BOOK REVIEWS

P. J. SMITH

Flow Cytometry & Cell Sorting, 2nd edition, by Myron R. Melamed, Tore Lindmo and Mortimer L. Mendelsohn. *Wiley-Liss Inc., March 1990. Pp. 824. $89.50, hardback*

A technology that enables quantitative measurements to be made on individual cells in large numbers is highly seductive. The availability of commercial 'flow microphotometers' and the immense range of biological applications mean that an increasing number of research workers and physicians are considering the use of these machines. Not all users of flow cytometers will have the appropriate background knowledge of instrument design, electronics, data processing and probe chemistry. Thus there is a need for a basic text on the theory and application of flow cytometry and sorting. The long awaited 2nd edition of Flow Cytometry and Sorting fulfils this role.

The question arises of whether the field is now too wide to be encompassed within a single volume. Clearly it is, but in its broad sweep of the subject this multiauthored book is an excellent summary of the state of the art in flow cytometry and sorting. For several years the 1st edition was the only comprehensive text on the subject and many workers in the field would have been happy to see the 1st edition reprinted because of the basic information it contained. However, the rapid development of flow cytometric techniques and applications has prompted the publication of a new edition. The vital statistics of this book are impressive: 39 extensively illustrated chapters providing over 5000 fully cited references in an 824 page volume. The format of the 1st edition has been retained with sections on cytophysical methods, cell preparation, cytochemical methods, analysis of measurements, and applications in cell biology, haematology/immunology and oncology. Retention of this format and many of the contributors to the 1st edition may lead the casual reader into believing that little has been changed. In fact, the girth of the 2nd edition has been increased by extensive rewriting and updating of the original contributions and the addition of new chapters on subjects such as the study of higher plants, microorganisms and the measurement of intracellular calcium. The classical applications of flow cytometry have not been ignored. Multiparameter analysis of cell populations, ploidy determination and the cell cycle are again covered by solid reviews from recognised experts. Importantly, the new edition introduces novel uses of flow cytometry in mutagenesis, karyotyping, molecular genetics and for the detection of single molecules.

The majority of chapters describe specific applications in satisfying detail and much emphasis is placed on the importance of the appropriate selection and use of fluorescent probes. Alan Waggoner, author of the chapter on fluorescent probes, echoes the general principle that 'the availability of new specific and sensitive fluorescent probes is the key to advances in the power of flow cytometry'. The 2nd edition works at more than one level: as a background text that demystifies the technology, as a guide to the characteristics of fluorescent probes for a given application, a showcase for the power of these machines to dissect the components of complex mixtures of cells, and perhaps most importantly a compendium of typical results obtainable from a wide selection of applications.

Flow cytometry has limitations in terms of the types of events that can be monitored. I suspect that many potential users would have welcomed a less celebratory approach to the power of, in the words of Harald Steen, this 'remarkable and fascinating instrument'. The book would have benefited from some critical evaluation of how flow cytometry competes with or complements other options such as fluorescence microscopy or image analysis. Important new areas such as flow cytoenzymology and the study of dynamic events in cells have been given little consideration. Recipe-seekers will be disappointed, since the book is not overburdened with lists of protocols and reagent preparations. Rather the general approach of most contributors is to proffer practical advice for given applications and cite references from which workers may glean vital experimental details.

For the flow cytometer operator the scope of this new edition should provide incentives and perhaps ideas for further developments in technology. For the occasional user the principles upon which the technology is based are fully explained together with data processing, data interpretation and the importance of standards and controls. For the non-user, contemplating the use of this technology, the book is an invaluable aid to increasing the steepness of the learning curve and may save much in terms of time, money and effort. Students will no doubt be directed towards this publication simply because it remains the best text on flow cytometry currently available.

Dr Smith works in the MRC Clinical Oncology & Radiotherapeutics Unit, Cambridge

HENRY HARRIS

Molecular Biology of Cancer Genes, edited by M. Sluyser. *Ellis Horwood, 1990. Pp. 292. £56, paperback*

The Editor tells us that he chose the title *Molecular Biology of Cancer Genes* rather than *Molecular Biology of Oncogenes* 'because the book deals not only with genes that cause cancer but also those that are involved in other ways in the neoplastic process'. That is an immense field to cover in less than three hundred pages, so it is of interest to see what criteria might have been used to permit a rational selection of subjects to be made. Unfortunately, neither the Editor's introduction nor the list of contents offers any clue. It is difficult, for example, to see why there is a chapter on *ras* oncogenes in human cancer, but no chapter devoted to any other single oncogene; why there is no discussion of the general characteristics of oncogenes as a special class of gene; why there is a chapter on the amplification of the *myc* oncogene in prostatic carcinoma cells, but no chapters on the amplification of other genes in other tumours and none on the biological significance of gene amplification as a whole; why there is a chapter devoted to oncogenes in lung cancer (a good chapter, by the way), but no chapter on the more deeply studied aberrations in colorectal carcinoma. Why is the behaviour of NCAM in small lung cell cancer more interesting than that of other adhesion molecules in other cancers? Why are tumour-suppressor genes, now the main centre of atten-

tion in the genetic analysis of tumour cells, dealt with (inadequately) in less than ten pages? Why is there no mention of the profound analysis of tumorigenic mutations in *Drosophila*? (*Drosophila* isn't even in the index.) The answer in each case, must, I fear, be that the choice of articles was determined by the Editor's personal range of interest and by the catchment area from which he was able to collect contributions. The end result is a heterogeneous collection of articles varying, as usual, both in their quality and in the depth of their analysis. Two or three of the fourteen chapters are good reviews of their subjects (although, of course, already dated); but as a balanced overview of current research on genes determining cancer, to say nothing of genes associated in other ways with cancer, the book fails. To succeed within so small a compass, a book of this kind must select the most important *general* features of contemporary research in the area and expound them in an intellectually coherent way. A collection of disparate essays by specialists writing in detail about their own particular experimental interests won't do.

One further point. There is no over-riding need to have historical introductions to books or chapters, but, if one does decide to have them, they should be accurate. This involves some serious work. The historical survey of genetic instability in tumours with which this book begins is a travesty.

Henry Harris is Regius Professor of Medicine in the University of Oxford

A. G. MORRIS

Programmed Cell Death in Tumours and Tissues, by I. D. Bowen and S. M. Bowen. *Chapman & Hall. Pp. 268. £38, hardback*

The death of cells cannot be said to be as important as their birth, yet cell death clearly matters in cell biology, and not merely as the pathological consequence of trauma; particularly in development, as the large-scale reorganisation of tissues is dependent on the death of cells. Broadly, two mechanisms of cell death are recognised: necrosis and apoptosis. The former results from membrane damage and consequent ion flux, with perhaps the major mechanism causing cell damage being changes in intracellular calcium concentrations. The latter differs crucially in that at a very early stage nuclear DNA is fragmented, without major changes in membrane permeability. Apoptosis, the 'programmed cell death' of the title, is the subject of this book.

However, those expecting a clear account of the mechanisms and role of apoptosis, as I was, will be disappointed. Although there is much that is useful here, after twice reading the book I felt that I had not learned much about apoptosis beyond what is in, for example, Duvall and Wyllie's short review in 'Immunology Today'. Of course, at book length, this account must contain much more material. However, I found much that was confusing in this book, and above all I am not really sure what it is about. There might, for example, be detailed accounts of apoptosis in tissue development, whilst in fact there are only brief allusions to, say, tadpole tail resorption to exemplify apoptosis in development. Similarly, there might be detailed accounts of apoptosis in human tumours, with careful distinction between apoptosis and necrosis, but there are not.

It is often assumed that apoptosis is a phenomenon under genetic control (there is evidence that macromolecular synthesis is required) and here we find this assumption taken as fact: 'The concept of programmed cell death implies genetic control' (p. 3) becomes 'Given the existence of specific DNA sequences which when activated bring about physiological cell death...' (p. 57) and 'Killer genes had to be selected early on in metazoan evolution...' (p. 176). However, there is no good evidence for this, certainly none presented here, and so surely there should be a more cautious approach and detailed examination of such evidence as there is.

What we do have, at excessive length, is an account of some aspects of cytokine biology and cellular immunology, loosely related to apoptosis. Now it is very clearly recognised that killing by cytolytic cells is by apoptosis, as probably is killing by tumour necrosis factor, and so quite plainly there is a good case for inclusion of some of this material in the book. But when the authors are reduced to statements such as '...it may seem strange to include growth factors [colony stimulating factors] in a book on cell death...' (p. 170) and 'Although these interleukins [5 & 7] have no obvious connection with cell death, they may be worth mentioning...' (p. 174) it does look as though there is a good deal of padding out. Indeed, most of the material in these sections of the book seems entirely irrelevant: for example, ten pages on interferon, five pages on the origin of natural killer cells and so on.

Some minor quibbles I have include the plethora of terms used for apoptosis, which are not always clearly distinguished from necrosis: 'cell murder', 'cell suicide', 'suicidal cell death', 'programmed cell death', 'physiological cell death', 'induced cell death'; too many trivial errors (including two spelling errors on the back cover); some wild statements ('...genetically dictated apoptotic death... should be of interest to oncologists, in that similar mechanisms might be therapeutically activated...').

I don't want to appear entirely negative. This book is flawed, chiefly by including material I regard as redundant at the expense of a fuller discussion of more relevant topics. But it does bring together a wealth of information important to the understanding of cell death, and is a useful addition to the cell biology literature.

Dr Morris is a member of the Department of Biological Sciences at the University of Warwick