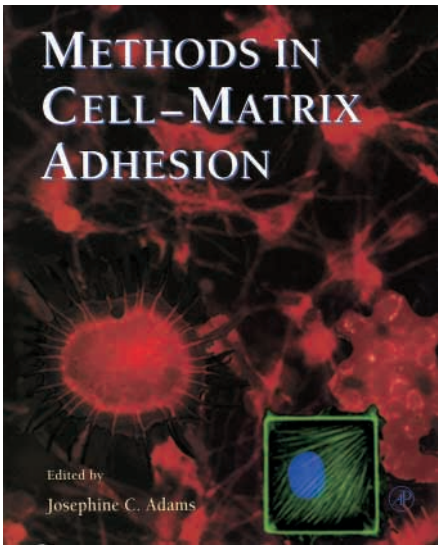
A guide for the ECM maze



Methods in Cell-Matrix Adhesion (Methods in Cell Biology, Vol. 69)

edited by Josephine C. Adams

Academic Press (2002) 461 pages. ISBN 0-12-044142-X
$89.95 (paperback)

Studying the extracellular matrix (ECM) and the ways by which cells interact with it is not an easy task. It requires a broad knowledge and practical skills in handling proteins that vary considerably in size, domain organization and post-translational modification. To make matters more complicated, the spatial organization of the ECM proteins holds vital information that is read by cellular adhesion receptors and translated into corresponding cellular behavior. In turn, cells actively modify, reorganize and build up the ECM environment. It is a real experimental challenge to explore, and at the same time to preserve, this tricky balance.

Methods in Cell-Matrix Adhesion is a very helpful guide for scientists daring to accept this challenge and determined to make their way through the ECM maze. The book is part of the very popular *Methods in Cell Biology* series sponsored by the ASCB and published by Academic Press. In this volume, Josephine Adams has assembled an especially useful collection of protocols written by experts recognized for their contributions in the field of extracellular matrix and cell adhesion.

Part I – Three excellent chapters open the book, outlining briefly the historical development of the field (what we know about the maze), the current appreciation of the three-dimensionality of the ECM and its impact on cellular signaling (where we are now in the maze), and how this research can be translated into practice, e.g. drug discovery (what we can possibly gain by mapping the maze).

Part II – 'Matrix Methodologies' comprises eight chapters covering different approaches used to study particular ECM components and particular aspects of the complex extracellular meshwork. They range from classical methods, such as preparation and use of monoclonal antibodies against ECM constituents, to new technologies, such as the use of atomic force microscopy, applied in this case for analysis of matrix dynamics. Separate chapters describe how to purify particular matrix components, how to express them as recombinant proteins by using baculoviruses and how they are proteolytically cleaved, either as individual matrix members or in the context of multicomponent ECM degradation.

Individual ECM proteins become self- or cell-organized into a composite three-dimensional meshwork that functions as an immediate cellular environment. Readers who are interested in these processes can find methods for analysis of basement membrane assembly, combined with extensive background information and protocols for preparation of synthetic or cell-assembled matrices.

Part III – 'Adhesion Receptor Methodologies' moves the focus to the cellular receptors: integrins that interact with the ECM. This is the shortest of the three methodological parts, but these chapters are very well written, provide a great deal of specific information and cover most contemporary integrin research. They include strategies for identification of molecules that are involved in cell adhesion, analysis of ligand binding or detection of proteins that associate with extracellular or intracellular domains of integrins. Investigators with a taste for more specialized techniques will find how to use surface plasmon resonance to measure ligand binding and fluorescence resonance energy transfer (FRET) approaches to study the intracellular coupling of adhesion receptors.

Part IV – The last methodological part of the book, 'Functional Applications of Cell-Matrix Adhesions in Molecular Cell Biology', covers the approaches used to study cellular responses to different extracellular environments. Classical methods such as cell attachment, cell spreading, and cell migration and invasion assays are very well presented, making them easy to follow and apply. This part also offers some more-specialized approaches like the use of flexible artificial substrates to assess cell-generated traction forces or the use of tissue slices to study cell migration in situ, which mimics more closely the in vivo environment.

In a multiple-author volume like this one, it is important to maintain a good level of coordination between different sections. The editor has kept a good balance between different parts and chapters of the book with one exception. Chapter 18, 'Application of Cell Adhesion to Study Signaling Networks', presents protocols that are widely available elsewhere (protein assay, immunoprecipitation, western blotting, etc.). The chapter is presented for novices and differs from the rest of the book, which is developed as a resource for experienced researchers in cell biology. Moreover, some statements, for example, 'calcium promotes integrin… cell adhesion' or the suggestion not to boil the SDS-PAGE sample 'so as to not reduce the antibody' without mentioning reducing agents such as β-mercaptoethanol, are obviously incorrect.

Apart from this and some other minor overlaps, *Methods in Cell-Matrix Adhesion* is a very good methodological book that gives answers not only to the 'how?' questions but also addresses the equally important 'why?' questions, by providing both protocols and background information. It is a useful

guide for any laboratory involved in cell-matrix adhesion research, not only as a source of frequently used protocols but also because of its wide methodological scope. The book makes it clear how others approach the complex cell-ECM labyrinth and there is a good chance that it may serve as Ariadne's* thread, helping daring scientists to navigate the ECM maze successfully.

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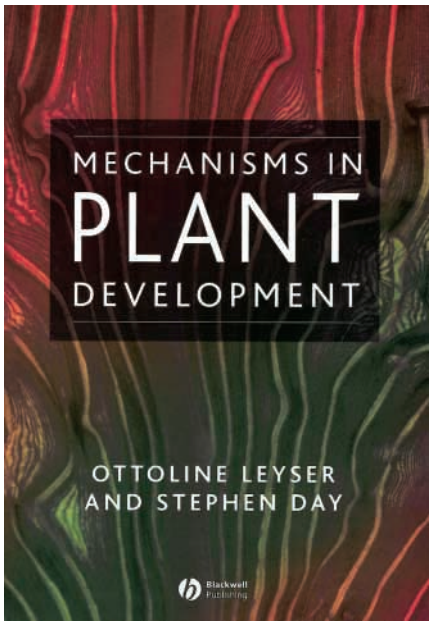
*The Greek myth of Theseus and the Minotaur – the daughter of King Minos, Ariadne, helped Theseus to slay the Minotaur and return from the complicated labyrinth. Ariadne gave Theseus a ball of thread, which he tied to the entrance and unrolled as he went into the maze in order to find his way back without getting lost.

A mechanistic view of development



Mechanisms in Plant Development

by Ottoline Leyser and Stephen Day

Blackwell Science (2003) 241 pages. ISBN 0-86542-742-9
£29.50 (paperback)

The field of plant developmental genetics has expanded rapidly over the past ten years and, for those of us who teach the discipline, finding a core text has been challenging. Up until now, most texts have been written in the context of the plant life cycle and, as a consequence, even in the best cases, they quickly dated. If you want to learn about developmental processes underlying a particular stage in the life cycle, you need both new and 'old' information. An alternative approach is to learn about mechanisms that underlie processes occurring throughout the life cycle of an organism. In this way, you can 'pick and mix' topics of choice to obtain an overview of a subject. Particularly in information-intense fields, this is the most effective way to teach and learn.

Towards this goal, a new textbook by Ottoline Leyser and Stephen Day discusses plant development in the context of mechanisms. Using case studies to illustrate specific processes, the ten chapters progress from an introduction to flowering plants, through characteristics of plant development, axis formation, position- versus lineage-based information, environmental influences and the coordination of development to, finally, a comparison with animal development. Because of its format, the book is likely to stand the test of time better than its predecessors. However, the real test will be whether it can be used by teachers and students. As general biology courses broaden to encompass the information explosion in topics as diverse as cell biology and ecology, students are graduating with less-specialized knowledge. In my opinion, it would be difficult for undergraduate students on this type of course to have a solid enough foundation in botany, genetics and development to appreciate fully what this book has to offer. However, students on more-specialized courses, and graduate students in particular, will benefit from the format. For example, some of the case studies could easily have been used in more than one chapter and can thus be used to encourage students to see the broader application. On a more practical note, the figures are excellent in that they clearly convey quite complex information.

Has the book achieved what it set out to do? The authors aimed to provide a conceptual framework from which to build an understanding of the subject. To my mind, you first need an understanding of the subject to discuss and challenge the concepts put forward in the book. This is because the chapters are unified on the basis of developmental processes per se, rather than on processes that are unified by underlying genetic pathways. For example, the chapter describing axis formation in leaves and flowers discusses at least seven distinct genetic pathways. In the absence of previous knowledge of these pathways in the context of the plant life cycle, it is difficult to synthesize the information in a conceptual framework.

Could the original aim have been achieved? I don't think so. We simply do not yet know enough about the genetic pathways that underpin developmental processes in plants. Although evidence that similar pathways act to facilitate specific processes at different developmental stages is starting to emerge, there is certainly not enough information to fill a book. So, in summary, the authors have successfully provided an advanced text for students and researchers interested in the complexity of plant developmental processes.

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