Laboratory for Cancer Research, University of Wisconsin.
(8) J. Pataki, C. Duguid, P. W. Rabideau, H. Huisman, and R. G. Harvey, *J. Med. Chem.*, 14, 940 (1971).
(9) M. S. Newman, W. C. Sagar, and M. V. George, *J. Am. Chem. Soc.*, **82**, 2376 (1960).
(10) (a) J. W. Cook and A. M. Robinson, *J. Chem. Soc.*, 505 (1938); (b) L. F. Fieser and A. M. Seligman, *J. Am. Chem. Soc.*, **60**, 170 (1938).
(11) L. F. Fieser and M. Fieser, *J. Am. Chem. Soc.*, **55**, 3342 (1933). See also L. F. Fieser, *ibid.*, **53**, 3546 (1931).
(12) The phrase "worked up in the usual way" means that an ether–benzene solution of the products was washed with dilute acid and/or base and with saturated NaCl solution. The organic layer was then filtered through a cone of $MgSO_4$ and the solvent removed by distillation or on a rotary evaporator. All compounds designated with an asterisk gave elemental analysis within ±0.3% of the theory for C, H, Cl, and N (where applicable).
(13) We thank Mr. R. Weisenberger for the mass spectra.
(14) M. Orchin and E. Woolfolk, *J. Am. Chem. Soc.*, **68**, 1727 (1946).
(15) All melting points and boiling points are uncorrected.
(16) H. G. Kuivila and O. F. Beumel, Jr., *J. Am. Chem. Soc.*, **83**, 1246 (1961).
(17) M. S. Newman and W. M. Hung, *J. Org. Chem.*, **38**, 4073 (1973).
(18) M. S. Newman and P. H. Wise, *J. Am. Chem. Soc.*, **63**, 2847 (1941).
(19) The present synthesis seems superior to that described by D. Horn and F. Warren, *J. Chem. Soc.*, 144 (1946).
(20) Highly pure sublimed magnesium was obtained through the courtesy of the Dow Chemical Co., Midland, Mich., and from Dr. T. E. Leontis, Battelle Memorial Institute, Columbus, Ohio.
(21) D. E. Pearson, D. Cowan, and J. D. Beckler, *J. Org. Chem.*, **24**, 504 (1959).
(22) Shorter periods of reflux, about 5–10 h, gave much poorer yields.
(23) Used as obtained from Foote Mineral Co., Exton, Pa.
(24) Used as obtained from Sigma Chemical Co., St. Louis, Mo. 63178.
(25) Neutral Woelm alumina (activity I) was used.
(26) We thank the General Aniline and Film Corp. for a generous gift of *N*-methylpyrrolidone.
(27) M. S. Newman and H. Boden, *J. Org. Chem.*, **26**, 2525 (1961).
(28) Data provided by Drs. James A. Miller and Elizabeth C. Miller, McArdle Laboratory for Cancer Research, University of Wisconsin, Madison, Wis.

Book Reviews

Clinical Cancer Chemotherapy. Edited by Ezra M. Greenspan. Raven Press, New York, N.Y. 1975. xvii + 414 pp. 16 × 24 cm. $16.50.

Steady progress in clinical cancer chemotherapy during the last few years has made it increasingly difficult for physicians in private practice to stay abreast of the developments in this field. Several short books on cancer chemotherapy have appeared since 1970 in order to fill this gap and also to provide short, economically priced textbooks for students in general medicine. The latest entry, edited by E. M. Greenspan of the Mount Sinai School of Medicine, consists of 20 short chapters arranged according to tumor type. All the authors are physicians and the overall result is a strong emphasis on the clinical aspects of cancer chemotherapy, though an effort is made to provide at least a brief background in respect to the biochemical and pharmacologic basis of action of antitumor drugs. There is also an interesting appendix consisting of 273 multiple choice, true and false, and matching questions that medical students as well as graduate physicians will find useful in studying for specialty board exams in oncology.

Despite numerous excellent qualities this book suffers from some inadequacies, most of them unfortunately having to do with the "background fundamentals". In Chapter One, for example, folic acid is said vaguely to be a "tumor antagonist" in MTX-resistant L1210 leukemia (p 8). Without amplification this is difficult to understand, especially since the supporting reference by Law is not a published article but a personal communication. Again in the opening chapter, actinomycin D, mitomycin, and the anthracyclines are described rather imprecisely as "protein inhibitors" (Table 1-3, p 10), whereas cyclophosphamide is described as being "atypical phosphamidase activated". On p 11 the phases of the cell cycle are enumerated as "S_1, G_1, S_2 (sic), and G_2". In Chapter Three, chlorambucil is incorrectly named "1-(di-2-chloroethyl)aminophenylbutyric acid" (p 16); the mechanism of activation of cyclophosphamide is said to involve phosphamidase enzymes, but no mention at all is made of the fact that oxidative cleavage of the C–N bond must first take place (p 38); the discussion of 6-MP mentions nothing about the active metabolites of this compound or their multiple sites of inhibition of purine biosynthesis (pp 43–45); and the action of methotrexate and aminopterin is described in a quite unorthodox way as resulting from sequential blockade of dihydrofolate reductase and thymidylate synthetase (pp 45, 46).

There are also a number of small but irritating inaccuracies. For example, vincristine is said to contain a methyl group in place of a formyl group (p 89), whereas in fact it is vinblastine that has the methyl group. Rubidazone is called "rubindazone" (p 90), L-phenylalanine mustard is referred to on one occasion as L-phenylalanine (p 167), and several well-known authors have had their names spelled incorrectly ("Workheiser" on p 68, "Hutchings" on p 88, and "Djirassi" on p 201).

Though medicinal chemists will no doubt derive more benefit from other reference sources, this book still makes worthwhile reading because it provides knowledgeable and sympathetic insight into the complexities that every new drug encounters once it reaches the real world of the clinic. It is also a healthy reminder that, although dramatic gains have been made in the field of cancer chemotherapy during the past 30 years, in some areas the rate of progress has been discouragingly slow.

For those who like to "comparison shop", it should be mentioned that a competitive volume appeared this year in the form of a second edition of "Cancer Chemotherapy" by Cline and Haskell (W. B. Saunders, Philadelphia, Pa.). The two books are of comparable length and both are printed on high-quality glossy paper, though the latter lacks a question and answer appendix.

Sidney Farber Cancer Institute **Andre Rosowsky**
Boston, Massachusetts 02115

Radioimmunoassay in Clinical Biochemistry. Edited by C. A. Pasternak. Heyden & Son Ltd., London. 1975. 299 pp. 16.5 × 25 cm. $29.50.

This volume represents a selection of papers presented at a symposium on Radioimmunoassay and Related Topics in Clinical Biochemistry held at Oxford in 1974. The main subject divisions are General Methodology, Drugs, Steroids, Thyroid Hormones, Protein Hormones, and Antibodies and Other Proteins. Most of the 29 papers are referenced and there is an index.

Several of the papers involved discussions of radioimmunoassay of drugs. Morphine, digoxin, and tetrahydrocannabinol assays are included as well as discussions of radioiodination tags for drugs and immunoreactivity of drug–protein conjugates.

Since this is only a selection of short papers no one topic is covered in detail, but rather a number of topics are briefly covered serving as an introduction to the vast field of radioimmunoassay. Unfortunately, because of the time lag in producing this volume and the fact that this was not an international symposium, its usefulness is limited. Already much of the material covered is dated due to rapid advances in the field. This volume therefore has little usefulness to those interested in or engaged in radioimmunoassay, except from a historic point of view for seeing the "state-of-the-art" in 1974.

Lahey Clinic Foundation **Ann Warner**
Boston, Massachusetts 02215

Lecture Notes on Pharmacology. 11th Edition. By J. H. Burn. Blackwell Scientific Publications, J. B. Lippincott Co., Philadelphia, Pa. 1975. 5 × 7 cm. 159 pp. $7.25.

A vade mecum of this reviewer since its introduction in 1948, "Lecture Notes on Pharmacology", now in its 11th edition, continues to serve the pharmacologist in much the same way that the classic Strunk–White "Elements of Style" serves the writer of English prose, by presenting basic concepts in the fewest possible words; "quintessential pharmacology" would serve as a fitting subtitle.

Continued interest in Professor Burn's little masterpiece stems from its highly selective up-dating. In the present edition, for example, recent developments are set forth in the following areas: (1) hypertension, in which the therapeutic efficacy of propranolol is shown to operate through a mechanism involving primarily suppression of the secretion of renin and, secondarily, suppression of adosterone; (2) fever, pain, and inflammation, in which inhibition of the synthesis and release of prostaglandins appears to underlie the action of the antipyretic analgesics (this reviewer has the feeling that this may be an oversimplification, however, especially with respect to the pain-relieving activity of aspirin); (3) gastric hypersecretion, in which the antihistaminic activity of two relatively new drugs, metiamide and burinamide, appears related to their action upon H-2 receptors; (4) the mode of action of vitamin D, in which the role of 1,25-dihydroxycalciferol (kidney hormone) figures prominently; and (5) barbiturate poisoning, in which the antidotal effects of ephedrine and digoxin are attributed to their reversal of the great decrease in cardiac output.

For those interested in quantitative pharmacology, the last chapter is especially valuable in that the author succeeds admirably in simplifying statistical concepts. For the pharmacologist, toxicologist, clinician, pharmacist, and, above all, the student of pharmacology, Professor Burn's book will have great appeal. I can recommend it, not only for its content but for its readability and style.

Department of Pharmacology **John F. Reinhard**
Massachusetts College of Pharmacy
Boston, Massachusetts 02115

Trace Substances and Health. A Handbook. Part I. Edited by Paul M. Newberne. Marcel Dekker, New York, N.Y. 1976. ix + 398 pp. $34.50.

This book contains five chapters, each chapter being a brief review of a class of environmental trace substances.

Chapter 1 ("Enterotoxin-Mediated Diseases", by William R. Beisel, 66 pp, 277 ref) is a pretty complete review of the literature through 1973. This chapter is very broad in scope covering therapy for enterotoxin-induced illness, enterotoxin purification techniques, physical properties of some enterotoxins, and biological effects in man and animals. The chapter is well written and provides interesting reading.

Chapter 2 ("Mycotoxins in the Environment", by Ronald C. Shank, 91 pp, 422 ref) provides "an extensive list of references ... to more detailed information in the literature" through 1973. Having no background in the area of mycotoxins, this reviewer found the chapter to be very enlightening. Especially interesting was the detailed section concerning the chemistry of the mycotoxins; indeed, most of the chapter is devoted to the chemistry of these substances. A portion of the chapter relates to the acute and chronic toxicity of mycotoxins in man.

Chapter 3 ("Pesticides", by Franklin D. Aldrich and Judith F. Gooding, 84 pp, 257 ref) provides very little specific information but a plethora of general information on the subject. The shortcoming of this chapter is that the authors tried to condense too many topics into one chapter. The purpose of the book would have been better served if one chapter each had been devoted to insecticides, herbicides, and rodenticides. The information in this chapter is so general that it will be of little benefit to the active researcher in this area. There were typographical (or spelling) errors in this chapter as well as some inconsistencies regarding the usage of chemical and pharmacological nomenclature.

Chapter 4 ("Food Chemicals and Food Additives", by Herman F. Kraybill, 73 pp, 167 ref) is supposedly devoted to the biological effects of chemicals found in food. Only the last 14 pp of the chapter relate to this topic, and then the author has supplied only cursory information. For example, five paragraphs cover the "cyclamate controversy" and only five paragraphs are devoted to nitrates, nitrites, and nitrosoamines. This is the weakest chapter in the book. Anyone seeking information regarding the effects of food additives on human and animal health would be advised to search elsewhere.

Chapter 5 ("Trace Elements and Health", by Donald J. Horvath, 37 pp, 137 ref) was a pleasure to read. Frequent reference is made throughout this chapter to a number of critical review articles. The author has summarized the literature highlights, especially 1970–1974, regarding the beneficial and deleterious effects of essential and nonessential trace elements on animal and human health. This chapter is very well written and serves the purposes of the book admirably.

The book has an adequate subject index, and there is an author index. The latter is really unnecessary in this type of book. "Trace Substances and Health" should make a nice addition to an institutional library inasmuch as chapters 1, 2, and 5 would be very helpful to someone beginning research in these areas and seeking brief literature reviews. The book cannot be recommended for personal libraries inasmuch as the generality of the individual chapters would provide little new information to the active investigator in these areas of research.

College of Pharmacy **Danny L. Lattin**
University of Arkansas for Medical Sciences
Little Rock, Arkansas 72201

Handbook of Psychopharmacology. Section I. Basic Neuropharmacology. Volumes 1–6. Edited by L. L. Iverson, S. D. Iverson, and S. H. Snyder. Plenum Press, New York and London. 1975. $22.50–$29.50 per volume.

In the past decade, a basic science of psychopharmacology has developed and grown rapidly. Advances in understanding the effects of psychopharmaceuticals on the brain have been made so rapidly that a new research paradigm has evolved. Not only are research efforts directed at understanding the mechanism of action of psychotropic agents but these drugs are now employed as powerful chemical tools to help elucidate brain function. Consequently, psychopharmacology has become a central concern of neuroscientists from many fields, e.g., neurobiology, psychiatry, and psychology. So much neuropsychopharmacological research has been conducted in recent years that it seems a herculean, if not actually impossible, task for scientists to keep current of all the latest advances. This series is offered as a comprehensive evaluation of neuropharmacology, behavioral pharmacology, pharmacological classification, and drug use and abuse.

Presented in three sections, this handbook series extensively reviews the major facets of psychopharmacology. Section I, Basic Neuropharmacology, attempts to relate basic neurochemistry and neuropharmacology to an understanding of the actions of psychotropic drugs. Section II, Behavioral Pharmacology in Animals, and Section III, Human Psychopharmacology, are in preparation. Section I is divided into six volumes. Each volume is approximately 300 pages long and is subdivided into 6–8 chapters, each written by a different author. Volume 3, Biochemistry of Biogenic Amines, and Volume 6, Biogenic Amine Receptors, were not available for review.

Volume 1, Biochemical Principles and Techniques in Neuropharmacology, focuses on new conceptual and technological approaches to psychopharmacological research. Chemical methods of measuring neurotransmitters (e.g., mass fragmentography, GLC, immunochemistry, and enzymatic–isotopic techniques) are discussed along with new systems for studying neurotransmitter function (e.g., tissue culture and isolated nerve terminals). Most of these chapters offer a critical analysis of the advantages and limitations of the various techniques. However, this is not a "cookbook" handbook and actual step-by-step procedures are not detailed.

Volume 2, Principles of Receptor Research, deals with new biochemical and neurophysiological methods which help to identify neurotransmitter receptors. The chapters in this book discuss electrical recordings of brain activity in vivo and in tissue culture as well as methodological approaches to ligand–membrane interactions, structure–activity relationships for receptor agonists and antagonists, denervation supersensitivity, and microiontophoresis. A chapter on techniques used for intracerebral administration of drugs is also included.

Volume 4, Amino Acid Neurotransmitters, characterizes the localization, metabolism, and action of these putative neurotransmitters like GABA, glycine, taurine, glutamate, aspartate, and the peptide hormones in the CNS. Most of the chapters emphasize the biochemical considerations of these compounds, such as chemistry and transport mechanisms, rather than pharmacological approaches.

Volume 5, Synaptic Modulators, covers the numerous chemicals known to affect synaptic transmission but which may or may not be neurotransmitters themselves. Chapters in this volume include: the effect of drugs on energy metabolism of brain and on cerebral transport; the role of cyclic nucleotides in the nervous system; purinergic transmission; hypothalamic hypophysiotropic hormones; the action of steroid hormones in the CNS; opiate receptor mechanisms. Unfortunately, no space is devoted to a discussion of the actions of prostaglandins in the nervous system.

This section on Basic Neuropharmacology in the Handbook of Psychopharmacology series is, in essence, a compilation of well-written critical reviews of various areas within the field. Each review (i.e., chapter) is written by a recognized expert in his specialty and successfully covers developments which have occurred in the last 5–10 years. Herein lies the difficulty in evaluating this tome: is a useful purpose served in gathering these articles together in a series of volumes (six in Section I and perhaps another 12 in preparation) such as this? Each chapter is similar in approach, content, and length to what many journals publish, especially those such as annual reviews and the various "advances" and "progress" journals. Little apparent advantage is gained on the basis of convenience, cost, or recency when compared to review journals. While important concepts are briefly explained or discussed, this series is not a textbook or teaching device for students unprepared in the area. An important element which is missing from this series, one that might better justify its single "handbook" title, is an attempt to interrelate each chapter or volume. There is only a 2-page preface for the entire six volumes. Each chapter stands completely independent aside from its being placed in a volume with other topics more or less in the same area. It would be helpful, and probably unique, if somewhere within the series one or more sections would be devoted to relating the material presented in each chapter to an overall picture of how each element fits into making up what we call psychopharmacology. Perhaps the "state of the art" of psychopharmacology has not yet evolved to this stage and thus preparing such a picture is an impossible task; if so, it would be unfair to expect any comprehensive analysis to tie these reviews together. But without such an effort, this series and other less extensive ones similar to it will continue to heap building blocks of data into a pile with no one attempting to place them into a structure or theoretical framework.

The stated goal for Section I of this series is to relate basic neuropharmacology to an understanding of the actions of psychotropic drugs. However, there is little discussion among these chapters on neurotransmitters, their receptors and methods for their measurement about anesthetics, hallucinogens, neuroleptics, sedative-hypnotics, and other classes of drugs which readily come to mind when someone mentions psychopharmacology. While there can be no question of the overwhelming importance of the role that neurotransmitters function as mediators of many drug effects in the CNS, a majority of the reviews appear to deemphasize information regarding drug–neurotransmitter interactions. Also, little attention is paid to the role the drugs themselves are playing as tools to help dissect and study brain function. Perhaps these data will be covered more fully in the succeeding two sections presently in preparation.

College of Pharmacy and Allied Health Professions
Northeastern University
Boston, Massachusetts 02115
Jeffrey B. Blumberg

Amino Acids, Peptides, and Proteins. Volume 7 (Specialist Periodical Reports). Edited by R. C. Sheppard with 21 contributors: The Chemical Society, London. 1975. xvi + 431 pp. 14 × 22 cm.

The latest volume in this continuing series covers the literature published in 1974, and one does not cease to be amazed at the speed and efficiency with which these Specialist Periodical Reports are turned out. The format remains essentially unchanged from year to year; only the list of "reporters" seems to vary a bit. It is obvious that the editor has developed a beautiful working plan, and though the end product is very terse and unassuming, the total effort behind it must be gargantuan.

The book was compiled by 21 contributors this time (compared to 18 in the previous one) and the total number of papers referenced is in excess of 3100, although actually there are now about 15% fewer pages. As always, there is a great deal of tabulated information, e.g., lists of some 300 individual proteins whose molecular weight, subunit structure, and partial or total amino acid sequence were reported during 1974. These tables stand as a mute testament to the limitless variety of proteins with which the plant and animal kingdoms are stocked, as well as to the untiring inquisitiveness of the chemists whose careers are spent in the study of these molecules.

The greatest number of pages (about 50% of the book in fact) is devoted to structural investigations of polypeptides and proteins, including chemical modification, x-ray, and solution conformation studies. The second largest section deals with advances in the field of peptide synthesis, and others cover individual amino acids, the chemical structure and biological activity of enzymes, and the chemistry of metal derivatives. Overall, the arrangement of material follows closely the organization of Volume 6 which was reviewed recently [*J. Med. Chem.*, 19, 858 (1976)]. Regrettably there is still no subject index.

For the convenience of ACS members, incidentally, the Specialist Periodical Reports may be obtained directly from the Books and Journals Division of the American Chemical Society.

Sidney Farber Cancer Institute
Boston, Massachusetts 02115
Andre Rosowsky

Peptides: Chemistry, Structure and Biology. Edited by Roderich Walter and Johannes Meienhofer. Ann Arbor Science Publishers, Ann Arbor, Mich. 1975. 1053 pp. 14.5 × 22.5 cm. $34.50.

This volume is a compendium of papers presented at the Fourth American Peptide Symposium and attests to the current extensive interest in all phases of peptide research. The topics covered are as follows: Conformational Studies, Synthetic Studies, Biologically Active Peptides, Brain Specific Peptides, Neurohypophyseal Hormones and Neurohypophysin Proteins, Hypothalamic Peptides, Antibiotics, Enzyme Inhibitors and Toxins, and Analytical and Isolation Procedures. A tribute to Lyman C. Craig is also included. All 121 papers are indexed and include references.

Since the book covers the current work of a large number of peptide chemists, it is an accurate reflection of the current state of the art and an invaluable reference for anyone interested in peptide research.

Lahey Clinic Foundation
Boston, Massachusetts 02215
Ann Warner

Drug Metabolism. Chemical and Biochemical Aspects. By B. Testa and P. Jenner. Marcel Dekker, New York, N.Y. 1976. xiii + 500 pp. $47.50.

This important and timely book is divided into two principal parts, one of which is devoted to the chemical aspects of drug metabolism and the other to the biochemical and physiological aspects. Part I presents an excellent review of the chemical pathways of foreign compound biotransformation. It is pleasurable and exciting reading, primarily because the authors have illustrated almost every example with large, bold, carefully drawn structures. Frequently the authors have taken the trouble to number the key positions in structures so that readers can easily relate them to the discussion. They almost invariably state the species in which a specific study was done and indicate whether the results being described are from in vitro or in vivo experiments. They often mention species differences in metabolite formation and helpfully point out that certain products are artifacts rather than true metabolites.

Bioorganic mechanisms involved in certain biotransformations are discussed where evidence is available, and in those instances where the evidence is not compelling, the authors offer just enough speculation to whet the appetite of a medicinal chemist. In no instance do they go into depth regarding the mechanistic implications of such processes as the NIH shift, but enough detail is presented to convey the concepts.

Each biotransformation pathway is presented in a short, independent section with its own set of references; this is one of the very attractive features of the book. A minor problem encountered in reading Part I is that the reader is very frequently referred forward or backward to structures and reaction schemes. Such an arrangement is necessary in order to avoid repetition of structures, but the reader is inconvenienced by being referred to sections of the book rather than to specific pages. Even though the sections are short, a good deal of time was spent paging through the sections in search of structures to which the authors had alluded.

One of the hazards associated with writing a book on a dynamic and rapidly proliferating subject such as drug metabolism is that some of the information presented is bound to be obsolete by the time the book is published. Indeed, a great number of developments have occurred since early 1974 which is apparently when the authors had to terminate their literature survey. The authors state on p 45 that K-region epoxides of polycyclic hydrocarbons are responsible for carcinogenesis; evidence reported in the past two years, however, indicates that this is probably not the case. No mention is made of the recently reported epoxide reductases and the numerous developments concerning reactive metabolites are, for the most part, not included. On p 139 the authors correctly point out that cleavage of the aromatic ester of cocaine does not occur in humans; however, one month after the publication of this book, a paper appeared which reported the detection of this hydrolysis product of cocaine in humans. Obviously, the authors can no more be held responsible for facts which changed after they completed their writing than they can be blamed for the unconscionable price which the publisher is charging for their book, but readers must be aware that many of the "truths" of xenobiotic metabolism are tentative, at best.

Throughout the entirety of Part I, the authors do an outstanding job of covering the chemical aspects of oxidations, reductions, hydrolyses, hydrations, dehalogenations, and conjugations. The emphasis is on the catalysis of these transformations by enzymes found in mammalian tissues, but the contributions of intestinal microflora are not overlooked. The authors present the material logically and systematically, although at times their systematizing seems a bit strained. For example, the division of esterase substrates into groups in which the alcoholic or acidic portion of the ester is larger seems somewhat artificial, particularly when it is stated that hydrolytic removal of the smaller group is usually not an inactivation process, and this is followed almost immediately by a discussion of the inactivation of pethidine (meperidine) by ester hydrolysis. Occasionally (rarely) misleading or confusing statements are made. Such is the case on p 119 where the authors state that they know of no example of an alcoholic group adjacent to an aromatic ring being oxidized to a ketone, while on pp 248 and 311 they discuss the oxidation of indanol to indanone. Such an oxidation is also known for methylphenylcarbinol.

A chapter on the stereochemistry of drug metabolism is very nicely done and there is also a chapter on the physicochemical aspects of drug metabolism, the brevity of which only reflects the paucity of available information. A highlight of Part I is the presentation of the metabolic schemes for 15 selected drugs. These schemes are frequently referred to throughout Part I and they serve to emphasize the numerous metabolic transformations which a single drug may undergo. Thus, while the authors lead us carefully and expertly through several examples of each individual type of metabolic transformation in the early sections of Part I, they use their 15 metabolic schemes to drive home the complexity of the matter in a most imaginative and informative way.

Part II of the book is devoted to the biochemical aspects of drug metabolism. The first chapter of this section provides a brief, nevertheless, comprehensive review of the drug-metabolizing enzyme systems. The presentation is clear and would provide an excellent introduction to this subject for the novice. The material is presented in a logical sequence and correlates with the reactions discussed in Part I of the book. The second chapter in Part II is a review on the induction and inhibition of drug-metabolizing enzyme systems. The stated object of this chapter is to contribute to a basic understanding of the mechanisms involved in enzyme induction and inhibition. The authors were, indeed, successful in achieving this goal. This chapter does not discuss the clinically significant outcomes of induction and inhibition of drug-metabolizing enzyme systems, a subject of great contemporary interest.

The third chapter of Part II is devoted to the discussion of the physiological factors which influence drug metabolism. Factors discussed are species differences, strain differences, sex differences, age differences, and other factors such as temporal, environmental, and nutritional factors. Biochemical considerations are included in the discussion of some of these factors and their interactions are also emphasized. Numerous examples are presented to underscore the qualitative and quantitative effects of these factors on the metabolism of xenobiotics. This chapter should prove to be very useful especially to readers with chemical orientation. In the final chapter of the book the authors review extrahepatic drug metabolism. It contains tables showing tissue distribution of phase I drug-metabolizing enzyme systems and conjugating systems. This chapter also contains a discussion of the comparative morphology and enzymology of hepatic and extrahepatic subcellular fractions, developmental aspects, and species variation in extrahepatic metabolism. A brief discussion with a table of types and examples of reactions carried out by intestinal flora as well as a discussion of placental metabolism is also included in this chapter.

In conclusion, this book fills a void which existed in the literature of drug metabolism. It provides an excellent compilation of major review articles as well as primary references and may well become as widely used as the classic 1959 text on drug detoxification by R. T. Williams.

Department of Medicinal Chemistry and Departments of Pharmacology and Medicinal Chemistry University of Minnesota Minneapolis, Minnesota 55455

Mahmoud M. Abdel-Monem
Patrick E. Hanna