

Book reviews

Chemistry for the 21st century

E. Keinan and I. Schechter (eds)

Wiley-VCH, Weinheim, 2000

xiv + 292 pages

ISBN 3-527-30235-2

This book is one of a three-volume set planned to take a forward look at where science is heading at the start of the 21st century. A second companion volume will deal with the life sciences, and a third with physics and the mathematical sciences.

The idea for these volumes stemmed from a quintet of special symposia held in May 1998 to celebrate the 20th anniversary of the Wolf Prize and the 50th anniversary of the State of Israel. Some of the contributors to these symposia are among the authors of the 15 chapters presented here, though disappointingly the editors have provided us with neither the biographical notes the non-specialist reader needs in order to appreciate the backgrounds of those who have provided these authoritative overviews, nor the basis on which their editorial selection of topics to be covered was made. We learn, however, that the book contains a 'broad-scope sampling' of subject matter, written by scientists who are well known in their fields, who have been encouraged to present their views of the perspectives and prospects in these fields.

The scene is ably set by J. M. Lehn in a thoughtful and stimulating introductory chapter putting chemistry in perspective, noting the hierarchy of levels (atomic, molecular, supramolecular) at which it can be probed and ultimately understood, highlighting the potential of supramolecular chemistry as a science of informed matter ('molecular sociology'), and drawing attention to the scope of chemistry, in general, for understanding life processes and for creating novel, abiotic, non-natural systems.

This excellent introduction is followed by two chapters that set a rather more specialized tone than seems appropriate. They are by C. R. Harris, S. D. Kuduk and S. J. Danishefsky on the subject of epothilones, substances of potential value in cancer chemotherapy, and by L. A. Paquette on the spirotetrahydrofuran motif and its role in biasing cyclohexane conformation and restricting nucleoside/nucleotide conformation. Subsequent chapters aimed less at the specialist than these, and with appropriately eye-catching titles, include one of particular interest to readers of this journal by G. Ertl on heterogeneous catalysis ('From black art to atomic understanding'), and others by S. H. Snyder ('Drugs for a new millennium') and by Y. Duan, S. C. Hardy and P. A. Kollman ('Protein folding and beyond'). There follow two surveys of aspects of environmental nitrogen chemistry: the enzymology of biological nitrogen

fixation by R. H. Burns, and the chemistry of nitrogen in soils by M. Schnitzler. All of these chapters convey, in terms intelligible to chemists whose specialisms lie elsewhere, the current state of play in these areas, exemplified by specific case studies and including discussion of future prospects.

The spirit of the book is also captured by L. R. MacGillivray and J. L. Atwood in their chapter on spherical molecular assemblies (rather ambitiously claimed to be a class of hosts for the next millennium!), which places pseudo-spherical supramolecular assemblies in a useful polyhedral context. Combinatorial (high throughput) research methods, popularized a decade or so ago in drug-discovery programmes, are next illustrated, in connection with materials discovery, by L. F. Schneemeyer and R. B. van Dover. There follows a fascinating chapter by P. Frank, W. H. Bonner and R. N. Zare, effectively on the origin of life itself, or at least of its vital chiral molecules ('On the one hand but not the other: the challenge of the origin and survival of homochirality in prebiotic chemistry').

The interface between experiment and theory, and the remarkable strides computational approaches to chemical problems have taken over recent years, feature prominently in the later chapters. These cover applications of molecular dynamics calculations (R. D. Levine), the past, present and future of quantum chemistry (T. D. Crawford, S. S. Wesolowski, E. F. Valeev, R. A. King, M. L. Leininger and H. F. Schaefer III), and quantum alchemy — materials aspects (M. L. Cohen). The final chapter, by R. J. Bartlett, explores how the quantum chemical treatment of molecular interactions will evolve from the two approaches used at present: the *ab initio* two-electron wave function theory, and the one-electron density functional theory.

This book thus contains a very mixed bag of review articles of a type one would normally find only in separate specialized texts. Unfortunately, some are written with little regard for the non-specialist (though chemically informed) background of the target reader, interested to see where other areas of the subject are going. Nevertheless, there is a lot of food for thought here, and rewarding reading for those prepared to make the undoubted effort needed to come to grips with advances beyond the confines of their own home territory. The future of chemistry, indeed of science in general, depends on its appeal to the creative lateral

thinker, the person prepared to discard or update outmoded ideas, to seek new challenges, to explore where lessons learnt in one area can fruitfully be applied to others. Books such as the present one may help spread the word.

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[DOI: 10.1002/aoc.229]

Pharmaceuticals: classes, therapeutic agents, areas of application

John L. McGuire (ed.)

Wiley-VCH, Weinheim, 2001

vi + 2315 pages. £635

ISBN 3-527-29874-6 (4 vol. set)

Pharmaceutical science has made a tremendous impact on chemistry since perhaps the first synthesis of aspirin in 1853, and subsequent developments in this field have greatly affected so many areas of chemistry. Obvious examples include natural product, peptide, nucleotide and polymer chemistry, surfactants, semisynthesis using microorganisms, and organometallic and inorganic chemistry, but there can be few fields not influenced in some way by the pharmaceutical industry.

Research and development in this industry have made significant contributions to our current understanding of the mechanisms underlying diseases and have been an important stimulus in the development of efficient and economic organic syntheses. There is consequently no shortage of textbooks and journals covering this vast industrial sector in specialist texts of one form or another. Few books attempt to cover this topic in its entirety, so vast is this field. *Pharmaceuticals: classes, therapeutic agents, areas of application* from Wiley-VCH is a notable exception. This four-volume handbook covers virtually every area of chemistry applied to the drug industry in a thorough and understandable way.

The four volumes are divided into nine sections, i.e. introduction and cardiovascular drugs in volume 1, neuropharmaceuticals, gastrointestinal drugs and respira-

tory tract agents in volume 2, anti-infectives and metabolic drugs in volume 3, and miscellaneous drugs and related technology in volume 4. Each section starts with an introduction, descriptions of the historical development of the field and the economic impact of the main drugs in that therapeutic area. Sections are generally divided into areas of therapeutic application, such as cancer chemotherapy, drugs affecting circulation, antimycotics and antipsychotics/neuroleptics. These areas are introduced by a description of the physiology and pharmacology that underlie the mechanisms of action of drugs and are subdivided into chapters that cover the main chemical classes and compounds. Where applicable, routes of syntheses are given along with chemical name and trade names, as well as the clinical application of drugs launched in most major worldwide markets. All chapters are concluded with a complete list of references.

Additionally, this book also describes the production of antibiotics by fermentation, pharmaceutical dosage forms, drug delivery systems, monoclonal antibody production and applications, veterinary pharmacology, and drug testing and licensing procedures. The comprehensive index contains indexes of the contributing authors, CAS registry numbers for the compounds mentioned throughout the text (well over 2000) and a general index that covers generic names, trade names and chemical names. The physiology and pharmacology descriptions are concise and do not require a specialist knowledge of the subject matter. Likewise, the chemistry is detailed with structures and synthetic pathways presented throughout the text, and this should be understandable by non-chemists. There are plenty of figures and tables to support the text, although I think a glossary of terms might have been useful.

This four-volume set may appear to be just another handbook on pharmaceutical chemistry. Far from it. It is an up-to-date and authoritative reference covering the entire pharmaceutical industry and it will appeal to chemists, pharmacologists and other professionals working in this industry because of its scope, detail and readability.

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[DOI: 10.1002/aoc.215]