

BOOK REVIEWS

Naturally Occurring Carcinogens of Plant Origin—Toxicology, Pathology and Biochemistry. IWAI HIRONO. Elsevier Science Publishing Company, 52 Vanderbilt Avenue, New York, NY 10017, 1987, xi + 234 pp., 23 × 15 cm., \$102.50.

Diet is known to be a significant factor in the onset of certain forms of cancer; some tentative estimates suggest it may be more important than tobacco, but the quantitative aspects remain to be determined. Still the evidence has been sufficient for the National Cancer Institute, a cautious body, to recommend a reduction in the consumption of fat and an increase in the intake of fruit, vegetables, and micro nutrients, all foods which are anticarcinogenic. Thus, the appearance of this book by a team of Japanese authors on naturally occurring carcinogens of plant origin is of some interest.

Ten main topics are covered (author's names in parentheses): cycasin and carrageenan (Hirono), bracken fern (Hirono and Yamada), saffrole and tannins (Enomoto), flavonoids (Natori and Ueno) mushroom hydrazines (Natori), pyrrolizidine alkaloids (Furuya, Asada, and Mori), betel nut (Mori), and active principles of Euphorbiaceae and Thymelaeaceae (Hirata). Two other chapters complete the book: the first (by Haga) describes the testing of a variety of plants which turned out to be noncarcinogenic, and the second (Natri) surveys the structures of a number of carcinogens obtained from plants. The authors are associated with a variety of academic departments ranging from chemistry to pathology. Not surprisingly, the chapters vary widely in character, although the dominant theme throughout is a discussion of biological activity.

The chapter on cycasin is devoted mainly to a detailed account of the results of biological tests. By contrast, the review of bracken fern gives an interesting account of the toxicity and carcinogenicity of the plant, and of the isolation of praquiloside and the determination of its structure. It is both a carcinogen and a cattle poison. The discussion of betel includes epidemiological studies. The discussion of flavonoids goes far beyond carcinogenesis, giving a comprehensive review of the biological effects of flavonoids. I found it the most interesting chapter of the book. The review of pyrrolizidine alkaloids includes a description of some new members of the family which were isolated from Japanese plants. The chapter on Euphorbiaceae and Thymelaeaceae is directed almost entirely to a survey of compounds, mainly diterpenoids. The biological effects, irritation and tumor promotion, are disposed of in a little more than two pages of which over half are tables. The carcinogenic hydrazines in mushrooms are not stable to cooking, but some of their metabolites remain. It is sad to think that cooked mushrooms may soon be regarded as unacceptable as cigarettes! By contrast the review on saffrole concludes that saffrole is probably not a human carcinogen. The chapters on carrageenan and tannins are short, six pages each including references. Carrageenan is carcinogenic. There is no good animal data demonstrating that tannins are carcinogenic.

The concluding chapter on secondary metabolites (ten pages) gives a brief survey of the biosynthesis of the main classes of secondary metabolites; it then shows how some naturally occurring carcinogens are related to specific biosynthetic pathways. It goes on to describe how some carcinogens are converted into their active forms. This chapter is too short to be of much use. It would be better to have a more substantial contribution that would tie the book together.

As an organic chemist I found many of the detailed discussions of biological activities heavy going. Most of the chapters were very interesting. As a whole the book is well-referenced though I could not find any citations later than 1984, and in some chapters there were none from that year. Thus, the claim in the first sentence of the preface that the volume reviews the present state of studies is, perhaps, a bit strong. The book does provide a sound coverage of the carcinogens of several groups of edible plants. I recommend it to those interested in the material discussed in the first 10 chapters. However, its price will preclude its purchase except by real devotees of natural products!

DESMOND M.S. WHEELER, *University of Nebraska—Lincoln*

Principles of Nuclear Magnetic Resonance in One and Two Dimensions. RICHARD R. ERNST, G. BODENHAUSEN and A. WOKAUN. Clarendon Press, Oxford University Press, 200 Madison Avenue, New York, NY 10016, 1987, xxiv + 610 pp., 16 × 24 cm., \$110.00.

This book provides an exceptionally comprehensive description of the basic principles of modern nmr techniques. As such, the book is undoubtedly destined to become the well-deserved companion of Abraham on many readers' shelves.

The very brief introductory chapter is lighthearted and fun to read. With subheads like "In the beginning was slow passage" "Spin alchemy: sorcery in nmr" and "The forbidden fruits of spectroscopy" one almost loses sight of the much more serious material to follow in ensuing chapters.

Chapter 2 begins to deal with the material in a much more sobering fashion, beginning with a brief description of the density matrix and proceeding to the numerous types of spin operators. Perhaps the most important of the latter is the concept of product operator formalisms which opens the door to understanding many of the contemporary 2D nmr experiments. The reader who wishes to derive the maximum benefit from the material contained in the first part of Chapter 2 will need to be diligent unless he or she is a very accomplished physical chemist. Chapter 2 then progresses to a thorough treatment of the nuclear spin Hamiltonian. Once again, this is complex material which will require effort for complete comprehension. The level of treatment continues through Chapter 3 which deals with average Hamiltonian manipulation.

Chapter 4 contains a thorough treatment of one-dimensional nmr experiments from response theory through a classical description of Fourier transform spectroscopy which contains a nicely compact treatment of composite pulses and related pulse trains. Chapter 4 next addresses the issue of sensitivity before launching into a quantum mechanical description of Fourier spectroscopy. Heteronuclear polarization transfer, which is of fundamental importance to experiments such as INEPT, DEPT, and heteronuclear chemical shift correlation, is treated next, followed by a description of dynamic process and finally Fourier double resonance.

The non-trivial topic of multiple quantum transitions is treated in Chapter 5. The number of transitions expected for various spin systems is considered first, followed by a review of classical continuous wave (CW) methods for observing multiple quantum transitions in a single quantum world. Two-dimensional methods of detecting multiple quantum coherences are treated last with experimental detail reserved for the second half of the volume which deals explicitly with 2D nmr.

The introduction of the second dimension in Fourier transform nmr spectroscopy is begun in Chapter 6. The first section on "Basic principles" is probably too brief for the neophyte; the authors then launch into a formalized treatment which continues through coherence transfer pathways and the workings of the double Fourier transformation. Readers with little or no background in 2D nmr spectroscopy may be disappointed with this treatment while those who are better versed in the area will appreciate the collection of this diverse assortment of topics in a single place. The authors next consider the topic of peak shape and the experimentally important phase-sensitive 2D nmr experiments followed by manipulations of 2D nmr data and sensitivity of 2D nmr experiments. In the last section, the issue of optimization is considered and some "practical recommendations" given. The individual looking for practical guidelines for parameters to use will, however, probably be disappointed with this section as the recommendations made deal principally with the issues of relaxation (interpulse delay) and digitization in the τ_1 and τ_2 time domains.

Chapter 7, entitled "Two-Dimensional Separation of Interactions," deals with the fundamentally important concept of segregating spectral information between the two frequency domains. Treatment begins with J -spectroscopy, progressing on to separation of chemical shifts and dipolar couplings in oriented phase before ending with separation of isotropic and anisotropic chemical shifts.

Correlation methods based on coherence transfer provide the subject matter for Chapter 8. Homonuclear correlation (COSY) is considered first before the introduction of modified 2D correlation experiments which include: SECSY, constant evolution time/ ϕ_1 -decoupling experiments, multiple quantum filtering and editing, relayed coherence transfer, coherence transfer by an average Hamiltonian in total correlation spectroscopy (TOCSY and later referred to as HOHAHA by Bax and coworkers). The topic of homonuclear multiple quantum spectroscopy, which is of growing importance, is treated next, with the major emphasis placed on double quantum coherence. Heteronuclear coherence transfer provides the final major topic of Chapter 8. Various forms of the heteronuclear chemical shift correlation experiment are considered, including those employing a refocusing pulse midway through the evolution period, the use of BIRD pulses, editing of heteronuclear correlation spectra, and heteronuclear relayed coherence transfer. Unfortunately, probably because of the limited number of papers which had appeared by the time that this was written, there is no mention of the now very important long range heteronuclear correlation experiments in their many forms.

Chapter 9 deals with the study of dynamic processes by 2D nmr techniques. Topics considered include selection of coherence transfer pathways, cross relaxation and exchange in systems without resolved couplings, exchange in coupled systems, 2D exchange difference spectroscopy, "accordion" spectroscopy,

cross relaxation and nOe , chemical exchange, indirect detection of longitudinal relaxation in multilevel spin systems, and, finally, dynamic processes in solids.

The final, brief chapter deals with nuclear magnetic resonance imaging, now more frequently referred to as magnetic resonance imaging or MRI, which has grown into a discipline of its own. This area has grown so rapidly that the interested reader must look elsewhere for any detailed treatment of this subject matter.

The authors have succeeded admirably in writing a rigorous treatment of modern Fourier transform nmr which will certainly stand the test of time, remaining a valuable reference volume probably into the next century. The book will be most useful for readers who are already well versed in Fourier transform and/or 2D nmr techniques. The individual looking to learn the basics of Fourier transform nmr or especially 2D nmr will find this volume very difficult reading material and would probably be well advised to begin with one of the less rigorous treatments to be found in other volumes on the topic which have appeared in recent years. Likewise, individuals who are looking for guidelines in implementing experiments, information on selecting parameters for experiments, or the basics in interpreting various experiments will also be disappointed, as this material is not to be found in this treatise. Overall, however, the volume is an excellent reference work and will be invaluable to the reader with the background to utilize it fully.

GARY E. MARTIN, *University of Houston*

Major Essential Oil-Bearing Plants of India. A. HUSAIN, O.P. VIRMANI, A. SHARMA, A. KUMAR, and L.N. MISRA. Central Institute of Medicinal and Aromatic Plants, P.O. Bag No. 1, P.O. Ram Sagar Misra Nagar, Lucknow 226016, India, 1988, 236 pp., 17.5 × 23 cm., \$125.00.

This book is an update of a small volume published by the CSIR in 1960 which up to that time was the only material available on the subject of essential oil plants in India. In the intervening years, considerable work on the production of essential oils in India has taken place. Since India is one of the important essential oil producing and exporting countries in the world, this book, describing various aspects of the production of some 42 essential oils, fills a void that has existed for some time.

The present volume includes a description of each plant, its habitat and distribution, cultivation, pests and diseases and their control, the distillation and/or extraction of the oils, the production yields, the uses of the oil, the chemistry of the oil, and references for each plant. It is stated that the book contains a list of ". . . all the important essential oil plants having industrial importance. . . ." It is not clear how this was determined, and undoubtedly there are other plants which could be included in this book. A total of 42 plants are described with a color plate for each plant and a fairly good overview of each of the above subjects. The index is 11 pages in length and has a good listing of subject material.

In general the book should be of use to those involved in the production of essential oils or anyone associated with essential oils. Unfortunately, there are a number of problems which greatly detract from the utility of the book. The binding is of such poor quality that the entire first section fell out of my copy in the hard back edition. Also many of the pictures are old and quite faded. The plate for *Zingiber officinale*—Fresh rhizomes (p. 120b) is upside down, one plate shows the fingers of the person holding the backdrop, and several of the pictures are poorly focused.

KENNETH L. STEVENS, *Western Regional Research Center, United States Department of Agriculture*

Alkaloids: Chemical & Biological Perspectives. S.W. PELLETIER. Wiley Interscience, 605 Third Avenue, New York, NY 10158, 1988, xii + 542 pp., 16.5 × 24 cm., \$110.00, ISBN 0-471-60298-1 (v. 6).

Volume 6 in this fine series provides an interesting and timely blend of biosynthesis, chemotaxonomy, synthetic strategies and methodology, structures, and pharmacological activity.

In Chapter 1, a thorough review of the mitomycins is presented. This class of compounds has assumed considerable importance from a clinical standpoint, and the mix of chemistry, biology, and pharmacology will make this an excellent source of information for a variety of scientists. Chapter 2 provides a detailed overview of the chemistry and chemotaxonomy of the indole alkaloids from the genus *Tabernaemontana*. This large family of compounds has a rich history of isolation, structure elucidation, synthesis, and bio-

activity studies. Chapter 3 is a survey of synthetic strategies for the synthesis of alkaloids by way of azomethine additions and α -aminocarbanions or α -aminoradicals. Numerous examples are discussed. Chapter 4 focuses on the biosynthesis of the protoberberine alkaloids, but also includes brief surveys of distribution and bioactivity. In chapter 5, an extensive review of the quinoline alkaloids, including the acridone and quinazoline groups, is offered.

The entire book is well written and edited. Only one typographical error was detected, the misspelling of a cited author's name. It was surprising that quinine was overlooked in the discussion of the pharmacology of quinolines. The illustrations range from satisfactory in one chapter to excellent in several. The reference lists are extensive and will be useful to both novices and veterans in the field. In general, the book should appeal to a very broad range of chemists and pharmacologists, as well as to botanists and chemotaxonomists. Every alkaloid chemist and synthetic chemist contemplating alkaloid targets will find this book very useful and informative.

My only lament is that this book (and the series) would be purchased by many more scientists and students for their personal libraries if the price were not so prohibitive. As it is, it should be in every library and those copies will be well used.

JOHN H. CARDELLINA, II, *National Cancer Institute*

Plantas Mediciniais, Seu Uso Tradicional em Moçambique, Tomus 2. P.C.M. JANSEN and O. MENDES. Instituto Nacional do Livro e do Disco, Maputo, Moçambique, 1988. Paperback. 259 pp., 14.5 × 21 cm.

This book (in Portuguese) is the second of many volumes currently under preparation on the medicinal plants of Moçambique. The first volume was published in 1983 and has been reviewed in this Journal (48, 167, 1985).

This second volume covers five families (Apocynaceae through Asclepiadaceae), in which 31 species are treated. The format of the book follows exactly that of the first volume. Information for each species entry (presented alphabetically by genus within each family) consists of: the accepted Latin binomial (with author citation and place of publication); synonymous Latin binomials (if available); common names; taxonomic description; ecological observations; specimens collected and examined (with an indication of the institutions where they are deposited); medicinal uses (based on field interviews, herbarium field notes, and literature); active principles and toxicity (if available, based on literature); and bibliography (includes titles not necessarily cited in the text). The immediately noticeable changes as compared to Volume 1 are the color of its cover and a change of the name of the publisher. Other details (including indices) are similar to Volume 1.

As was pointed out in the previous review, this book was written clearly with botanically oriented users in mind. However, natural product chemists in search of biologically active compounds will greatly benefit from the book. The ethnomedical data, much from primary sources, will provide the necessary leads, while the accurate taxonomic determination, illustrations, botanical nomenclature, descriptions, and detailed geographic distribution of each species will assure the collection of the correct species for investigation and its recollection in bulk quantities for isolation and structure elucidation work.

The same praises and critiques directed to the first volume also apply to this second volume.

In summary, this book is a welcome supplement to the widely used *Medicinal and Poisonous Plants of Southern and Eastern Africa* (J.M. Watt and M.G. Breyer-Brandwijk, 1962).

DJAJA DJENDOEL SOEJARTO, *University of Illinois at Chicago*

The Alkaloids. Chemistry and Pharmacology. Edited by A. BROSSI. Academic Press, 1250 Sixth Avenue, San Diego, CA. 1988. ix + 454 pp. 15.5 × 23.5 cm. ISBN 0-12-469532-9. \$99.00.

All alkaloid chemists know this series of volumes to be a set of indispensable texts both for reference and study. As with other areas of natural products, the literature in the alkaloid field is expanding so quickly that we rely upon volumes such as this to give entry into the subspecialty areas. The editor of such a series therefore has the task of judging which topics in alkaloid chemistry are appropriate at a given time for introduction or updating. We can be grateful for Dr. Brossi's judgment in choosing both topics and authors, and to the authors themselves for the valuable individual perspectives they bring to their work.

The analysis of alkaloids in substances of abuse has been transformed in recent years by the application

of sophisticated chromatographic and spectroscopic techniques, and it is fitting that this subject is reviewed by Y. Hashimoto and his colleagues from the Kobe Women's College of Pharmacy, whose contributions to the technical methodology of plant analysis have been so outstanding. In Chapter 2, Atta-ur-Rahman and A. Muzaffar review the steroidal alkaloids of the Apocynaceae and Buxaceae. This field has undergone a renaissance in recent years, owing largely to the recognition of a variety of new structural types. Chapter 3, by G.-Q. Han, Y.Y. Chen, and X.-T. Liang, reviews the alkaloids of traditional Chinese medicinal plants. This is timely in view of the worldwide current interest in this subject, and the fact that compounds from Chinese medicinal preparations are undergoing clinical evaluation in laboratories throughout the world. In Chapter 4, H. Hiemstra and N. Speckamp summarize the synthetic utility of *N*-acyliminium ions in the preparation of many important alkaloidal structures. Finally, in Chapter 5 M.F. Grundon reviews quinoline alkaloids structurally related to anthranilic acid, of which a large number have been discovered in recent years.

This volume, like its predecessors, bears witness to the indispensability of the series. All alkaloid chemists will find themselves using it on a continuing basis, and chemists new to the field will find it an invaluable point of departure in their investigation of the literature.

PHILIP W. LE QUESNE, *Northeastern University*

Naturally Occurring Phorbol Esters. Edited by FRED J. EVANS. CRC Press, 2000 Corporate Boulevard, Boca Raton, FL 33431. 1986. 313 pp. 18 × 26 cm. ISBN 0-8493-5117-0. \$125.00.

Croton tiglium L. (Euphorbiaceae), the source of croton oil, has had a fascinating history as a medicinal agent. This species has been used for many purposes in its native southern Asia and elsewhere, including, for example, as an abortifacient, antineoplastic agent, drastic purgative, skin irritant, and wart treatment. Interest in the active constituents of croton oil heightened after the demonstration of its tumor-promoting activity on mouse skin in the 1940s. In 1968, the Hecker group in Heidelberg established the correct structure of 12-*O*-tetradecanoylphorbol-13-acetate (TPA), the major purgative, skin-irritant, and tumor-promoting constituent of croton oil. In the years since its discovery, TPA has become an important natural product specialty chemical of use in many laboratories as a specific probe in carcinogenesis and cellular biochemical experiments. In addition, hundreds of diterpenes of the phorbol ester, daphnane ester, and ingenane ester types have now been isolated and characterized as skin-irritant, tumor-promoting, piscicidal, viral activating, and antileukemic and/or cytotoxic principles of plants in the families Euphorbiaceae and Thymelaeaceae.

This volume has been compiled by six collaborators from the United Kingdom, Egypt, and Qatar, and is organized into ten chapters. Over half the book is devoted to phytochemical topics, with separate chapters on the esters of phorbol, daphnane polyol esters, ingenane polyol esters, macrocyclic diterpenes, diterpene ester biosynthesis and chemotaxonomy, and non-diterpenoid constituents of the Euphorbiaceae and Thymelaeaceae. The remaining chapters deal with the environmental hazards of plant-derived diterpene esters, a taxonomic review of the Euphorbiaceae, the tumor-promoting and other biological effects of phorbol esters, and the biochemical mechanism of action of phorbol esters. The volume is provided with a substantial general index, and the bibliography is current up to 1985.

Of particular note is a thoughtful introductory chapter which provides an in-depth treatment of the possible carcinogenic hazard that plants containing phorbol esters might present to humans, especially those species that are used in folk medicine or are used as ornamental household or garden plants. However, the book might have been more complete if a chapter on the taxonomy of the Thymelaeaceae had been included, since this would have nicely complimented the thorough treatise presented on the botanical aspects of the Euphorbiaceae. Also, the suggestion by one of the authors to use the trivial name "macrinol esters" for certain toxins of the 1 α -alkyldaphnane ester type is unlikely to find wide application, given the large number of hydroxylated macrocyclic compounds otherwise known in nature. While the book is factually accurate, rather a large number of typographical errors were noted throughout the text.

Overall, this book does an excellent job of organizing much of the extensive literature on phorbol esters that has been published over the last 20 years. It is recommended for personal use by phytochemists specifically studying plants in the families Euphorbiaceae and Thymelaeaceae, as well as scientists interested in the activity of phorbol esters as tumor promoters or as antineoplastic agents. It will be a valuable addition to the libraries of all institutions where research is conducted on biologically active natural products.

A. DOUGLAS KINGHORN, *University of Illinois at Chicago*