at δ 6.42, J = 8 Hz. This pattern indicated that the three remaining aromatic protons in I must be located on three successive carbon atoms in ring B with the one most downfield (H_a) *ortho* to the ketone group, the one most upfield (H_c) *ortho* to the phenolic hydroxyl group, and the one in between (H_b) on the middle of these three carbons. This finding was further confirmed by the presence in the mass spectrum of the base peak IV, derived by acyl cleavage associated by hydrogen migration to ring A (3) (Scheme I). The highly conjugated nature of this fragment accounts for its abundance in the mass spectrum. The formation of fragment IV is favorable only if the β,β-dimethylallyl group is located *ortho* to the ketone group.

Although the evidence that I is the structure of cudranone was convincing, it was uncertain why the NMR signal of H_a was never as far downfield as expected for a proton *ortho* to a carbonyl group. This position was found not only for the H_a signal in I but also its trimethyl ether (II) and triacetate[5] (III) when taken in acetone-d_6 or deuterochloroform. A possible explanation for the shielding of H_a can be provided by assuming that I adopts a conformation that leads to the placing of H_a in the shielding zone of ring A. The assigned structure was confirmed by X-ray crystallographic analysis[6].

The structure of cudranone proves that biogenetic isoprenylation of xanthones does not take place after the cyclization of the corresponding benzophenones as suggested previously (4).

Cudranone exhibited significant activity against *Staphylococcus aureus* (MIC 25 μg/ml) and *Bacillus subtilis* (MIC 12.5 μg/ml) and even greater activity against *Mycobacterium smegmatis* (MIC 1.6 μg/ml)[7]. Further evaluation of antimicrobial activity of I is in progress.

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[5] Prepared by treating cudranone with acetic anhydride in pyridine at room temperature overnight. It crystallized from methanol as prisms, mp 100–101°.

[6] The details will be published.

[7] The minimum inhibitory concentration against these microorganisms was determined by the serial dilution method using streptomycin as a positive control. The results were read after incubation at 37° for 24 hr.

BOOKS

REVIEWS

Marihuana: An Annotated Bibliography. By COY W. WALLER, JACQUELINE J. JOHNSON, JUDY BUELKE, and CARLTON E. TURNER. Macmillan, 866 Third Ave., New York, NY 10022, 1976. 560 pp. 18.5 × 25.5 cm. Price $13.95.

This handbook will be most appreciated by those interested in the world literature on any aspect of marihuana (*Cannabis* species), its constituents, pharmacology, metabolism, toxicology, chemistry, synthesis, botany, *etc.* Every conceivable type of citation is found, ranging from reviews and books to original research reports, notes, communications, letters to the editor, rebuttals, book reviews, patents, dissertations, UN documents, introductory remarks to symposia, and the like.

The compilation was assembled by the Waller–Turner group, who have been actively engaged in *Cannabis* research for several years at the Research Institute of Pharmaceutical Sciences, University of Mississippi, under sponsorship of the National Institute of Mental Health. Literature coverage is stated to be from the beginning of 1964 through 1974, and "3045 entries covering the international scientific publications" are included (all entries are definitely not "scientific"). In all cases, the full citation of each entry is given, *i.e.*, all author names, journal title, volume, issue number, full pagination (in most, but not all, cases), and year of publication. Foreign language titles are given with parenthetical English translations in some cases.

Articles are entered alphabetically by senior author name. Most citations are followed by a brief abstract prepared by the editors. Author and subject indexes are included, as well as a summary table, the Biological Actions of Marihuana in Various Animals. The structure, molecular formula, and molecular weight of each known "natural" cannabinoid are given. Also, all of the names and structures of the metabolities of Δ^9-tetrahydrocannabinol, Δ^8-tetrahydrocannabinol, cannabinol, and cannabidiol are given, with an indication of those that are "active," although the term "active" is undefined.

Although this useful handbook represents a monumental effort on the part of the Mississippi group and was apparently prepared without governmental support (no acknowledgment was found to this effect), a number of minor deficiencies, as judged by this reviewer, and errors should be pointed out so that the user may be forewarned.

There is no statement concerning where the citations were obtained and how systematic the literature coverage may have been. For example, were "Chemical Abstracts" and "Biological Abstracts" covered completely for the stated time period? Were the brief abstracts derived from abstracts or from reading the original papers or books? Since the entries covered range from citations of introductory remarks to *Cannabis* symposia through entries in "Encyclopedia Britannica," one must wonder where the literature coverage started and ceased. For example, the authoritative book by H. Wagner, "Rauschgift-Drogen" (Springer-Verlag, Berlin, Germany, 1969), most surely should have been included in the handbook.

A useful addition to each citation would have been either the mailing address of the senior author and/or the secondary source, since the articles in some obscure journals would have to be verified before obtaining an interlibrary loan of the journal.

To this reviewer, the subject index was difficult to use. For example, no major heading concerning Isolation of Constituents was found. A major heading "Trigonelline (isolation from *Cannabis*)" was found, but no major headings for "Friedelin," "Epifriedelanol," "Sitosterol," "Stigmasterol," "Campesterol," and most other noncannabinoids isolated from *Cannabis* were entered. The major subject heading "Biochemistry" lists

under it "Edestin from hemp seed," "Edestinase from hemp seed," and "Quaternary bases in *Cannabis*" only. For the amount of biochemical studies published on the cannabinoids, the biochemists will be disturbed with this type of index coverage.

A large number of incorrect spellings of common and technical words are found in the abstracts. These errors are self-evident for the most part but confusing in cases such as, for example, citation 2914 where "Cannabidivarian" appears in the title of the article and "Cannabidivarin" in the abstract, the latter presumably correct. In a few cases, words and/or phrases are apparently missing in titles of articles or in the abstracts. These omissions are usually not too much of a problem as in citations 368, 431, 474, 740, 1290, 1321, 1679, 1905, 1927, 2058, 2480, 2493, 2708, 2722, and 2914. The journal citation in 301 is confusing, and citation 2212 does not refer to the journal cited.

When abstracts are given, there is a great degree of inconsistency regarding content. Also, the summary table on p. XXII hardly can be considered complete.

However, even though these minor problems were found, the book at a very reasonable price of $13.95 is a bargain. It will be an indispensable, and much used addition to the personal library of anyone having even a remote interest in *Cannabis*. It will be of special interest to researchers in the field of *Cannabis*, to students in the medical professions and social sciences, to the pharmaceutical industry, and to reporters in the media and should be available in every library.

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Essentials of Medicinal Chemistry. By ANDREJUS KOROLKOVAS and JOSEPH H. BURCKHALTER. Wiley, 605 Third Ave., New York, N Y 10016, 1976. 697 pp. 16 × 23.5 cm. Price $22.50.

The book is designed as an undergraduate text in medicinal chemistry as well as a resource work for the chemist and biologist interested in several aspects of drugs. The composition of the book is built around succinctly stated facts and theories, which the authors hope are presented in a palatable, yet useful, form for the student. The authors have in mind the role of the pharmacist as an information source helping the physician and patient.

The book is in eight parts and generally follows pharmacological or therapeutic categories. These are Introduction: Basics, Drug Development and Theories; CNS Drugs; Drugs Acting at the Peripheral Nervous System; Cardiovascular, Blood and Renal Systems; Chemotherapeutics; Vitamins; Hormones; and Miscellaneous Agents including Diagnostics. The appendix lists drugs in the USP and NF.

Each part consists of several chapters dealing with discrete topics. They are concisely written along the lines of precis or compendia. The highlights of drug structure and action, as well as side effects and dosage, are recorded. Structural formulas and tables are utilized to illustrate structure–activity relationships in some cases. Useful references are appended to each chapter and are divided into general background and specific citations by class of agents.

The book should prove useful as a compendium of information in medicinal chemistry. This book plus a text organized in depth over the same topics should provide the student with a good background in course work, for board exams, and for professional practice.

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Manual of Clinical Immunology. Edited by NOEL R. ROSE and HERMAN FRIEDMAN. American Society for Microbiology, 1913 I St. N.W., Washington, DC, 20006, 1976. 932 pp. 17.5 × 26 cm. Price $16.00, flexible binding; $20.00, cloth binding.

This much needed volume, written by 180 authorities in various aspects of the rapidly expanding field of immunology, presents the latest information. The book is directed mainly to laboratory directors and technologists but should prove extremely useful to graduate students, medical students, postdoctoral fellows, residents, and clinicians. The greatest value of this book is the presentation of methodologies, allowing a stepwise approach to various procedures currently used in both clinical and research immunology. Of particular importance is the discussion of the pros and cons of each procedure with emphasis on the pitfalls encountered. Suggestions as to sources of materials and equipment required for each test can save time when setting up a new method.

The arrangement of the book in sections covering different aspects of the components involved in immunological responses and the cross-referencing between chapters allow the investigator to understand not only his or her own area but also the influence of cellular *versus* humoral aspects of immunology. Of particular importance are the chapters covering delayed hypersensitivity, lymphocyte subpopulations, and lymphocyte transformation.

The principles of radioimmunoassay are well presented, and the methods for determining various hormones in body fluids have general applicability not only in the clinic but also in the research laboratory.

Coverage of the immunological aspects of bacterial, mycotic, parasitic, viral, rickettsial, and chlamydial diseases will assist the clinician in more accurate diagnosis. The disadvantages of immunofluorescence and radioimmunoassays in immunodiagnosis of viral diseases are discussed, and suggestions for the use of microplate enzyme methods are given. The main advantages of the latter are a long shelflife, cheap simple equipment, and the same degree of sensitivity as the other procedures.

In the immunohematology section, the chapters on autoimmune and drug immune hemolytic anemia and the immunology of clotting factors point out the importance of modern immulogical methods in the diagnosis of often fatal diseases. Allergic disease testing is well covered, but the importance of testing for drug hypersensitivity is not adequate, being confined almost entirely to penicillin. The subject of autoimmune diseases receives full treatment, including tests for antibodies to tissue-specific antigens. The section on tumor immunology covers the present state of the art and indicates the necessity for further research to improve early tumor diagnosis. The section on transplantation immunology presents the immunological aspects of tissue transplantation, particularly the rejection phenomenon. The last section is of importance to clinical laboratories because it covers legal requirements, quality control, standardization of materials and methods, and proficiency testing of laboratory personnel.

This volume should be available to clinical and research workers in immunology and, because the field is expanding so rapidly, it should be updated more often than most such manuals.

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Aliphatic Chemistry. Vol. 4. A Specialist Periodical Report. Edited by A. McKILLOP *et al.* The Chemical Society, Burlington House, London, W1V 0BN, England, 1976. 281 pp. 14 × 22.5 cm. Price $49.50.

The fourth volume of the Specialist Periodical Reports on aliphatic chemistry is comprised of four chapters which summarize developments reported during 1974 in each of the chosen areas. Chapter 1, on the chemistry of acetylenes, alkanes, allenes, and alkenes, was contributed by D. W. Dunwell, J. C. Saunders, and B. P. Swann. The second chapter, which deals with aliphatic compounds having other functional groups (carboxylic acids and their derivatives, amino acids, aldehydes and ketones, alcohols, amines, alkyl halides, ethers, sulfur compounds, and miscellaneous aliphatic compounds) was prepared by E. W. Colvin, who also contributed the analogous reviews in all of the preceding volumes of this series.

The remainder of the volume is devoted to surveys of the literature dealing with naturally occurring polyolefinic and polyacetylenic compounds (Chapter 3) and with the chemistry of prostaglandins (Chapter 4). Both of these chapters were written by G. Pattenden, as were the corresponding chapters of Volumes 2 and 3. The reviews of Chapter 3 include, in addition to other topics, summaries of new work on polyolefinic antibiotics (*e.g.*, ansamycins) and other microbial metabolites, a variety of plant-product structures, polyolefins and polyacetylenes of marine origin, and insect pheromones. The fact that the chapter on prostaglandins is less than one-third of the length of the same chapter in Volume 3 is cogent testimony to the author's opening assertion of the