

Preface

This book was based initially on the lectures on regulation and signal transduction that are offered to students of biochemistry, biology and chemistry at the University of Bayreuth. The first book appeared in 1997 and was written in German. It was then substituted by three English editions that are now followed by the fourth English edition, which includes data and references up to 2007.

Cellular signaling in higher organisms is a major topic in modern medical and pharmacological research, and is of central importance in biomolecular sciences. Accordingly, the book concentrates on signaling and regulation in animal systems and in man. Plant systems are not be considered, and results from lower eukaryotes and prokaryotes are only cited if they are of exemplary character.

It is the aim of the present book to describe the structural and biochemical properties of signaling molecules and their regulation. Furthermore, the tools used for signal transmission and the organizational principles of, and the interplay between, signaling pathways are presented. Signaling processes can be described nowadays more and more on a molecular level, and the structure–function relationships of many central signaling proteins have been worked out. However, it is increasingly recognized that the cell- and tissue-specific functions of signaling proteins have to be described in terms of their organization in supramolecular complexes, and in terms of the interplay between different signaling pathways. I have tried to address these topics in the new edition as far as possible.

Numerous studies in very diverse systems have revealed that the basic strategies of signaling and regulation are similar in all higher organisms. Therefore, the book concentrates on the best-studied reactions and components of selected signaling pathways, and does not try to describe distinct signaling pathways (e.g. the vision process) in a complete way. Due to the huge number of publications on the topic, mostly reviews are cited and original articles have been selected on a more or less subjective basis.

As compared to the previous edition, the fourth edition contains a new Chapter 1 that is devoted to the basics of cell signaling. Typical signaling proteins are multivalent and multifunctional, and these properties enable signaling proteins to engage in signaling networks of a highly complex nature. I have included some aspects of this topic in the new Chapter 1. The regulation of gene expression formerly discussed in Chapter 1 is now to be found in Chapter 3. Here, I have put more emphasis on chromatin modifications and I have included a section on micro RNAs – a topic of growing importance in gene regulation. The other chapters have been updated in light of new emerging principles of functions and interactions of signaling proteins and their organization in larger complexes.

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