

■ PREFACE

This is the fourth edition of *Cell Signalling*. When I originally penned the first edition I never expected to be editing the fourth—but here we are. The text was originally intended to be useful for those that wish to find out more about the subject, but with a view that it would be aimed at degree students in their second and final years of undergraduate studies. It was also hoped that the book would be of interest to those on a medical degree, or those embarking on postgraduate studies, where they were perhaps new to this area or need to refresh earlier studies. This intention has continued into the fourth edition, and hopefully it fulfils its purpose.

For this edition the text has been updated, but perhaps more significantly new sections have been added and the figures are now in colour. For this I have tried to be consistent, with various parts of the cell the same colour throughout the figures, with particular components highlighted in other colours. Hopefully this will allow figures to be compared more easily and therefore add clarity to the story of cell signalling. Once again many more references have been added, but unfortunately, once again, for those who actually do the experimental work it is impossible to quote all the primary references. Therefore reviews have been prioritized to enable the reader to work their way through the vast amount of literature on the topic.

The field of cell signalling continues to be very large and still expands at what seems like an exponential rate, with a great deal of new literature published in the journals every month. In this edition the original aim continues, that is, to describe the main components used by cells in their communications, with discussion on the ways in which they interact. This is still not an approach taken by many books which cover this area of biochemistry, but pathways are not just single lines of signal transducers leading simply from the original signal to the cellular response, but an intricate interplay of many components, with one pathway having profound effects on another. Therefore, the discussion of such components in relative isolation allows the knowledge gained about one particular component to be used when considering many pathways, not just the one in which it was first discovered. The aim continues to have a very generic approach, as the ubiquity of some of these systems means that an understanding of the mechanisms is relevant to all organisms throughout nature and not just mammals, or indeed the animal kingdom.

It has once again proved impossible to do justice to every area in this field for this edition, and the overall emphasis still reflects my interests so some people may feel that I have overlooked their particular area of research. To those that feel ignored I once again apologize.

This edition retains the structure of the last edition. It has been partitioned too. **Part 1** is an overview of signalling and the principles involved. **Part 2** deals with the components that may be involved in more depth. **Part 3** is a selection of some pathways and cellular events that help to illustrate the role and activity of signalling in cells. The final part is once again some final thoughts and ideas that the reader may reflect on, but this has been greatly expanded.

The book starts with an overview chapter, encompassing many of the ideas and discussions that could be applicable to all areas of cell signalling. **Chapter 1** also contains **further reading**, which includes several excellent chapters published in major textbooks covering cell signalling, as well as other books published on this topic, and as such would be a good place to start further reading. **Chapter 2** highlights how signalling components are grouped together in pathways. **Chapter 3** concentrates on the history and an overview of some of the main techniques that could be used to study cell signalling. **Chapters 4 and 5** concentrate on the use of extracellular signals and their perception, whereas **Chapters 6–10** concentrate on the intracellular components thought to be of most importance. **Chapters 11 and 12** take more specific examples of signalling pathways and try to show how these components might come together to complete pathways. **Chapter 13** is on some, but by no means all, of the signalling components that may be involved in the control of gene expression and development, whereas **Chapter 14** focuses on cell death. The final chapter tries to bring some ideas and thoughts together, and summarizes some of the discussion from the rest of the book.

Two new sections are also added to this edition. In the **What next?** sections I have tried to highlight areas where I think research should concentrate effort and resources. Experts reading these sections may not agree, but in a way that is the point, as there is no right answer here but the idea is to focus thoughts and perhaps discussions. I hope that researchers early in their careers may find these sections useful in particular. The other new sections are **Case studies**. Here papers have been chosen from the literature which either made a significant difference to the field or enable me to highlight techniques and methods. It was interesting choosing these papers and obviously there are many others that I might have used—some readers may feel I have ignored some obvious ones here. But I hope these are useful and again stimulate thought and discussion.

I remain, as always, indebted to all the scientists who did the work and published their papers so I could obtain the information needed for this book. Without their hard work I would not have any data to use to update my book to become a new edition! Like all research, cell signalling experiments can be both expensive and frustrating, so I really do appreciate the effort others have made here. I wish to particularly thank those who deposited structural data, which was used for several figures in the book. These structures were obtained from the RCSB Protein Data Bank (www.rcsb.org/pdb), to whom I would like to say a big thank you.

As with the original, the content of the book was greatly shaped by many conversations, and e-mails, with colleagues. I remain indebted to many of my colleagues at the University of the West of England (UWE), Bristol, and to the many colleagues and collaborators who have discussed their science at conferences and meetings. I must also thank the OUP team, particularly the editors Jonathan Crowe and Jessica White. They not only persuaded me to do the fourth edition, but have been totally professional and helpful. They were never afraid to make suggestions and the shape of the final book is very much down to their input, particularly that of Jess. Lastly, I would like to again thank my wife Sally-Ann, my son Thomas and my daughter Annabel for their never-ending help and, not least, encouragement. Without them this book would not exist.



3 A look at some of the history of the field and the current state of the art

A brief history of the field, from the early days of the field to the present day. This section provides a brief overview of the field and its development over time. It covers the early days of the field, the development of the field, and the current state of the art. The section is intended to provide a brief overview of the field and its development over time.

The field has developed rapidly in recent years, and there has been a lot of progress in understanding the underlying mechanisms. This section provides a brief overview of the field and its development over time. It covers the early days of the field, the development of the field, and the current state of the art. The section is intended to provide a brief overview of the field and its development over time.