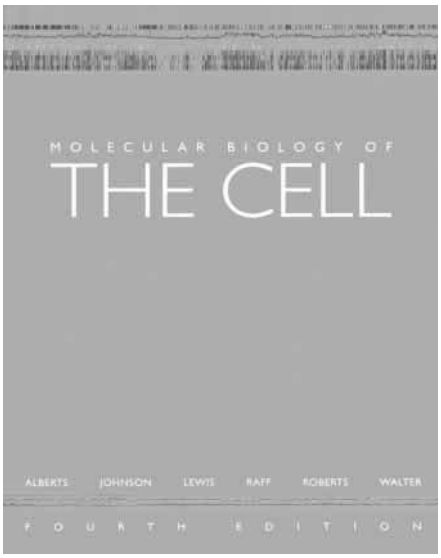
Primus inter pares



Molecular Biology of the Cell, 4th edn

by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter

Garland Science (2002) 1463 pages. ISBN 0-1853-4072-9
£44

It perhaps behoves book reviewers to ask themselves who on earth ever reads their products. A part answer is, presumably, those whose eye is caught by a new title or by one they had previously noted and fleetingly wondered whether it might be worth forking out for. The majority, I suspect, are like those who watch Formula One motor racing: they do so not for enlightenment, or even any real interest, but because of the unfailing magnetism of the prospect of spilled blood. Of course, if the review subject is a new edition of the bible of molecular biology, few will fall into the first category, and, for the thrill-seekers, sanguinary prospects are not good - after all, the first edition topped the best-selling list in Cambridge and has continued to be a scientific best-seller ever since (admittedly Cambridge has a pretty weird clientele but you get my drift). Having thus dispensed with our readership, what is to be said about the fourth edition of *Molecular Biology of the Cell*? The most casual glance confirms that standards have not slipped: short sub-sections with informative headings, highlighted key words, italicised chapter summaries and diagrams of great clarity - some still recognisable from the first edition but now, inevitably, all in colour. Of course, in one sense time has caught up with Alberts et al. By revolutionising the presentation of biology they set a new standard, and now, 19 years on, there are half a dozen or more general texts, all of remarkable quality and all owing something to that first edition. So, how does this edition compare with its predecessor and with its more embryonic rivals?

The most obvious difference is that it's bigger. One reason for the size of *Molecular Biology of the Cell* is the extensive discussion of topics that other general textbooks either omit or mention only 'en passant'. As examples, two pages are devoted to explaining how misfolded proteins are identified and disposed of, and lipid rafts are mentioned in no fewer than three places with two diagrams. However, the main reason for the size is, of course, the phenomenal rate at which data are accumulating in almost all areas of biology. For example, the intracellular vesicular traffic chapter has increased by ~17% to convey the enormous detail of macromolecular transport processes that has emerged since 1994. Even more dramatically, the cancer chapter is 39% longer than in the third edition. It now comprises a very clear and reasoned exposition of our perception of how tumours develop, the preventable causes of cancer and a brief summary of therapeutic strategies. This provides an excellent background, although it is slightly surprising that specific molecular data are relatively sparse. There is a complex and uninformative schematic of intracellular signalling pathways, preferable to which would have been a simpler summary of the fundamental pathways that programme malignant cell growth. This would have made the story more comprehensible and also made the point that, although each cancer may well be unique in its combination of genetic anomalies, the functional results appear to focus on a limited group of molecular circuits.

The authors observe that the advent of genomics has demanded revision of the molecular genetics content to the extent that the chapters on genomes, DNA structure, replication, repair, recombination and transcription, together with that on the experimental methods of cloning and sequencing, constitute a molecular biology textbook in their own right. A new chapter, 'Pathogens, Infection and Innate Immunity', noting that the human body, while comprising 10^{13} cells of its own, is also home to 10^{14} bacterial, fungal and protozoan cells, goes on to summarise the basic features of the major pathogens before discussing the mechanisms by which they control their hosts and the innate mechanisms by which hosts can control pathogens. All of which makes an absorbing read, the more so because it is liberally endowed with examples ranging from the familiar *Vibrio cholerae*, via the remarkable invasion strategies of the cat parasite *Toxoplasma gondii*, to the disturbing predilections of *Legionella pneumophilia*.

A CD-ROM has been added since the third edition, which provides videos illustrating the main points of each chapter together with some 3D structures. These are generally informative - the apoptosis and mitosis films are beautiful and the PCR cartoon is the clearest I have seen. The CD appears to offer a less extensive range than those accompanying some other texts, but it should be remembered that *Molecular Biology of the Cell* set the precedent of providing a substantial problems book, and Tim Hunt and John Wilson have contributed a revised version of this supplement for the fourth edition (Wilson and Hunt, 2002). The comprehensive nature of the problems book reflects its parent in that, together, they comprise an immense repository of information - so much, in fact, that one might advise first year students to go for the basic concepts and omit the fine detail. However, for final year students, post-graduates and post-docs, to say nothing of more senior citizens, the sheer scale of coverage by the fourth edition of *Molecular Biology of the Cell*

means it will be the first thing most of us will reach for in pursuit of the facts of life.

Reference
Wilson, J. and Hunt, T. (2002). *Molecular Biology of the Cell, Fourth Edition: A Problems Approach.* New York: Garland Science

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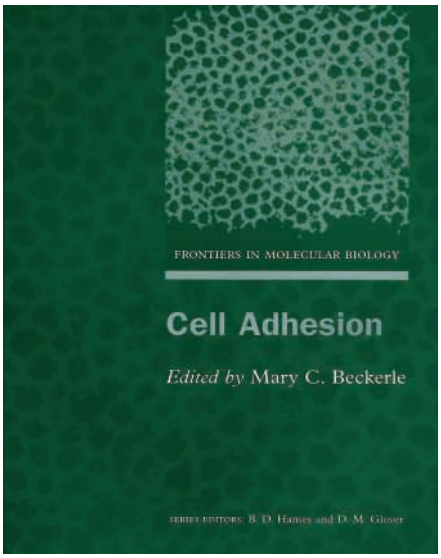
From adhesion molecules, through adhesive sites, toward functional tissues



Cell Adhesion

edited by Mary C. Beckerle

Oxford University Press (2002) 425 pages. ISBN 0-19-963871-3
£35

A multicellular organism is much more than a cluster of cells ‘glued’ to each other largely because of cell adhesions, which are much more than just a glue. Indeed, several decades of research have exposed cell adhesion as a complex process, mediating specific and dynamically regulated interactions as well as crucial signaling cross-talks between the cell and its environment. In addition to their intrinsic complexity, cell adhesions with different surfaces, formed by different cell types, are highly diversified in their molecular, structural and topological properties. Research into cell adhesion is constantly expanding, because new molecular players, mechanisms and functions are continuously emerging, and novel technologies are allowing us to study them in live cells.

The complexity, diversity and fast progress in the cell adhesion field challenge any attempt to cover the entire topic in a single book. The recent *Cell Adhesion*, edited by Mary Beckerle, handles these aspects wisely and systematically by focusing separately on two levels of complexity, namely adhesion molecules and cellular adhesion sites. Each chapter in this book is a focused review written by leading researchers and covers one type of adhesion molecule or adhesion site. The first part of the book reviews the structure and function of the major classes of eukaryotic cell adhesion molecule. In Chapter 1, Hansjürgen Volkmer describes the immunoglobulin superfamily cell adhesion molecules (IgCAMs), a large and diverse group of glycoproteins with extracellular Ig-like domains that mediate either cell-cell or cell-matrix adhesions during early development and in the adult. Chapter 2, contributed by Rodger McEver, describes selectins, which are cell-surface lectins mediating the adhesion between leukocytes, platelets and endothelial cells under blood flow in the vascular system. Another major group of cell-cell adhesion molecules is the cadherin family of transmembrane glycoproteins. In Chapter 3, Glenn Radice and Masatoshi Takeichi review the structure and function of classical cadherins, which mediate the homophilic and Ca^{2+}-dependent interactions in adherens junctions, and discuss their fundamental roles in cell-fate regulation and development. Integrins, a large family of heterodimeric receptors, are key mediators of cell-matrix adhesions and are involved in cell-cell adhesions. In Chapter 4, Douglas DeSimone and colleagues review the integrin family from historical, structural and functional perspectives.

In addition to the extensively studied IgCAMs, selectins, cadherins and integrins, new types of surface protein are increasingly implicated in cell adhesion. Cell surface heparan sulfate proteoglycans (HSPGs), whose function is just starting to become clear, mediate a variety of cell-cell, cell-matrix and cell-microorganism adhesions, which are reviewed by Merton Bernfield and colleagues in Chapter 5. In Chapter 6, Judith White and colleagues discuss the metalloprotease-disintegrins (ADAMs), a family of transmembrane glycoproteins identified just a decade ago, which mediate cell-cell interactions and have been implicated in various processes, such as myogenesis, neurogenesis and sperm-egg adhesion and fusion. This part ends with Chapter 7, contributed by Susann Brady-Kalnay, which focuses on receptor protein tyrosine phosphatases (RPTPs), an intriguing subgroup of IgCAMs that contain tyrosine phosphatase domains in their intracellular region.

At the cellular level, adhesion occurs mainly at specialized adhesive sites along the plasma membrane where clusters of specific adhesion molecules physically link the extracellular ligands to intracellular structural (usually cytoskeletal) and signaling proteins. The second part of the book describes the molecular organization and function of four main types of such adhesion sites. In Chapter 8, Barry Gumbiner and colleagues review the adherens junction, a major type of cell-cell adhesion site where classical cadherins associate with the actin cytoskeleton, structural proteins and key regulatory proteins such as β-catenin. A major class of cell-matrix adhesion site is focal adhesions, where clusters of matrix-bound transmembranal receptors, mainly of the integrin family, associate with complexes of a large variety of anchor and signaling proteins and, through them, with bundles of actin filaments. In Chapter 9, Lynda Peterson and Keith Burridge review the complex structure of focal adhesions, their dynamic evolution from focal complexes and segregation toward fibrillar adhesions, and the major signaling pathways

affecting them or affected by them. Although adherens junctions and focal adhesions are anchored to the actin cytoskeleton, the desmosomes and hemidesmosomes associate primarily with the intermediate filament system and mediate cell-cell or cell-basement-membrane adhesions, respectively. In Chapter 10, Kathleen Green and colleagues discuss these adhesions and their fundamental roles in epithelial tissues. The book ends with Chapter 11, in which Shoichiro Tsukita and colleagues review the tight junctions, which seal between neighboring cells in epithelial or endothelial sheets and function as a selective permeability barrier.

Covering each of the above topics in one review chapter is as challenging as covering cell adhesion in a single book. Wisely, the individual reviews do not attempt to exhaustively go into every irrelevant detail and aspect. Instead, they present a balanced discussion of the fundamental facts, mechanisms and concepts in a logical and didactic manner. It is good that speculative models, which are important for scientific progress but often have a short lifetime, are generally excluded from this book. The text contains many references to classic and recent papers, directing the interested reader to the source of detailed information. The book contains only black and white figures and microscopy images; however, some of the chapters could benefit from showing color images (mainly to highlight the relationships between different components). The inevitable overlap between chapters is usually kept within healthy levels, and cross-references direct the reader to the relevant chapters. Finally, the book is easy to read and has a friendly and coherent style.

In conclusion, this book is highly recommended for anyone who has a basic background in cell biology and wishes to get a broad and illuminating overview on eukaryotic cell adhesion. In addition, it would be a most useful reference book for cell adhesion researchers.

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