Book Reviews

An Introduction to Flow Cytometry

J.V. Watson, Cambridge: CUP, 1991, 443 pp. £50.00.

This is a very handsome volume consisting of 443 pages and numerous diagrams. The book is divided into 15 chapters with, in addition, a brief epilogue. The list of chapter headings is as follows:

Chapter 1 – Introduction; 2 – Fluid flow dynamics; 3 – Light and Optics; 4 – Electronics; 5 – Computing; 6 – Cell sorting; 7 – Preparation and staining; 8 – Miscellaneous techniques (e.g. slit-scanning and rare-event analysis); 9 – Instrument performance; 10 – Light scatter applications; 11 – Nucleic acid analysis; 12 – Nucleic acids and protein; 13 – Chromosomes; 14 – Dynamic cellular events; 15 – Applications in Oncology.

This book is certainly more than can be described by a simple list of chapter headings. Dr Watson describes his book as an 'Introduction', by which he seems to mean that it does not attempt to be comprehensive. However, topics which are covered in the book tend to be dealt with in some detail, whilst others are excluded completely. As is inevitable, the topics included are related strongly to the authors own interests and techniques described are heavily influenced by procedures in his own laboratory. Thus, Dr Watson's enthusiasm for the technology of flow cytometry is mirrored by the fact that ten of the fifteen chapters are instrument related. Clearly, and with justification, the author feels that an understanding of how flow cytometers work is a necessary prerequisite to obtaining meaningful results with such instruments. This addresses a real danger, attached particularly to modern analytical flow cytometers, that it is all too easy to stick a tube on one end of the machine and produce a vast amount of 'data' at the other end without understanding anything that goes on in between. Sadly, this can lead to the production of mountains of useless numbers.

Topics which are well covered in this book, in addition to instrument-related subjects, are various aspects of nucleic acid analysis including cell kinetics, the inclusion of time as a parameter in flow cytometric studies and staining of nuclear antigens. An example of something excluded (which is pointed out by the author himself) is Immunology – a vast field of flow cytometric applications.

Although this is not an all-encompassing encyclopaedia of flow cytometry, it most certainly is a book that I would want on my bookshelf. Dr Watson has managed to convey his enthusiasm for the subject and at the same time, produce an extremely readable book. He has very successfully included analogies and asides concerning everything from the principle on which aviation is based, to comments on the vortex produced during emptying of the bath. The anecdotes and analogies, of which there are many, are always relevant and they lighten the text of what is a very technical book. Another great virtue of this book, is the readiness of the author to give important information or advice, even when it might seem 'obvious'. A good example of this is on p. 136, where the need to filter large lumps of debris from cell (or nuclear) suspensions, if blocking of the machine is to be avoided, is emphasised. When I first started doing flow cytometry, I was amazed how many people repeatedly blocked their machines for lack of this precaution.

I have few points of disagreement with the book but where I do they are minor and are generally matters of opinion – not fact. For example, Dr Watson suggests on p. 384 that the BrdU technique for assessing the rate of cell proliferation, might be useful for developing 'fractionated' chemotherapy schedules for the treatment of cancer. Given my own research experience, I would be less sanguine about the value of cell kinetic measurements in the application of cancer chemotherapy.

What I can do with certainty, is recommend this book to anyone with an interest in flow cytometry, particularly those who have a desire to understand how their instrument works. I feel this book should be on the shelf (and taken off it regularly) in all flow cytometry laboratories.

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Guide to Flow Cytometry Methods

W. McLean Groghan & J.M. Collins, New York: Marcel Dekker Inc., 1990, 240 pp. \$99.75 (USA & Canada), \$199.50 (Others).

This is a compact book consisting of 15 chapters in 228 pages. The authors have run a flow cytometry laboratory equipped with Coulter Flow Cytometers since 1976. They state, in the preface, that the book began as a library of protocols, notes and reprints. A short introductory chapter is followed by chapters on the preparation of cell suspensions and DNA analysis. Chapter 4 is a brief description of the assessment of cellular viability and this is followed by a long chapter on light scatter and then by a brief discussion of immunofluorescence. Cell sorting is also dealt with fairly succinctly in Chapter 7 and this is followed by a series of brief chapters on mitochondrial stains, intracellular pH, intracellular calcium, glutathione, fluorescence anisotropy and membrane fluidity, cell surface receptors, cellular membrane potential and a final chapter on miscellaneous applications. The choice of subject material for any book is clearly influenced by personal interest and experience. However, I would have liked certain topics, such as chromosomal karyotyping and the combination of DNA with surface and internal cellular markers, to be covered. In contrast, I felt the chapter on light scatter was excessively long in the context of this book.

I was also unimpressed with the introductory chapter which seemed to try to cover too much ground without adequately dealing with the basic principles of flow cytometry. My main two criticisms of the book relate firstly, however, to its organisation and the second to its perceived goal. Looking first at the stated aims of the book; from its title and the authors views set out in the preface, this book was to be a practical guide, i.e. a 'methods' book. As such, each chapter includes protocols for the various techniques described. However, in each chapter the authors attempt a mini-review of the literature, which to my mind, is often too superficial to be useful but, nevertheless, takes up considerable space throughout the book. As the book is short, this leads to many practical applications being also dealt with too superficially. If we take Chapter 3 on DNA analysis as an example, pages 47 to 57 are spent reviewing the vast literature on clinical DNA flow cytometry studies. This means that kidney tumours, on which there is a considerable literature, get five lines, ovarian tumours four lines, and so on.

This brings me to my second major criticism of the book, namely the organisation within chapters and the order in which topics are covered. Again, we can take Chapter 3 as an example. Computer analysis of DNA data is mentioned on page 34. This is followed by a brief review of the literature and other sundry items. Then on page 58, another aspect of data analysis, namely the use of DNA standards to define ploidy levels, is referred to. The effect is to yield a disjointed chapter with no coherent section on the important topic of data analysis. I would have preferred this chapter to have run along the lines of principles of DNA flow cytometry, preparation and staining of cell suspension, collection of data and finally, data analysis.