certainly becomes clear on reading it. To attempt to cover the entire subject would be like trying to square the circle. Nevertheless, Gregory Rohrer has done a very good job here, despite a few weaknesses that one can expect in a first edition.

The contents are based on a lecture series for graduate students in the department of Materials Science and Engineering at Carnegie Mellon University, which the author gives as a one-semester course of 52 lecture units. In his preface he explains that his intention was to bring together the essentials of the available specialist books on crystallography, solid-state physics, and structural inorganic chemistry, in a form that would be useful for students. He certainly did not set out to provide a substitute for those works, and indeed he uses them by recommending appropriate parts of them for further reading and additional study.

There are ten chapters, beginning with an introduction to elementary principles and concepts, including the main trends in the Periodic System. This is followed by three chapters on the fundamentals of crystallography. Starting with the Bravais lattice, the various space groups are described, then the basic structural elements (molecular packing, the filling of interstitial lattice sites, classification schemes, etc.) are explained, and various key structural types are described.

After an introduction to diffraction methods for studying periodic structures, there are four chapters on different types of bonding in crystals, beginning (unusually) with a description of the weaker, so-called secondary, interactions. Ionic, metallic, and covalent bonding types are then treated in turn. These chapters on bonding in solids all follow the same pattern, beginning with phenomenological considerations, then presenting a physical model, with a description of the quantities that can, where possible, be measured. The final chapter is devoted to structure prediction. The book is completed by an appendix listing data relating to the individual chapters (space groups, atomic form factors, ionic radii, and other crystallographic data).

At the end of each chapter there are exercise problems (ranging from 10 to 30 in number, and varying widely in level of difficulty), to provide practice, extend the student's knowledge, and reinforce understanding. There is also a list of references naming sources for further reading which are also mentioned in the main text. A very useful feature is that page numbers in the secondary literature are given, thus avoiding the need for laborious searching in the sources.

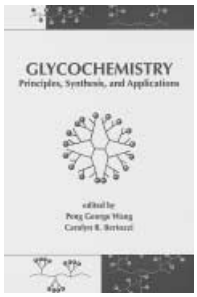
Some of the figures could certainly be improved by further editorial work. Better typesetting and a uniform typeface would bring an improvement. The graphs would benefit from a consistent layout, and in many cases one can see that a diagram has been reproduced from a draft with poor resolution. Unfortunately the usefulness of the book as a reference source is limited by the fact that the index is much too brief. It would certainly have been better to provide a separate index of crystal structures, and to greatly extend the subject index. However, neither this nor the aesthetic defects of the typography are very serious drawbacks, and they could be remedied in a future edition without too much extra work. Also, where calculations of the stability of structures are given in the chapters on bonding types, it would be possible to treat the concept of electronic structure in slightly greater detail than here. The treatment given here is not entirely up-to-date and does not take account of the most recent research results. Especially with regard to the last chapter, modern quantum-theoretical methods now appear to have provided a solid basis for the earlier purely phenomenological concepts of Miedema and others, and have even led to a further extension of those ideas. Such concepts are indispensable for a proper understanding of some aspects, especially in the development of new materials.

However, the book provides the reader with the basic fundamentals and much information. As the author explains, the contents are derived from a dozen or so other very good books (in which the topics are probably treated in much greater detail), but his book has the advantage of bringing together within it the main essentials of the structure of solids, with detailed references to the sources, and that is where its main strength lies. The well set out didactic presentation of the individual chapters should prove very suitable for students, and will also provide teachers with a good overview of the material to be covered. Furthermore, experienced researchers too will benefit from the considerable amount of structural data included, and the numerous tables and panels within the main text and in the appendix listing physical quantities. Therefore, the book can be recommended for everyone concerned with crystalline solids in the broadest sense, as a useful compendium and handbook of long-lasting value.

Peter Kroll
Institut für Anorganische Chemie
Technische Hochschule Aachen
Aachen (Germany)

Glycochemistry. Principles, Synthesis, and Applications. Edited by *Peng George Wang* and *Carolyn R. Bertozzi*. Marcel Dekker, New York 2001. 682 pp., hardcover $ 195.00.—ISBN 0-8247-0538-6

The appearance of this 682-page monograph raises high expectations. It aims to give a comprehensive overview of the broad field of modern glycochemistry within a single volume, and to provide an up-to-date literature survey covering the latest developments in the field. We must now consider whether the contributing authors have succeeded in that task.



As the subtitle implies, the articles are arranged in three main sections. The first section consists of six chapters dealing with the chemical synthesis of complex oligosaccharides. In the preface the editors of the monograph state that this section contains a group of comprehensive articles forming a logical sequence. It seems to me that although each individual chapter merits that description, the section as a whole does not fully achieve the stated aim for the enormous subject of oligosaccharide synthesis. In the first chapter (32 pp., 71 references) Peter Seeberger gives a detailed and up-to-date survey of the latest develop-

  1433-7851/02/4113-2414 $ 20.00+.50/0

ments and successes in solid-phase-supported syntheses of complex oligosaccharides, with a clear and concise explanation of the principles and strategies, also indicating the extent of what can currently be achieved. However, at the end of this excellent article the author is perhaps a little too euphoric with regard to the possibilities for automated synthesis of oligosaccharides. I have doubts about whether there can be such a thing as an "absolutely selective strategy" for synthesizing oligosaccharides on solid phases with high yields. The other five chapters of this section describe special methods for synthesizing oligosaccharides in solution. David Gin contributes a rather over-enthusiastic description (20 pp., 60 refs.) of the method of "dehydrative" glycosylation of a 1-hydroxyglycosyl donor. Although this is interesting and thought-provoking from a chemical viewpoint, such relatively specialized methods are often insufficiently selective to be useful for longer oligosaccharide syntheses. In the third chapter (23 pp., 47 refs.) David Crich gives an excellent overview of the chemistry of glycosyltriflates and their use in oligosaccharide syntheses. This article is concise, understandable, and comprehensive. The fourth chapter, by Maarten Postema and Daniel Calimente, is the longest in this section (53 pp., 164 refs.), and deals with C-glycoside syntheses. That is always a difficult topic to present in a clear and up-to-date way, but the authors have succeeded admirably. The remaining two chapters are concerned with D-arabinofuranosides from mycobacteria (Todd L. Lowary, 28 pp., 119 refs.) and with the chemical synthesis of bioactive steroid saponins (Biao Yu and Yongzheng Hui, 14 pp., 28 refs.). In my view these both deal with examples that are too specialized to be of general interest, and also the methods described are already well known. Considering the great variety of glycosylation methods that are currently used for synthesizing oligosaccharides, it would have been more useful to replace these by two surveys of a more wide-ranging kind. In this part of the book concerned with synthetic methods I would have liked to find articles on new developments and on improvements to important existing glycosylation methods, such as those for thioglycosides, halogenoses, alkenyl glycosides, and imidates, which are still the basic tools of oligosaccharide synthesis. I would also have wished to see a chapter on the synthesis of inosite derivatives, which are of increasing importance in glycochemistry. However, not everything can be covered in a book of just under 700 pages.

The second section of the book is devoted to biological aspects of glycochemistry (often called "glycobiology") and consists of seven chapters. As a chemist working on synthetic aspects, I find this section excellent, as it gives a broad overview of the many different aspects of the role of sugar chemistry in biology. In the first chapter (44 pp., 58 refs.) Randall J. Halcomb and Mark D. Chappell provide a comprehensive description of glycosylations using sialic acids. As well as chemical methods the authors include details of modern chemoenzymatic syntheses using sialyl transferases. In the second chapter (55 pp., 234 refs.) David Mann and Laura Kissling give an excellent account of the fundamental principles of carbohydrate–protein interactions. This stimulating article is a highlight of the book. Next, in another outstanding contribution (29 pp., 117 refs.), Rene Roy describes new developments in the multivalent presentation of carbohydrate epitopes, and explains the principles of the "clustering" of sugar molecules, with the sialic acid method as an example. New lines of research in this area, such as the properties of glycodendrimers, are also clearly explained. The fourth and fifth chapters of this section (Jalal Haddad, Lakshmi Kotra, Mei-Zheng Liu, Shahriar Mobashery, altogether 113 pp., 481 refs.) discuss the structures and syntheses of aminoglycoside antibiotics in great detail. Although this is an important and very interesting group of compounds, it might have been better to restrict these chapters to a shorter treatment and publish additional details elsewhere. The sixth chapter, by Bryan Yeung, Pek Chong, and Peter Petillo (66 pp., 131 refs.), is devoted to the synthesis of glycosaminoglycans, but it is not clear why the topic should be treated in such detail in a section that is supposed to be about "principles". In describing the synthesis of glycosaminoglycans by classical glycosylation reactions, the authors burden the reader with an enormous amount of experimental detail, which belongs in an original paper but certainly not in a monograph. In contrast, the last chapter of this section (Jacqueliyn Gervay-Hague and Thomas Weathers, 40 pp., 74 refs.) is an interesting and stimulating discussion of pyranosylamino acid conjugates, a class of compounds which the authors describe in precise and thorough detail. On the whole, however, it was unnecessary to have this as a separate second section. In any case, the division into three sections is only indicated in the preface, and the articles are numbered in sequence through the book as a whole.

The remaining five chapters of the book form the section on "Applications", but actually they are almost exclusively concerned with enzymatic methods. An excellent chapter by Xiangping Qian, Keiko Sujino, Monica Palcic, and Murray Ratcliffe (29 pp., 132 refs.) considers the use of glycosyl transferases in oligosaccharide synthesis, with a concise and frank discussion of their advantages and disadvantages. In the second chapter (13 pp., 28 refs.) Cheng and Qu-Ming Gu are mainly concerned with another rather specialized topic, the modification of polysaccharides catalyzed by lipases and beta-galactosidase. The title of this chapter, "Biotransformations of Polysaccharides", led me to expect more. The next two chapters (by Peng George Wang et al., altogether 56 pp., 264 refs.) describe a case study on the alpha-galactose epitope followed by a discussion of the importance of bacterial glycosyl transferases in biology and medicine. I enjoyed reading these two excellent articles, which touch on all the various aspects of glycochemistry. The final chapter by Scarlett Goon and Carolyn Bertozzi (32 pp., 159 refs.) is entitled "Metabolic Substrate Engineering", and contains a detailed discussion of the fascinating possibilities for modifying oligosaccharides on cell surfaces. The book is completed by a detailed subject index.

Does the book fulfill the ambitious aims mentioned at the beginning of this review? The answer has to be: yes and no. Some of the articles are excellently written, and the wealth of information presented is concentrated on the most important aspects. But there are also some weaker ones that might have been

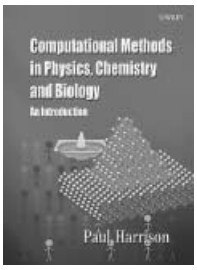
  1433-7851/02/4113-2415 $ 20.00+.50/0

replaced to advantage by others on areas of glycochemistry and glycobiology that have not been discussed at all. For example, I would have liked to find a separate contribution on carbohydrate analysis, as many of the results described would not have been possible without the remarkable developments that have occurred in NMR spectroscopy and mass spectrometry.

For readers who are not very familiar with glycochemistry the book offers a good way of quickly gaining a sound appreciation of the many different aspects of the field. As already mentioned, the amount of experimental detail in some chapters is probably too much for that purpose, but despite that I recommend the book to those readers, and therefore I answer yes to the above question. On the other hand, of course, the book does not go far enough for specialist readers. Their general needs are better served by other (mainly multivolume) works that are already available. Also, in cases where a specific area of development is described in a short article in this book, the specialist reader will instead go to a relevant monograph where the topic is treated more thoroughly. Therefore, for those readers the answer to the question must be no.

Thomas Ziegler
Institut für Organische Chemie
Universität Tübingen (Germany)

Computational Methods in Physics, Chemistry and Biology. By *Paul Harrison.* John Wiley & Sons, Inc., New York 2001. 201 pp., softcover £ 24.95.—ISBN 0-471-49563-8



Numerical experimentation, that is, the computational modeling of physical phenomena, has become established as a third pillar, next to laboratory experiment and theory, in the investigation of the natural world. The present book attempts to provide undergraduate students in physics, chemistry, biology, and related areas with the basic techniques underlying many of the computational models used in these numerical experiments. The nine chapters cover topics such as numerical and approximate solutions for the Schrödinger equation (e.g., perturbation methods and the variational principle), technical applications such as matrix methods and the use of basis sets to expand state functions, deterministic and stochastic simulation techniques, percolation theory, evolutionary methods and genetic algorithms, and finally molecular dynamics.

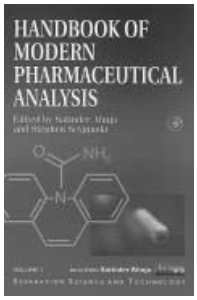
The fundamental physics which the various numerical methods attempt to model is introduced in a very brief and often superficial manner. Constructs such as the Kronecker δ or divergence are used with no further explanation. Without solid prior knowledge the reader will certainly have difficulties in understanding this important background information. The numerical techniques themselves are explained in more detail, and are accompanied by examples of the use of the corresponding algorithms in computer programs written in C (one example in Fortan is also included). All chapters end with a summary and a set of tasks and projects. The source code examples, as well as hints and outline answers to the problems, are available through the Internet from the author's website.

As the title suggests, the author defines the audience of this book as computational physicists, chemists, mathematicians, and biologists. However, the examples and the overall style of treatment are strongly biased towards physics. Chemistry and biology related aspects are only very rarely touched upon. This becomes evident, for example, when Monte Carlo simulations are introduced with the words: "Monte Carlo simulations are usually associated with electron scattering processes in semiconductors". While this mirrors the author's background in quantum electronics and semiconductor physics, it completely neglects the important role of these techniques in other areas. For example, Monte Carlo methods have important applications in chemistry and are used for molecular mechanics simulations, an aspect which is not mentioned at all in the book. Similarly, the chapter on molecular dynamics focuses almost exclusively on applications in solid-state physics. The great importance of these methods in many areas of chemistry is noted only very briefly, even though molecular dynamics simulations are nowadays frequently used in many academic and industrial laboratories for the prediction of properties of reagents, potential new drugs, and other chemicals. Moreover, some of the information regarding chemical aspects is even incorrect, for example in Figure 8.12 where C–H and H–H bonds are shown as being weaker than a C–C single bond.

To sum up, this book is certainly of value for students interested in computational physics. On the other hand, chemists, and probably also biologists, will find it less suitable because much physical background knowledge is required, and direct ties to applications in these disciplines are missing.

Wolfram Koch
Gesellschaft Deutscher Chemiker
Frankfurt am Main (Germany)

Handbook of Modern Pharmaceutical Analysis. By *Satinder Ahuja* and *Stephen Scypinski*. Academic Press, San Diego 2001. 566 pp., hardcover $ 124.95.—ISBN 0-12-045555-2



Pharmaceutical analysis can be considered from several aspects: the analytical methods that are available, the areas of application, and the regulatory requirements. The structure of a book on pharmaceutical analysis is determined essentially by the kinds of readers for whom it is intended. In the case of the *Handbook of Modern Pharmaceutical Analysis* those readers are analysts working in industry. Accordingly, the book places the areas of application and the regulatory aspects in the foreground, whereas the reader is assumed to be already largely familiar with the analytical methods.

After an introductory chapter giving a good overview of the main areas of

  1433-7851/02/4113-2416 $ 20.00+.50/0