BOOK REVIEWS

S. J. OWENS

Plant Sperm Cells as tools for Biotechnology, edited by H. J. Wilms and C. J. Keijzer. *Pudoc, Wageningen, The Netherlands, 1988. Pp. 177. Dutch f. 90.*

This volume provides a valuable contribution to an area of plant science that has been, until relatively recently, largely ignored, particularly by Western scientists. It is a volume that I found very readable and informative, and is essential for the study of the sexual reproduction process in plants. The volume appears to have been the result of a workshop that included some 39 invited contributors. Professor Scott Russell was one of those contributors and much of the current interest in sperm cells is derived from his pioneering paper with Professor David Cass (Russell & Cass, 1981).

Unfortunately, the title is somewhat misleading, since much of the book is concerned with methods for examination and isolation of sperm cells, and with their morphology and ultrastructure, rather than with the use of plant sperms as biotechnological tools. The authors appear to have 'jumped the gun' with respect to biotechnological applications. In addition, readers should note that the generative cell (the precursor cell to the sperms) is included in at least two chapters, a feature not apparent from the title. There are 18 papers arranged in five sections, with all but two by joint or multiple authors. The first section, comprising just one chapter, is an introduction to the current status of sperm cell research and applications to plant breeding. Subsequent sections focus on male gametogenesis, the male germ unit, sperm cell isolation, and sperm cells and plant breeding. The principle modern methods presented and discussed are three-dimensional reconstruction techniques, antibody techniques for locating the cytoskeleton, and one method of confocal scanning laser microscopy. The isolation, storage and manipulation of viable sperm cells form another focal point, from which much of the subsequent genetic engineering techniques will be derived.

The species included in the papers are *Beta vulgaris*, *Brassica oleracea*, *Euphorbia dulcis*, *Galanthus nivalis*, *Gerbera jamesonii*, *Lilium longiflorum*, *Plumbago zeylanica*, *Spinacia oleracea* and *Zea mays*. Though the choice of species at first appears to be random, there are reasons beyond the obvious one, of crop plants. *P. zeylanica*, for example, has pollen tube delivery into the embryo sac without the aid of synergids, which may make observations of fertilization easier. It was also the plant that originally stimulated the recent interest in the field (Russell & Cass, 1981). Research on *Brassica* is part of a wider programme, which includes studies on self-incompatibility. What is affirmed is that only very few species have been studied to date, and that a considerable effort was required to obtain such data. This being so, the description of a male germ unit (MGU) may be premature as it is based on such a narrow database. Professor C. Dumas, who was involved in coining the term MGU, ably reviews the subject.

Most papers are short, six being five pages or less (including micrographs, diagrams and references but excluding colour plates), the rest being 10 pages or less. There are 15 good quality, colour plates plus additional legends on pages 153–177 at the back of the book. The chapter in which a colour plate is included is referred to at the top of the plate, and its legend either appears beneath the plate or on a legend page facing the plate. Inclusion of chapter and paper titles would have improved the speed of location of colour plates in relation to the text.

The volume lacks data on nuclear form and architecture, and comments only briefly on gene activation and expression in generative and sperm cells.

RUSSELL, S. D. & CASS, D. D. (1981). Ultrastructure of the sperms of *Plumbago zeylanica*. I. Cytology and association with the vegetative nucleus. *Protoplasma* **107**, 85–107.

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Working with Animal Chromosomes, by Herbert C. Macgregor and Jennifer M. Varley. *Second edition, John Wiley & Sons, Ltd, 1988. Pp. xv + 290. £22.50, paperback*

One of the most long-lasting contributions of the late Professor C. D. Darlington was his book 'The Handling of Chromosomes', published in 1942 with L. F. La Cour as co-author. I am quite sure that most students in cytology read this book many times during the ensuing three decades for consultation as well as for the enjoyment of seeing the many beautiful photographs of chromosomes. I lost two copies and finally purchased the 1960 edition and kept it home to avoid another stealing.

However, during the last two decades, cytogenetic technology, especially that of human and mammalian cytogenetics, made so much progress that there was an urgent need for a new book to cover both classic and modern cytology. In the early 1980s, a representative of a publishing company persuaded me to prepare such a book. I actually drafted three chapters, but discontinued my effort after seeing the new book by Macgregor and Varley *Working with Animal Chromosomes* published in 1983 by John Wiley and Sons.

Working with Animal Chromosomes combines descriptions of classic and contemporary methods. If I had the nerve to continue my manuscript, I might have placed different emphasis and used a different writing style, but there was no reason for me to spend a lot of time to add little. My only wish was that the book would be revised in a few years to incorporate descriptions of several new technological advances being developed at that time, especially indirect immunofluorescence. But the 1983 version was so useful that to prevent it from playing another Hudini, I kept the copy in my office so well hidden that I later had a hard time finding it.

I am very pleased to read the second edition, which granted my wish to have several pieces of new information added, including indirect immunofluorescence, surface spreading of synaptonemal complexes, isolation

of polytene chromosomes, and others. The book contains 11 chapters: (1) Chromosome size, number, and shape; (2) Mitotic chromosomes; (3) Chromosomes in meiosis; (4) Chromosome banding; (5) Polytene chromosomes; (6) Lampbrush chromosomes; (7) Visualization of transcription (by Aimee H. Bakken & R. S. Hill); (8) In situ hybridization; (9) Autoradiography; (10) Measuring nuclear or chromosomal DNA; and (11) Safety and the law. The last chapter is a new one. It also contains a revised list of names, addresses and telephone numbers of suppliers.

This book contains so much useful information that it should be consulted by all biologists who desire to work with chromosomes seriously or just for fun. As the authors state in their Preface, they wrote this volume for three different kinds of person: high school and college teachers, inexperienced investigators, and experienced investigators. To this end, the authors successfully fulfilled their aim. The presentation is clear throughout, and most illustrations are good. On the negative side, I wish more photographs could have been included for instruction and for enjoyment, and hope that a few illustrations that are not of superior quality will be replaced in the next edition. At any rate, I can now display the first edition on the book shelf in my laboratory and keep the second edition in a secret place.

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Gap Junctions, edited by E. L. Hertzberg and R. G. Johnson. *Alan R. Liss, New York. Pp. 566. $96.00 hardback, £85.00 paperback*

For many years the extraordinary order apparent in micrographs of gap junctions inculcated the belief that they were relatively simple structures, showing little variation from tissue to tissue, species to species. This book, based on a meeting held in July 1987 in California, demonstrates rather clearly how ill-founded such beliefs were, and shows that there is not one gap junction but many. Indeed, one might be forgiven for thinking that gap junctions are really so complicated that proper understanding is a long way off.

The explosion of new information that has been apparent for the past two or three years makes this book particularly useful, since it collects together recent work of most of those now engaged in the study of gap junctions from a variety of viewpoints. This is, at one and the same time, both the greatest strength and greatest weakness of the volume. Strength, because it is possible to gain a very good understanding of the overall state of the field; weakness, because the sheer volume of material threatens to overwhelm the reader.

There are seven sections. The first five (Biochemistry, Structure, Molecular Biology, Regulation, Biophysics) focus on the basic features of gap junctions and provide the framework for the last two sections on possible functional roles in Growth Control and Development. On the whole, the papers deal with issues in a matter-of-fact way, with most authors taking the trouble to point out where issues of contention or experimental difficulty arise. This means that one can really get the flavour of the way in which the field is developing. The ever-increasing number of cDNAs coding for gap junction proteins suggests that we may still be at the tip of the iceberg in our analysis and identification of the proteins that make up and regulate this deceptively simple structure.

The status of the gap junction as a structure in search of a function (as it was once described by Lewis Wolpert) is highlighted by the last two sections, which are in many ways the least satisfactory. Not because of the articles, which are well written and interesting, but from the stand-point of our understanding of what gap junctions actually do in organs, cultured cells and development. Because the sad fact of the matter is that, by and large, we are as ignorant now as we were over 20 years ago when the classic paper by Potter, Furshpan & Lennox on the squid embryo first appeared. The sections on cell–cell communication in transformed cells show rather clearly that as our knowledge has grown so our understanding has diminished, since there appears to be no simple relation between the efficiency of gap-junctional communication and the transformed state and general principles are hard to derive, at least from the present data. On a more positive note, the analysis of the cellular *src* gene in relation to gap-junctional communication demonstrates how molecular analysis and site-directed mutagenesis can illuminate our understanding of possible regulatory mechanisms.

The gap-junction field has always had its fierce controversies, with various protagonists taking up relatively entrenched positions. With time, the controversies have changed; as one set is resolved, so another emerges. This (dare I say characteristic?) feature of the field is still with us. Of course differences are to some extent glossed over in the published articles, but sufficient comes through to make me sad that I missed the live discussions and regret, just a little, that these discussions are not included. But that would have made the volume truly unmanageable for the student or interested outsider.

The past four or five years have seen a number, probably too many, multi-author volumes on gap junctions. The real advances in understanding have been too few to warrant such constant reiteration. What does this volume have that others do not? Like all Symposium Volumes, this freeze-frame of the gap junction field, taken in July 1987, will date rapidly. This makes it an unwise purchase for an individual. Nevertheless, there are many good things contained in it, both for the specialist and the novice. The attention to experimental detail and recognition that there are some real problems, makes this volume more useful than most. Get your library to buy it, be informed, instructed and even entertained. But let us hope that there can now be some moratorium on large books about gap junctions until some major clarifications have emerged that would enable the next book to escape the paper recycling industry for rather longer than the current norm.

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