Book Reviews

Arabidopsis Protocols. Methods in Molecular Biology, *Vol. 82*. Edited by JOSE MARTINEZ-ZAPATER and JULIO SALINAS, Humana Press 1998. 440 pages. Price $79.50. ISBN 0 89603 391 0.

This book is a must for anyone moving into the Arabidopsis field and setting up a new lab. It will also be useful for more established labs as I discovered when passing the book around my group. The book is divided into seven parts:

I. Arabidopsis culture
II. Purification of subcellular organelles and macromolecules
III. Mutagenesis and genetic analysis
IV. Gene mapping in Arabidopsis
V. Transient and stable transformation
VI. Gene cloning strategies
VII. Gene expression analyses

I particularly liked the early chapters in Part I dealing with very basic and everyday problems encountered when working with Arabidopsis: growth of plants; harvesting of seeds; controlling pests etc. These are rarely dealt with in the literature but can really slow down progress in a new lab. Part II carries chapters detailing protocols for the isolation of organelles and macromolecules which will be extremely useful to the whole Arabidopsis community. These sections are always dealt with very briefly in methods sections in papers and so having detailed protocols with tips is invaluable. The editors have done well in persuading researchers with extensive experience with particular techniques to produce the protocols.

Genetic analysis, use of the recombinant inbred (RI) lines and exploiting the RI lines in QTL analyses are admirably described by Maarten Koornneef, Carlos Alonso-Blanco and Piet Stam. These analyses provide the basis for most Arabidopsis research but I imagine even the most seasoned Arabidopsis scientist will find them an interesting and informative read. Different PCR- and Southern-based markers used by the Arabidopsis community are covered in four different chapters: AFLP (amplified fragment length polymorphism) fingerprinting; production of a high density AFLP map; CAPS (cleaved amplified polymorphic sequences) and ARMS (Arabidopsis RFLP mapping set). SSLPs or SSCPs are not covered. These chapters give detailed accounts of how to use the markers and where to get further information. Part IV also carries a chapter by Agyare, Lemieux and colleagues on mapping cloned sequences by hybridization to YAC (yeast artificial chromosome) clones that constitute the Arabidopsis physical map. This approach will replace mapping of DNA markers on the RI lines very soon.

Part V contains chapters describing very detailed protocols for transient and stable transformation. The latter can be achieved by root, leaf or *in planta* transformation although it was my impression that many of the transformants from leaf disc transformation were polyploid. These protocols are unlikely to go out of date quickly as they have been published for several years and have now been modified to the point that they are extremely straightforward. The *in planta* transformation is fast becoming the method of choice because of its ease and lack of steps requiring sterile culture. However, the transformation frequencies still vary widely between different ecotypes and genotypes and between different labs!

The Gene cloning strategies section (Part VI) is by necessity more of an overview of different techniques rather than detailed protocols. However, the chapter by Leung and Giraudat gives very extensive protocols for working with YACs and an extremely useful protocol for subcloning YACs into cosmids in preparation for the complementation experiments. Other chapters cover chromosome landing strategies with AFLPs, transposon tagging with *Ac*/*Ds*, *En*/*I* transposon tagging and T-DNA tagging. Part VII includes a range of detailed *in situ* hybridization protocols using both sections and whole mounts. The authors, who are extremely experienced in these protocols, provide some beautiful examples and it is a pity that these are not in colour. Part VII also includes chapters on the use of luciferase and β-glucuronidase as reporter genes in plants. Last, but not least, there is a chapter on a protocol for *in vivo* footprinting in Arabidopsis.

Overall the book is extremely useful and I hope it will be used. A considerable amount of effort went into producing the very detailed protocols, the majority of which will not go out of date. Although protocol books and course notes from EMBO and Cold Spring Harbor practical courses are available on the Web, I would still recommend most people to see a copy of this.

CAROLINE DEAN
John Innes Centre,
Colney Lane,
Norwich NR4 7UH

Molecular Evolution and Adaptive Radiation. Edited by T. J. GIVNISH and K. J. SYTSMA. Cambridge University Press. 1997. 621 pages. Price £65/$105. ISBN 0 521 57329 7.

The idea for a book on this topic seems an excellent one, as recent advances in molecular evolutionary studies have provided phylogenetic trees for many groups of organisms and having in hand a reasonably objective phylogeny can be expected to enable one to gain greater understanding than was previously possible of evolutionary events such as adaptive radiations. In these terms, the book is highly successful. Eighteen of the twenty-one chapters describe particular adaptive radiations, giving detailed descriptions of taxa in which interesting evolutionary changes have occurred (eight of which involve very recently diversified groups).

The particular evolutionary changes described in the book are all of great interest in themselves, and the beginning of almost every one of these chapters describes fascinating biology and natural history: I was delighted to read about the backward-facing pouches of some burrowing marsupials, and about the epiphytic orchids that grow only on twigs less than 2·5 cm in diameter. Such "isn't life wonderful" information is always of interest, and forms a necessary background to any ecological thinking. The groups of organisms reviewed range widely, with four invetebrate taxa (including one non-arthropod), two fish, one reptile, three mammal and eight flowering plant taxa. The inclusion of so many plant case studies with studies of animal groups is welcome, and indicates the interest that plants can have for evolutionary biologists. The only difficulty is dealing with the jargon, which creates a real problem for a book covering a wide taxonomic range. A glossary would have been helpful. Most of the authors include good figures (though some of the photographic plates are poor), but many then go on to use obscure terminology without explanation. It is difficult to digest "root-tuberoids", "stigmatic processes", "cauline leaves", and "resupinate labella", all in one page, and this is merely a random example.

Apart from this problem, most chapters are well written and most maintain roughly comparable levels of detail when describing their individual cases, though it is a pity that greater uniformity was not maintained in such matters as whether amounts of divergence are indicated in quantitative terms in the phylogenetic trees, and whether bootstrap tests of significance are shown. A weakness of the uniformity in the book's plan, however, is that a collection of case studies of adaptive radiations begins after a while to feel repetitive. After the initial section of each chapter, most describe the phylogenetic analysis and many include discussions of how MacClade software was used to try and determine when in the group's history some important phenotypic change occurred. After a number of repetitions of this chapter plan, it becomes difficult to feel enthusiastic about reading another such section, or looking at another phylogenetic tree. These sections are also difficult for the non-taxonomist reader, as they again contain jargon that is not explained, and rely on concepts that are not always clear in the minds of other biologists. For instance, in Chapter 2 important arguments are based on consistency indices, but these are not explained to allow readers not familiar with them to evaluate the arguments.

Most chapters soon recover their biological interest as conclusions emerge about the order and number of evolutionary changes that have happened in each of the cases examined, though many of the case studies involve assumptions that could be challenged, and some of the conclusions are uncertain and may be changed in the future. Clearly, the attempts to tell the history of particular groups described here should one day lead to improved tests of hypotheses about the reasons why particular morphological features evolved in some species but not in others, but we are at present rarely in a position to answer such questions. A related problem is that it is not always clear why the morphological features were chosen, rather than other characteristics of the plants or animals described. Many of the characteristics seem to have been picked simply because they are the defining features of the taxa studied, but this is an excessively taxonomic viewpoint, and it is unclear whether they offer the most insight into the evolution of these groups, or are necessarily particularly interesting in relation to our understanding of important evolutionary questions. For example, the chapters dealing with floral evolution are mostly somewhat isolated from a general view of what evolutionary factors are important for floral function.

The book is thus chiefly a compendium of interesting phylogenetic case histories, telling us all we need to know about the evolutionary events with respect to interesting phenotypic characteristics in each of the groups included, with valuable bibliographies. Few

chapters confront questions of very general interest. Most of them attempt to raise some interesting general issues, but few of the studies are yet really sufficiently complete to answer the questions raised. An exception is the work on sticklebacks, in which the taxonomic and population biology aspects are successfully integrated, but in many chapters the focus is perhaps too taxonomic, and not evolutionary enough. Some feeling of generality emerges from the sheer weight of repeated instances of such findings as convergent evolution in one taxonomic and ecological instance after another, and the repeated evidence for very fast evolutionary change and for reversals of changes; these more or less anecdotal impressions do add to the interest of the book.

Ideally, the study of a large set of adaptive radiations should, at least some day, lead to greater generality. Only three chapters are not case studies. The final chapter reviews published data from fish and other taxa to estimate times taken to generate the observed numbers of species, and thus to find the times taken for new species to evolve. These are presumably overestimates, since morphologically indistinguishable sibling species may be counted as single species, and these may tend to be separated by less time than visibly different species. Strikingly short, and strikingly variable time estimates are derived for fish species to evolve. It may, however, be difficult to be certain about species numbers, for instance in groups of geographically isolated populations. A major gap in this book as a whole is the lack of information on reproductive isolation, and the reliance mainly on morphological species definitions. No data are provided on the relationship between accumulation of evolutionary differences and the development of reproductive isolation.

Furthermore, little or no attempt is made to integrate taxonomic analyses with our current understanding of molecular evolution, which might have led to more diversity among chapters. Several chapters raise claims that would be of general importance, but do not examine them thoroughly. An example is the suggestion in chapter 3 that: "Interspecific divergence based on genes involved in morphological development, e.g. floral homeotic genes, may prove to be more closely correlated with morphological divergence within the silversword alliance lineage than changes in cpDNA or nuclear rDNA sequences". This represents a kind of suggestion that is frequently raised in evolutionary studies. Chapter 1, for instance, suggests that "the great flowering of morphological bodyplans in the PreCambrian" may not have been a true adaptive radiation, in the sense that ecological diversity was causing evolution, but merely the time when "metazoans began to assemble cassette-like kits of homeotic genes that governed fundamental aspects of the development of multi-celled organisms". Such ideas are not often tested, so we do not know whether it is likely that genes identified by their major effects on morphological processes are often important in morphological evolution; mutations of major effect are likely to be highly detrimental.

These are gaps that may be filled in the future, and this book does an excellent job of reviewing many interesting evolutionary situations in a similar format, so that the similarities and differences between different cases are highlighted, and interesting questions for future study are raised.

DEBORAH CHARLESWORTH
Institute of Cell, Animal and Population Biology (ICAPB)
University of Edinburgh
Ashworth Laboratories
King's Buildings
West Mains Road
Edinburgh EH9 3JT

RNA Structure and Function. Edited by ROBERT W. SIMONS and MARIANNE GRUNBERG-MANAGO. Cold Spring Harbor Laboratory Press 1997. 741 pages. Price $145. ISBN 0 87969 509 9.

Retroviruses. Edited by JOHN M. COFFIN, STEPHEN H. HUGHES and HAROLD E. VARMUS. Cold Spring Harbor Laboratory Press 1997. 843 pages. Price $180. ISBN 0 87969 497 1.

One sometimes reads that the printed book as a repository of information is about to be replaced by the Great Web. Cold Spring Harbor are out to stave off that eventuality for as long as possible, and on present form that could be quite a while. The editors of these two books have recruited some of the leaders of research into the RNA world to bring us up to date in this most dynamic of areas.

Simons and Grunberg-Manago's monograph is about equally devoted to RNA structures and the uses to which they are put. Since we first learned about the roles of mRNA, tRNA and rRNA in the general transfer of sequence information from DNA to protein, numerous other functions of RNA have come to light, and are described here by the people involved in their discovery. Elizabeth Blackburn, for example, contributes an article about telomerase RNA, essential for the maintenance of chromosome ends. And several other articles document the various ways in which special RNA sequences and conformations intervene to regulate gene expression: termination of transcription, the cutting and splicing and sometimes even the editing of the primary transcript, and, in a number of cases, the feedback regulation of the rate of translation. Even the near-universal code is subject to regulation. How many of us knew that UGA, the third termination codon, can, with the aid of certain downstream RNA structure, encode selenocysteine?

The next edition of this book may be able to explain how Xist RNA inactivates the mammalian X-chromosome, and the equally problematical role of RNA in the silencing of transgenes.

Whereas RNA fulfils many functions for the organism, it can also, given access to reverse transcriptase, go into business, it appears, on its own account. The Coffin, Hughes and Varmus volume has twelve Chapters, each a virtually free-standing monograph, covering between them all aspects of retrovirology. One long chapter of special interest to geneticists and evolutionists is that by Boeke and Stoye on the various kinds of genomic elements, present in the genomes of most organisms, that seem to have originated as reverse transcripts. These retroelements include retrovirus genomes at various stages of decay, the so-called LINE elements (e.g. mammalian L1 and Drosophila I) that encode, or once encoded, reverse transcriptase and nothing else, and SINE elements (e.g. Alu1 of humans), seemingly derived long ago from honest working RNA molecules but now, thanks perhaps to LINE-encoded reverse transcriptase, vastly multiplied without apparent function. In the human genome, the L1 and Alu1 elements between them may account for up to 20 per cent of the total DNA. One cannot help thinking that the evolution of chromosome structure may have had as much to do with the adjustments needed to accommodate all this apparently selfish sequence as with helping the organism to cope with the outside world – though the promoters or enhancers of initially useless elements may sometimes have been recruited to perform useful functions.

These are both large books, both well-illustrated and fully referenced. But whereas *RNA*, *Structure and Function* is in the reasonably handy format familiar from previous CSH monographs, *Retroviruses* is physically in a different league. It is a splendid book, with abundant multicoloured Figures, well-organized Tables and as many references to the literature as anyone could want – close to 1500 for Rosenberg and Jolicoeur's article on *Retroviral Pathogenesis* alone. But its sheer weight, about four kilograms, makes it seriously difficult to read, especially by anyone who needs to lift it a little to bring it into focus. Is this a sign of the future – the Web for reading and books as monuments? I hope not.

J. R. S. FINCHAM
Institute of Cell, Animal and Population Biology
University of Edinburgh

https://doi.org/10.1017/S0016672396239643 Published online by Cambridge University Press