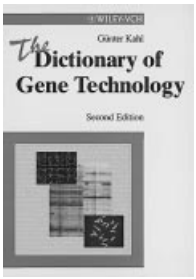
Sequence Specifics

Dictionary of Gene Technology. 2nd Edition. By *Günther Kahl*. Wiley-VCH, Weinheim 2001. xv + 941 pp., hardcover € 159.00.—ISBN 3-527-30100-3

To anticipate the verdict right at the start: this book should be available within hand's reach for everyone who is enthusiastically involved with molecular biology and gene technology, whether as a student or a teacher. It should not be merely kept on the bedside table of those who have got into the habit of reading dictionaries as a way of getting to sleep.



In this updated second edition Günther Kahl has produced a dictionary in which one can find explanations of all but a very few of the rapidly growing number of abbreviations in this field. It is a dictionary in the best sense of the word—not the sort of encyclopedia in which one finds, for example, names of people and historical details. The user will consult this work to find out about a term or the principle of a reaction or technique and to gain an understanding of it, without having to read through a chapter of a textbook or several original papers. It contains over 6500 entries, sometimes with detailed explanations, supported by many clear and easily understandable figures, the whole being a thoroughly comprehensive dictionary of gene technology.

But what actually is "gene technology"? Günther Kahl answers that question in a cross-reference to the entry "genetic engineering": it is an in vitro methodology for altering the structure of genes or designing them, and for constructing chimeric genes. This technology includes both the transfer of genes into different organisms and the expression of genes within a new genetic context. Gene technology provides the methods used to investigate the structure and regulation of genes, and is the basis for a wide variety of industrial applications, for example in optimizing the performance of organisms used in biotechnological processes for the manufacture of chemicals or pharmaceuticals.

Accordingly, the scope of the entries in this dictionary not only includes the genetic and molecular biological fundamentals of gene technology but also covers a wide range of terms concerned with the technological application of that knowledge. The many cross-references form a comprehensive network enabling one to quickly find the explanation of a term. That is especially important because the actual entry does not always correspond to the everyday laboratory expression. Thus, for example, "error-prone PCR" is not listed, but an explanation is quickly found under "Polymerase chain reaction mutagenesis (PCR mutagenesis)". It is pleasing to find entries for many research topics of current interest, such as "DNA chip technology", "Gene library", "Nanotechnology", and "Single molecule sequencing". However, key expressions that relate to the present heated public debate about gene technology and its new possibilities (e.g., stem cells derived from embryos) have not yet been included here. Thus it seems that a third edition of the work will be needed!

Further browsing through the dictionary reveals other positive features, including the author's evident familiarity with practical details, as shown, for example, by entries such as "Eppendorf", "Falcon plastic ware", "Millipore filters", "Mini-prep", "Qiagen columns", or "Parafilm". Careful attention to detail and awareness of needs at the laboratory bench is also apparent in the appendix. For example, it contains a comprehensive list of all the data banks that are relevant to gene technology and are essential for anyone engaged in research on genes, proteins, and structures. However, although so much diligent work has gone into the preparation of this dictionary, the author Günther Kahl has kept a sense of humor: he has included (at least) three joke entries, one of which caused me to go immediately to the World Wide Web for more information, from which I discovered the motivation for that entry—a reward awaits the first to find it and give the correct answer!

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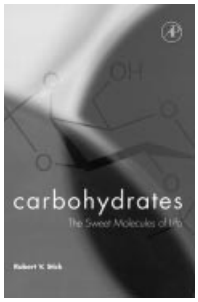
Carbohydrates. The Sweet Molecules of Life. By *Robert V. Stick*. Academic Press, London 2001. 265 pp., hardcover $ 64.95.—ISBN 0-12-670960-2

This is a further addition to the succession of books on carbohydrate chemistry that have appeared in the last few years. It treats the main aspects of modern carbohydrates chemistry in a very condensed form, with particular emphasis on the synthesis of sugars and sac-



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charides. According to the dust-jacket, the book is suitable for reading by everyone with an interest in the chemistry of carbohydrates, and especially for advanced students.

All important aspects of carbohydrate chemistry are treated in a clear and understandable way. After a nice introduction on the historical development of the subject and an account of Emil Fischer's remarkable contributions, the author gives a clear explanation of important concepts such as conformation and anomeric effects. This is followed by an excellent chapter on the role of protecting groups in carbohydrate chemistry, which gives the reader a good overview of the special problems of using protecting group techniques for sugars. The next two chapters deal with the reactions of monosaccharides (44 pp.) and with glycosylation reactions, including the structure of the *o*-glycosidic bond (64 pp.), both essentially following the usual pattern found in previous monographs. The latter chapter is really excellent, and gives a very good account of all the most recent developments. The last four chapters of the book, dealing with the synthesis of oligosaccharides (including new types of solid phases and enzymatic methods), with disaccharides, with oligo- and polysaccharides, and with glycoconjugates and carbohydrate vaccines are rather brief, and here the reader will need to refer to other books to gain a full understanding. In particular the biological aspects of carbohydrates are treated very superficially here, and it would have been desirable to have more factual information. Each chapter of the book ends with a short bibliography listing the most important relevant publications. At the end of the book is an appendix on the nomenclature of sugars, referring the reader to the literature on the subject, and a bibliography of the most important journals and monographs devoted to carbohydrates. The subject index is very thorough and comprehensive, enabling one to quickly find a topic of interest. The formula schemes are excellent and all have been drawn with great care.

The literature list at the end of the book contains 205 references and seems to be adequate. A slight criticism is that for some topics the list gives only textbooks and no original papers. The book is suitable for all researchers who seek a fast and convenient source of information about the most important aspects and modern developments in the rapidly advancing area of carbohydrates. However, the book does not seem very suitable as a textbook for advanced students.

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Green Chemical Syntheses and Processes. (ACS Symposium Series, Vol. 767.) By *Paul T. Anastas, Lauren G. Heine* and *Tracy C. Williamson*. Oxford University Press, Oxford 2000. x + 353 pp., hardcover £ 79.50.—ISBN 0-8412-3678-X

The editors have grouped the papers under five subject areas. After an introductory chapter written by the editors, the first main section has the title "Designing Safer Chemicals". It begins by reporting on measures to control caterpillars of the genus *Lepidoptera*. Tebufenozide gives improved selectivity in insect control by acting as a mimic of 20-hydroxyecdysone: the Rohm and Haas company received the Presidential Green Chemistry Award for it. The control of similar insects using pheromones, which can now be manufactured more cheaply from precursors made by an in vivo synthesis using yeasts, is hampered by too high species specificities.

Another article reports on attempts to make certain metal-complex dyes more environmentally acceptable by substituting Fe in place of Cr, Co, or Cu. The use of these new products for the dyeing of polyamide is restricted to a few special cases (patents are cited). Applying a permanent protective layer to metals using paints or polymers usually involves dipping them in a chromate bath. An alternative is treatment with phosphoric acid, although even then one obtains better adhesion if it is followed by chromate treatment.

The section on "Green Chemical Syntheses" consists of four chapters. The topics include the substitution of dimethyl carbonate in place of phosgene, dimethyl sulfate, and methyl halides, and the use of water or mixtures of water with organic solvents in organic syntheses. It is noticeable that there is no mention of the versatile solid-state reactions that give 100% yields without solvents, without generating wastes, and without the need for product workup. That is all the more surprising since none of the examples described approaches a yield of 100%, and all involve a workup stage to give a pure product. The achievable yields from the (usually incomplete) reactions are at best described as "good", and the subsequent workup is not mentioned. Strategies for avoiding waste generation are seldom discussed.

Nevertheless, some of the reactions described are interesting from a synthesis viewpoint. Thus, dimethyl carbonate (b.p. 90 °C) can be used for the monomethylation of active methylene compounds at 180–220 °C, for splitting ketones to give two methyl esters, and for converting oximes with active methylene groups into *N*-methyloxazolinones. The monoalkylation of aniline derivatives can be carried out at 120–150 °C in the presence of zeolites. However, the claim on page 98 that there are no wastes to be disposed of is incorrect. The discrepancy is especially striking in Table 5 on page 96, which cites 100% conversion and only 22% yield.

Syntheses carried out in water have long been known. However, the optimism about environmental benefits expressed here is immediately dampened when it turns out that one adds compounds such as pyridine, triethylamine, acetonitrile, tetrahydrofuran, or heavy metals or their complexes, or when the workup (chromatographic in some cases) requires the use of organic solvents. The articles devote particular attention to allylations and propargylations (aldehydes, cycloketones) and ethynylations using the metals Sn, Zn, In, Bi, Mn, Pd, and Ru or their complexes. The usefulness of such reactions is demonstrated in carbohydrate syntheses without the need for protecting groups. No direct comparisons with extensively researched synthetic methods using other reaction media are given. The net gain to the environment is especially questionable in cases where an intensive workup procedure is needed, and where one has to dispose of the aqueous phase as a waste product (however, indium can be

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