folic acid series is discussed separately and includes a résumé of the physiological actions of the substances, as well as of possible biosynthetic routes.

In keeping with the tradition of this series, excellent bibliography, author and subject indexes are supplied, and the physical appearance of the volume is of a high caliber. Chemists and biologists alike will welcome the volume as an addition to their libraries.

RESEARCH DEPARTMENT
CIBA PHARMACEUTICAL PRODUCTS, INC. HANS HEYMANN
SUMMIT, NEW JERSEY

Heterocyclic Compounds with Indole and Carbazole Systems. The Chemistry of Heterocyclic Compounds. Volume VIII. ARNOLD WEISSBERGER, Consulting Editor. By WARD C. SUMPTER, Western Kentucky State College, Bowling Green, Ky., and F. M. MILLER, University of Maryland, Baltimore, Md. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1954. xii + 307 pp. 16 × 23.5 cm. Price, $10.00 single copy, $9.00 subscription price.

This book, dealing with indole and carbazole systems, contains a review of the methods of synthesis of the simpler compounds such as indole, carbazole, isatin, oxindole, isatogens and indoxyl, and an account of the properties and reactions of these compounds and their more complex derivatives. A résumé of the highly complex naturally-occurring indole derivatives also is included. The material is systematically presented and the reader obtains a good idea of the methods of preparation and the reactions of the indolic type of compounds although, as the authors mention, they have not attempted to duplicate Beilstein in listing every compound. The chapter on indigo, for instance, does not delve at length into the details, yet it supplies an overall picture of the problem at hand and the way it was solved.

It is stated in the preface that the literature up to the end of 1952 has been consulted and that several important papers of 1953 have been included. Some omissions such as the structure of corynantheine, based on work published in 1950–1952, and the latest structure of alstonine, published in 1952, lead one to the conclusion, however, that the literature survey for 1950–1952 at least has not been too thorough. Furthermore, under the heading tryptophan, one would have expected to find some mention of kynurenine, and the biochemical relationship of these two substances. It is also regrettable that the book is marred by numerous typographical errors that careful proof-reading would have avoided.

Not to end on a discordant note, however, the book should be very helpful to the chemist in supplying him with a bird's-eye view of a most complex field of organic chemistry and biochemistry in which research in recent years has been most active.

DIVISION OF PURE CHEMISTRY
NATIONAL RESEARCH COUNCIL LEO MARION
OTTAWA, CANADA

Grignard Reactions of Nonmetallic Substances. By M. S. KHARASCH, Professor of Chemistry, The University of Chicago, and Otto Reinmuth, Research Associate, The University of Chicago. Prentice-Hall, Inc., Publishers, 70 Fifth Avenue, New York 11, N. Y. 1954. xxii + 1384 pp. 15 × 23 cm. Price, $15.00.

Someone once remarked that if a speaker at a gathering would ask "Is there an economist in the house?" positive replies would come not only from the few followers of Adam Smith who might be present but also from bankers, merchants, brokers and industrialists. Similarly, a question put to a group of chemists "Is there someone here who knows about Grignard reactions?" might elicit almost universal response, for who among us has not carried out a Grignard reaction? If pinned down, however, few of us would care to be quizzed on the large area covered by Kharasch and Reinmuth. The fact that no modern comprehensive treatise is available on a subject as common as this is testimony to the tremendous literature on the subject. The authors would have performed a valuable service if they had prepared nothing but a bibliography, but the critical expository treatment combined with the judicious care in presentation make this a reference work of unusual importance.

The size of the book may discourage some persons from attempting to delve into its contents, but actually of the 1384 pages less than 450 pages represent text since there are over 900 pages of tables and 37 pages of index. The reviewer found the index useful for broad categories but not so helpful in locating specific compounds. So much of the information is tabular, however, that this would be expected.

A detailed chapter on preparation of Grignard reagents is followed by one on their constitution and dissociation, then one on some radical reactions of Grignard reagents, followed by eighteen chapters covering reactions with compounds containing the various functional groups. Much of this presentation, of course, is factual copy of published work, but the authors have been motivated throughout to explain the observations in terms of modern theory and to evaluate conflicting data in the light of their own experience.

A few of the topics dealing with Grignard reactions which are given this type of critical appraisal include the radical reactions, Grignard reagent enolate formation, α-halo ketone dehalogenation, the concept of a quasi 6-membered ring transition state in many Grignard reactions, constitutional factors affecting order of addition, mechanisms of carboxylic ester reactions, hindered alkyl esters, speculations on the reaction mechanisms with acyl halides and acid anhydrides, effective migratory aptitudes in epoxide ring opening, and reaction mechanisms with alkyl halides.

Although this book will be invaluable as a work of reference, it seems reasonable to predict that chemists, intending to use it only for reference purposes, will find themselves staying to read it long after the reference is located. It is that kind of book.

NORTHWESTERN UNIVERSITY
EVANSTON, ILLINOIS CHARLES D. HURD

Solvents and Allied Substances Manual with Solubility Chart. Compiled and edited by C. MARSDEN, B.Sc., A.R.I.C., British Industrial Solvents, A Division of The Distillers Company Limited. Elsevier Press, 402 Lovett Boulevard, Houston, Texas. 1954. xii + 429 pp. 16.5 × 25 cm. Price, $12.95.

The author states in the preface that he "has necessarily accumulated a mass of information on solvents and allied chemicals currently in commercial production. . . . A careful and critical study of this conflicting data has been made and the outcome is offered in this volume. That all the information contained in it should be completely accurate is too much to hope but the more serious discrepancies and variations in published information and figures have been eliminated by careful selection in an effort to ensure that the data here presented are as accurate as possible in terms of present knowledge."

In a typical example of one of the more common solvents, such as acetone, where naturally fairly complete information was available, the following data are given. Under physical characteristics and properties are listed: mol. wt., b.p., m.p., flash point (closed and open cup), auto-ignition temperature, specific gravity, refractive index at 20 and at 25°, caloric value, specific heat at 20°, coefficient of cubic expansion at 20° and the mean from 0–100°, electrical conductivity at 20°, dielectric constant at 20°, explosive mixtures with air at 20° (upper and lower limits), latent heat of evaporation, latent heat of fusion, evaporation rate (for ether = 1 and for *n*-butyl acetate = 100), dilution ratios for cellulose nitrate solutions for water, toluene, xylene, petroleum naphtha and butanol, viscosity, surface tension at 20° and at 30°, vapor pressure, solubility in water, critical temperature, critical pressure and critical density. Other information given relates to methods of manufacture, industrial grades, azeotropes, physiological properties, and storage and handling. The main manufacturers both in the United States and in Britain are given for each solvent.

In other instances, particularly for very special proprietary solvents, comparatively very few data are given. For example, under "Intrasolvan E," a product whose manufacture is confined to Britain, only four physical characteristics are listed together with storage and handling.

The manual contains 17 short appendices. Each of these will be useful, particularly the index of trade and proprietary names and the list and addresses of manufacturers. A solubility chart is included in band on the inside of the back cover.

Each solvent is assigned a preferred name in bold caps. Regrettably, not all of these conform with accepted nomenclature. It is difficult to reconcile hexylene glycol with $(CH_3)_2C(OH)CH_2CH(OH)CH_3$. Immediately below each preferred name in brackets are listed lesser names which presumably are used in the trade. Many of these are incorrect. For example, isohexyl alcohol represents $(CH_3)_2CHCH_2CH_2CH_2OH$ and not $(C_2H_5)_2CHCH_2OH$ as given in the manual. Mention should also be made of the frequent yet improper use of the prefix iso with an alkanol such as isobutanol, isohexanol, isopropanol and others.

Some errors are present in the manual. Production of dioxan from ethylene glycol is by dehydration and not dehydrogenation as stated on page 153. Nitropropane is listed as nitropeopane in the index. Octadecadiene is misspelled on page 391.

The publishers recommend the manual as a reference book for industry, especially that concerned with paints, lacquers, varnishes, pharmaceuticals, perfumery, cosmetics, essences and flavorings, soaps and lubricating oils, dyestuffs and pigments, petroleum refining, textile processing, dry cleaning, rubber processing and plastics. The book is recommended for consideration by scientists in these fields, although usefulness of the manual will be somewhat limited particularly in view of some omissions from the list of solvents, among which are acetonitrile, dimethylformamide, dimethyl phthalate, nitroethane, nitromethane, 1-nitropropane, 2-nitropropane, tricresyl phosphate, to mention a few.

RESEARCH DEPARTMENT
R. J. REYNOLDS TOBACCO COMPANY MURRAY SENKUS
WINSTON-SALEM, NORTH CAROLINA

Tables for Predicting the Performance of Fixed Bed Ion Exchange and Similar Mass Transfer Processes. By ASCHER OPLER, Project Leader, Research Department, The Dow Chemical Company, and NEVIN K. HIESTER, Senior Chemical Engineer, Stanford Research Institute, Stanford Research Institute, Stanford, California. 1954. iii + 111 pp. 21.5 × 27.5 cm. A limited number of free copies are available and will be furnished as single copies to requestors.

This book is a competent tabulation of the Bessel solutions to the differential equation initially proposed by H. Thomas, which empirically correlates ion exchange column behavior. According to this equation

$$\left(\frac{dq}{d\gamma}\right)_v = kC_a\,q_b - \frac{k}{K_{ab}}\,q_a\,C_b$$

where k is a rate constant, γ is a time-dependent parameter, K_{ab} is a concentration equilibrium constant and C, q refer to the concentration of each species in the outside solution and that inside the resin, respectively.

The initial portion of the book is devoted to a demonstration of the applicability of the above equation to ion exchange column behavior under various boundary conditions and in general to other related phenomena such as heat transfer and adsorption of the Langmuir type. The authors obtain a series of empirical constants which they relate to such ion exchange operating parameters as flow rates, column length, void space, resin selectivities, diffusion rates, etc.

The remainder of the book is devoted to a description of the mathematical techniques used, and a tabulation of specific solutions for a wide range of operating conditions. The authors, moreover, include representative examples which are helpful in clarifying the tables. It would have been useful and pertinent, however, to have compared predicted performance with actual experiment.

As for mathematical techniques, the authors rely to a considerable extent on the $(1 - J)$ values compiled by Brinkley. They obtain the solutions of Bessel functions in part by means of an asymptotic expansion suggested by L. Onsager. An elaborate punch card system has been set up by the authors and the project is well executed. It should be noted however, that the advent of such instruments as the "Oracle"[1] should result in a considerable extension both in scope and accuracy of tabulations of this sort, because such instruments permit a direct calculation of the Bessel function.

For those who are concerned with a fundamental understanding of ion exchange column behavior, the tables are not as complete as could be desired. Although the mathematical task would have been considerably more difficult, it would have been very valuable to have determined more solutions as a function of the fractional degree of attainment of equilibrium. Moreover, the basic differential equation as applied to column performance assumes that the exchange selectivity is independent of resin composition. When one realizes that in some cases this value can change at least tenfold during experiment, considerable caution must be exercised in making such an assumption.

For the most part, the tables contain a considerable number of solutions of columns operated under "breakthrough conditions" and should prove to be highly useful to chemical engineers concerned with column design for a particular separation problem.

(1) Oak Ridge automatic computer and logical engine, an electronic digital computer.

CHEMISTRY DIVISION
OAK RIDGE NATIONAL LABORATORY B. SOLDANO
OAK RIDGE, TENNESSEE

Organic Syntheses. Volume 34. By WILLIAM S. JOHNSON, Editor-in-Chief. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1954. v + 121 pp. 15.5 × 23.5 cm. Price, $3.50.

It is said that procedures submitted to *Organic Syntheses* should involve "The preparation of compounds which are of general interest" or should "illustrate useful synthetic methods." The adequacy of this volume as to the first requirement is largely a matter of opinion (one may take heart, if one's current interests have been overlooked, in the thought that new volumes, like new theories in education, will appear at more or less regular intervals). Surely, compounds such as di-*tert*-butyl malonate, diphenylacetylene, diphenyl succinate, ethoxyacetylene, methylisourea hydrochloride, phenanthrenequinone and *o*-phthaldehyde fall within this category.

Several contributions appear to fulfill the second objective. Among these may be cited the arylation of quinone (p. 1), the conversion of an acid to its nitrile (p. 4), the conversion of an ester into its ethoxalyl derivative with subsequent decarbonylation of the latter (p. 13), the peroxide-initiated interaction of aldehydes with ethyl maleate to form acylsuccinic esters (p. 51), the Darzens glycidic ester synthesis (p. 54), the conversion of a succinate to a thiophene (p. 73), the sulfonation of an olefin (p. 85), side-chain bromination (pp. 82, 100), and the very interesting conversions of trimethylbenzylammonium salts into *o*-methylbenzylamines (p. 56, 61). Of special interest is the synthesis of *p*-tolylsulfonylmethylnitrosamide (p. 96) and its use in the preparation of diazomethane (p. 24, 99).

The present volume appears to be well up to the standards set by preceding volumes in clarity of description, freedom from typographical errors, and general excellence of printing, diagramming and indexing.

DEPARTMENT OF CHEMISTRY
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