

## Book reviews

**Lundsteen, C.; Piper, J. (eds.): Automation of Cytogenetics.** Berlin Heidelberg New York: Springer International 1989. 316 pp. Hard bound DM 128.00.

The book contains 20 articles that were presented by researchers, developers and users of cytogenetics automation at one of the three Workshops in Berlin (1986), Cortona (1987) and Langollen (1988) sponsored by the European Community. Collaborative cytogenetics automation research and development activities in Europe are supported by the "Concerted Action in Automation of Cytogenetics." The book gives in its introductory pages a brief account of the structure of the European community programme for medical and health research.

The articles are presented in six different parts with clear titles befitting the content. The first part deals with the general principles and requirements of automatic chromosome aberration scoring in metaphase cells for mutagen studies: classical chromosome aberrations, sister chromatid exchanges, dicentric and micronuclei (micronucleus assay). The second part reviews the progress and evaluation of automated karyotyping systems. There is a rapidly growing demand for karyotyping, especially for prenatal diagnosis. Therefore, the current automated systems are aimed at efficient karyotyping and quicker and precise processing, which depend very much on the quality of the metaphase image. In addition, this part focuses attention on the development of the most appropriate type of analysis system, based on the size of analysis, the staff, and the structure and facility of the laboratory. The third part is especially devoted to flow cytogenetics. In contrast to the microscopic morphological study of chromosomes, automated flow cytometry allows a rapid analysis of an extremely large number of chromosomes with great accuracy. Details are clearly presented on karyotyping, analysis of chromosomal rearrangements, and future advances, such as digital image analysis and flow cytometry for the detection of structural chromosome aberrations (e.g. translocations) with hybridized DNA probes. The fourth part describes the recent developments and evaluation of automated systems for the preparation, culturing and harvesting of human chromosomes or blood specimens for cytogenetic analysis. Several details on the hardware set-up and the software organization of the machine are presented. One of the major tasks in chromosome analysis automation is to obtain good segmentation data in order to separate the overlapping chromosomes. The fifth part treats the general problem of the separation of chromosomes that touch with each other. In addition, it presents a model-based contour analysis technique for recognizing and automatically resolving composite chromosomes by exploring more task-specific knowledge in developing segmentation algorithms. The last part deals with the classification of chromosomes: cytogenetic analysis by automatic multiple cell karyotyping, composite patterns, high resolution studies on the banding pattern of R-banded human chromosomes at different degrees of chromosome condensation, and a structural approach to the analysis and classification of chromosome banding patterns. When compared to human/mammalian automated cytogenetics, plant chromosome analysis is lagging far behind due to the multiple complexities of chromosome size and structure differences among various species and of cell wall and cell cycle dynamics. The rapid progress and great advancement in the automation of human chromosome analysis should form a guideline to the development of automation systems for plant chromosomes.

The texts of the articles are clear and the article subdivisions are consistent throughout the book. All the articles provide an extended list of relevant references and an additional bibliography up to 1988. The book contains a surveyable table of contents and useful subject index. The figures and tables are well documented and informative. This attractive book is recommended as a reference source to all scientists and students in the field of medical cytogenetics, mutation research, automation, and flow cytometry.

K. Sree Ramulu, Wageningen

**Benson, E. E.: Free Radical Damage in Stored Plant Germplasm.** Rome: International Board for Plant Genetic Resources 1990. 128 pp. Soft bound.

The primary aim of conservation programs is the maintenance of genetic stability. The central target of evaluation is the genome, or more specifically the DNA. Most studies on genetic stability have been carried out on plant seeds. A genetic evaluation of the cryoconservation of in vitro-stored germplasm should also include evaluation of the pollen grains. The phenomenon of somaclonal variation has received the most attention. The IBPGR-commissioned report of Erica Benson (University of Nottingham) summarizes scientific work on the implications of free radical activity for the safe conservation of plant genetic resources – in seeds. It is quite evident that most of the information available comes from relatively intensive studies of animal systems. Present data suggests that damage mediated by free radicals makes an important contribution to the net deterioration that occurs in plant material stored under cryopreservation in liquid nitrogen. The first part of the report provides a background to free radical chemistry; the second part overviews the role of free radicals in stored plant germplasm. The interaction between oxidative stress and primary and secondary plant metabolism is emphasized. The application of external antioxidants is offered as one way of aiding recovery and so reducing genetic instability. However, the time of application of these antioxidants seems to be critical, partly because the information on the role of oxidative stress in cryopreserved plant germplasm is scarce. The report concludes with a review of the problems and potential benefits of the use of biochemical stability tests in monitoring damage in stored plant germplasm. All in all, this report is a useful literature review (based on more than 300 references) for anyone interested in a better understanding of free radical pathology.

H. F. Linskens, Nijmegen

**Wertz, D. C.; Fletcher, J. C. (eds.): Ethics and Human Genetics. A Cross Cultural Perspective.** Berlin Heidelberg New York: Springer International 1989. 536 pp., 53 tabs. Hard bound DM 198.–.

Apart from acceptance, technological achievements are also subject to criticism and rejection. This attitude becomes clear, for example, with biotechnology. Apart from facts (genetically engineered plants may become plagues) and politics (genetic engineering is only feasible for large companies), ethics also plays a role: for example, the question about the ultimate consequences of biotechnology for human beings and the question whether we are allowed to manipulate nature in such a way. The developments in biotechnology should lead to, at least, an interest in ethics among biologists and serious consideration by professional philosophers. In biology, the discipline of ethics has hardly been developed. In contrast, the related area of ethics in

medicine is an established field both of philosophical studies and of empirical examinations. The book under review contains a cross-cultural study on the attitudes towards and the occurrence of prenatal diagnosis and abortion. For the reader of TAG, it is interesting to note how these ethical questions are dealt with in the various societies, how the facts are, and how ethics and law have evolved. Medical ethics has undoubtedly a great impact through the medical students and presents lines along which ethics can be developed in biology.

G.-J. de Klerk, Lisse

**Obe, Günther (ed.): Advances in Mutagenesis Research 1.** Berlin Heidelberg New York: Springer International. 217 pp., 49 figs., 14 plates, 16 tabs. DM 148.-.

This new series of reviews on mutagenesis treats the subject from the broadest possible point of view. The editor has set high standards for the authors, as is evident from this first volume of seven reviews. Moreover, the editorial board of five of the more illustrious names in the field of mutagenesis (Evans, Natarajan, Rosenkranz, Sobels, and Sugimura) gives a certain promise that more volumes of the same breadth and high quality will be forthcoming.

The first review by H. Hayatsu is a wondrous narrative on the ability of blue cotton and blue rayon to absorb mutagenic compounds. He presents detailed protocols as well as lists of compounds already collected with this material. Anyone who has sought mutagens in river water by concentrating the mutagens from tens of thousands of liters with XAD-2 chromatography will welcome this enormous simplification for detecting mutagens in the environment. The second review by R.M. Speed describes meiosis in mammals and human beings. This review stresses methods for analysis as well as displaying photographs from electron microscopy of many of the types of chromosomal aberrations that have been observed. It has a comprehensive list of 207 references. This is a job well done. The third review by H. Nöthel presents a detailed analysis of mutation-mutation equilibria in evolution, emphasizing the extraordinary role played by *Drosophila* investigators in this important field. He notes that transposons play an important role in regulating mutation rates, so it follows that environmental causes like high temperature or poor nutrition, which induce transposon movement, may be more important than mutagens in setting mutational equilibria. Spontaneous events win again. The fourth review by R. Huber and M. Bauchinger discusses the development and provides perspectives of the human lymphocyte micronucleus assay. This method is undergoing continuous refinement. Thus, the older techniques are well described and some of the current techniques involving immunofluorescence are merely mentioned. The fifth review by C. Kessler on a nonradioactive DNA sequence detection system is an enthusiastic and wide-flung account of how digoxigenin DNA binding can be used to replace almost everything that radioactive labeling does now. A total of 233 references are cited, but not many are on the method; most are on what can be replaced. The sixth review by C.A. Smith and I. Mellon on possible clues to the organization of DNA repair systems in mammalian cells is a well thought-out attempt to utilize the philosophical approach of Philip Hanawalt to show how DNA repair acts preferentially in chromosomal regions undergoing transcription, and what this means for germ-line cells versus somatic cells with respect to DNA repair. This is an interesting account of a burgeoning field based on an innovative point of view. The final review is by F.K. Ennever on the use of short-term genotoxicity tests in risk assessment. It is a scholarly, albeit pessimistic, article on the problems associated with environmental risks involving suspected carcinogenic chemicals. Risks, costs, and the multiplicity of chemicals to be assessed are carefully evaluated.

All in all, this is a fine start to a welcome series. There are two short-comings which ought to be corrected in future volumes of this series: the names of authors should be provided in full, because as time and history proceed, more and more literary devices will be needed to know who did what. The second short-coming is much more troublesome. The index is not only incomplete, it is the same hastily done index provided by most publishing houses. It just will not suffice for scholars. With a new series, here was an opportunity to provide an author index which included every author cited by the reviewers, an index for chemicals with CAS numbers (obviating the need for CAS numbers in the text), and a subject index for the topics discussed. An opportunity missed can be a situation rectified.

R. C. von Borstel, Parma (Italy) and Edmonton (Canada)

**Wright, C. J.: Manipulation of Fruiting.** London Boston Singapore: Butterworths 1989. 414 pp. Hard bound \$ 70.00.

While the title page leads the reader to expect that this is a one-author monograph on the major event of the life cycle that produces the harvested parts of the majority of plants, this is actually the proceedings of the 47th University of Nottingham Easter School in Agricultural Science, held at Sutton Bonington in April 1988, and the "author" is actually the editor. Certainly, the controlling and promoting of fruiting is an economically important goal, but only about one-half of the 26 contributions are devoted to manipulation in a strict sense; the others concentrate on important physiological and genetic aspects of flower formation, fertilization and fruit set such as flower initiation, pollination, incompatibility, and canopy microclimate. According to this meeting, "the future" lies in the manipulation of fruit-ripening physiology. Three chapters are devoted to the genetic regulation of fruiting, with emphasis on apples, pears, and raspberry. The leading idea is apparently that the production of regular crops of high quality fruit from easily managed, high-yielding orchards is an important objective of modern fruit growing. With two exceptions (citrus), the emphasis of this proceedings is on the fruit species of the British Isles – apple, pears, cherries, plums, raspberries, strawberries. From the 16 poster presentations, only the titles and authors are mentioned.

H. F. Linskens, Nijmegen

**John, B.: Meiosis. Developmental and Cell Biology, Vol. 22.** Cambridge: Cambridge University Press 1990. XII + 396 pp., 131 figs., 74 tabs. Hard bound \$ 89.50.

This book is a must for every cytogeneticist and in fact for every geneticist because it deals with the very essence of genetics: the cell biological processes where recombination is realized and regulated. The coverage is not restricted to genetic exchange, which makes some other books on meiosis so disappointing, but includes segregation in all of its intricacies. The approach is primarily descriptive, although where possible molecular information is provided. It so happens that molecular biology has only touched upon the basic meiotic processes, and description remains essential.

The author is not inclined to deviate from the classical paradigmas: Darlington's note on reduction and the sexual cycle as the basic ground for meiosis still serves as the motto for the prologue. Of course, the opposite is true: the primary function of meiosis is not reduction, but recombination. Reduction and the sexual cycle are derived processes, solely designed for realizing recombination. This conservatism makes the book less challenging than it could have been. The style too is not as brilliant and lucid as some other publications by the same author, and sometimes it looks as if the labour of writing has muted his wit. This is no wonder when one considers the tremendous area covered. The fact that well over 800 references are quoted demonstrates only part of the extensiveness of the coverage.

In several instances the author remarks that further research is required, and usually he is right. On the other hand, in many more cases definitive conclusions are suggested where the basis in the original publications is quite narrow.

The emphasis is on insect cytogenetics, which has always been the author's main subject of research, and in many respects insects are indeed the most informative material. Mammals and especially plants have been treated more stepmotherly, except for inevitable classical examples like the pairing regulation in wheat, the biochemistry of exchange in lily (hard to reproduce), etc. On the other hand, the cell biological principles of the meiotic process, including the many deviations from the classical pattern, are very similar in all higher eukaryotes, and variations are essential for analysis. However, negligence of the use of interspecific hybrids, manipulated plant chromosomes, and quantitative and mathematical models in meiosis research is an clear deficit of this book. There must have been a reason for omitting these subjects, but whatever it is, it is not convincing.

Of course an author attempting to cover as difficult and extensive a subject as meiosis must be prepared to meet with criticism. At the same time any critic should be grateful that someone has dared to start and subsequently succeed in finishing the tremendous task of writing such a comprehensive and consistent review of a central segment of biology.

J. Sybenga, Wageningen

**O'Brien, S.J. (ed.): Genetic Maps. Locus Maps of Complex Genomes. Book 6: Plants.** Cold Spring Harbor: Cold Spring Harbor Laboratory Press 1990. 151 pp. Paperback US \$ 27.00.

The fifth edition of this monumental work consists of six smaller books, each based on an arbitrary subdivision of biological organisms. The part on plants, not including algae (book 2) and fungi (book 3), assembles genetic maps of tomato, wheat, corn, soybean, *Arabidopsis*, lettuce, broccoli, garden pea, petunia, barley, and rye. These maps include gene maps of nuclear, chloroplast, and mitochondrial genomes plus RFLP tables of several species. The collection is updated from the fourth edition of July 1987. The valuable compilations are reproduced by means of camera-ready techniques so adapted to the rapid gene mapping efforts of many scientists. H.F. Linskens, Nijmegen

**Richards, R. J.: Darwin and the Emergence of Evolutionary Theories of Mind and Behavior.** Chicago and London: University of Chicago Press 1987. 700 pp., 36 figs. Soft bound US \$ 20.75.

Evolutionary theory and the theories of mind and behavior had very close relationships and mutually influenced one another up to approximately 1900. Then, after a long lag, the relationship revived with the rise of ethology and sociobiology. In the book under review, Robert Richards deals with the history of this relationship from the late 18th century up to the rise of sociobiology. A number of articles and books have already examined the various parts of this history, but the present study offers an integrated overview. After a short chapter on early evolutionists like Erasmus Darwin, Lamarck, Cuvier and Frederic Cuvier (brother of the famous George Cuvier), Richards discusses in much detail Charles Darwin's contributions. (Nevertheless, the title of the book, *Darwin and the emergence of evolutionary theories of mind and behavior*, is misleading as far as only a minor portion deals with Darwin exclusively). Subsequently, he analyzes at length the developments during the first decades after the *Origin of species* in the works of Spencer, Romanes, Mivart, Morgan, Baldwin and James. The historical narrative ends up with a relatively short chapter (45 pages) on the twentieth century, including behaviorism, ethology and sociobiology, etc. Apart from giving a history of the relationship between evolutionary and behavioral theories, Richards also

uses this history as a model in a study of the history of ideas. According to Richards, the development of ideas in time is in many respects similar to biological evolution, and in a final chapter he argues in an excellent way that the history of the theory of evolution demonstrates this development. Two appendices have been added to the book, the first specifically on the evolutionary model of the growth of scientific knowledge and the second on evolutionary ethics.

By and large, the 700 pages of this book demonstrate the excellent scholarship of Richards. His study is very interesting for the layman and offers many new views and insights for the specialist. Of course, when such a broad field is covered, it is easy to find parts that have not been dealt with or that are treated in a stepmotherly fashion. I will mention only two examples. The author himself apologizes for dealing almost exclusively with Anglo-American researchers. In confirmation with his choice, two of the most influential psychologists, Freud and Piaget, who both started their scientific work as biologists before switching to psychology, are not (Freud) or hardly (Piaget) dealt with. The influence of evolutionary theory is very strong in the psychological research of these two men, as has been shown by Sulloway for Freud (in *Biologist of the mind*) and is clear from the various books on evolutionary theory of Piaget. Admittedly, though, this influence was in one direction only, and both psychologists had no influence on the development of evolutionary theory itself. A second example is the omission of the question of why the theories of behavior have not been incorporated in the Modern Synthesis. At first sight it seems to be obvious that the predominant theory in those days, behaviorism, was too much a non-biological theory, but this should have been examined by Richards in detail. Why did behaviorism become the predominant theory? How does behaviorism relate to the non-Darwinian evolutionary theories of the first decades of this century and to biology in general? Was there any interest for the biology of behavior among the evolutionists of the Modern Synthesis? All these questions might be important to our understanding of the complex relationship between both areas and also to Richards' model of an evolutionary development of scientific theories.

In spite of such shortcomings, this book is excellent. It will definitely become a standard for historical studies in both evolutionary and behavioral science. It is unique in its richness of thoughts and is a pleasure to read G.J. de Klerk, Lisse

**Defense Molecules, UCLA Symposia on Molecular and Cellular Biology, New Series, Vol. 121.** New York: Wiley-Liss 1990. 316 pp., 52 figs., 25 tabs. Hard bound \$ 97.00.

This volume presents interesting and novel information to those readers interested in basic biological defense processes. The book comprises summaries of 25 lectures given at an UCLA Colloquium at Lake Tahoe, California, February 20–27, 1989 on "Defense Molecules" by a group of international investigators.

The book focuses on the problems of "defense" in plants, invertebrates and vertebrates. The major topics considered in detail are resistance mechanisms in plants and invertebrates, the role of phagocytes/macrophages in defense, non-immunoglobulin defense mechanisms, alloreactivity, the evolution of antibodies and the major histocompatibility complex, the evolution of cytokines, primordial immune mechanisms and the role of T-lymphocytes in disease.

The title "Defense Molecules" could be misleading or at least be too narrow in that the scope of the book is universal with respect to defense problems, ranging from cellular recognition phenomena to the detailed molecular analysis of receptor, effector and regulatory molecules. The overall principle is the "similarity" of defense mechanisms in the sophisticated and

intriguing strategies of all multi-cellular organisms facing the survival necessity of distinguishing between self and non-self in response to parasitism. This is, for example, the induction of phytoalexins in plants by pathogen-derived "elicitors" or the induction of interleukin by environmental biological and chemical insults in invertebrates and vertebrates.

This book is a valuable reference (with an agreeable detailed index) for phytopathologists and biochemists and may contribute to more sophisticated and reasonable basic approaches in the various fields of host-parasite/pathogen interaction.

K.-H. Kogel, Aachen

**Brown, A. H. D.; Marshall, D. R.; Frankel, O. H., Williams, J. T. (eds.): The Use of Plant Genetic Resources.** Cambridge University Press, Cambridge, UK 1989.

These proceedings of the workshop "Genetic Resources and the Plant Breeder" provide a wealth of crop-specific genetic resources information, which makes the book valuable reading for PGR specialists. Other contributions are more of a general nature furnishing information for non-PGR specialists. All contributions are written by leading breeders and PGR scientists.

The book is divided into six parts. The first part examines the role of genetic resources for breeders and experimental biologists. The second part discusses the use of sorghum, potato and cereal collections, and lists the major constraints limiting their use. The advantages and disadvantages of large collections, core collections and networks of dispersed collections are reviewed in part three, followed by practical and theoretical considerations of evaluation of germ plasm in part four. The fifth part focuses on wild relatives, while the final part presents recent developments and their use for genetic resources work, such as in vitro techniques, disease screening, RFLP, and molecular biology.

The book is very much written from a plant breeder's perspective, much less from a conservation of genetic heritage stand point of view. Moreover, the book does not discuss the criticism that is often expressed regarding the collection and storage of genetic resources, plant breeder's rights, and socio-economic consequences.

A. J. G. van Gastel and A. Elings, Aleppo (Syria)

**Spiess, Eliot B.: Genes in Populations.** 2nd edn. New York Chichester Brisbane Toronto Singapore: John Wiley & Sons 1989. 774 pp., 94 figs., 137 tabs. Hard bound \$ 74.95.

The well-known population genetics text-book "Genes in Populations" (first edition 1976) has been revised and thoroughly updated. Since this reviewer is certain that most of the readers of this review are familiar with the first edition it will be sufficient to mention the principle changes that the author has made in the second edition.

Recent results from theoretical and experimental evolutionary genetics literature have been incorporated without upsetting the continuity and the loss of basic concepts.

Advances in population genetics are, of course, predominantly those derived from molecular phenomena (DNA sequencing techniques, methods of molecular genetics). However, many new developments and extensions of previous fundamental "classical" results are also included in this edition. These topics are listed by the author himself in the preface: (1) evidence of gametic association (linkage disequilibrium) and whether selection history is implied; (2) polygenic traits, including those in human populations; (3) assortative mating evidence; (4) sexual selection; (5) measuring fitness in bacterial populations as well as plants and animals with less emphasis on *Drosophila*; (6) variable fitness, particularly environmental heterogeneity with habitat choice in selection dynamics; (7) resolution of the neutralist-selectionist controversy to the extent that present limita-

tions allow; and (8) role of gene flow (migration) in the integration and separation of gene pools.

Now, some additional comments shall be given for those readers who are not familiar with the first edition: This comprehensive volume provides an excellent introduction to the experimental and theoretical genetics of populations in which basic genetic principles have been extended to the dynamics of genes and genotypes in groups of interbreeding individuals. The book is organized into four chapters (introduction and history; genetic equilibrium and random mating; nonrandom mating: consequences for the genotype; forces changing gene frequencies) and an Appendix containing several statistical and mathematical notes that have been selected for convenience to assist the reader in becoming acquainted with the symbols and concepts used in the main text. The treatment is presented from three different points of view: evolutionary, quantitative and medical-anthropological.

Illustrative examples from the experimental literature demonstrate how theoretical principles are applied to real problems. The end-of-chapter exercises provide ample opportunity for the testing and evaluation of data.

The book can be profitably read by those with a background in basic genetics and mathematics. The author has succeeded in keeping the mathematics involved on a moderate level. This excellent book provides a comprehensive, up-to-date reference volume for researchers and students in the fields of genetics, population biology, ecology, zoology, botany, agriculture, medicine, anthropology and agronomy. It can be recommended without any restriction. Nevertheless, the following critical comment must be made: there are many excellent text-books on population genetics available. Is there really any need for an additional one?

M. Hühn, Kiel

**Lothar, H.; Dernick, R.; Ostertag, W. (eds.): Vectors as Tools for the Study of Normal and Abnormal Growth and Differentiation.** NATO ASI Series, Cell Biology, Vol. 34. Berlin, Heidelberg, New York: Springer 1989.

This book focusses on the use of vectors as tools for the study of normal and abnormal growth and differentiation. The ability to introduce genetic alterations into stem cells cultured in vitro, which subsequently can be reintroduced into developing organisms and embryos, has opened an exciting new area of research. In various contributions it is described how desired genes can be introduced into cells using either retroviral vectors or DNA electroporation techniques. Both the advantages and disadvantages of these methods are described. The targeting of the introduced genes and the ability to remove native genes by homologous recombination techniques are the subjects of a number of interesting contributions. It is well recognized that introduced vectors can also be used to trace the developmental fate of the introduced cells, although less attention is paid in this book to this particular subject.

The technology which is being developed in these studies may eventually be used for approaches towards somatic gene therapy. It is realized by all researchers in this field, however, that such applications can only be reached over a longer term, and no direct examples of such an approach are described in this volume. The second part of this book deviates from the original context by focussing on the role of polypeptide growth factors and oncogenes in normal cell proliferation and malignant progression. This is a very broad area of research, and the contributions can therefore only be fragmentary.

This book is of particular interest for researchers with a background in this field, but should not be regarded as an introductory textbook. In addition, this area of research is rapidly expanding, and therefore this book can not be more than only a snapshot.

E. J. J. Zoelen, Nijmegen