(V. P. W. Böhm), micellar systems (G. Oehme), and supercritical fluids (W. Leitner). It is a pity that the contribution on chemical reaction engineering has not been updated and expanded to cover aspects of catalyst recycling, a key issue for the development of molecular catalysis. The short contribution by J. Herwig on "New reactions" demonstrates the interest in multiphase or multifunctional systems for increasing selectivity. High-throughput approaches to homogeneous catalysis are discussed in a (too short) contribution from Symyx. On the other hand, the fully rewritten section by R. Schmid et al. on applications of molecular modeling in homogeneous catalysis offers a good introduction to the application of computational methods in the investigation and optimization of some important catalytic processes. The sections on catalytic C–C coupling reactions (Heck reaction, cyclopropanation, Fischer–Tropsch synthesis, arene coupling reactions) are updated, especially for the Heck reaction. Some concepts for catalyst design are discussed in a new contribution by W.A. Herrmann et al., with the example of N-heterocyclic carbenes applied to olefin metathesis and the Heck reaction.

The second subdivision of Chapter 3 is still a patchwork of contributions on methods, catalysts, reactants, and processes. Surveys on biocatalysis, enzyme-analogous processes, and membrane reactors contain new references on recent work. One should mention the article by R. Anwander about the advantages of using rare-earth complexes in homogeneous catalysis (over 100 additional citations), the new contribution by F. Agbossou-Niedercorn on phosphorus-containing ligands for homogeneous enantioselective catalysis (ca. 200 references), and the more realistic essay by C. Bianchini et al. on catalytic hydrogenation of heterocyclic sulfur and nitrogen compounds for understanding industrial HDS and HDN processes for clean fuels (ca. 40 additional citations).

The third subdivision of Chapter 3 remains as such, with updated references to recent literature. Enantioselective reactions and processes are discussed in the contributions by H.-U. Blaser, B. Pugin, and F. Spindler (technical applications), M. Beller and K. B. Sharpless (osmium-catalyzed dihydroxylation), and P. W. Jolly and G. Wilke (hydrovinylation): they complement the personal view by R. Noyori. As noticeable changes, one can mention the introduction of catalyzed formation of organic carbonates in the review on "Carbon dioxide as a C_1-building block" (E. Dinjus et al.) and the completely rewritten reviews on reductive carbonylation of nitro compounds (M. Dugal et al.) and the Pauson–Khand reaction (W. A. Herrmann). Moreover, new topics are introduced in "Chemicals from renewable sources" (J. P. Zoller, 24 references), and "Chemistry of methyltrioxorhenium" (F. E. Kuhn and M. Groarke on reactivity, with 31 references, and W. A. Herrmann on technical synthesis with 9 references).

Chapter 4 sums up the personal view of the editors on prospects regarding the scientific and industrial issues of homogeneous catalysis, routes to immobilization, applications to colloids, and exploitation of multicomponent and multifunctional catalysts. The key aims of homogeneous catalysis, namely efficiency and selectivity, lead to initiatives for new reactions (activation of C–H, C–C, and C–F bonds) and improved catalysts (tailored ligands, rare earths, etc.).

Anyone who already has some knowledge of molecular transition-metal chemistry will find this book extremely useful for a thorough account of the state of the art in homogeneous catalysis, both in its accomplishments (Chapter 2) and trends (Chapter 3). The reader wishing to study topics in greater depth has access to over 6000 literature references, with some from 2002!

To summarize, the second edition of this comprehensive handbook is not a clone. A lot of new material has been introduced, especially in the domain of methodologies and organic syntheses which require catalysts. It should be present in every laboratory concerned with the future of catalysis and sustainable chemistry.

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Host–Guest Chemistry. Mimetic Approaches to Study Carbohydrate Recognition. Edited by *Soledad Penadés*. (Series: Topics in Current Chemistry.) Springer-Verlag, Heidelberg 2002. 241 pp., hardcover € 144.00.—ISBN 3-540-42096-7

This book, in the well-known format of *Topics in Current Chemistry*, is a collection of various reviews covering emerging areas of interest in the field of carbohydrate recognition. It is aimed at PhD students and researchers other than specialists in the field.

It has only recently been recognized that carbohydrate–carbohydrate interactions can play a key role in cell adhesion, recognition, and communication. Previously the study of such interactions has been hindered by the structural complexity of carbohydrates and by the fact that these interactions are polyvalent and made up of very weak monovalent interactions. Recent developments of new model systems, and the adaptation of new analytical techniques to study carbohydrate–carbohydrate interactions, have boosted research in this area.

The results of these new investigations are treated in the seven chapters of the book: 1. Model Systems for Studying Polyvalent Interactions; 2. Carbohydrate–Carbohydrate Interactions in Biological and Model Systems; 3. Unravelling Carbohydrate–Carbohydrate Interactions with Biosensors Using Surface Plasmon Resonance (SPR) Detection; 4. Interaction Forces with Carbohydrates Measured by Atomic Force Microscopy (AFM); 5. Recognition Processes with Amphiphilic Carbohydrates in Water; 6. Artificial Receptors as Chemosensors for Carbohydrates. 7. Artificial Multivalent Sugar Ligands to Understand and Manipulate Carbohydrate–Protein Interactions. In each chapter a general introduction to the specific topic is followed by a detailed discussion with a wealth of examples. An adequate list of references is given at the end of each chapter to help the reader in search of more detailed information.

The first chapter, as the title indicates, deals with model systems that are used to investigate carbohydrate–carbohydrate interactions. These are divided into low-valency and high-valency mod-

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els, which are followed by a short survey of novel models such as dynamic self-assembled monolayers and models based on cells, bacteria, and viruses. The comparison of the various kinds of models, presented at the end of the chapter, can be very useful in enabling researchers to design the most suitable model for their studies.

The second chapter describes a few examples of carbohydrate–carbohydrate interactions in natural and model systems (carbohydrate–carbohydrate interactions involved in the formation of the structural network of the extracellular matrix and in the cell walls of bacteria and plants are not included). The chapter concludes with the very few reported examples of thermodynamic data on carbohydrate–carbohydrate interactions.

The third and fourth chapters describe, respectively, the use of SPR and AFM to study interactions between saccharides. The two techniques are described in a simple but detailed fashion and again many examples are presented.

The fifth chapter analyzes the recognition phenomena taking place in the presence of amphiphilic carbohydrates, ranging from cyclodextrins to glycolipids and glycoproteins.

The sixth chapter is another interesting review written by T. D. James and S. Shinkai. These authors, who are very active in this area, describe in detail the chemistry and the application of sugar receptors based on boronic acids. These compounds are at present the only kind of artificial receptors for sugars that are truly able to work in aqueous solutions and they offer interesting perspectives.

The last chapter returns to the concept of multivalency already discussed in the first chapter. The importance of the design of a multivalent carbohydrate ligand needed to influence biological processes such as carbohydrate–protein interactions is explained in detail.

The particular value of this book is that it gathers together much information about different techniques and research areas having carbohydrate recognition as a common denominator. The layout of the book makes a good impression, but the absence of a keyword index is inconvenient. The many drawings and schemes throughout the book are in general correct and very clear, facilitating the understanding of the text.

This book is a useful and easily readable monograph about a subject that is rapidly growing in importance and, in our opinion, the heterogeneity of the various chapters has to be counted as an advantage. In conclusion, *Host–Guest Chemistry* can be highly recommended to beginners in the field of carbohydrate recognition.

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Encyclopedia of Chemical Physics and Physical Chemistry. Vols. 1–3. Edited by *John H. Moore* and *Nicholas D. Spencer*. Institute of Physics Publishing, Bristol 2001. Over 3000 pp., hardcover $ 750.00.—ISBN 0-7503-0313-1

Over 100 years since the beginnings of physical chemistry, now for the first time we have a comprehensive encyclopedia of this discipline. According to the definition of physical chemistry as an interdisciplinary field between physics and chemistry, the undertaking is not expected to be easy. Robin Hochstrasse rightly says in his preface that the committed chemical physicist or physical chemist must be a jack-of-all-trades, who deals both with physical phenomena of chemical processes and with the influence of physical variables on those processes. In addition he examines substances and processes by using physical methods, and tries to describe and explain them by using physical ideas and methods. Today this means to have mastered the basics thoroughly, to further develop the techniques, and to apply them in the various fields from materials science to biology.

The editors-in-chief John Moore and Nicholas Spencer have not only faced this marathon challenge but solved the problem with style. They have recruited a top-flight team of authors for the three-volume *Encyclopedia of Chemical Physics and Physical Chemistry*. 127 authors provide a full range of information on established and modern fields of physical chemical knowledge. Almost one hundred articles add up to more than 3000 pages. The structure of the encyclopedia is simple. The first volume presents the fundamentals such as microscopics, thermodynamics, and statistics as well as dynamic processes. The second volume comprises the broad range of theoretical and experimental methods for determining the properties of molecules and materials. The third volume concentrates on applications of the basic principles and methods in modern fields of physical chemistry. Chapters on single-molecule spectroscopy, clusters, and fullerenes, continuing up to zeolites, colloids, and semiconductors, span the whole gamut between the microscopic and macroscopic worlds.

This balancing act between traditional and ultramodern physical chemistry succeeds. Some techniques and methods that were subjects of recent Nobel Prize awards, such as ultrafast spectroscopy, can be found here, as well as the mature field of thermodynamics. The modern chapters especially cross-refer to each other and underline that physical chemistry and chemical physics are closely related fields of study. The cross-references excite the reader's interest and stimulate him or her to examine other volumes or topics. For example, readers who are thrilled by the inspiring chapter about fullerenes will wish to know how the methods for preparing the buckyball molecules work in detail. Sometimes they may wish to look up the fundamentals, while on the other hand, after intensively studying the basic principles and methods, one wants to know how things can be used in practice.

However, not all chapters are sufficiently linked up. For example, in Chapter B1.4 of the applications volume, "Microwave and terahertz spectroscopy", the technique of far-infrared vibration-rotation-tunneling spectroscopy (FIR-VRTS) is introduced. Water clusters are discussed as an example of systems that can be investigated by this method. The quotation as well as the figure are taken from a doctoral dissertation. In Chapter C1.3, "Van der Waals molecules", of the same volume, water clusters are also discussed, but without referring to Chapter B1.4, which introduces the FIR-VRTS method. Results of ab initio calculations on such associates are shown in the applications volume,

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