with a small Bunsen flame or an electric heating coil. As soon as the arc strikes, a stream of water is immediately run over the lamp. Soft water or distilled water should be used. The lamps operate satisfactorily on 3 to 5 amperes with a potential drop of 60 to 300 volts. The upper electrode is positive.

The intensity varies with the individual lamps but the intensities on the different lines have been found to be approximately ten times or more as great as those obtained with commercial lamps operating under normal conditions. Uranyl oxalate has been decomposed at the rate of 0.5 g. of oxalic acid per minute using a cylindrical cell around the lamp. Raman effects have been observed with shorter exposures than are required with other lamps.

Some lamps have given fifty hours of service but when operated at very high intensity they usually fail after ten hours. Many lamps have shown but little decrease in intensity over the first few hours.

The lamp described here is particularly useful for illuminating spectrometer slits or for irradiating small volumes of material. Experiments are being continued also with metals other than mercury.

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NEW BOOKS

Einführung in die theoretische Wirtschaftschemie. (Introduction to the Principles of Economic Chemistry.) By Dr. Phil. RUDOLF KOETSCHAU. Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1929. xii + 155 pp. 13 figs. 15.5 × 23.5 cm. Price, unbound, RM. 12; bound, RM. 13.50.

Scientists in the past, starting from the known or central truth of phenomena, have tended to explore outward almost exclusively along the straight line of their own discipline. Chemists stuck to chemistry, and biologists to biology.

In the last few decades, however, there has been a steady obliteration of boundary lines, and a continually increasing coöperation among specialists. Research in the no man's land between the natural sciences is bringing astounding results, now partly embodied in texts on physical chemistry, biochemistry, astrophysics and the like. The social scientists have likewise exchanged results among themselves. But the natural sciences and the social sciences have generally been thought in the main to lie in different strata.

Dr. Koetschau does not think so. In fact, he believes that a new science ought to be recognized: economic chemistry or chemical economics. It

conceivably might be the forerunner of a host of hybrid sciences—economic botany, economic geology, etc. All such new sciences need analytical working tools, concepts unequivocally defined. Such Dr. Koetschau's book purports to give for economic chemistry.

It quite naturally divides itself into three main parts: an introductory essay on epistemology, a description of certain alleged economico-chemical concepts for which sundry symbols are coined, and a manifesto consisting of twenty theses or tentative generalizations, presented in the approved medieval manner for verification, modification or nullification.

The first part (pp. 1–29, 55–65) endeavors to prove that economics and chemistry as sciences lie on the same plane, that their concepts are germane, and that, therefore, cross-fertilization is possible. The familiar contentions of the Neo-Kantians, especially Windelband, Rickert, and Cassirer, are adduced. The natural sciences and the social sciences both use the quantitative-mathematical method of fixing the orbit of their concepts, and in so far as that is true, their concepts are not contradictory, but correlative. The arguments of Oppenheim in his "Natural Classification of Sciences" are also used. In short, no gulf exists between the natural and the social sciences. Their laws differ in degree, not in kind. In other words, it is possible for a science of theoretical economic chemistry to exist.

The second part (pp. 29–55, 65–86) describes four sets of concepts, supposedly coördinate, which lie in the domain of economic chemistry. The first consists of the totality of chemical and physico-chemical processes in so far as they have or can have economic significance. The symbol "ch" is used to designate all the laws of homogeneous and heterogeneous chemical equilibria for all states of aggregation—the law of mass action, the Le Chatelier principle, the phase rule, etc. The second set of concepts comprises (p. 45) the totality of changes of matter which are purposively manipulated to take place in definite amounts during a set period of time. Chemical processes can now be represented by vectors, which, when combined, show a definite quantum of salable product. All the principles which guide the chemical technologist, such as the tendency to substitute continuous for batch processes, are designated by the Greek letter χ. The third set of concepts, represented by the letter w, comprises the numerous laws (sic! p. 50) which economics has discovered; laws which have reference to demand, supply, value, credit, and so on; laws which, by assuming that business is run to maximize profits, formulate the interaction of the forces at work in a given system of interdependent economic equilibria, and evaluate their benefit or harm to society as a whole. A superficial attempt is made to utilize the results of statisticians and of mathematical economists such as Schumpeter and Pareto. The fourth set of concepts, designated by the Greek letter τ, logically it ought to come third, represents all those principles of procedure, both technological and commercial, which are

commonly implied in the phrase, "the present state of the arts." τ stands for all those practices of sound business administration, plant location, process costing, etc., which Mr. Chaplin Tyler has so ably elucidated in his "Chemical Engineering Economics."

Thus the transition is made from pure chemistry via chemical technology and business technique to economics. A science is mapped out which is designed to coördinate the efforts of the chemist seeking the truth for its own sake, the endeavors of the chemical engineer interested primarily in the technological perfection and dovetailing of the productive processes, the energies of the business man worshiping profits, and the theoretical and practical programs of the political economist endeavoring to maximize social income and general prosperity.

The third part of Dr. Koetschau's book consists of twenty theses, which in part recapitulate, and in part trace interrelationships between, the four sets of concepts. The result, as one might expect, is meager. Chemists who go into business must keep in mind that chemical processes must be adjusted so as to earn maximum profits. Such are the platitudes to which the theses can be reduced, so that one has the distinct feeling of being all dressed up in formidable terminological clothes, with no place to go.

Finally, attention must be called to the extraordinary amount of reading which has been epitomized in the book. Over 210 authors are cited, twenty of them more than five times, in about 130 pages of text. The volume shows not only ingenuity in the coining and defining of terms, but also an heroic, even if to the skeptical reader an unsuccessful, attempt to found a new science.

THEODORE J. KREPS

The American Illustrated Medical Dictionary. A Complete Dictionary of the Terms used in Medicine, Surgery, Dentistry, Pharmacy, Chemistry, Nursing, Veterinary Science, Biology, Medical Biography, etc., with the Pronunciation, Derivation, and Definition. By W. A. NEWMAN DORLAND, A.M., M.D., F.A.C.S., Lieut. Colonel, M.R.C. U. S. Army, Member of the Committee on Nomenclature and Classification of Diseases of the American Medical Association; Editor of American Pocket Medical Dictionary. Fifteenth edition, revised and enlarged with the collaboration of E. C. L. MILLER, M.D., Professor of Bacteriology and Biochemistry, Medical College of Alabama. W. B. Saunders Company, Philadelphia, 1929. 1427 pp. 16 × 23 cm.

This fifteenth edition of a volume first issued in 1900 has been amplified and brought up to date by the inclusion of many new terms, and is reset from new type. The reasons for its popularity may easily be understood. The typography and the arrangement of material are excellently chosen, making it convenient to consult and read. Some 70,000 of the terms of medicine and related arts and sciences are contained in it. The definitions are brief, encyclopedic discussions being happily absent. The many illus-

trations are for use rather than ornament; and the hundred or so tables are admirably selected, sufficiently complete and carefully arranged, whereby the user's time and effort are economized.

Many terms in the borderland subjects of medicine have been included, and here lies its value to chemists, for not only may the common terms of chemistry be found but also the words and phrases of modern biological science with which the chemist of today is increasingly concerned.

Although in the introduction it is stated that the nomenclature adopted by the American Chemical Society (among others) has been followed, this is not always true, nor is the chemistry invariably as modern as would appear desirable. Soda, for example, is defined as "a loose term which generally refers to sodium hydrate, (NaOH)"; and the spelling hydrochinone is preferred to the commonly accepted form hydroquinone. Nevertheless, for its borderline terms alone it is valuable and should be available to every student and worker in the biological sciences.

WILLIS A. BOUGHTON

Handbook of Chemical Microscopy. Vol. I. By ÉMILE MONNIN CHAMOT, B.S., Ph.D., Professor of Chemical Microscopy and Sanitary Chemistry, Cornell University, and CLYDE WALTER MASON, Assistant Professor of Chemical Microscopy, Cornell University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. xiii + 474 pp. 162 figs. 15.5 × 23.5 cm. Price, $4.50.

"The present Handbook of Chemical Microscopy is an attempt to present in logical and concise form the principles and methods involved in practical microscopy. * * * Altho based on 'Elementary Chemical Microscopy,' the present book has been entirely rewritten, and expanded in all sections. * * * Much of the material here compiled and discussed for the first time in book form is of paramount importance to all microscopists * * * . Volume I has been confined to a discussion of optical principles of instruments, manipulative methods of general application and the observation of physical and physico-chemical phenomena." The purposes indicated in the preceding extracts from the preface have been well carried out. The first chapters discuss the microscope in general, and the microscope for chemical use in particular. More attention might well have been given to the petrographic microscope, since the more accurate measurement of properties, as opposed to merely qualitative observation, is becoming of increasing importance in general work. Subsequent chapters give adequate discussions of illumination methods, ultramicroscopy and photomicrography and much detailed information is given of special manipulative procedures. The determination of melting points with the aid of a hot stage surely is not inherently so inaccurate a procedure as is implied in the footnote to the table on page 211: "Melting points as observed under the microscope are apt to be several degrees lower than

those recorded above." A great deal of attention is given to petrographic methods, including the study of crystals in both polarized and non-polarized light, and, on the whole, the discussion is unusually clear. The difficult subject of interference figures and their interpretation is well treated. The difference between the "Becke line" and the bright line obtained with axial illumination is not clearly brought out, and in subsequent discussion leads to some confusion. In practice the Becke test is used far less than the axial illumination method, and the remarks on page 374 concerning their relative accuracy apply equally well to anisotropic substances. In the footnote on page 376 mention should also be made of the publications of Winchell, "The Optic and Microscopic Characters of Artificial Minerals," University of Wisconsin Studies in Science No. 4, and Fry, "Tables for the Microscopic Identification of Inorganic Salts," Bull. No. 1108, U. S. Dept. of Agriculture. The sentence, middle of page 377, beginning, "If the material is uniaxial * * ," is misleading; the index for the ordinary ray, ω, is determinable on every grain, but only when it is oriented properly with respect to the polarizer. A grain cannot lie in such a manner as to show β, and appear isotropic, as implied near the top of page 378. It does not necessarily follow from $(\gamma - \beta) > (\beta - \alpha)$ that the grain is positive, as stated on page 378; this is a first approximation that does not hold when the birefringence is large.

The increased scope of this book as compared with "Elementary Chemical Microscopy" will greatly add to its value both as a textbook and for general reference, and it is encouraging to think of a generation of chemists equipped to make use of the powerful aid of the microscope both to supplement and to replace chemical analysis. The illustrations are well done. The reviewer will look forward with great interest to the appearance of Vol. II.

GEORGE W. MOREY

Colloid Symposium Monograph. Vol. VI. Papers presented at the Sixth Symposium on Colloid Chemistry, University of Toronto, June, 1928. Edited by HARRY BOYER WEISER, Professor of Chemistry, The Rice Institute. The Chemical Catalog Company, Inc., 419 Fourth Avenue, New York, 1928. 346 pp. Illustrated. 16 × 23.5 cm. Price, $6.50.

Colloid Symposium Annual. Vol. VII. Papers presented at the Seventh Symposium on Colloid Chemistry, Johns Hopkins University, June, 1929. Edited by HARRY BOYER WEISER, Professor of Chemistry, The Rice Institute. John Wiley and Sons, Inc., New York, 1930. viii + 300 pp. Illustrated. 15.5 × 23.5 cm. Price, $4.50.

The annual Colloid Symposia have been foci of research enthusiasm and the annual volumes containing the papers delivered at these Symposia have been and are important factors in the publication of American chemical research. The articles thus published are not only useful, but

in marked contrast with much of our periodical literature in chemistry they are interesting. This is due in part to the great variety of subjects covered under the caption of Colloid Chemistry, but chiefly to the fact that these articles are often not merely the report of a single detached investigation but are a readable summary of all of the author's researches and those of others in the field.

The two most recent volumes (VI and VII), containing the papers presented at the annual Symposia on Colloid Chemistry in 1928 and 1929, are particularly varied and interesting in their contents. It is perhaps invidious to select particular articles for special mention, for such a selection is at once highly subjective and arbitrary. The reviewer cannot, however, refrain from calling attention to the brilliant, trenchant and interesting introductory address in the 1928 volume, entitled "Living Matter," by Sir William B. Hardy, and to the very instructive articles in the same volume, by Alfred J. Stamm on "The Structure of Softwoods" and by A. Baird Hastings on "The Rôle of Hemoglobin in the Blood."

Again in the 1929 volume, the paper by A. Frumkin, entitled "Significance of the Electrocapillary Curve," is an unusually careful and exhaustive study of this difficult subject. The article by Donald H. Andrews, entitled "Some Evidence on the Nature of Extra-Molecular Forces," appears to offer a promising and novel avenue of attack to this fundamental problem.

Attention should be called to the fact that the name of the publication has been changed in the 1929 volume from Colloid Symposium Monograph to Colloid Symposium Annual, and that the publishing firm has also been changed. The editor and publisher are to be congratulated on their success in reducing the price from $6.50 to $4.50 for practically the same sized volume without any sacrifice of appearance or quality.

ARTHUR B. LAMB

Organic Syntheses. An Annual Publication of Satisfactory Methods for the Preparation of Organic Chemicals. Vol. X. Edited by HANS T. CLARKE, with ROGER ADAMS, JAMES B. CONANT, HENRY GILMAN, C. S. MARVEL, C. R. NOLLER and FRANK C. WHITMORE. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, 1930. vii + 119 pp. 15.5 × 23.5 cm. Price, $1.75.

Inasmuch as the Editorial Board of Organic Syntheses is preparing a revised collection of the material presented in the first nine volumes, volume ten is treated as the first number in the second decade of the series and contains no index to preceding volumes. "Otherwise no departure has been made from the general plan adopted in recent numbers, beyond the inclusion of a rather greater proportion of organic preparations of a biochemical rather than a strictly synthetic character."

The list of preparations is as follows: acetol, *n*-amyl benzene, benzene-

sulfochloride, benzophenoneoxime, bromoacetone, α-bromonaphthalene, casein, *o*-chlorobenzoic acid, dimethylglyoxime, diphenylmethane imine hydrochloride, durene, duroquinone, erucic acid, ethyl fumarate, ethyl oxomalonate, glutaric acid, heptanol-2, lauryl alcohol, malononitrile, methyl oxalate, *m*-nitroacetophenone, oxalic acid (anhydrous), α-phenyl-β-benzoylpropionitrile, piperonylic acid, 1-propylene glycol, isopropyl lactate, pyromellitic acid, β-resorcylic acid, sodium 2-bromoethanesulfonate, taurine, *l*-tryptophane.

E. P. KOHLER

Der adsorbierende Bodenkomplex und die adsorbierten Bodenkationen als Grundlage der genetischen Bodenklassifikation. (The Adsorbing Soil Complex and the Adsorbed Cations of the Soil as a Basis for the Genetic Classification of Soils.) BY Professor K. K. GEDROIZ, Leningrad. Translated from the second edition of the original Russian by Dipl.-Ing. H. KURON, Assistant in the Agricultural Chemistry Institute of the University of Breslau. Foreword by Professor Dr. Paul Ehrenberg. Theodor Steinkopff, Residenzstrasse 32, Dresden-Blasewitz, Germany, 1929. viii + 112 pp. 15.5 × 23.5 cm. Price, unbound, RM. 5.

The author discusses the problem of soil classification and genesis on the basis of the chemical and physical characteristics of the soil colloid. His general conclusion is that such knowledge of soil colloids as we now possess is adequate for a separation of the soils into broad fundamental groups but it is not adequate for a more detailed classification. The great soil groups which he discusses are the chernozem, the solonetz, the podsol and the laterite. If this conclusion were the net result of his discussion the book was perhaps not worth review, but such is not the case. He not only discusses the present state of our knowledge of the genesis of the soils and the composition of the colloids derived from widely varying kinds of soil but he presents a tactful and critical review of the recent literature on the subject, especially that from American and Russian sources.

He presents a coherent theory of the nature of the soil colloid and supports it with cogent theoretical and experimental evidence. His ideas are cautiously expressed and interspersed with regrets because of the frequent lacunae in our information and the paucity of experimental evidence, especially of the relationship of the bases in the soil colloid.

Because of his high position as a soil scientist his ideas are worthy of careful consideration and will be found stimulating even though, as he says himself, many of them are purely speculative and may not receive general acceptance. His consideration of alkali soils is especially important because he, if any one, is in a position to speak with a certain authority in that field.

The book is certainly to be commended to the attention of any one interested in soil research.

HORACE G. BYERS