

## Book reviews

**Vasil, I.K. (ed.): Cell Culture and Somatic Cell Genetics of Plants, Vol. 1. Laboratory Procedures and Their Applications.** Orlando, San Diego, New York, London, Toronto, Montreal, Sydney, Tokyo: Academic Press 1984. XXXI, 825 pp., several figs. and tabs.

In any kind of scientific endeavor easy access to reliable up-to-date methods and techniques is indispensable. This is especially true in such rapidly developing fields as genetic engineering and its practical applications. While many basic techniques of recombinant DNA technology applicable to plants are available in a number of laboratory manuals, methods that serve as preparatory to plant genetic engineering have had to be picked up by researchers from current literature. The present volume, the first one in a multi-volume treatise, nicely fills this void and, in addition to presenting a full coverage of laboratory procedures and their applications in cell culture, contains all the basic methods of plant somatic cell genetics, a branch of science in its own right.

All chapters have been written by outstanding experts with first-hand experience in their field. The formidable task of the editor of making the book coherent by seeing to it that the guidelines be observed by the authors of the 85 chapters, is to be highly appreciated. Of course, even so, the individual chapters with a maximum of ten printed pages each, but usually less, vary somewhat as to the extent of details provided. Only in very few cases are the commercial sources of some minor equipment or special chemicals missing.

Apparently, an attempt has been made to order the sequence of the individual chapters in such a way that they follow some logic. As might be anticipated with such a huge multifaceted volume, the outcome necessarily is a matter of taste.

Two introductory chapters (organization of plant tissue culture laboratories and educational services for plant tissue culture) are followed by chapters on two basic topics: nutrition and media in plant cell culture and induction and maintenance of callus cultures. The next chapters are devoted to techniques and procedures used in the *in vitro* propagation of plants as organisms or organs (clonal propagation, culture of shoot meristems) with emphasis on some species of special interest (orchids, citrus, palms, gymnosperms, pea, fruit plants). This section concludes with a description of procedures for the acclimatization of micropropagated plants. There follow techniques to be used with plant material at the cellular level. In this part the treatment of the material is centered around general procedures rather than plant species (induction and maintenance of cell suspension cultures, fractionation of cultured cells, large-scale culture of cells in suspension, synchronization of suspension culture cells, photoautotrophic cell cultures, quantitative plating technique, the feeder layer technique, culture of isolated mesophyll cells, the multiple-drop-array screening technique). After an "interruption" comprising detailed descriptions of establishing cultures of ovaries, ovules, embryos, endosperm and anthers, we return to techniques of isolating and handling plant cells, this time in the form of protoplasts. A detailed account of the many ways by which protoplasts can be isolated and cultured from tobacco, *Petunia*, *Datura*, *Brassica*, tomato, potato, carrot, cereals and

grasses concludes, so to say, the description of basic methods needed to produce the starting material for actual genetic experiments. In these chapters it would have been profitable to lay more emphasis on the quantitative aspects of protoplast isolation i.e. on the expected yield of protoplasts obtainable from an estimated number of cells per gram leaf material.

In the chapters following, a number of useful techniques and procedures for use in somatic cell genetics are described (fusion of protoplasts, isolation and uptake of organelles (nuclei, chloroplasts, chromosomes), incubation of liposomes with protoplasts, cell transformation by coculture with *Agrobacterium tumefaciens* and Ti plasmid DNA uptake, mutagenesis of cultured cells, mutant selection, etc.).

In addition to this full arsenal of techniques and procedures, strictly connected with cell culture and somatic cell genetics of plants, this volume has the special merit of also including a number of "auxiliary" methods such as inoculation of protoplasts with plant viruses, elimination of viruses, freeze preservation of cells and meristems, isolation and analysis of fungal phytotoxins, terpenoids, alkaloids, plant growth regulators, techniques used in light microscopy, electron microscopy, microspectrophotometry, flow cytometric analysis, autoradiography, protein extraction and analysis etc. One wonders, however, why DNA and RNA are that much less important than proteins, as to deserve full neglect.

It is a pity that in the subject index some methods which are described in full detail in some chapters, but not indicated by their titles, are omitted (e.g. isolation of protoplasts, pp. 515 or 525–526). I would have liked to see a Subject Index with more particular details.

In summary, this is a laboratory manual in the strictest sense of the word, and an excellent one, for that matter. It certainly fills in a long-felt gap and is a must for everyone working in plant biochemistry or plant genetics in the largest sense of these words.

F. Solymosy, Szeged

**Blin, N.; Trendelenburg, M.F.; Schmidt, E.R.: Molekular und Zellbiologie – Aktuelle Themen.** Tokyo, Berlin, Heidelberg, New York: Springer 1985. IX + 199 pp., 52 figs. Soft bound DM 32,-.

The authors succeeded in gathering a large number of actual topics in molecular and cell biology and as well as selecting such methods which promote research progress. The excellent introductions and overviews of recent methods play an important part in the text and represent the main value of the book. The most authors have organized special courses in corresponding fields. The papers, therefore, are clearly written and illustrated with diagrams which effectively simplify concepts presented in the text. The book contents cover DNA, chromosome and protein analyses, gene expression and regulation.

The paper on DNA sequencing (Schmidt) presents not only the Maxam-Gilbert and Sanger methods, but also the conditions for the preparation of DNA, cloning and labelling including further improvements of these methods. In the

following paper Suhai gives insights into the mathematical and information-theoretical results to arrange the sequencing data. Lindenmaier summarizes knowledge on cloning vectors of *E. coli* and Nordheim discusses DNA itself. Using the example of cytoskeleton analysis Jockusch and Füchtbauer show how it is possible to find the location and function of cell compounds by microinjection (for instance of antibodies). Of all the papers on protein analysis I will only mention the one of Ball and Groner on cell surface proteins that demonstrates the possibility of association to the problem of malignant transformation.

Advances in chromosome research are illustrated by Jäckle et al. (microcloning of chromosomal fragments), by Blin (assortment of metaphase chromosomes by flow cytometry) and by C. and T. Cremer (the use of DNA libraries to analyse chromosome aberrations and Mendelian genes of men). Methods about gene transfer into eukaryotic cells (Hauser), analysis of gene expression (Hofman et al.) and regulation in eukaryotes studied with the SV40 model (Chowdhury et al.), and in the genome of the mouse breast tumorvirus (Groner) complete the summary of up-to-day methods.

The book is printed in German. It will be very useful for all those interested in the progress in this field with the aim of experimental research or in gaining information about experimental work. The chapters are completed with well-selected citations.

E. Günther, Greifswald

**Dobat, K., in collaboration with Peikert-Holle, Th.: Blüten und Fledermäuse (Chiropterophilie).** Frankfurt/M.: W. Kramer 1985. 307 pp., 108 figs., 24 tabs. DM 78,-.

This is a fascinating book about a fascinating group of animals. The authors have covered all aspects of chiropterophily (the pollination of flowers by bats) with great thoroughness, integrity, and fairness to other authors, and by doing so they have come up with the first truly exhaustive treatment of the subject, a book that deserves to be made "required reading" for every biology teacher and student of floral ecology. It should be translated into the English language as soon as possible so that it can reach a wider audience, and should be recommended for inclusion in biological and general libraries. For a book of this caliber, the price is quite reasonable. It is obvious that both the authors and the publisher have lavished great care on it: printing-errors are virtually absent, the illustrations (including some color photographs) are excellent, and the bibliography is very complete (Tuttle's very informative and attractive semi-popular article in "Smithsonian" probably came out just a little too late for inclusion in this 1985 book).

The general introduction is followed by a very readable and well-documented historical overview of the subject. After that, the reader is treated to chapters in which, first, the various adaptations of chiropterophilous plants, and then those of anthophilous bats are described in fascinating detail. The chapter covering the geographical range of chiropterophily is brief but quite adequate. Chapter 7, however, dealing with the evolution of chiropterophily, may cause some eyebrow-raising: it is hard to see the relevance of Dobat's lengthy discussion of continental drift, since there now is a reasonable consensus that anthophilous vertebrates evolved rather late in the game, perhaps in the late Tertiary, when the present distribution of the land-masses had, essentially, been already established. Furthermore, even those biologists willing to accept Leppik's ideas about the evolution of biological flower-types would probably agree that chiropterophily is not strictly

tied up with any particular kind of floral architecture, so that Dobat's discussion of these ideas is, likewise, largely irrelevant. Chapter 8 gives a very complete enumeration of records of presumed chiropterophily; mention is made of the bat-species involved, the name of the observers, and the country or region where the observations were made. Chapter 9 is the counterpart, in which the plant taxa visited by bats for pollination are dealt with in the same manner.

All in all, an outstanding and immensely useful book. However, it has "les défauts de ses qualités". A laudable desire for thoroughness can easily be pushed to ridiculous extremes! We find an example of this on p. 106–107, where the odors produced by bat-pollinated flowers are described in completely subjective human terms; 37 (!) categories are distinguished, including "rancid oil", "beer", "sour milk", "mouse-urine", etc. The odor of *Durio* flowers appears in no less than 7 (!) of these. Clearly, this sort of categorizing is out-of-date and unscientific. It is true that the human nose can give good leads; see, e.g., U. Harder (1973), "Die verbale Klassifizierung von Gerüchen", *Parfümerie und Kosmetik* 54: 106–112. However, more scientific, objective, methods are now available! In his 1961 (!) pollination book, the present reviewer already mentioned that H. G. Derx has chemically identified diacetyl (used in the margarine-industry to produce a butter-flavor) as the major component of the flower-odor of a bat-pollinated *Fagraea* species. Gas-chromatography has become the method of choice for the analysis of odors, and it would be very surprising indeed to find that it has not yielded at least some information on the odors of bat-pollinated flowers. The index is not of much help here. The reader checking the item odor ("Geruch") may even get the feeling of being sent from pillar to post, for he is first sent from "Geruch" to "Duft", and from there to "Blüte" (flower). The individual stumbling upon "Blütenduft" is also sent to "Blüte", without mercy!

In chapters 9 and 10, the authors' praiseworthy efforts to give credit where credit is due have, again, caused them to overshoot the mark. It is impossible to decide whether the authors quoted have made original observations, or whether they give secondhand information in a general article or book. On p. 225, e.g., the present reviewer is mentioned in connection with *Kigelia aethiopica* in Panama – a country where he has never been! Three species of *Kigelia* are listed here, but they may well be one and the same. In general, the plant names should be checked for correctness and possible synonymy.

In spite of its completeness, the book still leaves certain questions unanswered. It is possible to see the life-style of pollinating bats, which are active at night, as a mirror-image of that of the diurnal hummingbirds. It has been demonstrated that in the latter, at least in the smaller ones, the rate of metabolism drops to a small fraction of the daytime value in the hours of darkness. The suggestion has been made that in the smaller bats a similar phenomenon occurs in the daytime. Dobat does not comment on this matter at all.

The above remarks point to flaws in the book that are very minor. They can easily be taken care of in future editions. May there be many of those!

B. J. D. Meeuse, Seattle

**Cook, P.R.; Laskey, R.A.: Higher Order Structure in the Nucleus. Journal of Cell Science, Suppl. 1.** Cambridge: Company of Biologists 1984. 234 pp., several figs and tabs. Hard bound \$ 19.00.

This book represents a collection of 14 papers, originating at the 1984 Manchester Meeting of the British Society for Cell

Biology at the Biologists Symposium, which together present nearly all aspects of the Higher Order Structure in the Nucleus. Inherent is the not always optimal choice of authors so that some elements are over-emphasized while others are treated too lightly. The topics discussed range from DNA sequence effects on chromatin and chromosome structure and function in chromosome separation, gene activity and gene activation, through higher order chromatin structure and the mitotic regulation of chromosome condensation, to the structural components of the chromosome scaffold, the nuclear matrix and lamina-pore complex, and the intranuclear localization of individual chromosome species. Most presentations are re-written combinations of several recent papers, generally with some additional unpublished material. This low-priced book can be a good up-to-date introduction to the structural and functional complexity of the eukaryotic nucleus for any general, cell or molecular biologist, while at the same time providing additional detail and nice illustrations for researchers involved in this field.

J. H. Waterborg, Reno

**Chapman, A.B. (ed.): General and Quantitative Genetics. World Animal Science, Vol. A4.** Amsterdam: Elsevier 1985. XIV/408 pp. Hard bound Hfl 250,-.

This volume consists of 16 chapters, nine of which were written by W. D. Hohenboken. The first chapter by J. F. Crow is an elementary introduction to classical Mendelian genetics and the second chapter by Hohenboken deals with inheritance associated with sex. The next seven chapters, all by Hohenboken, provide an overview of quantitative genetics and classical animal breeding. All of these chapters are well written, giving copious examples of application to livestock breeding and requiring no more than introductory algebra to understand the theory. Methods of statistical estimation are not outlined so that a reader would have to go to another source to determine the "how to". The chapters on maternal effects and genotype by environment interaction are particularly well documented with good examples from recent literature in animal breeding. The chapter on measuring selection response has a good discussion of discrepancies between predicted and realized response. Although several laboratory animal selection experiments are cited, almost no space is devoted to selection results with beef cattle, sheep, poultry and pigs. The chapter on selection index theory by K. Rönningen and L. D. Van Vleck requires much more mathematical knowledge than the previous chapters. The notation is very cumbersome, and would have benefited from use of matrix notation to introduce the solution to index equations. The description of best linear unbiased prediction methodology is a good introduction to the topic. Illustration of several selection index experiments could have been used to show how effective the selection index method is in practice. The next two chapters on inbreeding by F. Pirchner and cross-breeding by Hohenboken effectively summarize current knowledge of inbreeding depression and heterosis in livestock. From here the book turns its attention to genetics at the cellular level with chapters by D. Zartman, N. S. Fechtmeier and M. A. J. Ansay and R. H. Hanset. Molecular genetics can no longer be ignored in formulating methods to improve genetically the efficiency of livestock production. These chapters review topics like transcription, translation, chromosome abnormalities, meiosis, mutation and gene regulation. The final chapter on genetic engineering in domestic animals by Fechtmeier reviews new non-traditional techniques that have potential for increasing the rate of genetic improvement.

Reflecting the rapid advances in biotechnology, this chapter is already out of date since it was written before the publication of many recent findings, e.g., the successful transfer of the human growth hormone gene into mice.

The high cost of this book would preclude its use as a text. However, it will serve as a valuable reference source for students and researchers in animal breeding and quantitative genetics.

E. J. Eisen, Raleigh

**Greenwood, P.J.; Harvey, P.H.; Slatkin, M.: Evolution. Essays in Honour of John Maynard Smith.** London, New York, New Rochelle, Melbourne, Sydney: Cambridge University Press 1985. VIII+328 pp., several figs. and tabs. Hard bound \$ 49.50.

The book under review contains a collection of essays in honour of John Maynard Smith, one of the leading British evolutionists of this century. Trained as an engineer, Maynard Smith switched to biology and made important contributions in many areas of evolutionary biology. In his early years, Maynard Smith's work was, to a larger part, experimental but from the seventies he almost conclusively devoted himself to theoretical biology. Maynard Smith revived old questions, posed new ones, and sometimes gave answers. His most lasting and unique contributions undoubtedly lie in the fields of biomechanics, population dynamics, community ecology and the evolution of behaviour. MacArthur and Hamilton had introduced game theory into the study of evolution, but it was Maynard Smith who made the most profound and extensive contributions. His concept of 'Evolutionary Stable Strategy' (ESS) will play a lasting role in the study of animal behaviour.

The essays in the volume under review exemplify the kind of work Maynard Smith has encouraged in an excellent way. Unfortunately, there is no chapter which gives a general survey of his work or of his scientific method. With regard to the latter, the Preface refers to 'Smith's laws', three theorems which should be invoked when a scientific dispute cannot be settled on objective grounds or also otherwise, and which are worth mentioning in this review: (1) The bellman's theorem, "What I say three times must be true" (from Lewis Carroll); (2) aunt Jabisco's theorem, "It is a fact the whole world knows" (from Edward Lear); and (3) the third law, "It is a truth universally acknowledged" (from Jane Austen).

G. J. de Klerk, Canberra

**Simon, M.; Herskowitz, I.: Genome Rearrangement. UCLA Symposia on Molecular and Cellular Biology, New Series, Vol. 20.** New York: Alan R. Liss 1985. 336 pp., several figs. and tabs.

Barbara McClintock was the first one to discover transposable elements, at the genetic level. Since then, transposable elements and, more generally, DNA rearrangements, have been found and characterized at the molecular level in many pro- and eukaryotic organisms. In 1984, one of the UCLA Symposia on molecular and cellular biology was devoted to "Genome Rearrangement". In the present volume, the proceedings of 24 mostly significant presentations are published. From both the meeting itself and this book, it is indeed clear that DNA rearrangement is much more common and diverse than the classical model of transposable elements.

The book is divided into 4 sections of 5-10 papers each. Roughly, these 4 sections cover the following subjects: I Mutation/gene activation; II Variation/programmed re-

arrangement; III Amplification and diminution; IV Gene activation.

In section I, the by Dr. McClintock discovered transposable elements Ac and Ds are analyzed at the molecular level. Further, this section contains papers on mitochondrial DNA sequences in the yeast nuclear genome, on replication of bacteriophage Mu as well as on Tn5 insertion specificity.

The second section deserves a lot of attention. First of all, from the results presented in 4 papers, the relationships between examples of inversion and transposition found in bacteria become clear. The invertases found in bacteriophage Mu (Gin), *Haemophilus* phase variation (Hin), the *E. coli* P invertible region (Pin), as well as the resolvases encoded by Tn3,  $\gamma\delta$  but also those encoded by Tn501, Tn21, Tn1721 show considerable homology. The second part of section II forms a compilation of papers on different types of phase variations found in *E. coli*, *Borrelia* (antigenic variation), *Neisseria gonorrhoeae* (pilus<sup>+</sup> → pilus<sup>-</sup>) and antigenic variation in Trypanosomes.

In sections III and IV, the reader is brought into some probably less familiar examples of genome rearrangement which often are involved in the activation of gene expression by means of amplification (and aneuploidy) as well as transposition resulting in the correct positioning of transcriptional regulatory elements.

In general the book contains excellent papers with good introductions. People with a good molecular biology background are provided with a nice overview of genome rearrangement and its impact on gene expression.

P.J.M. van den Elzen, Amsterdam

**Rodrigues, R.L.; Tait, R.C.: Recombinant DNA techniques. An introduction.** London, Amsterdam, Don Mills, Sydney, Tokyo: Addison-Wesley 1983. xviii + 236 pp., several figs. and tabs.

Recombinant DNA techniques were developed in the 1970s, being based on the use of vectors (plasmids or viral DNA), and the discovery and ready availability of restriction enzymes for cutting the DNA at specific sites. Ligase-mediated splicing also played its part. The authors of this book have both been involved in the development of these recombinant techniques since the 1970s and are well qualified to set out this laboratory manual which deals with the fundamental principles of recombinant DNA technology, the sort of principles needed before proceeding to advanced research.

The book is set out so that each chapter covers one or more experiments preceded by an introductory discussion of theoretical and practical aspects of the experiment. The authors have intended that each succeeding chapter should build on the one before it. However, each chapter is also self-contained and the work described can be performed separately, thus gaining the best of both worlds. The authors have chosen to use the histidine and arabinose operons of *E. coli* extensively in the particular experiments described. The exercises cover the techniques of transformation, ligation, use of restricting enzymes and the purification and analysis of DNA, all described in nine chapters and involving fifteen

exercises. These make up less than half the book. The remainder of this manual is devoted to appendices setting forth various recipes, protocols, restriction maps and nucleotide sequences and tables. It is here where the experience and knowledge of the authors comes to the fore, with many down-to-earth and well-described recipes and protocols being presented which are taken for granted in the more advanced manuals, or at best only briefly and inadequately described.

The authors have performed the experiments as described themselves and vouch for the reproducibility and clarity of results. The experiments involve the formation of recombinant DNA molecules from organisms that exchange genetic material naturally and therefore exempt from, for example, the U.S. National Institute of Health Guidelines. They must, however, be performed in a PI physical containment facility using appropriate laboratory practices.

A useful index completes this highly practical and well-organised manual. It is to be recommended for those taking their first steps in this growing and exciting field.

J.F. Jackson, Glen Osmond

**Mizrahi, A.; Wezel, A. L. van (eds.): Advances in Biotechnological Processes, Vol. 4.** New York: Alan R. Liss 1985. XV/356 pp. Hard bound £ 64.-.

In volume 4 the scope of this series is consequently continued: to present reviews of current developments and applications in biotechnology, thus integrating genetics, biochemistry, microbiology, chemical engineering with process technology. It has achieved this industrial application in the capacities of culture tissues, cells and microorganisms in the fields of health, nutrition, pollution and energy.

The focus of the present volume is on the specific techniques and methods employed in the conversion, creation and application of organic and genetic substances. The first 3 chapters treat the genetic engineering of human interferons from lymphoblastoid cells, including the cloning of interferon species, the construction of trp expression plasmids and the purification and properties of bacterial interferon. Most interesting is the contribution on the interdisciplinary importance of the new hybridizing technique of electrofusion, especially for yeast hybridization and plasmid transfer, rounded off with a hypothesis for the production of cells in the course of evolution. The fifth chapter reviews the production, characterization and clinical utility of carcinoembryonic antigens. The final four chapters analyse diverse agents derived from human blood, plant cell suspensions and microbes. Of special interest to the biologist is a contribution on the methods for yield improvement of secondary metabolites from plant cell suspension cultures and includes the genetic approaches to increased product formation. Unfortunately the problem of the release or leaching-out of molecules from floating or immobilized cells is not touched upon.

The appeal of the series is not only the fact that the authors are leaders in the field but also the fact that the comprehensive reviews describe the most actual state of the art and include extensive lists of references with full titles.

H. F. Linskens, Nijmegen