the characteristic peak at 2265 cm^{-1}, but satisfactory elemental analysis could not be obtained. A solution of this product (0.592 g, 3.67 mmol) in dry PhH (3.5 ml) was added to **5** (0.50 g, 3.67 mmol) suspended in PhH (3.5 ml) containing Et_3N (1 ml). After stirring overnight with moisture excluded, the reaction mixture was filtered and washed (H_2O). The yield was 0.565 g (51%). The compound was recrystallized several times from hot DMF–MeOH, and the crystals were washed with Et_2O: mp 247–253° (softens at 243°). *Anal.* ($C_{16}H_{15}N_3O_3$) C, H, N.

1,3-Bis(5-acetyl-2-pyridyl)urea Bis(guanylhydrazone) (6b) Hydrobromide. To the symmetrical urea derivative **6a** (90 mg, 0.302 mmol) in DMF (1 ml) were added 16% HBr (0.5 ml) and aminoguanidine sulfate (93 mg, 0.755 mmol). The solution was heated to boiling, when a light brown precipitate formed, yielding 186 mg (94%) of 6b. Considerable difficulty was experienced in crystallizing the material, since it precipitated as a gel from hot DMF: mp 230–235° dec, with shrinking at 217°. *Anal.* ($C_{17}H_{25}Br_3ON_{12}$) C, H, N.

1-(4-Acetylphenyl)-3-(5-acetyl-2-pyridyl)urea Bis(guanylhydrazone (7b) Hydrobromide. To the unsymmetrical urea derivative 7a (0.167 g, 0.563 mmol) in a solution of DMF (1.5 ml), MeOH (1.8 ml), H_2O (0.5 ml), and 16% HBr (0.5 ml) was added aminoguanidine sulfate (0.194 g, 1.58 mmol) and the mixture was heated. The product precipitated immediately. After standing for 3 hr and filtration, it was washed with Me_2CO, yielding 0.30 g (85%). The product was purified by repeatedly dissolving it in DMF containing HBr and precipitating it with either MeOH or isobutyl alcohol. Finally the product was washed with H_2O and then with Me_2CO. *Anal.* ($C_{15}H_{25}Br_2N_{11}O \cdot 2H_2O$) C, H, N.

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Book Reviews

Synthetic Methods of Organic Chemistry. Vol. 26. Edited by W. Theilheimer. S. Karger, Basel, Switzerland. 1972. 576 pp. 15 × 22.5 cm. $79.80.

This new volume of Theilheimer introduces the sixth series of this important work much to the appreciation of chemists engaged in organic synthesis. Almost 1000 new references to papers published between 1969 and 1971 are presented in the usual systematic manner. New references to material in the preceding series have been included and the index also contains additional and revised entries to former volumes. The useful survey on trends in synthetic organic chemistry appears for 1972 in this volume.

In an informal survey of this department, it was found that a considerable number of graduate students engaged in organic synthesis did not use Theilheimer, primarily because of difficulty in mastering the classification system. Each volume contains explanatory notes on classification and actual examples are given in volume 2, which, unfortunately, is now out of print and consequently may be unavailable in some newer libraries. Thus, the editor may give some consideration to providing a more extensive discussion of the classification system, including examples, in the next volume. It would be a pity for anyone engaged in organic synthesis not to have complete command of this worthwhile series.

Department of Medicinal Chemistry Kevin H. Bell
College of Pharmacy
University of Minnesota
Minneapolis, Minnesota 55455

Regulation of Purine Biosynthesis. ACS Monograph 170. By J. Frank Henderson. American Chemical Society, Washington, D. C. 1972. 303 pp.

The ACS Monograph Series is intended to serve two purposes: first, to provide a thorough treatment of a selected area for persons working in unrelated fields so that they may correlate their own work with a larger area; second, to stimulate further research in the specific field treated. Dr. Henderson's monograph should serve both purposes admirably. The worthwhileness of surveying such a narrow field as the regulation of purine biosynthesis might be open to question had not the author done such an excellent job of relating the subject to such clearly important and diverse topics as the whole field of intermediary metabolism, human diseases resulting from aberrant rates of purine synthesis, and the mechanism of action of such important drugs as 6-mercaptopurine. "Regulation" is defined broadly to include all factors which actually or potentially affect the rate of purine biosynthesis or constituent parts of the pathway.

The first chapter is devoted to an overview of purines in nature and an introduction to the mechanisms of regulation of the *de novo* pathway. The second chapter then discusses in detail the *de novo* pathway, and the third chapter, only four pages long, describes the properties of the individual enzymes that carry out each of the ten steps of the pathway. The fourth chapter on substrate concentrations, which includes lengthy sections on related subjects such as the pathways of glycine synthesis and their regulation, the folate metabolizing enzymes, and the importance of δ-aminolevulinate and methionine and which is actually almost one-half of the text, illustrates the complexity of the subject and points up the fact that our current knowledge, as Dr. Henderson puts it, "represents merely the top of an iceberg." In chapter five the author points out that the physiological significance of end-product inhibition of purine biosynthesis *de novo*, considered by many to be *the* control mechanism, is, in fact, not clear today, particularly in mammalian cells *in vivo*. The paucity of information on the subject of chapter six–regulation of enzyme amount and genetic regulation–is more widely appreciated. The chapter on the effects of drugs on purine biosynthesis is not as thorough and complete in its coverage as most of the preceding chapters, perhaps because this subject has already been reviewed extensively in the literature and is really not a major concern of this work. Even so, information very pertinent to the mechanism of

action of some of the purine antimetabolites, particularly the thiopurines, is not discussed.

In the opinion of the reviewer, this book is a definitive statement of the status of our knowledge of purine biosynthesis *de novo* today. It is a must acquisition for workers in the field or persons interested in learning about this important area of biochemistry. The book is relatively free from errors and of high quality.

Southern Research Institute John A. Montgomery
Birmingham, Alabama 35205

The **Isoquinoline Alkaloids: Chemistry and Pharmacology.** By Maurice Shamma. Vol. 25. Organic Chemistry, A Series of Monographs. Alfred T. Bloomquist and Harry Wasserman, Ed. Academic Press, New York, N. Y. 1972. xviii + 594 pp. 16 × 23.5 cm. $35.00.

This volume represents the 25th in a series of monographs whose stated aim is "to present the chemistry, spectroscopy, biogenesis, and pharmacology of the isoquinoline alkaloids." The book is not intended to be a compendium such as Manske's "The Alkaloids." It is a particularly pleasant surprise to find discussions in each chapter on the degradation, syntheses, reactions, absolute configuration, biogenesis, and, when available, X-ray crystallography, mass, uv, and nmr spectroscopy, and pharmacology as it pertains to the particular alkaloidal class in a precise, well organized, and uniformly readable style.

Included in the discussion as separate chapter headings are all of the alkaloidal types which might be expected to be considered as isoquinoline bases. However, the author points out that his discussion excludes the morphine, hasubanonine, Erythrina, Amaryllidaceae, tubulosine, and colchicine series which others may have incorporated as isoquinoline bases. A brief appendix includes the occurrence of the isoquinoline alkaloids by plant families. There are author and subject indexes.

The author has succeeded in keeping the chemical discussions in this book current and up to date. The literature is surveyed in detail generally through 1971 with many references included from 1972. Although chemistry pervades all the chapters, this reviewer must comment on the pharmacological data presented for most of the alkaloids discussed. In many instances the treatment of these is too brief and its presentation too elementary in scope and outlook to be of great value to the active workers in the field. Literature citations are often fragmentary or not well referenced. Typical of these is the statement on p 78 that "the ketonic and tetrahydrobenzylisoquinoline, BB 572, is a smooth muscle relaxant, a gastric secretion inhibitor, and a tachycardic as well as a β-adrenergic simulator" (or stimulator?) (no reference cited). Citations as they pertain to pharmacological effects of compounds are frequently 10–20 years old. In spite of such shortcomings this book is not only recommended reading and reference material for medicinal chemists, organic chemists, and biochemists, but for students and researchers interested in the many facets of natural product chemistry as well. With the exception noted, the author's stated aims have been admirably achieved.

Department of Medicinal Chemistry and Pharmacology John L. Neumeyer
College of Pharmacy and Allied Health Professions
Northeastern University
Boston, Massachusetts 02115

Carbonium Ions. Vol. III. Major Types (Continued). Edited by George A. Olah and Paul von R. Schleyer. Wiley-Interscience, New York, N. Y. 1972. xii + 535 pp. 23.5 × 16 cm. $29.95.

In the first three volumes in this series (a total of five are planned), the editors have maintained a well-organized overview of a rather complex subject. When taken in perspective, the series serves to record the development of the discipline quite nicely, with the first volume devoted to historical and analytical considerations and the second to generalized methods of formation and chemical properties. Also in the second volume a specific survey of the major types of carbonium ions is begun. This survey is continued throughout the present third volume and will also make up the entire fourth volume.

Specifically, Volume III covers the major areas of the classical–nonclassical ion investigations, but from a historical point of view, and successfully places this formerly controversial topic in its proper perspective. After reading the various chapters, one is left with the feeling that each molecular system must be judged on its own merits and that many systems cannot be assigned to either classical or nonclassical behavior. The development of the greatly increased chemical awareness that resulted from the controversy certainly is well illustrated in this volume.

Fittingly, this volume is dedicated to the late Professor Saul Winstein, who did so much to advance the field of organic chemistry. Thus the book's initial chapter is a reprint of the Centenary Lecture given by Professor Winstein to the Chemical Society (London) in 1967, in which the concepts of nonclassical ions, homoconjugation, and homoaromaticity are elucidated to such a degree that much of the material remains current today. These concepts are further discussed in the following chapter concentrating on homoallylic and homoaromatic cations. No monograph on the classical–nonclassical ion problem would be complete without a discussion of the 2-norbornyl cation, and this is extensively reviewed by G. Dann Sargent in the third chapter. Following this is a set of two chapters covering the topics of cyclopropyl carbonium ions derived from the cyclopropylcarbinyl system. The volume is concluded with a lengthy review of phenonium ions, subtitled the "Solvolysis of β-Arylalkyl Systems."

All factors considered, the book covers its chosen topics extremely thoroughly and quite deeply, although at times seemingly *ad nauseam*. The necessary inclusion of the numerous studies which contributed to the evolution of physical organic chemistry could conceivably limit the book's usefulness mainly to persons trained in physical organic chemistry, for unless one has a basic familiarity with the concepts on which the work is based, much of the details become somewhat hard to follow. The collective work is timely, however, as an exhaustive compilation of the previous two decades of carbonium ion chemistry. At the present time, when physical organic chemistry in its own right is becoming less emphasized in active research but its principles are being applied to other fields of chemistry, the presence of a comprehensive review of the original literature close at hand can prove invaluable.

University of Minnesota James G. Henkel
Minneapolis, Minnesota 55455

Neuropharmacology and Behavior. By V. G. Longo. W. H. Freeman, San Francisco, Calif. 1972. xiv + 184 pp. 16 × 24 cm. Clothbound, $6.95. Paperbound, $3.95.

This brief, fascinating book will be appreciated more by the nonexpert than the expert in the field of psychoactive drugs. It consists of a six-page introduction entitled "Chemotherapy of Mental Diseases" followed by four chapters on the antipsychotics, the antidepressives, the tranquilizers, and the hallucinogens. A short history of the discovery and development of each group of drugs is presented along with a summary of their most important pharmacological effects in man and animals. Uses and side effects of the therapeutically important drugs are discussed and even a smattering of structure–activity information is included. Emphasis is placed upon the electrophysiological effects of the drugs, but biochemical studies receive much briefer treatment. The longest chapter covers hallucinogenic drugs. This chapter includes the expected coverage of mescaline and related compounds, LSD, psilocybin, and marihuana, as well as a number of minor hallucinogens such as bufotenine, dimethyltryptamine, diethyltryptamine, oloiugui, and fly agaric (amanita muscaria). The anticholinergic and anesthetic hallucinogens are also mentioned. The combination glossary–index is helpful in guiding the novice through some of the technical terminology and adds to the general usefulness of the book.

As the author points out in the preface, he has worked in the field of neuropharmacology from its infancy and the book presents an overview of the development of the field as seen by a practicing scientist. In order to attain broad coverage in a small book, the author has had to limit his discussion. This lends both strength and weakness to the presentation. Clarity has not been sacrificed for the sake of brevity and therefore the reader can attain a sound introduction to the subject without a large investment of time. On the other hand, one frequently finds himself wishing that the author had provided a more in-depth analysis of the information. A refreshing aspect of the book is the author's comments on the contribution of various experimental techniques to the understanding of the central actions of drugs such as LSD. His words of caution regarding the meaning and interpretation of experimental results are welcome.

University of Minnesota Patrick E. Hanna
Minneapolis, Minnesota 55455