second and third part, the implementation of the principles of the regulation of gene expression and the control of the cell cycle, apoptosis, and the immune response are clarified. Finally the fourth part shows how error functions in signal transduction can lead to the development of cancer. With a deliberate abandonment of a large number of factors, the author, however, has also left out some important branches such as, for example, signal transfer in neural systems. One would search in vain in this book for channels and neural receptors. Possibly he sees these themes as being handled in sufficient detail in standard biochemisry textbooks. Praise should be given for the 9-page index of abbreviations at the start and the 20-page glossary at the end of the book, which helps not only the beginner to get on board.

The signal pathways described are illustrated by numerous schemes, the graphical resolution of which is sometimes only just satisfactory. In addition it must be said that many symbols and arrows in these pictures are not understandable for beginners without further details, and that they sometimes appear to be noncommittal. For that the author is not necessarily to blame, as the current status of research has numerous gaps and inconsistencies. Perhaps a more uniform design of the illustrations would have been better. In addition, many schemes appear to be very static so that the development of the process can not be easily envisaged. There is a large number of three-dimensional protein structures in which ribbon representations are shown, but unfortunately none are in stereoview. Besides the pictures in grayscale throughout the text there are 30 high-quality color plates in the middle of the book, although some of them appear rather small. There don't seem to be any printing errors, while one or more (excusable) lapses in content can be found. For example, Ras is not linked to the regulatory subunit of Pl(3) kinase and Mx proteins are not GAPs for other GTPases.

The separate chapters each treat a particular aspect of signal transduction and are self-contained. At the same time, the author—with the long-standing routine as a lecturer—is successful in writing the entire book as a unified entity. He uses the summaries, conclusions, or outlooks where appropriate to conclude one theme and link to the next. As mentioned already, he shows the biochemical principles of signal transduction with examples, each one representing the best researched—and perhaps most important—systems. He goes into great depth in these and lays great importance on the functional and structural finesses of the signal pathways as well as to make the proteins involved easily discernable. The text is too "heavy" in some places, but it always returns to a general view and a biological context. Occasionally (and perhaps too rarely) the link between a biochemical dysfunction and the associated illness is made. It is clear what is already known and which questions remain open. Now and then the author also permits himself to make suggestions as to what must be the next research topic.

The limited scope of this book indicates that the author intended the book for readers already with a basic knowledge of biochemistry. As such, this book is suitable for advanced students. However, it is also recommended for everyone working in the area of signal transduction research, who should keep this book at hand for when they want to clarify a particular mechanism or connection again, and to get quick access to the most important original papers and review articles. The contents of this book provides what the author promises: After reading it, one will have met the prominent signal pathways in cells and understood the principles of cellular signal transduction.

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Operators and Promoters. The story of Molecular Biology and its Creators. By *Harrison Echols* and *Carol A. Gross*. University of California Press, Berkeley 2001. 466 pp., hardcover £ 45.00.—ISBN 0-520-21331-9

This is an unusual book. One of the authors, the lambda phage expert Harrison ("Hatch") Echols, began work on the book six years before his death in 1992. In contrast to a normal textbook, in which one sets out to present the current situation in a field, Echols wanted to describe the development of the ideas, methods, and experiments of molecular biology, and the scientists involved. His aim was to discuss, from his viewpoint, the ways of thinking and working of individual researchers who have contributed to progress in the field, which he had himself taken part in and observed. He was certainly familiar with that. In 1992, when he died, the manuscript was unfinished. However, he had asked his wife, Carol A. Gross, to finish and publish the book. She has now done that, although it has taken almost ten years to complete it. The main contribution of the resulting book lies in the description of the work up to about 1990 on understanding transcription and its control in *E. coli*.

There are ten chapters. The first is an introduction to the structure and function of DNA and proteins. Chapter 2 deals with the deciphering of the genetic code. The book contains sketches by Echols of the scientists whom he knew and liked. Many of these are not generally well known. It seems that Echols did not know Erwin Chargaff and Heinrich Matthaei personally, and consequently there are no sketches of them, and the descriptions of them are rather superficial.

The following chapter is concerned with gene control. Echols recounts that when, at a conference in Cold Spring Harbor in 1961, he asserted that the regulation of the synthesis of alkaline phosphatase in *E. coli* is positive, Monod sprang to his feet and shouted "No, No! All regulation is negative. We have similar mutants, but we know how to interpret them correctly." He then quotes Mel Cohn as describing how, a year later, Monod said to him: "Mel, we were right all along". Such stories, which would not be found in a normal textbook, give one food for thought.

Further chapters are concerned with DNA replication, transcription, RNA, and DNA recombination. Then there is a chapter in which Echols is on more familiar ground, concerned with the regulation of regulation. Here the world of lambda phages, Echols's speciality, is brought to life. He reports how, in 1968, he tried to persuade the lambda phage research community to put together all

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their results in a book at quarterly intervals, the authors being only named collectively at the beginning. However, he failed to get a majority in favor of the idea. The last two chapters deal with retro-viruses and DNA cloning in *E. coli*. Although these were not his areas of activity, he worked closely beside the researchers involved, and consequently both chapters are interesting.

The book contains a seven-page chronological list of discoveries covering the period 1941–1987. There is a 71-page bibliography, but it is placed after the ten chapters and is not directly linked to their contents. As the citations essentially end with 1990, they do not cover many topics that one would have wished to find. For example, there is no mention of Jeffrey Miller, who achieved the most precise mutant analysis of Lac repressor available up to now. Similarly there is no reference to the work of Richard Ebright, who first showed in detail how the CAP/CRP protein interacts with RNA polymerase. Also there is no discussion of the function of the auxillary operators *lac 02* and *lac 03*.

Thus, the book is very good within the topics that it covers. However, it does not include all the topics that one should know about. Quite a lot is missing, and the reader should be aware of that. Nevertheless, advanced students and researchers in biochemistry should not be discouraged from reading the book thoroughly. The subjects covered are treated very clearly. Leaving aside its omissions, I prefer it to any textbook that I know. I recommend interested scientists to buy it and read it.

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Electrochemical Reactions and Mechanisms in Organic Chemistry. By *James Grimshaw*. Elsevier Science, Amsterdam 2001. 414 pp., hardcover $ 251.50.—ISBN 0-444-72007-3

Organic electrochemistry is an interdisciplinary science in the best sense of the term. It combines the techniques of physical chemistry with the methods of organic synthesis and the study of organic reaction mechanisms, with the aim of preparing new compounds, finding new synthetic routes, or optimizing existing ones. Modern techniques in organic and inorganic chemistry have already moved much closer together, at least for small molecules, so that now it is common to refer to electrochemical studies in both fields as molecular electrochemistry. A very wide variety of molecules can undergo some form of electron transfer at an electrode. Consequently this branch of chemistry is highly relevant for material sciences and life sciences, from fundamental research to large-scale technological applications. For example, electrochemical methods are now extensively used to characterize the redox properties of new compounds.

However, in stark contrast to that, the general level of interest in this area of chemistry is not very high if one looks at the situation in the universities. It only rarely appears in the undergraduate curriculum. When positions for electroorganic specialists become vacant, they tend to be replaced by different specialities. Thus, a concise monograph on organic electrochemistry could have a useful effect in making chemists again more aware of the subject. James Grimshaw of Queen's University, Belfast, who is well known in the field, has now produced such a work: *Electrochemical Reactions and Mechanisms in Organic Chemistry*.

Molecular or organic electrochemistry has two main facets: the first concerned with the synthesis of molecules (which puts the emphasis on the "organic" side), and the second with the elucidation of the reaction mechanisms involved (the more physical chemistry orientated aspect). Ideally, these two should interact closely with each other, but for most electrochemical research groups the focus is mainly on one or the other. In James Grimshaw's book it is the synthetic applications that predominate. The techniques for investigating reaction mechanisms and their fundamental principles are described concisely (perhaps too briefly) in an introductory chapter. It would have been helpful throughout the book, and especially in this chapter, to cite some of the many review articles including the most recent ones, so that the interested reader could have easy access to the original literature when necessary. Unfortunately not all the chapters provide that. For example, the most recent reference given on the use of simulation methods for analyzing cyclic voltammogramms (which provide the experimental data for the quantitative study of reaction mechanisms) is the 1981 book by Dieter Britz. A new edition of that appeared in 1988, but more recently (since 1995) there have been other important reviews of this topic, covering radical advances such as commercial simulation programs, new computational techniques, and ways of describing mechanisms in the formula language familiar to chemists. Here the author has omitted an important part of the toolkit used by the electrochemist working on mechanisms.

The main part of the book is concerned with detailed descriptions of electrochemical syntheses involving the preparation or use of the most important classes of organic compounds (saturated and unsaturated hydrocarbons, halides, arenes, alcohols, amides, amines, carbonyl compounds, and nitro, nitroso, azo, and azoxy compounds). Two chapters fall outside this classification, as they deal with a particular type of reaction: reductive cleavage of bonds. However, that scarcely interferes with the flow of the text. Oxidations and reductions are equally represented. Direct and indirect (i.e., mediated) electrolyses are discussed. For all the reactions described, the mechanisms are discussed very thoroughly, citing experimental evidence from the literature, then their synthetic applications are listed. The importance of the effects of different electrolytes, electrodes, and additives on the progress of reactions is, of course, emphasized, as also are the effects of these factors on selectivity, which can also be greatly influenced by the choice of potential. The text is enlivened by many attractive formula schemes, which also encourage one to thumb through the pages looking for items of interest.

The literature coverage up to the mid-1980s is very comprehensive (at least for those areas of the subject with which I am familiar and which I can easily evaluate). However, some important publications that appeared later have not found their way into the lists of

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