

Book Reviews

Recombinant Proteins from Plants: Production and Isolation of Clinically Useful Compounds. Edited by C. Cunningham and A. J. R. Porter (University of Aberdeen). Humana Press, Totowa, NJ. 1998. xi + 308 pp. 15 × 22.5 cm. \$79.50. ISBN 0-896-03390-2.

The remarkable potential of plants as chemical factories is receiving increasing attention from biotechnology researchers in academia and industry as the technology for genetic engineering has become widespread and, in many cases, routine. In addition to the engineering of metabolic pathways for primary and secondary metabolites, the production of foreign proteins, especially those with pharmaceutical potential, promises to change forever the way in which protein-based drugs are produced. This volume is a comprehensive compilation of technical protocols covering all the available molecular approaches for expression of recombinant proteins in transgenic plants. After introductory chapters covering the expression of transgenes in both monocot and dicot plant species, about 10 chapters cover topics ranging from expression of viral proteins and proteinase inhibitors to antibodies. These chapters provide an overview of what is possible with current technology and a preview of future developments. It is a bit surprising, however, that one of the most exciting developments in the field, the production of “edible vaccines”, has not been addressed as an invited contribution. There are also chapters discussing possible technical problems to be encountered, for example, transient expression, stability of recombinant proteins, and intracellular localization. The book concludes with several chapters on protein quantification and analysis.

Like many books of this nature, comprising a rather large number of heterogeneous contributions, this volume is more a collection of chapters than a critical or thorough overview of the field and its underlying technologies. The most useful chapters in this reviewer's view are those that complement the technical protocols with detailed comments on the limitations of the techniques, practical tips, etc. I believe this book would be most useful to researchers new to the area, as it provides a thorough coverage of current techniques. It may be of particular interest to natural products researchers who are studying “specialty” proteins from plants. The book should be a useful addition to libraries in the biological and chemical sciences and a practical guide for researchers and graduate students willing to enter this field.

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The Alkaloids: Chemistry and Biology. Vol. 51. Edited by G. A. Cordell (University of Illinois at Chicago). Academic Press, Inc., San Diego, CA. 1998. ix + 439 pp. 15 × 22.5 cm. \$135.00. ISBN 0-12-469551-5.

This is the 51st volume of the distinguished series on alkaloids established in 1950 by R. H. F. Manske and H.

L. Holmes, continued by A. Brossi, and which is now edited by Geoffrey Cordell.

The present volume covers Aspidospermine Alkaloids (197 pages), *Cephalotaxus* Alkaloids (71 pages), Ipecac and Related Alkaloids (51 pages), and Amaryllidaceae Alkaloids (102 pages). Also included is a cumulative index of titles and a subject index for the present volume.

The chapter on aspidospermine alkaloids by J. E. Saxton reviews the literature from 1977 through 1996, including coverage of the isolation of 240 alkaloids, both new and previously known, during this period, conveniently summarized in a table. For example, tabersonine was isolated from 25 different plants during this period, and numerous new alkaloids are discussed. Chapter topics include isolation and structure determination, rearrangements and transformations, and total synthesis, the latter of which comprises the bulk of the chapter (some 85 reaction schemes). The chapter on *Cephalotaxus* alkaloids by M. A. J. Miah, T. Hudlicky, and J. W. Reed reviews the literature through May 1997 and covers isolation and structural studies, synthesis of natural and unnatural examples of these alkaloids, analytical and spectroscopic studies, and pharmacological and clinical studies. A welcome decision by these authors is full coverage of the synthetic literature back to the beginning work in this area. Chapter 3 on ipecac alkaloids by T. Fujii and M. Ohba, which covers the period 1983–1997, summarizes occurrence, chemistry and synthesis, analytical methods, biosynthesis, and biological activity. Nearly 40 new alkaloids are described. The final chapter by O. Hoshino on amaryllidaceae alkaloids covers the period since 1987 and includes isolation and structure elucidation, synthesis, and biological activity of lycorine, crinine, narciclasine, galanthamine, tazettine, lycorenine, montanine, mesembrine, and other types.

The excellent presentation mirrors previous volumes in this series, and with a total of nearly 1200 references, the reader who is interested in any of these types of alkaloids is well advised to look here first. Ironically, the only error noted was the misspelling of “alkaloids” (p 271).

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Herbal Remedies: Heilpflanzen. Edited by Thomas Brendler, Joerg Gruenwald, and Christof Jaenicke. Deutscher Apotheker Verlag, Stuttgart, Germany. 1997. \$99.00. ISBN 3-7692-2221-0 (DAV).

The public use of herbal medicines continues to grow in all countries and with it the interest of many health-care professionals. Texts dealing with detailed information on large numbers of herbs are necessarily weighty volumes, and herein lies one of the advantages of the disk Phyto CD, which is the CDROM version of *Herbal Remedies: Heilpflanzen*. This revised second edition contains infor-

mation on some 670 botanical drugs and includes some 5000 references. The installation on to your PC will take up 10MB of your hard drive, and although it is said to be compatible with Windows 95, the actual instructions are given for Windows 3.x. However, once installed, Phyto CD is easy to use, even for a mere beginner of computer usage like myself. English speakers need, at the onset, to accept that their English version is a translation from the German.

What can you obtain from this CD encyclopedia? Information can be searched by plant name, either the binomial Latin name or the English or German name, drug name, chemical compound, or indications for use. When a specific plant name is selected then, by means of clicking on the appropriate buttons, it is easy to display an enlarged photograph of the plant and to read a brief history and details of habitat, flowering and harvesting times. Information available for each plant drug includes its effects, usage including German Commission E indications, homeopathic, Indian, and Chinese uses, and constituents. Do not get too excited because chemical structures are not included. In addition, each herb includes a section on literature references that are either specific to that herb or are taken from a more general review article. The font size can be reduced or enlarged for easy reading (stops all that squinting at the screen), and there is also a bookmark and notes facility. These are particularly useful because it not only allows direct access to a selected plant but it also allows you to add your own notes and comments or additions.

I selected initially *Achillea millefolium* and, skipping over the German pseudonyms, noted that milfoil, millefolium, and yarrow were not given as English synonyms, although milfoil, for example, is included in the overall list of English names. All the details I expected were there at the click of a few buttons, together with references to the pertinent literature. However, the text is not very detailed, basic information being given, and the serious reader will need to consult specific references. Moving on to St. John's Wort, *Hypericum perforatum*, I failed to find mention of antiviral action.

Despite these minor comments, I am happy to be in possession of this particular CD, which I will continue to use. To those of you interested in phytotherapy, I recommend this CD version of *Herbal Remedies: Heilpflanzen*; to the authors and publishers, I would suggest a need for a more careful check of English and of English texts available on this subject.

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Medicine from the Mountains: Medicinal Plants of the Sierra Nevada. By Kimball Chatfield (Lake Tahoe Community College). Range of Light Publications, South Lake Tahoe, CA. 1997. viii + 219 pp. 13.5 × 21.5 cm. \$17.95. ISBN 0-9658001-0-5.

The flora of California, with more than 5800 species, 24% of which are endemic, comprises more than one-quarter of

the species found in North America. Only nine other states have even half as many species as California. Being home to many indigenous groups, each with long histories of using herbal remedies, it is no surprise that many California plant species have a long history of medicinal use. *Medicine from the Mountains* provides an account of 33 of the most important genera that occur in the Sierra Nevada, including sections on botanical description and habitat, chemistry, history and modern uses, toxicity, dosage, and notes on cultivation. The body of the text is followed by a list of references, which are in random order and would be more useful if listed alphabetical and cited in the text, a list of nurseries able to supply medicinal plants, a limited glossary, and an index.

The botanical descriptions provided are incomplete and generally do not provide enough information for identification of the plants discussed, and no information is provided to help distinguish between the multiple species of the genera treated in each chapter: 12 species of *Arnica*, 11 species of *Pinus*, and six species of *Rumex*. However, Chatfield himself claims that identification is not the aim of the book and in the introduction refers readers to several floras and field guides, although he fails to mention *The Jepson Manual* (University of California Press, 1993), the most comprehensive and authoritative flora for the region.

Quite a bit of information is provided about the chemistry of each plant group, but it is usually a general account for the genus, lacking information on chemical differences of the species, and the information provided would be more useful if references had been provided. Likewise, the information provided on toxicity and dosage is provided as a general account for the genus and also lacks references. While information on cultivation is brief, Chatfield does include an eloquent plea for readers to grow these herbs, rather than wild harvest them, and the extensive list of nurseries that can provide seeds or plants provided as an appendix will be particularly useful for gardeners.

The strength of *Medicine from the Mountains*, and the reason it will be of interest to most readers, is the section on history and modern use. Here Chatfield traces the use of fennel from the ancient Greeks, stinging nettle from accounts in 16th century herbals, and manzanita from indigenous groups of the American southwest. The account provided for each species makes interesting reading, and Chatfield combines information on past and present uses with discussions of conservation status of plants in the Sierra Nevada region. While not a detailed or comprehensive volume, *Medicine from the Mountains* will appeal to those interested in medicinal plants of California and to all interested in the history of medicinal use of plants.

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Bioorganic Chemistry: Peptides and Proteins. Edited by Sidney M. Hecht (University of Virginia). Oxford University Press, Inc., New York, New York. 1998. 532 pp. 16 × 23 cm. \$75.00. ISBN: 0-19-508468-3.

This book is the second volume of a series which began with "Bioorganic Chemistry: Nucleic Acids" and will soon be joined by a third volume, "Bioorganic Chemistry: Car-

bohydrates". "It is intended to support the teaching of graduate students in bioorganic chemistry." To this end, the editor has divided the book into 14 chapters which correspond to the average number of weeks in a semester at most Universities. Each chapter begins with a broad overview of the general principles and summarizes the key findings that form the basis of current dogma in that subdiscipline. The chapters finish with more in-depth examples of current studies, generally from the work of the chapter authors, who, for the most part, are the world's leading authorities in their particular area. To make the job of teaching even easier, a set of overheads is available for each chapter (not reviewed). Professor Hecht reports that the material presented in this book has been used with great success by himself and others as a text book for an advanced graduate special topics course.

Chapter 1, "Introduction to Peptides and Proteins", by Professor Axely, is an excellent beginning to a book of this type which is to be potentially used as a text to a group of graduates with diverse undergraduate training in that it provides a quick review of the structures, one and three letter codes of the 20 amino acids found in most peptides and proteins, as well as a staccato overview of almost all aspects of protein science, such as folding, structural analysis, enzyme purification, enzyme kinetics, etc., some of which are covered in more depth later in the book. At the end of this chapter, the student will have been exposed to "the main vocabulary of the area". This introduction is followed immediately by the chapter, "Chemical Synthesis of Peptides", by Professors Hruby and Meyer, which provides insight into basic SPPS, side chain protection, various methods for coupling including methodologies for rather difficult coupling, amino protecting groups, and deprotection, as well as a section on the generation of peptide libraries. Several chapters on structural analysis, structure determination, and protein folding follow which provide the student or reader with an in-depth overview of cutting edge protein science in these areas. Chapter 9, "Site-directed Mutagenesis", is a representative example of the excellence of most of the chapters in this book in which the authors have presented a topic which most students perceive as either incredibly difficult or in some way akin to magic in a straightforward understandable style. The chapter presents many of the current methods of mutagenesis except for my favorite method, marketed as "QuikChange" by a to-be-unnamed vendor. The chapter, "The Structural Basis of Antibody Catalysis", by Professor Hilvert et al., is cutting edge science, again reduced to a level of understanding of most graduate students yet still at the level to be useful to the more experienced researcher. Professor Hilvert utilizes the excellent example of catalytic-antibody rearrangement of chorismate to prephenate (chorismate mutase) from his own laboratory to demonstrate the potential of this area. A chapter that even the hard-core organic synthetic-type graduate student should find interesting, in addition to Chapter 2, is the chapter, "Use of Enzymes in Organic Synthesis", which provides an overview of the advantages and disadvantages of biocatalysis, the type of reaction for which enzymes are available, as well as an excellent selection of examples of each type of reaction.

Since I did not discuss all the chapters in this book, I have listed the title of each chapter to give the readers of this review at least a chance to peruse the titles of all the chapters, listed in order of appearance: "Introduction to Peptides and Proteins", "Chemical Synthesis of Peptides", "Total Synthesis of Proteins", "Structural Analysis of

Proteins", "Protein Structure", "Protein Folding", "Nucleic Acid Interactive Protein Domains That Require Zinc", "Understanding the Mechanisms and Rate of Enzyme-catalyzed Proton Transfer Reactions to and from Carbon", "Site-directed Mutagenesis", "The Structural Basis of Antibody Catalysis", "Peptide Hormones", "Peptide Mimetics", "Use of Enzymes in Organic Synthesis", "Engineered Proteins in Material Research".

The references for all the chapters are at the end of the book which was no doubt an editor's nightmare; however, my preference would have been to have the references for each chapter at the end of that chapter. The present arrangement is difficult for the user of single chapters. Overall, I would highly recommend this book not only for its potential use as a text book for an advanced topic for a graduate or senior honor's course but for research directors to give the beginning graduate student, postdoctoral fellows, or technicians as a primer in the area because *Bioorganic Chemistry: Peptides and Proteins* is also for the everyday practitioner even at the \$75.00 price.

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Practical Polyphenolics: From Structure to Molecular Recognition and Physiological Action. By Edwin Haslam (University of Sheffield). Cambridge University Press, New York, NY. 1998. xv + 422 pp. 17 × 24.5 cm. \$100.00.

This book summarizes the work of Professor Haslam's distinguished career devoted to defining the significance of plant polyphenols. For that reason alone, it must be in the library of chemists and biologists interested in phenolic plant metabolites. The book is written in a friendly way, with excerpts taken from his personal correspondence that are especially interesting to those who have labored for years with these compounds. That historical perspective allows a nice focus on how far we have come in this science over the last 30 years. Most important, I believe, is that this book demonstrates the myriad ways that plant polyphenols influence our lives. Professor Haslam makes a strong argument for continued study of intermolecular association of plant polyphenols with other biopolymers.

At first glance, a reader with knowledge of the chemistry of plant polyphenols might be put back a bit by the claims that "this is the only book to describe the scientific basis for the action of plant polyphenols in a wide range of technologically important phenomena" because Professor Haslam himself has written other fine books and made important contributions to books edited by others. That claim, and the very selective treatment of the structure and biosynthesis of condensed and hydrolyzable tannins in Chapter 1, starts the book out on what I believe is a slow pace. For example, there is virtually no discussion of the chemistry of commercially important wattle or quebracho tannins and references to chestnut tannins are scarce. While largely a review of material that can be found in his previously published work, this chapter does provide a useful summary of the chemistry of these compounds for a reader new to the field.

Professor Haslam can be forgiven for the moderate pace at his start, however, because he warms to the real subject

of this book in Chapters 2 and 3 on molecular recognition and the interaction of plant polyphenols with other compounds. In these two chapters, he gains momentum and really begins to get into his usual stride. Here we find a nice series of thought-provoking essays. His insights are keen, and he challenges his readers to take up the task of learning more about how plant polyphenols interact with other biopolymers to express biological activity.

Professor Haslam's book continues to gain strength as he moves into Chapters 4 and 5, dealing with the role of plant polyphenols in the taste, bitterness, and astringency and the chemistry underlying the "maturation" of those properties in foods. Here he reaches full stride and engages us in discussions of the chemistry that might be considered the most important commercial and ecological aspects of these compounds. Readers are asked to study carefully as he carries us through a series of analyses of the significance of plant polyphenols in foods and beverages. His treatment of teas is especially nice. Here, associations between polyphenols and caffeine are highlighted. Similarly, the oxidation and complexation of condensed tannins with proteins define the properties of chocolate. The discussion of persimmon tannins and their use in Japan for a wide array of applications (including the removal of proteins from sake!) once more highlights the important associations between plant polyphenols and other biopolymers in their commercial use.

Chapter 5 also contains an interesting analysis of competitive binding of tannins to carbohydrates and proteins as an explanation for the loss of astringency in ripening of fruits. That leads the reader into a valuable summary of the chemistry of carbohydrate gels and mechanisms by which these gels can associate with and "encapsulate" polyphenols. A similar mechanism is proposed for the sequestration of tea polyphenols by casein to explain the loss of astringency resulting from milk in the tea. This chapter concludes with an analysis of the chemistry that occurs in aging of wines and the significance of oak polyphenols on the quality of whiskey.

In Chapter 6, Professor Haslam asks us to change our focus to our visual rather than taste senses. Inter- and intramolecular recognition once again comes to the fore in

providing an explanation of how more than 250 million colors can be produced from such a few basic anthocyanin chromophores. This chapter especially makes one appreciate the great impact molecular associations have on the quality of our lives.

Favorite reading for many will lie in Chapters 7 and 8 because of the strong interest of the influence of plant polyphenols on human health. Professor Haslam has done well to stay with the fundamental science that supports the biological impacts of herbal medicines. Chapter 8 deals with perhaps the most important property of plant polyphenols, centering on their antioxidant properties and the chemistry of the oxidation of these extremely reactive compounds.

Chapter 9 appropriately closes the book with a valuable analysis of the physical chemistry that helps us understand the vegetable tanning process dating back at least 3000 years. Leather manufacture with vegetable tannins remains the predominant industrial use of these compounds, and they retain their market because of the high-quality heavy leather produced. Perhaps the earliest applications of intermolecular recognition and oxidation of *o*-quinones lie here. A reader can't avoid the thought that there is so much to do to bring our science to reasonable parallel with the art that we have applied to improve our lives.

Professor Haslam's book is attractively presented and reasonably priced at only \$100/US. There are problems with some of the references, but readers with the intent of seriously studying these compounds will easily work through those minor errors. I, and I'm certain many others, will read this book many times over to appreciate the insights Professor Haslam shares with us.

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