Book Reviews

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BOOK REVIEWS

Solubility Behavior of Organic Compounds (Techniques of Chemistry Volume 21). D.J.W. GRANT and T. HIGUCHI. Wiley-Interscience, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158. 1990. lii + 600 pp. 15.5 × 23.5 cm. $99.95. ISBN 0-490-21302.

This is a rather impressive scholarly document dealing with the theoretical and practical aspects of aqueous solubility. It is presented mainly from the point of view of pharmaceutics but contains discussions of partitioning and distribution which will be of interest to the medicinal chemist and chemical engineer working in a pharmaceutical setting.

The book is composed of 12 chapters, a reference section, author index, and subject index. In the beginning are useful sections of abbreviations and symbols and their chapter source. These are helpful, as many abbreviations and acronyms are used. A brief outline of each chapter is also presented.

The book is a well-written, easily read source for those interested in the more practical problem of predicting solubility. It contains references to the important methods but focusses on the group contribution approach and discusses the advantages and disadvantages of this methodology. The main disadvantage of this approach is that it is based on the assumption of additivity; the authors are well aware of this pitfall and present an honest discussion of it rather than dodge the issue.

The authors justify the group contribution approach (p. 307) on the basis that "rigorous methods of this type [based on molecular structure] are limited almost entirely to mixtures of nonpolar species." This statement reveals a lack of awareness of the recent developments of computational chemistry in which Monte Carlo and molecular dynamics methods have been used in numerous instances to simulate solution properties of rather complex molecules.

The overall impression this book gives, however, is a highly positive one. It contains excellent discussions of the theories of aqueous solubility and should be an excellent source for advanced graduate courses in solubility.

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A First Course in Organic Chemistry. DOUGLAS LLOYD. John Wiley and Sons, 605 Third Avenue, New York, NY 10158. 1989. xi + 363 pp. 16 × 23.5 cm. $67.95. ISBN 0-471-92408-3.

Teaching organic chemistry in one term, usually to a group of students who would rather be doing something else, is quite a challenge. Besides a lively and entertaining teacher, the choice of a textbook can make all the difference in the world in grabbing the attention of the student. *A First Course in Organic Chemistry* is a textbook for a one-term course for students already having a foundation of general chemistry. It could be also used for advanced high school students or as a part of a freshman course in chemistry. It presents organic chemistry in a fairly simple and straightforward manner, and sprinkled throughout the book are brief discussions everyday applications in industry, biology, etc. This is what makes organic chemistry come alive to a non-scientist.

It is the author's intention to present organic chemistry to the uninitiated "*as it is presently done*" (author's italics). To this end he introduces rudimentary nmr spectroscopy very early as a tool for compound identification, especially for the distinction of structural isomers. Other spectroscopic methods as well as X-ray crystallography are mentioned in the text and are discussed briefly in an appendix. However, other than this, there is little else to relate what is being taught to the modern laboratory.

Like other organic chemistry texts, the book is organized by functional groups, but the order in which these functional groups are introduced is somewhat different from that in most texts. For example, aromatic compounds are saved for last. The concept of chirality is also introduced late in the text. Each chapter is followed by a few (one or more) questions, the answers of which are provided at the end of the book. In order to keep the text at a small size, there is almost no review of basic concepts, so the student plunges right in with such ideas as acid-base theory. It is for this reason that this reviewer feels that this text would not be particularly good for any group of students who did not have a thorough grasp of general chemistry. Because of this, as well as its exorbitant price tag for a textbook, it is unlikely that this book will gain a large audience as a text for a one-term introductory organic chemistry course.

JOSEPHINE W. REED, *Virginia Polytechnic Institute and State University*

Unified Separation Science. J. CALVIN GIDDINGS. Wiley-Interscience, John Wiley and Sons, 605 Third Avenue, New York, NY 10158. 1991. xxiv + 320 pp. 16 × 23.5 cm. $54.95. ISBN 0471-52089-6.

This book is a much-needed compilation by a world-renowned separation scientist of the theoretical principles underlying chemical separations and the application of these principles to various separation methods. The book is sufficiently comprehensible to be used by senior undergraduates and graduates as a textbook but is also sufficiently detailed to be used by both novice and experienced researchers as a reference. The many literature citations at the end of each of twelve chapters will be particularly useful to the latter.

The book is fundamentally theoretical, which should not surprise anyone familiar with the author's research. The theoretical approach is essential to the achievement of the author's objective, which is "to develop separation science as a unified discipline rather than as a farflung collection of unrelated techniques." Yet, the principles encoded by the numerous equations liberally sprinkled throughout the text are illustrated repeatedly by practical applications from the chemical literature. The pure experimentalist should feel only modestly uncomfortable while reading the book (and perhaps stimulated to do more than only experimental work!). The lucid writing style of the author enhances the ease with which the book is read.

The author begins with the recognition that all systems, including chemical ones, move toward equilibrium. In achieving equilibrium, chemical species become spatially oriented, such that their chemical potentials are minimized. By generating selective gradients in these potentials, the separation scientist can localize these species in different regions of space and achieve separation, regardless of whether equilibrium is actually reached or not. At the same time, the scientist must minimize nonselective entropic (i.e., diffusive) mixing, which also lowers chemical potentials but at the expense of destroying separation.

From this basic principle, the author then derives from equilibrium thermodynamics the fundamental equations for the one-dimensional flux of chemical species, which is induced by these chemical-potential gradients. (With minor exceptions, such as in the discussion of two-dimensional separations, theory is restricted to one dimension.) This flux is then related to the equation of continuity by a classical derivation. The possible transport of species by fluid flow of many kinds, including laminar, turbulent, convective, electroosmotic, and capillaric, then is addressed, and this transport also is incorporated into the equation of continuity. From the final result—the time-dependent convective-diffusion equation—the author argues that all separations, however apparently different, can be quantitatively investigated. Much of the remainder of the book is devoted to the proof of this argument.

With this equation (or appropriate subunits), the author shows that various processes of zone broadening and dispersion can be interpreted as effective increases in the rate of molecular diffusion, which reduces separation efficiency by entropic mixing. Various measures of this dispersion, including plate height, plate number, resolution, and peak capacity, then are derived or defined.

Armed with these theoretical tools, the author then addresses that class of separations in which chemical equilibrium is actually reached. He accomplishes this goal by applying the time-independent flux equation to the formation and characterization of steady-state zones. Such zones are generated by many methods, including isopynic sedimentation, isoelectric focusing, elutriation, ultracentrifugation, zone melting, and reverse osmosis. From the fundamental theory previously developed, specific equations for the resolution and peak capacity of these methods are derived. Lest the reader become overly optimistic, the power of these methods then is tempered by a discussion of the statistical limitations on the separation of chemical species, an area to which both the author and reviewer have contributed.

By applying these same theoretical principles, the author then addresses the migration and elution of nonsteady-state zones, which are encountered in zone electrophoresis, rate sedimentation, field-flow fractionation, and chromatography. Specific equations for resolution, peak capacity, plate number, and plate height are derived for these methods. When possible, contrasts between steady-state and non-steady-state separations are developed.

The author concludes the book with extensive material on the theories of field-flow fractionation and chromatography. This concluding material is perhaps unsurprising, as these subjects have primarily occupied the author's research interests over his career.

To augment the utility of the book as a text for collegiate or graduate work, the author has included several problems at the end of each chapter, answers to which are reported at the end of the text. The difficulty of these problems is varied among three levels. The author's delightfully wry sense of humor is apparent in one problem, which requires the solver to calculate the length of column required to separate some hypothetical isotopes, one of which can be used "to blow an adjacent planet to smithereens." The author parenthetically observes, "Remember, lofty goals are worth the trouble."

A few shortcomings in any major endeavor are inevitable. Several typographical errors exist but are fortunately not confusing; undoubtedly, they will be corrected in future editions. The principal reservation that the reviewer has is that, in attempting to cover so many attributes of separations (and, in general, suc-

ceeding quite well), the author has sacrificed depth for breadth. A specialist in any particular area will most probably find that his area is oversimplified and the subtle nuances are left unaddressed. In addition, much of the work in the section on chromatography has already been reported in the author's excellent work, *Dynamics of Chromatography*.

Another minor criticism most likely reflects the reviewer's bias as an analytical chemist. Two methods of separation whose applications in the field of analytical chemistry have grown explosively over the last decade are capillary zone electrophoresis and supercritical fluid chromatography. While the former method is discussed slightly, only a cursory treatment of the latter is presented. In addition, engineers will find little on preparative separations of interest to them, e.g., distillation, crystallization, and membrane processes. Biotechnical researchers will be nonplussed by the absence of any discussion of affinity chromatography and the minimal discussion of hydrophobic interaction chromatography.

Yet, no one book can address every possible topic in separation science in great detail. In light of his stated goal, the author has issued a remarkable accomplishment, which will undoubtedly become a classic reference work in the years to come.

JOE M. DAVIS, *Southern Illinois University at Carbondale*

Antiviral Compounds from Plants. JAMES B. HUDSON. CRC Press. 200 Corporate Blvd., N.W., Boca Raton, FL 33431. 200 pp. $95.00. ISBN 08493-6541-4.

Perhaps a more descriptive, albeit lengthier, title for this book might have been "Viral pathogens, targets for antiviral drug discovery, and antiviral compounds from plants." In the Preface, the author clearly acknowledges that personal opinion is interspersed throughout the text of the book. Nevertheless, such opinions are usually easily recognized and the reader can agree or disagree and still find a substantial volume of useful information in this well-organized general treatise. The book is divided into fifteen chapters which generally cover three major areas: viral diseases and control, methodology for antiviral drug discovery from natural sources, and a survey of plant products with reported antiviral activity. The first three chapters provide general background information that is especially useful to the chemist who may not have a strong foundation in biology. These three chapters provide a useful overview of viral diseases in general (Chapter 1), how a virus works (Chapter 2), and why we need new antivirals, i.e., the limitations in the current efforts to control viral diseases (Chapter 3). These discussions are clearly meant to provide a general overview rather than indepth information, and as such are extremely useful, touching at least briefly on everything from the route of transmission, symptoms, and occurrence of viral diseases to the probability of the successful use of monoclonal antibodies in viral disease control. Clearly, then, it can be seen that such subjects, in a three-chapter, 41-page section, are not dealt with in any significant detail. However, for the purpose of background information and introduction to the potential usefulness of plant antiviral compounds, which is the main focus of the book, it is an excellent overview.

The second area of discussion deals with the methodology utilized in screening natural products for antiviral activity. It is in this discussion that the author's personal bias is most evident. However, these chapters (4 and 5) provide a good and thorough discussion of the variables which complicate a comparison of antiviral data from different viruses and cell lines, the difficulties in translating in vitro activity to in vivo efficacy (i.e., the relevance of persistently infected vs. productively infected cell lines), and the problems inherent in evaluating crude plant extracts for biological activity in sensitive in vitro cell culture systems. Included are possible explanations for loss of activity on fractionation, the recognition that false negatives can, and probably do, arise from antagonisms by other plant or medium constituents, and some speculation as to why folkloric use of plants may not be verifiable in in vitro assay systems. These discussions will hearten many pharmacognosists who routinely encounter such difficulties, regardless of the specific bioassay employed. It is questionable whether the use of tonics for prophylactic control or the preparation of natural products in a plant extract base, both of which appear to be advocated by the author, will be met with much enthusiasm by the medical community; nevertheless, the points which are raised are valid and routinely encountered by all who pursue this area of research. These is some naiveté with regard to the issues of animal models and whole animal systems, but these are relatively minor and do not significantly detract from the usefulness of the book.

As one might expect, the major focus of the book is on the last section, the survey of plant products. Following a brief overview of photochemistry and the effect of photosensitizers on viruses (Chapter 6), the remaining chapters provide a survey of antiviral compounds from plants, categorized by structural class, i.e., furocoumarins, alkaloids, flavonoids, terpenoids, etc. The use of compound names under the structures, rather than structure numbers, makes the reading easier; however, this is almost necessary given that

the compound structure is often far removed from the textual discussion of the compound. An additional feature which facilitates reading and use of the text is the summary at the end of each chapter. The last two chapters cover plant proteins and peptides, which are often not included in other surveys dealing with bioactive plant products, and certain plant extracts with reported antiviral activity but which have not been fully characterized.

Overall, this is a useful reference book for natural product chemists interested in the discovery of new antiviral agents. While the discussion regarding the validity of assay results is primarily from one person's perspective, it nevertheless raises most of the important points which the reader should consider when undertaking such research endeavors. It will also be a useful addition to institutional libraries.

ALICE M. CLARK, *The University of Mississippi*

Advances in Economic Botany: Volume 8, New Directions in the Study of Plants and People. Edited by GHILLEAN T. PRANCE and MICHAEL J. BALIK. The New York Botanical Garden, Bronx, New York 10458. 1990. vii + 278 pp. 17.5 cm. × 25.5 cm. $58.65 (paper). ISBN 0-89327-347-3.

This is the eighth volume of a series by the Institute of Economic Botany of the New York Botanical Garden, which also publishes the bimonthly journal *Economic Botany*. Researchers familiar with that journal will find that *Advances in Economic Botany* offers a diverse series of articles that are similar to those offered in *Economic Botany*. Topics in the volume include ethnobotany, agronomy, linguistics, anthropology, nutrition, ecology, history, economics, botany, and historiography. Most of the articles focus on the Neotropical rain forests, with a special emphasis on the Amazon region. The tropics continue to fascinate phytochemical explorers, and this volume is very enjoyable reading; however, the eclectic nature of the articles will make this volume less attractive to a person focused on pharmacological studies or pharmacognosy.

Although *Advances in Economic Botany* was originally established for the publication of larger manuscripts and symposia, the 17 articles in this volume vary from 8 to 27 pages in length. Three of these articles contain material of pharmacological interest.

Pedro Acevedo-Rodriguez contributed "The Occurrence of Piscicides and Stupefactants in the Plant Kingdom." Although the article contains no original research, a valuable list of the 935 species of plants used as piscicides is included. The list also gives the geographic region where each of the plants is used and the parts of the plant used. The presumed poisonous principle is included; however, this could be improved with more specific information. Fortunately Acevedo-Rodriguez gives the bibliographic information for the original reports. The author appears to have done an exhaustive review of reports that are difficult to obtain: older books and government bulletins from Brazil, India, and French and English colonial authorities in Africa.

Hans T. Beck has contributed a review on the botanical, medicinal, and ethnobotanical literature of the genus *Paullinia*. This genus contains species that are exploited as sources of caffeine, fish poisons, and folk medicines. Any scientist interested in phytochemical or pharmacological studies of this genus will find valuable bibliographic information about journals that generally are difficult to obtain from other sources.

The article by John D. Mitchell, a dermatologist, on the "Poisonous Anacardiaceae" should also provoke some pharmacologic and phytochemical interest. Several members of this family (e.g., poison oak and poison ivy) cause severe skin allergies. Mitchell has surveyed the literature and presents bibliographic material that would be valuable to anyone studying the problems caused by plants of this family. Mitchell also has a botanical key to the poisonous Anacardiaceae and gives botanical descriptions of the plants reported or suspected of causing dermatitis.

The articles in the volume are well written and illustrated and should be interesting to a variety of readers. However, only a small number of articles will be relevant to phytochemists or pharmacologists interested in acquiring reference books for their research laboratories.

ELOY RODRIGUEZ and JAN E. WEST, *University of California–Irvine*

Lignans: Chemical, Biological, and Clinical Properties. D.C. AYRES and J.D. LOIKE. Cambridge University Press, 40 West 20th Street, New York, NY 10011. 1990. xix + 402 pp. 15 × 22.5 cm. $95.00. ISBN 0-521-30421-0.

This book is a comprehensive review of the literature on lignans through April 1988 and includes chapters devoted to isolation, structure determination, biological activity, biosynthesis, and synthesis. The first chapter is primarily a brief discussion of the nomenclature of lignans, including absolute configuration. The second chapter is devoted entirely to a comprehensive registry of lignans reported in the literature through April of 1988. This registry is organized by structural class and includes the references to the original isolation report and the plant from which the lignan was isolated as well as the structure of each lignan. If a particularly important piece of spectral data is reported in the reference, this is also noted. This should be a very useful listing for those natural product chemists working on the isolation and characterization of lignans, since it will enable researchers quickly to evaluate their compounds as new or previously reported.

The third and fourth chapters are concerned primarily with the biological and clinical properties of the lignans, with the third chapter consisting of an overall review of the known data for lignans, including mammalian lignans, and the fourth chapter concentrating on etoposide and teniposide, the two derivatives of podophyllotoxin which are clinically useful. The third chapter is particularly important since it brings together the diverse biological activities seen in different lignans, adding to the commonly recognized microtubule inhibition and antitumor activity associated with podophyllotoxin and its congeners.

The fifth and sixth chapters are very useful for those working in this area, particularly those researchers who may be dealing with lignans for the first time. Chapter 5 concentrates on the isolation and purification of lignans from different sources. The merits and disadvantages of different chromatography methods are discussed, as is the formation of artifacts in the isolation procedure. Chapter 6 is devoted to methods of structure determination as applied to lignans as a whole and to specific classes of lignans. The focus of this chapter is primarily on the standard techniques of uv, ir, nmr, and mass spectroscopies, but chemical correlations are also discussed for specific examples. The final section of this chapter discusses the application of optical rotatory dispersion and circular dichroism techniques to the determination of stereochemistry in lignans. This is an often overlooked technique which is very useful for lignans.

Chapter 7 discusses the known data and the theories regarding the biosynthesis of lignans. It is clear from this chapter that this is still an area in which much additional work remains to be done. The final chapter is devoted to a review of syntheses of lignans. This chapter first presents the different general approaches which have been used to synthesize lignans and then is divided into classes of lignans. Within the discussion of the synthesis of each class, a variety of approaches is presented.

Overall, I found this a very useful, comprehensive, and fairly current review of the lignan literature. There are a few typographical errors which do not detract from the information presented. My only serious complaint is that some of the structural representations and associated data have been reduced to a point where they are difficult to read. This is particularly annoying when one is trying to find a specific structure or read an nmr chemical shift value. I would recommend this book for researchers who work on a regular basis with lignans, and strongly recommend that it be acquired by libraries of their institutions.

ALBERT T. SNEDEN, *Virginia Commonwealth University*

One-dimensional and Two-dimensional NMR Spectra by Modern Pulse Techniques. Edited by K. NAKANISHI. Kodansha/University Science Books, 20 Edgehill Road, Mill Valley, CA 94941. 1990. xii + 234 pp. 18 × 25.5 cm. $38.50 (paper). ISBN 0-935702-63-6.

The text is primarily a collection of high resolution nmr spectra obtained at the Suntory Institute for Bioorganic Research over the past ten or so years. The text is divided into three major sections: Part I, One-dimensional Ft-nmr, Part II, Two-dimensional Ft-nmr, and Part III, Principles of Ft-nmr. A basic understanding of Ft-nmr is assumed, and only limited theoretical discussions are presented in Part III. Both one-dimensional and two-dimensional nmr experiments are organized and presented based on the type of structural information that may be obtained from that particular experiment. This method of presentation is very useful to the organic chemist who may be unfamiliar with the use of modern Ft-nmr for structure elucidation. Part I, One-dimensional Ft-nmr, begins with a comparison of the 100 MHz and the 500 MHz ^{1}H spectra of α-santonin. This comparison illustrates the advantages of a higher field instrument. The following 30 one-dimensional spectra are presented in order of increasing difficulty or different information content. These spectra include spin decoupling difference spectra, nOe difference spectra, inverse gated

and gated proton decoupling spectra, INEPT and DEPT spectra. Most of the example spectra are of interesting natural products. Along with each spectrum and structure of the compound a short discussion of the experimental (including pulse sequence in complicated experiments) parameters and results are presented. Part II, Two-dimensional Ft-nmr, begins with the *J*-resolved spectrum of α-santonin. In Part II an additional 60 two-dimensional spectra are presented in order of increasing difficulty. These spectra include examples of the homonuclear experiments COSY, ROESY, HOHAHA, NOESY, and the heteronuclear experiments HMBC, HMQC as well as many variations of these experiments. Once again many of the examples are of interesting natural products, and a short discussion of the experimental parameters including the pulse sequence and results are presented along with the spectra and structure of the compound. In Part III short discussions of selected one-dimensional and two-dimensional experiments are presented. One major deficiency of the text is that a theoretical discussion of nmr is lacking; however, there are many other excellent presentations of the basic theory of nmr in the literature.

It is clear that a basic knowledge of Ft-nmr is required for the reader to obtain maximum benefit from this text. In my opinion the text is perfect for the practicing organic chemist to use as a reference to select nmr experiments to solve structural problems. The text presents many real-life examples of the uses of nmr to solve various structural problems in natural products. From a teaching perspective the text is not suitable to use as a primary teaching source. However, the text presents a large number of interesting examples with references that may be investigated further in the primary literature as in class examples of real-life challenges in structure elucidation. Overall as a reference text, the book has a great deal of merit and will be of value both to the practicing organic chemist and to more senior graduate students.

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