group of mainly flagellate, primitive, scaly, green algae rather little known outside the ranks of phycologists but which may well hold important clues to the origin of land plants. So much has been discovered about this group in the past few years, in particular about the details of flagellar structure and root systems, that the review is most valuable in bringing together the extensive findings and interpreting them. It ends with an attempt at a comprehensive phylogenetic tree in which all known genera and the main characteristics—morphological and biochemical—are utilised.

To sum up, this is a well produced volume with a range of topics which should contain something of interest to every phycologist. However, it could well provide some useful lateral inspiration from the biology of unicellular or simple algae for even the most entrenched higher plant researcher.

*John D. Dodge*