the fundamentals of heat transfer and the thermal properties of materials, are most apposite and should be compulsory reading for all ultrastructural cryomicroscopists. The chapter on heat transfer outlines how conduction and convection remove heat from the specimen (radiation being sensibly ignored). Follow the mathematics if you need this sort of assurance, but this is not essential, as the author provides a clear explanation of the transfer processes involved in sample cooling. In the chapter on the thermal properties of materials, the author first considers water and simple two-component systems before tackling the far more complex situation presented by multicomponent biological material. It is a big step from understanding the thermal behaviour of water–gelatin solutions to even beginning to appreciate what is going on in frozen peas and blood. Too many approximations have to be made, the properties of the individual components of cells and tissues become indistinct and one is left with the impression that it might, after all, be better to base these calculations solely on dilute salt solutions. This is no criticism of the author but merely a reflection of the inevitable consequence of the complexity of biological material.

The following three chapters, and indeed the second half of the book, provide the nuts and bolts of rapid cooling: slamming, plunging and spraying. Each technique and its derivatives are explained in sufficient detail to understand the physical processes involved in the optimal conditions for rapid cooling. Although not a do-it-yourself manual, each of these three chapters provides sufficient technical detail to enable those well versed in these matters to build their own working models. There are useful comparisons between the three methods, not only of the different rates of cooling that may be achieved but also of the utility and application of a given cooling regimen for a particular biological problem.

The real forte of this book is the numerous worked examples that abound in every chapter. These deal with real materials, like slices of cucumber, drops of blood and pieces of kidney, and avoid abstractions such as spheres of finite dimensions. These worked examples provide cryobiologists with a simple system into which they may substitute numbers from their own experiments and obtain quantitative measurements of cryofixation.

These calculations are facilitated by a computer program, CRYOFIX, which allows investigators to plug in the various parameters of their particular systems, i.e. type of apparatus, specimen size and shape, entry or impact velocity, etc., and calculate the distribution of cooling rates within the specimen. These values may then be compared with the critical cooling rate that produces a particular ice-crystal size. The software costs £150 + VAT, and is available from the Institute for Applied Biology, University of York, YO1 5DD.

This is a very useful book and provides a thorough account of the most critical part of the preparative procedures of ultrastructural cryomicroscopy. The author is to be congratulated on showing only three micrographs of frozen material and substituting instead many comprehensive graphs and tables. A micrograph is, after all, prone to subjective bias and chosen to reveal what the writer wants to show. Graphs and tables reveal what readers need to know for their own work.

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JEREMY S. HYAMS

The Cytoskeleton in Cell Differentiation and Development, edited by R. B. Maccioni and J. Archega. *IRL Press, Oxford, 1987. Pp. xiii + 367. £45.00 paperback ($85.00)*

The proceedings of scientific meetings rarely translate into good books but few make as bad a job of it as this volume. *The Cytoskeleton in Cell Differentiation and Development* is, frankly, pretty awful. The presentation is awful, the organization is awful and the illustrations are awful. This is a pity since the contributors include some notable figures in cytoskeleton research and a number of the individual chapters are well worth reading. The topic is also clearly an important one, although anyone expecting to find profound insights into the role of the cytoskeleton in either differentiation or development in this book will be severely disappointed.

The Cytoskeleton in Cell Differentiation and Development had its origins in an international meeting in Granada, Spain in April, 1987. I hope for the sake of the participants that the symposium was organized in a more coherent and logical fashion than this book. The volume begins with the text of three plenary lectures, all interesting in their own right but none of which bears more than a superficial relationship to the topic at hand, nor to what comes subsequently. The remainder of the book is divided into seven sections, each of which comprises three or four 10–15 page articles and about the same number of two-page contributions, which are essentially extended abstracts. This curious organization, coupled with the fact that the book is produced in 'camera-ready' form (more of which later), with the inevitable wide variation in type, results in a highly disjointed and unsatisfactory effect; in fact, it looks a mess. Four of the sections are primarily concerned with microtubules and one with intermediate filaments. The others are a rather bizarre mixture of papers on teeth, mitosis, protozoa, *Xenopus* and so on.

Even those sections that are somewhat more coherently arranged contain some curious anomalies. I am still trying to work out on what basis a paper on the thick fibres of mammalian sperm gets into a section on 'Intermediate and Actin Filaments in Cell Differentiation and Cancer Biology', which, incidentally, contains nothing whatsoever on actin. In fact, you have to look extremely hard for any mention of actin at all. This highly unbalanced approach to the cytoskeleton is further exaggerated by the fact that nine of the articles concerning microtubules come from just two research groups (Avila five, Maccioni four).

My major condemnation of this book, however, must be reserved for the production, which has involved photographic reduction of the submitted manuscripts to an A5 format. In addition to the generally distracting effect of a wide variation in the style and quality of the typeface, this has had disastrous consequences for the illustrations, several of which appear less than postage-stamp size. It has also in many cases increased contrast to the point of totally obscuring detail. The other great disadvantage of this type of production is that it gives the editors no scope to edit. This means that the contributions vary enormously in quality, and glaring mistakes, for example "microtubulus-associated proteins", which appears in the title of one article, go uncorrected. All of this might be acceptable if it resulted in an interesting, up-to-date and, primarily, affordable volume. It hasn't and therefore it isn't.

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H. F. LINSKENS

Pollen: Cytology and Development. International Review of Cytology, vol. 107, edited by K. L. Giles and J. Prakash. *Academic Press, Orlando, 1987. Pp. 455. US$69.50*

There will be no need for a special monograph on pollen within the next few years thanks to the well-edited collection of expertise on pollen biology, including genetic manipulation, which makes this special volume of the *International Review of Cytology* a reference book for plant breeders and geneticists alike. The increasingly important role given to pollen in conventional breeding programmes as the vehicle for transfer of genetic information is complemented by new opportunities provided by the use of pollen in biotechnology. Twelve excellent reviews by eighteen authors present a nearly comprehensive picture of this rapidly expanding field of plant biology, which has such a promising future. The introductory reviews, Fundamental aspects on pollen germination (J. Heslop-Harrison), The biochemistry of meiosis in the anther (H. G. Dickinson), The tapetum (G. P. Chapman), and pollen dimorphism (N. Sunderland and B. Huang), provide a solid base for the following chapters on more applied aspects. Heslop-Harrison's review integrates our knowledge of hydrodynamics, respiration, tip-growth, tropism and energy release in a brilliant way; apparently amino acids are emitted and this process is not only a passive leaching but also regulated by energy-demanding controlled processes. The applied field is entered into with chapters on the culture of pollen *in vitro* (I. K. Vasil), androgenic development (J. Prakash and K. L. Giles), induction of pollen-derived plants (Hu Han and Bin Huang) and the mentor pollen technique (R. B. Knox, M. Gaget and C. Dumas). These topics cover the regeneration of haploid plants and the use of doubled haploid plants. The presentation by T. Gaude and C. Dumas on overcoming breeding barriers concentrates on self-incompatibility, whereas the incongruity barrier is neglected. The pollen-based technique of genetic manipulation (D. Hess) receives adequate treatment, as does the cryopreservation of pollen and the formation of pollen banks (Y. P. S. Bajaj).

The reader should give special attention to the chapter on the aerobiology of pollen (P. Downing), which one does not expect to find in a volume on cytology. It provides excellent background information on the long- and short-distance transport of diaspores, including pollen, with special emphasis on wind pollination, a mechanism important that is not only in pollination, but also in allergology. The author makes it very clear that the forecast of the pollen load of the air is not only dependent on the weather conditions, but even more on the "flowering weather", the genetically or microclimatologically determined differences in initiation, maturation and heading, as well as on the concentrations of free-floating particles and molecules.

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