1, exchanges with D_2O, OH), 3.60 (d, 1, J = 4 Hz, $CHCO_2Me$), 4.42 (m, 1, CH_3CH), 5.42 (AB q, J = 15 Hz, CO_2CH_2), 5.82 (d, 1, J = 2.5 Hz, collapses to singlet with D_2O, pyrrolyl), 7.60 (d, 2, J = 9 Hz, aryl), 8.27 (d, 2, J = 9 Hz, aryl), 8.97 (br s, 1, exchanges with D_2O, NH); MS, m/e 378 (M), 334 (M - CH_3CHO), 302, 198, 181. The NMR spectrum also revealed that **7a** was contaminated with a small amount of another pyrrole thought to be the product retaining the cysteamine side chain.

Band C provided the disulfide 8 (1.6 mg) as a clear oil: IR (CH_2Cl_2) 3450, 1727, 1520, 1350 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 2.82 (t, 2, J = 6 Hz, SCH_2), 3.55 (q, 2, J = 6 Hz, CH_2N), 5.20 (s, 2, CO_2CH_2), 5.34 (br s, 1, NH), 7.52 (d, 2, J = 8.5 Hz, aryl), 8.23 (d, 2, J = 8.5 Hz, aryl); MS, m/e 510 (M), 357, 314, 256, 255, 254, 233, 136.

Replication of the experimental conditions on the separate isomers revealed that **7a** and 8 were derived from **5b** and that **6b** was stable even after prolonged exposure.

Aminolysis of 5b and 6b. A solution of **5b** (5.9 mg, 0.01 mmol) and **6b** (5.9 mg, 0.01 mmol) in THF (1.0 mL) was treated with morpholine (17.4 μL, 0.2 mmol) and left at room temperature in a capped flask. Aliquots were removed periodically and examined by TLC and UV spectroscopy (5 μL in 2 mL of dioxane), both of which showed complete disappearance of **5b** after 4 days. The reaction mixture was diluted to 10 mL with EtOAc, washed with H_2O (2 × 2 mL), pH 3 buffer (2 mL), 5% $NaHCO_3$ (2 mL), and brine, dried, and evaporated to a pale yellow oil (13 mg). The crude product was chromatographed on a 0.25 × 85 × 200 mm silica gel GF plate using 3:1 EtOAc–$CHCl_3$ as developing solvent. UV visualization showed minor bands at R_f 0.04 and 0.45 and three major bands at R_f 0.13 (band A), 0.30 (band B), and 0.52 (band C). The major bands were removed and eluted with EtOAc.

Band A provided the hydroxypyrrole **7b** (2.1 mg) as a clear oil: IR (CH_2Cl_2) 3425, 1725 (sh), 1710, 1665, 1625, 1580, 1525, 1350 cm^{-1}; ^1H NMR (300 MHz, $CDCl_3$) δ 1.11 (d, 3, J = 7 Hz, CH_3CH), 3.5–3.8 (m, 9, morpholino and CHCO), 4.33 (m, 1, CH_3CH), 4.67 (br s, 1, exchanges with D_2O, OH), 5.40 (AB q, 2, J = 14 Hz, CO_2CH_2), 5.75 (d, 1, J = 2.5 Hz, collapses to singlet with D_2O, pyrrolyl), 7.61 (d, 2, J = 9 Hz, aryl), 8.29 (d, 2, J = 9 Hz, aryl), 8.99 (br s, 1, exchanges with D_2O, NH); MS, m/e 433 (M), 415 (M - H_2O), 389 (M - CH_3CHO), 253, 236, 209, 136, 114.

Band B afforded Δ^1-isomer **6b** (4.6 mg, 78% recovery), and band C afforded the disulfide 8 (1.2 mg).

Replication of the reaction conditions on the separate isomers revealed that **7b** and 8 were derived form **5b**, whereas **6b** was unchanged even after prolonged reaction times.

Acknowledgment. The authors thank W. J. Leanza for experimental guidance in preparing the bisprotected thienamycin derivatives, Dr. R. A. Firestone for helpful discussions during this work, Ms. Jean S. Kahan for the antibacterial assays, and Dr. B. G. Christensen for his support and encouragement during this investigation.

Book Reviews

Medical and Biological Applications of Electrochemical Devices. Edited by J. Koryta. Wiley, New York. 1980. ix + 331 pp. 15.5 × 23.5 cm. $79.00.

Medical and biological applications of electrochemical techniques can be divided into two categories. The first concerns with utilizing electrochemical methods for the study of chemical actions of molecules, proteins, and enzymes of biological significance. In the second category, electrochemical techniques are treated as powerful analytical tools in the determination of the amount of the chemical substance of interest in biological samples. This book deals with the latter aspect with an emphasis on the direct measurements in biological media. The authors present, in a comprehensive way, those electrochemical devices which have been introduced to the laboratory and clinic during the last 2 decades.

The first chapter is a concise review of relevant concepts in electroanalytical chemistry. The principles and practices of ion selective electrodes are treated in detail in Chapters 2–5. These include both liquid-membrane and solid-state ion selective electrodes and their applications in the measurements of ion activities in whole blood, plasma, urine, single cells, and excitable tissue. The next three chapters cover voltammetric (polarographic) methods applied to analysis of oxygen in biological materials, to in vivo measurements in kidneys and brain tissues, and to determination of 1,4-benzodiazapin derivatives in body fluid. Finally, Chapter 9 described enzyme electrodes and their possible biomedical utilizations.

This monograph will be a valuable reference for those electrochemists who are involved in biomedical research and for those medicinal chemists, pharmacologists, and clinical chemists who are constantly seeking for improvements on their analytical procedures. It offers a comprehensive background knowledge, some practical considerations, and an exhaustive literature survey on the recent applications of ion selective electrodes, enzyme electrodes, and voltammetric electrodes in medicine and biology. The overall quality is excellent, and the editor (Koryta) and contributors ought to be congratulated. It is a must for a science library. The price, $79.00, would be the only thing which might prevent the addition of this book to the personal collections of those who are interested in the specific topics.

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Forensic Toxicology. Edited by J. S. Oliver. University Park Press, Baltimore. 1980. 320 pp. 14 × 22 cm. $39.95.

This book consists of the papers presented at the European Meeting of the International Association of Forensic Toxicologists, held at the University of Glasgow in August, 1979. Thirty-six individual contributions are included here, dealing with a wide variety of analytically related problems in forensic toxicology. These analytical techniques include thin-layer chromatography, gas–liquid chromatography, mass spectrometry, high-performance liquid chromatography, and mass spectrometry. Most analytical methods and approaches deal with organic compounds, such as drugs, hydrocarbons, pesticides, etc., but there are also discussions of the trace analysis of metals and organometallic compounds. As expected, almost all of the matrices analyzed are of biological origin, such as whole blood, plasma, tissues, and related matter. Dealing with forensic related matters, the analyses emphasize drug overdose, arson fatalities, accidental and intentional poisonings, and similar situations. Much of the analytical approaches are somewhat standard by this time, but certain sample preparations, extractions, workups, etc. are often novel, practical, and extremely useful. Of special interest to this reader was a discussion of extractive dialysis by Brandenberger and Bucher.

There is little question that this must have been a very successful scientific meeting, as the vast majority of the papers presented are of interest to anyone involved in forensic related research areas. However, it would appear that the emphasis has been on analytical chemistry as applied to forensic related matters, with relatively little discussion or emphasis on the toxicological aspects. Perhaps a better title for the conference and book might have been analytical toxicology or analytical chemistry as applied to forensic toxicology. Nevertheless, the book is of general interest to anyone involved in trace organic/inorganic analyses, especially

where these deal with matrices of biological origin. There are excellent discussions of experimental approaches, sample preparation, extraction, workup, and final instrumentation conditions and parameters. It should be relatively easy to apply these analytical methods to similar problems in forensic or general analytical areas.

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Phenytoin-Induced Teratology and Gingival Pathology. Edited by T. M. Hassell, M. C. Johnston, and K. H. Dudley. Raven Press, New York. 1980. xii + 240 pp. 16 × 24 cm. $25.00.

This volume of 18 chapters is concerned with two aspects of the toxicity of phenytoin. This anticonvulsant drug was introduced by Putnam and Merritt more than 40 years ago and is widely regarded as the drug of choice for treatment of generalized tonic–clonic seizures ("grand mal") or elementary partial seizures (focal motor) and as second only to carbamazepine in the treatment of complex partial seizures (temporal lobe epilepsy). It is probably the drug most widely prescribed for anticonvulsant therapy.

That phenytoin might be teratogenic was first reported in 1964. Subsequently, several prospective studies have suggested that the incidence of certain gross congenital abnormalities may be doubled by phentoin. A distinctive syndrome whose features include facial dysmorphia and mental deficiency ("fetal hydentoin syndrome") has been identified, and the risk for pregnancies exposed to hydantoin has been estimated at 10–20%. A comparable syndrome can be induced in mice exposed to therapeutic plasma levels of phenylhydantoin. The teratogenicity and other toxic effects are probably due to reactive metabolites, among which an arene oxide intermediate is likely to be significant. Seven chapters are devoted to the problem of phenytoin teratogenicity. The evidence (including problems of statistical evaluations) is very clearly laid out. Dr. D. Smith concludes "We are beyond the time when we may do prospective studies because to me, ideally the human embryo and fetus should not be exposed to hydantoin at this point and time".

Gingival pathology is surveyed in eight chapters covering experimental and metabolic studies and clinical problems. The disfigurement of gingival overgrowth appears to be a cruelly unnecessary addition to the burdens of patients with epilepsy. Improved dental management can help significantly. The models using cats and monkeys or gingival cell cultures have improved our understanding, and further work could lead to prevention.

One of the three introductory chapters discusses effects of phenytoin on the immune system. This volume does not cover other major aspects of phenytoin toxicity, such as acute and chronic effects on the brain or toxic actions on the skeletal and hemopoietic systems.

Although this is a symposium-derived book (and benefits from inclusion of edited discussion), details of the time and place of the symposium are not given. Unlike many symposium volumes this one is beautifully produced and is up-to-date, including many 1979 and a few 1980 bibliographic references. It will be useful to physicians and dentists working with patients on antiepileptic medication and to those concerned more generally with mechanisms of drug metabolism and toxicity.

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Nucleotide Analogs, Synthesis and Biological Function. By Karl Heinz Scheit. Wiley, New York. 1980. xi + 288 pp. 16.5 × 24 cm. $29.50.

This book should be considered primarily as a reference source for the synthesis, chemistry, biochemistry, and use of specific nucleotide analogues. There is also some nucleoside work described, since a number of nucleotide synthetic procedures use nucleosides as the starting material. The book is comprised of seven major divisions or chapters: (1) "Chemical Structure of Nucleotides"; (2) "Nucleotides with Modified Heterocyclic Substituents"; (3) "Nucleotides with Uncommon Glycosidic Bonds"; (4) "Nucleotides with Modified Phosphate Groups"; (5) "Nucleotides with Altered Sugar Parts"; (6) "Methods of Phosphorylation", and (7) "Reactive Derivatives of Nucleotides". *The first chapter* provides basic information on the elctronic and tautomeric structures of the heterocyclic moieties, as well as the conformations (syn, anti, exo, endo, gauche, trans, etc.) related to the carbohydrate moieties (ribose, 2-deoxyribose) of the common nucleotides from nucleic acids. *The second chapter* is divided into five subdivisions which involve: (1) substitution at ring nitrogen atoms; (2) substitution at exocyclic groups; (3) introduction of exocyclic substituents; (4) ring analogues of purine nucleotides, and (5) ring analogues of pyrimidine nucleotides. The first three subdivisions only involve purine and pyrimidine nucleotides, while subdivisions 4 and 5 describe the aza and deaza purine and pyrimidine nucleotide analogues, with a small miscellaneous section on other nucleotides, e.g., tricyclic, triazole, etc. The third chapter covers nucleotides with uncommon *N*-glycosidic bonds (e.g., *iso*-AMP) and the C-nucleotide psuedouridylic acid. *Chapter four* covers thiophosphates, phosphites, phosphonates, analogues with altered P–O–P and P–O–C bonds, and a section on miscellaneous analogues that fall outside the above categories. *Chapter five* is comprised of nucleotides with modifications in the carbohydrate moiety, per se, e.g., arabino, xylo, and lyxo analogues vs. ribo and deoxyribo. These modified carbohydrates are all furanosyl derivatives except for the miscellaneous section which describes a few pyranosyl derivatives. *Chapter six* describes the methods used for the synthesis of phosphate esters and nucleoside polyphosphates. *Chapter seven* is subdivided into two sections, with one section on reactive derivatives of nucleotides and the second section on photogenerated reactive derivatives of nucleotides. There is a more than adequate subject index, author index, and list of references (including some 1978 references). This is a well-organized and well-written book with no more than the usual minor typographical errors in the major portion of the book. However, the reader should be aware of an excessive number of structural and nomenclature errors in Section 2.4, e.g., structures and nomenclature for I → VII (page 61), no pyrazolo[4,5-*d*]pyrimidine (page 64), nomenclature wrong for 7-deazanebularine (page 67), wrong structure for *256* and *257*, etc. As stated previously, this book is primarily a reference source for the synthesis, chemistry, biochemistry, and use of specific nucleotide analogues and will be a valuable addition to the library of everyone working in the area of nucleosides and nucleotides.

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Electrochemistry. Volume 7. Specialist Periodical Reports. Edited by H. R. Thirsk. The Chemical Society, Burlington House, London. 1980. xii + 268 pp. 14 × 22 cm. $63.00.

Because of the many areas emcompassed under the umbrella term "Electrochemistry", the editors of this series have chosen to devote each volume to a few authoritative reviews-in-depth on selected topics of current interest, rather than attempting blanket coverage of the entire field. This seems a reasonable procedure. The present volume includes chapters on synthetic aspects of organic electrochemistry, membrane phenomena, application of A.C. impedance methods to solid electrolytes, and the electrical double layer. The articles are generally quite good. It is surprising that some rapidly developing areas, e.g., semiconductor electrodes, surface-modified electrodes, and electroanalytical theory, have not been covered in this or the preceding volume.

While most of the articles appear to have surveyed the literature up to 1976–1977, and sometimes even later, the review on organic electrochemistry is limited to "material published during 1975". Thus, this article, published in 1980, is badly out of date (and the series is falling behind: Volume 6, published in 1978, covered the literature to the end of 1974) and of correspondingly less

interest to those for whom it is presumably intended.

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Metal Ions in Biological Systems. Volume 10. Carcinogenicity and Metal Ions. Edited by Helmut Sigel. Marcel Dekker, New York and Basel. 1980. xxii + 381 pp. 15 × 23 cm. $49.75.

The role of metal ions in causing or promoting cancers has been a matter of great concern since the beginning of investigations related to carcinogenicity. Very little evidence definitely linking specific metal ions to carcinogenic effects was available until quite recently, however, and the subject has been more characterized by mystery than certainty. The present volume is, accordingly, most welcome in clarifying this situation. A great deal of information has been gathered in this volume regarding metal ion carcinogenicity and, although some of it is conflicting, some definite effects of specific metal ions have emerged. The overall picture is still somewhat disappointing in that the results of many studies have been inconclusive, but there is enough information to show definiate carcinogenic effects in the case of certain metal ions, such as chromium and nickel, as well as cadmium, arsenic, and beryllium. In one chapter (Chapter 2), the authors have been able to rank the metals in terms of the greatest tendency toward carcinogenic properties. Some correlation between metal ion carcinogenicity and ability to induce gene mutations has also become evident. It should be pointed out that this is a multiauthor volume.

The book is divided into chapters on (1) "The Function of Metal Ions in Genetic Regulation", still a highly speculative subject; (2) "A Comparison of Carcinogenic Metals"; (3) "The Role of Metals in Tumor Development and Inhibition", a subject still plagued with more questions than answers; (4) "Paramagnetic Metal Ions in Tissue during Malignant Development", a topic that has provided no clear evidence of species specific for malignancy; and (5) "Ceruloplasmin and Iron Transferrin in Human Malignant Disease", a subject which has also resisted clear-cut conclusions.

Other chapters follow on (6) "Human Leukemia and Trace Elements", where definite effects of metal ions on malignancy are shown but where no connections between metals and viruses or organic carcinogens are known; (7) "Zinc and Tumor Growth" and (8) "Cyanocobalamin and Tumor Growth", both of which provide little of proven importance; (9) "The Role of Selenium as a Cancer-Protecting Trace Element", where strong indications of the protective effects of selenium are detailed but little is known of the underlying mechanisms. The final chapter is concerned with tumor diagnosis using radioactive metal ions and their complexes.

Despite the comparative lack of definitive results reported, this book should be of much value to anyone interested in exploring this fascinating field or becoming acquainted with the present level of its development. Fundamental researchers in the fields of biochemistry, bioinorganic chemistry, or cancer chemotherapy should find the book of great interest. It should be part of any library holdings on cancer, toxicology, or bioinorganic chemistry.

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Metal Ions in Biological Systems. Volume 11. Metal Complexes as Anticancer Agents. Edited by Helmut Sigel. Marcel Dekker, New York and Basel. xx + 427 pp. 15 × 23 cm. $55.00.

The possibility that metal complexes might have anticancer properties has been investigated in rather desultory fashion over the past 50 years or so, but not until the discovery of the anticancer effects of the *cis*-diaminodichloroplatinum compounds was any significant progress achieved with metal complexes. Since the announcement of their anticancer effects in 1969, this field has undergone a more systematic investigation for determining anticancer properties of metal coordination compounds. This volume relates the findings that have been made, primarily over the last decade, with not only platinum compounds but other metal complexes. At present, only the platinum compounds have shown useful clinical properties.

The introductory chapter of this multiauthor volume summarizes the properties of various metal ions with anticancer potential (Co, Fe, Ni, Zn, Rh, Pd, Ir, and Ga) and their complexes. The following two chapters are concerned with aqueous platinum(II) chemistry and the binding of this metal to biological molecules, as well as the clinical aspects of anticancer platinum complexes. Other chapters are devoted to carcinostatic copper complexes, oncological implications of the chemistry of ruthenium, and metal complexes of alkylating agents, still an area of potential significance. The final two chapters are devoted to discussions of metal binding to antitumor antibiotics and interactions of anticancer agents with enzymes, particularly the metalloenzymes. It should be pointed out that, other than the discussions of the anticancer platinum complexes, the topics selected are of more potential than of realized anticancer utility.

For anyone interested in this multifaceted field relating metal complexes to anticancer effects, the book makes very interesting reading. The discussions in this volume, as well as those in Volume 10, are remarkably uniform in style and well written. Since further development of this area of research requires the knowledge of a variety of specialists, the book should be available to all who are involved in anticancer research. This and the preceding volume have both author and subject indexes, and the print and tables are easy to read. Both Volume 10 and 11 should have utility for the anticancer researcher for some time to come.

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Biomedical Pattern Recognition and Image Processing. Edited by K. S. Fu and T. Pavlidis. Verlag Chemie, Weinheim. 1979. 441 pp. 15 × 21 cm. $33.80.

This book represents Life Sciences Report 15 of the Dahlem Conference. These conferences are supported by German industry and Deutsche Forschungsgemeinschaft, the German organization for promoting fundamental scientific research. The goal of this workshop was to examine the present and future applicability of general pattern recognition and image processing techniques to specific biomedical problems. The objective is to make understandable and useful the vast amount of information that modern transducers and instruments can provide a physician or scientist about the structure and dynamics of a living human or animal.

The report consists of an introduction written by J. H. van Bemmel and 12 background papers. The four theoretical paapers are "Syntactic Approach to Pattern Recognition" (K. S. Fu), "Image Analysis Segmentation Methods" (C. A. Harlow and R. W. Conners), "Methodologies for Shape Analysis" (T. Pavlidis), and "Models of Visual Perception" (H. Marko). The four by biomedical researchers are "Computed Tomography: Three-Dimensional Imaging with Photons and Nuclear Magnetic Resonance" (T. F. Budinger), "A Brief Overview of Cardiology" and "A Brief Overview of Pattern Recognition in Psychology and Histology" (G. Zajicek), and finally "Pattern Recognition in Neurobiology" (M. Abeles). The four on biomedical pattern recognition are "Statistical Approaches to Biomedical Data Analysis" (B. Schneider), "Methods in One- and Two-Dimensional Signal Processing" (S. J. Poppl), "Texture Analysis for Biomedical Imagery" (N. J. Pressman, R. M. Haralick, H. W. Tyrer, and J. K. Frost), and "Computer Hardware for Biomedical Pattern Recognition" (K. Preston, Jr.). These are followed by four group reports that were written at the meeting and represent a synthesis of views by the assembled experts. These are "Cardio-Pulmonary Systems", "Cells and Tissues", "Neurobiology", and "Biomedical Imaging and Modeling". The book thus represents both a review of the state-of-the-art and suggestions for research needed to advance the field.

This book is well-written and possibly of general interest to medicinal chemists. For those chemists whose research involves

pattern recognition, several of the chapters reveal how problems similar to our own have been approached by others. In particular, the problem of shape analysis and description is pertinent to the problem of how to describe the shape of a molecule, and the problem of recognizing time-dependent phenonema applies to conformational flexibility.

Although I doubt that many medicinal chemists would choose to purchase this book, I do recommend that it be included in a medical library.

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Solutions Manual and Workbook to Accompany Organic Chemistry. By Daniel S. Kemp and Frank Vellaccio. Worth Publishers, New York. 1980. 671 pp. 21.5 × 30.5 cm. $11.95.

Recognizing that organic chemistry can only be learned by an exposure to systematic problem solving, Kemp and Vellaccio have provided a workbook to be used in conjunction with their text "Organic Chemistry". The first half of this useful supplement is a workbook containing questions and answers that do not appear in their text. Although organized by chapter, only some of the covered workbook topics coincide with those of the text and special emphasis is given to those topics most easily mastered by problem solving. The second half of the workbook provides solutions for all the problems appearing in the text. Although the student may be tempted to read the workbook like a text, only a deliberate commitment to read and answer each question of this valuable supplement will be the most beneficial.

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Long-Term Effects of Neuroleptics. Advances in Biochemical Psychopharmacology. Volume 24. By F. Cattabeni, G. Racagni, P. F. Spano, and E. Costa. Raven Press, New York. 1980. xxxii + 619 pp. 16 × 24 cm. $58.00.

This volume originates from a symposium held in March 1979 in Monte Carlo, Principality of Monaco, under the auspices of the World Health Organization and the National Institute of Mental Health.

The majority of the papers published by the 239 contributors in this volume are centered around the concept that synaptic plasticity guides the compensatory mechanisms that are triggered by the blockade of dopamine receptors elicited by the long-term administration of neuroleptics. This volume examines the molecular mechanisms involved in both the therapeutic benefits and the untoward side effects of the neuroleptic drugs.

Careful reading of this volume hopefully will generate an impetus to find a novel approach in the therapy of psychosis. It appears that the blockade of dopamine receptors may not be the mechanism to cure the inherent excess in dopaminergic transmission but instead may be the trigger point of indirect mechanisms whereby psychoses can be relieved. Those neurologists, neuropharmacologists, and medicinal chemists who are willing to take on the challenge will wish to purchase this volume. The need for new types of antipsychotic drugs is clearly pointed out in this volume.

Staff

GABA Neurotransmission: Current Developments in Physiology and Neurochemistry. Brain Research Bulletin. Volume 5. Supplement 2. Edited by Harbans Lal. Ankho International Inc., Fayetteville, NY. 1980. ix + 946 pp. 22 × 28 cm. $150.00.

This volume is devoted to the proceedings of the International Symposium on GABA and Other Neurotransmitters held on Nov 6–9, 1979, at Myrtle Beach, SC. There are 156 papers grouped into three subtopics: neuronal systems and physiological functions, pharmacology of GABA-ergic drugs, and mechanisms underlying diseases and drug actions. This volume provides a valuable view of the multidisciplinary strategies to studying the role of GABA in CNS function and a reassessment of current knowledge. Missing though is any of the discussions and dialogues that no doubt took place between presentations. Although this monograph is beyond the reach of most individual budgets, this volume cannot be ignored by any investigator in the GABA field.

Staff

Analytical Profiles of Drug Substances. Volume 9. Edited by K. Florey. Academic Press, New York. 1980. ix + 618 pp. 15.5 × 22 cm. $34.00.

Consistent with the established goal for this series of monographs, the physical and chemical properties, analytical methods, and, where appropriate, metabolism and mode of action of 19 drugs are included in this volume. These include: bacitracin, bretylium tosylate, carbamazepine, cefalor, cefamandole nafate, cyproheptadine, dibenzepin hydrochloride, digoxin, doxorubicin, fluphenazine decanoate, gentamicin sulfate, haloperidol, khellin, lorazepam, methoxsalen, nadolol, nitrazepam, nitroglycerin, and trifluoperazine hydrochloride. An addendum includes recent information on griseofulvin (cf. Vol. 8) and methadone hydrochloride (cf. Vol. 3). The usefulness of these volumes to all who deal with the analysis, quality control, identification, and metabolic studies involving compendium drugs can scarcely be understated.

Staff

Flavins and Flavoproteins. Proceedings of the 6th International Symposium on Flavins and Flavoproteins. Edited by Kunio Yagi and Toshio Yamano. Japan Scientific Societies Press, Tokyo, and University Park Press, Baltimore. 1980. xvi + 740 pp. 19.5 × 26.3 cm. $79.50.

From the six International Symposia on Flavins and Flavoproteins, beginning with the first organized in 1965 at Amsterdam by E. C. Slater and continuing through the most recent meeting organized in 1978 at Mt. Rokko by Kunio Yagi and Toshio Yamano, have come, with one exception, comprehensive conference volumes. These constitute a consistent and extensive research record during a period of steady growth of interest in the structure and workings of proteins, of which the flavoproteins are a small but ubiquitous class. Like the heme and iron–sulfur proteins, flavoproteins have a built-in spectroscopic probe, which gives the intellectual focus so attractive to physicists and chemists interested in quantitative biology. Additionally, flavins themselves have proven tractable to the synthetic chemist, and a wide variety of substituted coenzyme analogues are now available. Consequently, during the period of activity covered by the present volume (up to early 1978), much effort was expended applying various spectroscopic techniques to natural and derivative flavoproteins. The results of these investigations are described in 89 papers, grouped in major categories (of 50–100 pages each) as follows: "Chemical Aspects of Flavin Action", describing the results of studies with modified coenzymes and substrates, attempting to sort out hydride, carbanion, and electron-transfer properties of flavoenzymes; "Flavo-Protein Dependent Oxygen Activation", wherein direct flavin-O_2 reactions were investigated; "Flavin-Dependent Dehydrogenation", describing attempts to probe the catalytic mechanism of several flavoenzymes such as succinate dehydrogenase, also discussed (with nicotine oxidase, trimethylamine dehydrogenase, and cholesterol oxidase) in the subsequent section "Covalently Bound Flavins", followed by the four closely related sections "Reactive Intermediates of Flavoproteins", "Protein–Flavin Interaction", "Physical Chemistry of Flavins", and "Flavoprotein Chemistry". Finally, three sections are devoted to "Metabolism and Biosynthesis of Flavins", "Complex Flavoproteins", and "Flavoproteins in Mixed Function Oxidases"—the last two having, for the most part, interchangeable papers. As can be seen from the titles, with the exception of the "Metabolism" section the entire volume is devoted to the chemistry and physics of flavoproteins, as opposed to any contribution these catalysts make to physiology. Interestingly, within this highly specialized sphere of activity are found the efforts of over 50 laboratories, on the evidence of the present volume.

This volume will not interest the casual reader, being intended for the specialist. The specialist should not cavil at the price of the volume, considering that it gives in detail the research position of a whole field as of March 1978 in one convenient package. Every biological science library of any pretensions must have this (and the previous volumes) for the same reasons. The articles vary in quality but are for the most part concise, well illustrated, and referenced. The one damning point is the *absurd* delay between the meeting and the appearance of the proceedings. The faithful cadre who have molded these meetings and this research field, including Slater, Yagi, Yamano, Kamin, Massey, Hemmerich, Walsh and Singer, should in the future attend to a more prompt publication of this important ongoing scientific record.

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Neurotransmitters and Drugs. By Zygmunt L. Kruk and Christopher J. Pycock. University Park Press, Baltimore. 1979. 176 pp. 13.5 × 21 cm. $8.95.

This book describes various neurotransmitter systems in the body, their association with clinical states, and the interaction of therapeuctically used drugs within these systems. Each chapter is devoted to a specific neutrotransmitter substance and examines their biosynthesis, storage, release, receptor interaction, and inactivating mechanisms, together with important drugs known to selectively interact with these various mechanisms. This little book adequately covers all pharmacological aspects of neurotransmission in both the peripheral and central nervous systems and will be a useful introduction to those chemists comtemplating working in the nervous system. Although structures of drugs are not given, limiting the understanding of the action of drugs as agonists and antagonists, a limited appendix to drug names and a brief bibliography to further reading are provided. Considering the very reasonable price, those medicinal chemists wishing a brief introduction to neurotransmitters will want to purchase this volume.

Staff

Hormonal Proteins and Peptides. Techniques in Protein Chemistry. Volume 9. Edited by Choh Hao Li. Academic Press, New York. 1980. xv + 268 pp. 15.5 × 23.5 cm. $35.00.

The present volume contains reviews of spectral and chromatographic analytical methods for proteins and peptides. The first chapter describes the advances in chromatographic analysis using fluorometry and is written by M. Rubinstein, S. Stein, and S. Udenfriend. The advantages and disadvantages of the commonly used fluorogenic reagents fluorescamine, MDPF, and *o*-phthalaldehyde in amino acid analysis, pre- and postcolumn detection, and polyacrylamide gel scanning among other applications are described. The greater applicability of the first reagent is highlighted by the authors who developed the techniques. The isolation and characterization of the opioid peptides are timely examples of the use of these methods.

The most welcome chapter is the one on partition chromatography by D. Yamashiro. Unlike the other techniques described in this book, partition is rarely the subject of a review. The development of the theory is interesting and may stimulate more theoretical and experimental treatments. The practical techniques are very useful, not only for the column chromatography but for liquid–liquid chromatography without a solid support. However, in the comparison of partition chromatography and HPLC in the separation of deletion analogues of β-endorphin, the author demonstrates great skill in the former technique and less in the latter, although the point that the reverse-phase column is working by adsorption rather than partition is well taken. This chapter will prove to be an important reference article on partition chromatography, a useful procedure.

The third chapter written by H. Edelhoch and R. F. Chen covers polypeptide structural analysis by absorption and fluorescence spectroscopy. Analysis of aromatic groups is well described with discussions of new methods such as derivative spectroscopy for Phe and Trp residues. Perturbation difference spectroscopy by solvent, ionization, and temperature is presented as well as applications of fluorescence spectroscopy. This is a good review of the achievements in the field and interesting goals remaining. Optional rotatory dispersion and circular dichroism are the subjects of a lucid chapter by T. A. Bewley and J. T. Yang on the measurement of chiroptical phenomena in proteins. The basic theory is presented followed by experiments on the pituitary hormones. Changes in backbone and side-chain conformation can be discriminated for some hormones by circular dichroism. The final chapter is a memoir of K. O. Pederson about working in Svedberg's laboratory. The development of the ultracentrifuge, which was an early important analytical technique for proteins, is described as well as the author's work on an early characterized glycoprotein, fetuin.

Good practical information is available in the articles, especially for the older techniques. However, a comprehensive review of high-performance liquid chromatography, a new and widely used technology, as applied to proteins and polypeptides is sorely needed. This book may serve as an update in the respective methodologies for nonspecialists and amplifying explanations for graduate students.

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Analysis of Drugs and Metabolites by Gas Chromatography–Mass Spectrometry. Volume 7. Natural, Pyrolytic and Metabolic Products of Tobacco and Marijuana. By B. J. Gudzinowicz and M. J. Gudzinowicz. Marcel Dekker, New York. 1980. x + 557 pp. 15 × 22.5 cm. $69.50.

This volume extends the series of comprehensive reviews of GC and GC/MS data concerning pharmacologically important substances initiated in 1977. Chapter 1, "Natural, Pyrolytic and Carcinogenic Products of Tobacco", is organized into sections devoted to the chemical composition of tobacco leaf and tobacco smoke. The literature is covered through 1978 with a total of 212 references. Constituents of plant material are discussed by chemical classes: tobacco alkaloids, hydrocarbons, alcohols, sterols, and fatty acids and esters. Evidence for the presence of the carcinogen *N'*-nitrosonornicotine is reviewed. Data presented include compound structures, methods of isolation and sample preparation, GC conditions and retention times, mass spectra and techniques for quantitation. Tobacco smoke is an extremely complex mixture. Names of nearly 500 compounds identified as of 1968 are compiled in a table. Due to advances in analytical technology, the authors point out that "the identifications of literally thousands of other complex molecular structures have been achieved" since that time. Specialized methods of isolating volatiles from tobacco smoke are mentioned. Among the various chemical constituents are CO, CO_2, aliphatic hydrocarbons, ketones, phenolic compounds, low-molecular-weight acids, sulfur-containing compounds, and miscellaneous compounds such as hydrazine, nitric oxide, ammonia, and vinyl chloride. Tobacco alkaloids and their pyrolysis products have been studied in detail, as have the many polynuclear aromatic hydrocarbons identified in tobacco smoke condensates. Methods for analysis of tobacco-related compounds and metabolites in biological media are also reviewed.

Chapter 2, "Natural, Pyrolytic and Metabolic Products of Marijuana", is also divided into sections concerning chemical constituents of marijuana plants, constituents of marijuana smoke, and analysis of marijuana-related compounds in biological media with 240 references through 1978. Structures of natural cannabinoids, synthetic analogues, and metabolites are presented. Much of this review deals with work intended to correlate chromatographic profiles obtained from extracts of plant material with genetic and geographic origins of the marijuana samples. In general, the type of data presented is similar to that presented in the first chapter.

The usefulness of this volume is severely limited by the lack of a consistent format for reporting analytical techniques and data abstracted from original papers. No attempts were made to evaluate relative strengths and weaknesses of the various methods or of data resulting from application of these methods. The emphasis is on including all relevant literature and presenting original data in a loosely organized way, rather than serving the reader by distilling the most important information and presenting it in a readily accessible manner.

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Progress in Drug Metabolism. Volume 4. Edited by J. W. Bridges and L. F. Chasseaud. Wiley, New York. 1980. ix + 335 pp. 15 × 23 cm. $72.00.

The first chapter, titled "Pharmacokinetics in Drug Development", takes a pragmatic approach to pharmacokinetics in an effort to emphasize the importance of the inclusion of pharmacokinetic and bioavailability considerations at every stage of drug development. The authors point out that losses in time and money are virtually inevitable if pharmacokinetic and bioavailability testing are applied solely as an end point in dosage form evaluation. The chapter opens with a brief and nonmathematical introduction to pharmacokinetics. The relationship between the aqueous solubility of a drug and its absorption is discussed, as well as such factors as presystemic metabolism. The importance of pharmacokinetic considerations in pharmacological and toxicological screening and in the development of delivery systems for preclinical and clinical studies is addressed. Of particular interest to medicinal chemists is the section on chemical research in which the authors describe ways in which pharmacokinetic parameters may be altered by chemical manipulation of drug molecules.

The chapter of pharmacokinetics is followed by one on "Gastrointestinal Absorption of Drugs and Other Xenobiotics". Although there is a limited amount of redundancy between this chapter and the first one, emphasis is placed on methods of assessing transport, the role of gastrointestinal motility in absorption, mucosal transport, and the role of circulatory systems in absorption. Eleven pages of the chapter are devoted to a discussion of the relationships between the physicochemical properties of drugs and their absorption from the gastrointestinal tract. This topic is one which is of considerable importance to medicinal chemists who are interested in the optimization of the effectiveness of drugs administered by the oral route.

The third chapter, titled "Drug Bioavailability and Its Clinical Significance", again addresses some of the issues raised in the preceding two chapters. However, the emphasis here is placed on dosage forms, the effect of disease states on bioavailability, and on the bioequivalence of generic drugs.

With Chapter 4 the theme of this volume changes from drug absorption to drug analysis. Titled "The Gas Chromatographic Analysis of Drugs in Biological Fluids", this chapter describes the preparation of biological samples for analysis and the derivatization of drugs for gas–liquid chromatographic analysis. Also included is the obligatory section which describes the components of a gas–liquid chromatograph. The chapter is accompanied by a 38-page appendix consisting of an alphabetical listing of drugs along with certain experimental parameters that are important for the quantitative assay of each drug in biological fluids by gas–liquid chromatography. The appendix includes 631 references to the original literature, making it a valuable source of information to research workers in the field of drug analysis.

High-performance liquid chromatography, a much reviewed subject in recent years, is discussed in the final chapter. There is a section covering general principles (equipment, sample preparation, quantitation, etc.) and a section which discusses the analysis of drugs of various pharmacological classes. An 8-page table provides a useful guide to the primary literature by listing references to the high-performance liquid chromatographic analysis of individual drugs, together with a limited amount of data on experimental conditions.

Although there will be only a limited number of medicinal chemists who will wish to include this volume in their personal libraries, it should be included, along with earlier volumes in the series, in the library of any institution engaged in drug research.

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The Biochemistry of Glycoproteins and Proteoglycans. Edited by William J. Lennarz. Plenum Press, New York and London. 1980. xiv + 381 pp. 16 × 23 cm. $35.00.

The growing awareness of the importance of glycoproteins and proteoglycans in the structure and function of microbial, plant, and animal cells assures that a current, comprehensive text dedicated to these macromolecules would be both a timely and useful book. My overall impression of the book under review, however, was that the title is a misnomer: the book does not present (as claimed by the publisher) a comprehensive overview of glycoconjugates suitable for students and researchers. For example, it quickly (and incompletely) treats fundamental glycoprotein chemistry, including isolation and analysis, and does not address in any depth many glycoconjugate classes, such as those occurring in microbial and plant systems and the glycoproteins involved in animal neural systems. Instead, the main emphasis of the text is on recent advances in mammalian cell-surface glycoproteins, an emphasis stated by Editor Lannarz in his Preface. Thus, I would find a title reflecting this emphasis more appropriate to the contents of the book.

The book is divided into seven chapters dealing with various aspects of glycoprotein structure, biosyntheses, and (postulated) function. As might be expected in a multiauthored text of this nature, there is some overlap and/or duplication of the subject matter, but this is not a serious fault. Chapter 1 is a general treatment of glycoproteins and their oligosaccharide subunits. Since this chapter is, in effect, introducing the remainder of the book, I would have hoped to have seen some (albeit brief) introductory material on the basic structures and linkages of the sugar residues in the oligosaccharide subunits described. Such, however, is not the case and instead the reader is immediately presented with a myriad of glycoprotein structures which, to the uninitiated, could result in considerable confusion.

Chapters 2 and 3 provide an in-depth treatment of glycoprotein biosynthesis dealing with, respectively, the formation of saccharide lipids (such as glycosyl derivatives of dolichol phosphate) and the function of glycosyltransferases. The two chapters thus complement each other in following glycoprotein biosynthesis from sugar nucleotides to the transfer of oligosaccharide chains onto acceptor proteins. For clarity and continuity in understanding the order of the cellular events involved, however, the reader is advised to reverse the order of the chapters. Chapter 3 also includes a second section dedicated to an excellent review of another important class of glycoconjugates, the gangliosides. While the inclusion of material on glycolipids in a glycoprotein text may appear inappropriate, the discussion presented (as well as other discussions on glycolipids such as that found in Chapter 4) illustrates that no comprehensive text dealing with glycoconjugates can (or should) avoid inclusion of chapters devoted to glycolipids and proteoglycolipids.

Chapters 4 and 5 both deal with surface alterations in the glycoproteins on mammalian cells. Such alterations may result in plant lectin resistance (Chapter 4) or offer potential molecular comparisons between the surfaces of normal and malignant cells (Chapter 5). While these chapters overlap somewhat in their subject matter, they both present a good overview of current research utilizing glycoprotein alterations as a tool to study the biosynthesis and structure of a macromolecular class in normal and disease states. These two chapters also illustrate the need to address many cell-surface glycoproteins as specific receptors for various agents acting on or necessary for normal cell function. This concept is the basis for Chapter 6 which updates progress in characterizing the surface glycoproteins of (primarily) hepatocytes which appear to mediate pinocytosis of various compounds into the cells.

Chapter 7 represents the "proteoglycan" portion of the text title and presents a comprehensive review of the structure, biosynthesis, and metabolism of proteoglycans in connective tissue. As might be expected, the emphasis of the chapter is on hyaluronic acid, chondroitin and keratan sulfates, and heparin and their interaction with complexing proteins. This is the longest chapter in the book and the most suitable to a comprehensive text. It is well organized, clearly written, and provides the reader with an excellent review of both the fundamental aspects of proteoglycan chemistry as well as current research on these compounds.

This book, then, is best suited to workers involved in glycoprotein research. Its specialized nature and primary emphasis on mammalian cell-surface glycoproteins do not qualify it as a general text on glycoprotein biochemistry.

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Molybdenum Chemistry of Biological Significance. Edited by William E. Newton and Sei Otsuka. Plenum Press, New York. 1980. x + 424 pp. 16 × 25 cm. $39.50.

This volume is a collection of papers presented at the first meeting on molybdenum chemistry of biological significance, organized by the editors and held in Japan in April, 1979. It includes eight papers on nitrogenase, dealing mainly with kinetics and mechanism as studied with isotopic probes and alternate substrates (e.g., cyclopropene). Another five papers deal with the Mo–Fe cofactor of the nitrogenase complex and related MoFeS complexes as "models" for this cofactor. Another major portion of the book is comprised of 14 papers dealing with inorganic complexes of molybdenum. Included are structural studies employing a wide variety of spectroscopic techniques, as well as kinetic and mechanistic studies of various redox reactions of the complexes and/or their ligand systems. A third section of the book collects more specialized topics, including a simple description of EXAFS (X-ray absorption fine structure) spectroscopy and its application to probing the ligand environment of Mo centers, and papers on other Mo-containing enzymes, including nitrite reductase, formate dehydrogenase, xanthine oxidase, and sulfite oxidase.

The individual papers are well referenced and illustrated; the book is indexed and its production was handled nicely. It is likely that non-molybdenum chemists and biochemists will find it rather specialized and hard to get into. This problem could have been eased by an introductory chapter to set a context for the reader (i.e., what are the hallmarks of molybdenum chemistry and biology and what are the major questions) or by a concluding chapter summarizing the benchmarks in the molybdenum area *after* the conference. Nevertheless, this book represents a valuable source of information on its title subject and can be recommended for both libraries and researchers interested in the biological chemistry of molybdenum.

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The Antigens. Volume 5. Edited by Michael Sela. Academic Press, New York, San Francisco, and London. 1979. 15 × 23 cm. xiii + 410 pp. $38.00.

This volume contains four extremely well-written and inclusive chapters. The first two chapters review tumor antigens and antigens of helminths. Chapters three and four relate to response mechanisms to these tumor antigens.

The chapter on tumor antigens contains sections relating to their biochemical characterization and immunological detection. The authors accurately reflect current knowledge in this area and clearly suggest caution in the analysis of tumor antigens. They point out that many putative "tumor specific" antigens that have been found to be associated with various malignant states are also present in certain benign diseases. Both in vivo and in vitro methods to assess tumor specificity are described. Recent methods utilizing the production of monoclonal antibodies to tumor antigens are cited as offering great promise both in diagnosis and in patient management. The second chapter specifically relates to both the characterization of helminthic antigens and to their immunity. The authors review several animal models currently utilized to study helminths, and their potential limitations of these models, when applied to man, are clearly identified. Animal models have shown that these parasites elicit a local immune reaction which may involve both humoral and cellular responses. The authors also point out that these helminthic-specific antigens when purified can be used both for the detection of this disease and for its clinical management. Another obvious potential use for well-defined antigens is as a vaccine. Chapter 3 is a review on the specific functions of cytotoxic lymphocytes. Following a definition of this class of cells, the authors describe three types of cytolytic responses which include (i) cytolytic T lymphocytes, (ii) antibody-dependent lymphocyte-mediated cytotoxicity, and (iii) natural cytotoxicity mediated by lymphocytes. The specific and nonspecific characteristics and limitations of these response mechanisms are described.

The final chapter is an excellent update and analysis on the complement system. This chapter includes sections on the biochemistry and reaction mechanisms of complement. The tables and diagrams in this chapter are excellent and provide the reader with a quick and accurate analysis of the complement components and the nature of their interactions. This chapter provides the reader with one of the most inclusive reviews of complement that has appeared in the literature to date.

In general, this volume is extremely well-written, carefully updated, and very well referenced. Three of the four chapters, for example, have well over 600 references. Another major advantage of this volume is that it would be extremely useful for people with both limited and advanced backgrounds in the areas covered. The insights and interpretations offered by the authors could provide well-versed readers with new directions. The volume is highly recommended and could be considered required reading for interested investigators.

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Boron in Biologie, Medizin und Pharmazie. By Wolfgang Kliegel. Springer-Verlag, Berlin, Heidelberg, and New York. 1980. x + 900 pp. 17 × 25 cm. $210.10 (DM 356).

Dr. Kliegel has prepared a truly excellent compendium relating to the physiological effects and uses of boron and its compounds in the biological, pharmaceutical, and medical sciences. This book is written in German and contains summaries in English of the various chapters that are presented. The scope of this work and its comprehensive nature makes it a very essential reference for researchers who are involved in any phase of the biological effects and uses of boron compounds. It emphasizes once again the importance of languages other than English to the research scientist.

The author has divided the book into five distinct sections. The first two are very brief, providing an introduction to the subject and a general overview of the biological effects and significance of boron in plants, animal, and man. The third section, which comprises the major part of this textbook, relates to the element itself, its derivatives, and the various boron compounds which have been prepared and used biologically. Unsurprisingly, more than half of this section and nearly 50% of the text are devoted to boric acid and its derivatives. Within this section as well are described the use and effects of boron hydrides and boron–halogen compounds; there is also a major section on organoboron structures. In this latter area, one may find the various organoboranes, the boronic/borinic acids and their derivatives, and the developing area of carboranes.

The fourth section is a very excellent one dealing with the specialized area of neutron capture therapy of cancer that revolves about the unique nuclear properties of the nonradioactive boron-10 isotope and its propensity for absorbing thermal neutrons. The fifth and final section relates to the toxicology of the various boron

compounds. The author emphasizes an important but frequently unstated point, namely, that different boron compounds, as occurs with various carbon compounds, have markedly different toxic effects in animals and man.

In conclusion, this superb text presents in a single volume the current knowledge base and usage of boron and its various compounds in the biosphere and in biomedical research. Without question, it will become a key reference work and one widely used by all biologically oriented researchers who are interested in the use of boron compounds.

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Quantitative Toxicology (Selected Topics). Edited by V. A. Filov, A. A. Golubev, E. I. Liublina, and N. A. Tolokontsev. Translated from the Russian edition (1973) by V. E. Tatarchenko. Wiley-Interscience, New York. 1980. xviii 462 pp. $32.50.

This book is the effort of four Leningrad toxicologists to present a systematic account of the quantitative aspects of toxicology. The 1973 Russian edition of the text has mostly been retained and more current information (through 1977) has been updated in addenda to the chapters. To express toxicological information in quantitative terms is a complex task and the authors have largely based their monographs on Soviet literature and toxicological practive. The first chapter covers the interaction between the poison and the living organism, e.g., the influence of age, biorhythm, routes of exposure, and sex. A discussion of the relationship between the dose and toxic effect follows and is particularly interesting because it considers threshold doses, "toxic action zones", and maximum permissible concentrations. The authors stress that, while factors such as concentration, physiochemical properties, and species determine toxicity, perhaps first and foremost the method used to establish toxicity is crucial to determining threshold doses. Moreover, they recognize that the difficulty of determining such threshold concentrations is compounded by the lack of agreement about what is to be considered a threshold effect. The authors clearly define their concept of "toxic zones" as the slope of the dose–response curve after it has been linearized. About a third of the book is devoted to a fairly complete and standard treatment of kinetic aspects of the absorption and fate of toxicants in the body. This treatment of toxicokinetics ends with the outline of an interesting but highly theoretical model for the kinetics of uptake of stable compounds. Two chapters detail the quantitative evaluation of the cumulation of poisons and poisons acting jointly. Toxicologists in the Soviet Union have always given considerable weight to structure–activity relationships and have developed a number of empirical methods for calculating different toxicity indexes from physiochemical properties and estimating tentative maximum permissible concentrations of new chemicals. An extensive discussion of this approach is given in the last two chapters. Various methods are detailed for calculating biological and toxicity indexes for different classes of organic and inorganic compounds and subsequent use of these indexes in the selection of chemicals for laboratory testing. This book should give an interesting perspective to American toxicologists and serves as a basis for the collaboration of chemists and toxicologists in developing the predictive aspects of the science. Unfortunately, behavioral toxicology, recognized as an important subdiscipline in Russia, receives little attention in this book.

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Books of Interest

Encyclopedia of Chemical Technology. Third Edition. Volume 9. By Kirk-Othmar. Wiley, New York. 1980. xxiv + 902 pp. 18 × 26 cm. $145.00.

Synthetic Peptides. Volume 5. By George R. Pettit. Elsevier Scientific, Amsterdam. 1980. viii + 404 pp. 15.5 × 23 cm. $109.75.

Cholestasis in Infancy. Its Pathogenesis, Diagnosis and Treatment. By Morio Kasai and Kazuo Shiraki. University Park Press, Baltimore. 1980. xiv + 439 pp. 16 × 24 cm. $65.00.

Cell Potassium. By Roderick P. Kernan. Wiley, New York. 1980. xiii + 200 pp. 15.5 × 23 cm. $32.50.

Enzyme Engineering. Future Directions. By Lemuel B. Wingard, Jr., Llia V. Berezin, and Anatole A. Klyosov. Plenum Press, New York. 1980. xiv + 521 pp. 16 × 24 cm. $59.50.

Radio-Immunoassay of Steroid Hormones. 2nd Edition. By Derek Gupta. Verlag Chemie International Inc., Deerfield Beach, FL. 1980. xvi + 256 pp. 17.5 × 24 cm. $48.80.

An Introduction to Synthesis Using Organocopper Reagents. By Gary H. Posner. Wiley, New York. 1980. xvii + 140 pp. 16 × 23 cm. $23.50.