chromatography, and the melting and mixture melting points of the synthetic product (IV) with an authentic sample of dehydrocycloheximide (7) revealed that the two products were, in fact, identical.

Our research on the synthesis of IV was initiated on the model enamine (VI) prepared from piperidine and 2-methylcyclohexanone (V) since it has been suggested that enamines which are substituted in the 2-position might not undergo reaction (5). However, we have found that enamines of this type are reactive; thus, condensation of the model enamine (VI) with glutarimide-β-acetyl chloride (III) resulted in the formation of a 25% yield of (±)-nordehydrocycloheximide (VII), thereby establishing that acylation at the 6-position is feasible. The reason that the yield of VII and of IV was not over 50% is most probably caused by the fact that the distilled enamine is actually a mixture of double bond isomers in which the double bond is either at C_1-C_6 or C_1-C_2. Since only that isomer in which the double bond is at C_1-C_6 (II or VI) can give IV or VII, the reduction in yield can readily be understood. Evidence that the enamine is a mixture of double bond isomers is available from its infrared spectrum. Thus, in the C=C region, II exhibits two peaks, one at 1680 cm.$^{-1}$ and one at 1645 cm.$^{-1}$ The enamine VI also exhibits peaks at 1670 cm.$^{-1}$ and 1640 cm.$^{-1}$ However, the enamine prepared from cyclohexanone and piperidine exhibits only one peak in the C=C region at 1645 cm.$^{-1}$ This result would be predicted for this enamine since it cannot exist in an isomeric form as can II or VI.

One final point which requires comment is the stereochemical assignment of the methyl groups of dehydrocycloheximide (IV). It has been established that in cycloheximide the methyl groups are *trans* (1, 4), but no proof of the stereochemistry of dehydrocycloheximide has been reported. However, the present synthesis of dehydrocycloheximide (IV) establishes that the methyl groups are *trans* since IV was synthesized from (+)-*trans*-2,4-dimethylcyclohexanone (I). It might be argued that the α-methyl group of I could be isomerized during the preparation of the enamine, but this hypothesis was shown to be rather unimportant when it was found that the acid catalyzed hydrolysis of the enamine (II) regenerated a 75% yield of (+)-*trans*-2,4-dimethylcyclohexanone (I). This result therefore offers strong support to the assignment of the *trans* methyl groups in dehydrocycloheximide (IV).

(1) Schaeffer, H. J., and Jain, V. K., THIS JOURNAL, **50**, 1048(1961).
(2) Schaeffer, H. J., and Jain, V. K., *ibid.*, in press.
(3) Lawes, B. C., *J. Am. Chem. Soc.*, **82**, 6413(1960).
(4) Lawes, B. C., *ibid.*, **84**, 239(1962).
(5) Stork, G., Terrell, R., and Szmuszkovicz, J., *ibid.*, **76**, 2029(1954).
(6) Phillips, D. D., Acitelli, M. A., and Meinwald, J., *ibid.*, **79**, 3517(1957).
(7) Kornfeld, E. C., Jones, R. J., and Parke, T. V., *ibid.*, **71**, 150(1949).
(8) Lemin, A. J., and Ford, J. H., *J. Org. Chem.*, **25**, 344 (1960).

HOWARD J. SCHAEFFER
VIJAY K. JAIN

Department of Medicinal Chemistry
School of Pharmacy
State University of New York at Buffalo
Buffalo

Received January 25, 1963.
Accepted for publication February 13, 1963.
The research described in this paper was submitted by V. K. Jain in partial fulfillment of the Ph.D. degree requirements.

This investigation was supported in part by a Public Health Service research career program award CA-K6-18718 from the National Cancer Institute and in part by Research Grant CY-4812 from the National Cancer Institute, National Institutes of Health, Public Health Service.

Book Notices

Year Book of Drug Therapy. 1962–1963 Series. Edited by HARRY BECKMAN. Year Book Medical Publishers, Inc., 35 E. Wacker Drive, Chicago 1, Ill., 1962. 648 pp. 13 × 20 cm. Price $8.50.

A new section has been added to this revised volume entitled "Precautions," replacing the section entitled "Critical Evaluation of the Year's New Drugs." As with prior editions, the major presentation is through abstracts covering reports of new therapeutic or prophylatic uses and applications of drugs during the "series year." The abstracts are well written in the concise and meaty form which has become characteristic of this series. In the newly added section, sketches of accumulated experience regarding the toxic actualities and potentialities of drugs in current use will be of invaluable assistance to pharmaceutical and medical personnel.

Protein Metabolism. Edited by F. GROSS. Springer Verlag, Berlin-Wilmersdorf, Heidelberger Platz 3/, West Berlin, Germany, 1962. xi + 521 pp. 14 × 20.5 cm.

The proceedings of an international symposium are reported—the fourth in a series of such symposia sponsored by Ciba, Ltd., Basle. Major topics covered by the participants include: Action of hormones at the cellular level; Factors influencing protein metabolism in the organism; Evaluation and mode of action of anabolic steroids; Protein metabolism in human pathological states; and

Effects of anabolic agents in man. Papers presented and the discussions which followed are reported under the pertinent topic heading. Subject and author indexes are included for ready access to items of particular interest to the reader.

Chemistry of Carbon Compounds. Vol. 5. Edited by E. H. RODD. American Elsevier Publishing Co., Inc., 52 Vanderbilt Ave., New York 17, N. Y., 1962. xv + 912 pp. 15 × 22 cm. Price $29 single; $26 series.

This concluding volume in this series furnishes a general index to the entire five volumes and supplements, in part, selected topics in which there have been conspicuous advance during the decade which has elapsed since the work was started. The general index covers 676 pages. Topics included in this volume are The preparation and use of isotopically labelled organic compounds, Natural acetylenic compounds, Developments in carbohydrate chemistry, and The structure of proteins.

Tables of Random Permutations. By LINCOLN E. MOSES and ROBERT V. OAKFORD. Stanford University Press, Stanford, Calif., 1963. 233 pp. 15.5 × 23.5 cm. Price $7.

Tables of random permutations of 9, 16, 20, 30, 50, 100, 200, 500, and 1000 integers are provided. The source was the RAND deck of a million random digits; the method utilized to generate permutations from the random integers is described in detail in an appendix. The authors point out that for many common uses in the biological, physical, and social sciences and in engineering, tables of random numbers are less useful than tables of random permutations.

Practical Pharmaceutical Chemistry. By. A. H. BECKETT and J. B. STENLAKE. The Athlone Press, University of London, 2 Gower Street, London, S.C. 1, 1962. viii + 378 pp. 15.5 × 25 cm. Price $10.10.

As a student text in quantitative pharmaceutical chemistry, this book covers a wide variety of methods for the control of chemical purity in medicinal substances. The classical methods of volumetric and gravimetric analysis and limit tests for trace impurities are included but in addition, the authors have included complexiometric, electrometric, and conductometric titration techniques, titration in nonaqueous media, aquametry, and the use of ion-exchange resins in analysis. Instrumental methods based on absorptiometry, spectrophotometry, fluorimetry, and polarography are also included. The first three chapters cover chemical purity and its control and the technique and theoretical basis of quantitative analysis. Along with chapters on specific techniques, the book also includes a chapter on the theory of absorption spectra.

Infrared, Ultraviolet, and Visible Absorption Spectra of Some USP and NF Reference Standards and Their Derivatives. By ALMA L. HAYDEN, OSCAR R. SAMMUL, GEORGE B. SELZER, and JONAS CAROL. Association of Official Agricultural Chemists, Box 540, Benjamin Franklin Station, Washington 4, D. C., 1962. 104 pp. 17.5 × 25.5 cm. Price $2.

Infrared, ultraviolet, and visible absorption spectra of 175 USP and NF Reference Standards are illustrated, together with structural formulas and recording data. Infrared absorbance spectra of 32 organic nitrogenous bases derived from some of these standards are also presented. Text and tables describe, in considerable detail, sample handling and recording techniques.

Recent Developments in the Sterilization of Surgical Materials. A Symposium. The Pharmaceutical Press, 17 Bloomsbury Square, London, W.C. 1, 1961. xi + 232 pp. 15 × 23 cm. Paperbound. Price $7.

This paperbound volume reports a symposium on recent developments in the sterilization of surgical materials held at the University of London in April of 1961 and consists of papers presented and discussions during the symposium. The report covers sterilization by ionizing radiation, gaseous methods of sterilization, and sterility tests. It is indexed by subject.

The Chemistry and Manufacture of Cosmetics. Vol. 2. By MAISON G. DENAVARRE. D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J., 1962. xiv + 413 pp. 15.5 × 23.5 cm. Price $12.50.

Included in this second volume of a four volume set is extensive coverage of the materials used or of potential use in cosmetics manufacture. Each class of material is arranged alphabetically and fully described to include its chemistry, toxicity, commercial materials, cosmetic uses, germicidal properties, methods of manufacture, emulsifying properties, hazards, and sources. Essential formulations are also included. When the four volumes of this second edition are completed, the cosmetic chemist will have a ready reference to assist him in his work.

Staining, Practical and Theoretical. By EDWARD GURR. The Williams and Wilkins Co., 428 East Preston St., Baltimore 2, Md., 1962. xii + 631 pp. 15 × 22 cm. Price $16.

The author's stated objectives in writing this book are to present new ideas regarding the mechanism and theory of staining reactions and to bring together, in concise form, a large number of staining procedures previously scattered throughout the literature. He has succeeded in providing an encyclopedic reference volume. Some 700 stain formulas and 300 procedures are included. The first section of the book deals with theoretical considerations and the second section provides procedures in monograph form, frequently with a boldfaced description of the use of the particular stain. A third section contains the formulas for the stains, fixatives, and tables needed in this work. An index for rapid reference completes the book.

Readings in Pharmacology. Edited by LOUIS SHUSTER. Little, Brown and Co., 34 Beacon St., Boston 6, Mass., 1962. xii + 548 pp. 15.5 × 23.5 cm. Paperbound. Price $5.50.