

methoxide, the major product was 2-carbomethoxy-3-ketothiophane (oil, b. p. 116–116.5° [9 mm.]). From this keto-ester, a *semicarbazone* (m. p. 187–187.5° [mixed with the semicarbazone of the other isomer, m. p. 170–176°]. *Anal.* Calcd. for $C_7H_{11}O_3N_3S$: C, 38.7; H, 5.1. Found: C, 38.8; H, 4.7), a *monobenzylidene derivative* (m. p. 129–130°. *Anal.* Calcd. for $C_{13}H_{12}O_3S$: C, 62.9; H, 4.8. Found: C, 62.7; H, 4.9) and a *monofurfurylidene derivative* (m. p. 139.5–140.0°. *Anal.* Calcd. for $C_{11}H_{10}O_4S$: C, 55.5; H, 4.2. Found: C, 55.7; H, 4.3) were prepared.

Either of the isomeric β -keto-esters gave on hydrolysis 3-ketothiophane (oil, b. p. 58.2–58.4° [7 mm.]). *Anal.* Calcd. for C_4H_6OS : S, 31.4. Found: S, 30.3). A *dibenzylidene derivative* (m. p. 187.5°. *Anal.* Calcd. for $C_{18}H_{14}OS$: C, 77.8; H, 5.1; S, 11.5. Found: C, 77.9; H, 5.3; S, 11.7) and a *difurfurylidene derivative* (m. p. 191–192°. *Anal.* Calcd. for $C_{14}H_{10}O_5S$: C, 65.1; H, 4.2. Found: C, 65.1; H, 3.9) were prepared.

The 2-carbomethoxy-3-ketothiophane is remarkable in that on treatment with weak oxidizing agents (iodine, ferric chloride) it is rapidly and

quantitatively converted to a double compound, $C_{12}H_{14}O_6S_2$ (m. p. 188.5–189.5°. *Anal.* Calcd. for C, 45.3; H, 4.4; S, 20.1. Found: C, 45.3; H, 4.6; S, 20.3), *dibenzylidene derivative* (m. p. 236°. *Anal.* Calcd. for $C_{26}H_{22}O_6S_2$: C, 63.0; H, 4.5. Found: C, 63.0; H, 4.6). From the double compound, by desulfurization, a *substance*, $C_{12}H_{18}O_6$ (m. p. 125–126°. *Anal.* Calcd. for C, 55.8; H, 7.0. Found: C, 56.7; H, 7.3), and from the latter by treatment with dilute mineral acids, an *acid*, $C_{10}H_{12}O_6$ (m. p. 152–153°. *Anal.* Calcd. for C, 56.7; H, 5.7. Found: C, 56.8; H, 6.0) were obtained, which we believe to be, respectively, dimethyl α, α' -dipropionyl succinate, and 2,5-diethylfuran-3,4-dicarboxylic acid.

We should like to take this opportunity to point out that the 2-furfurylidene-3-ketothiophane-4-carboxylic acid methyl ester described above possesses the complete continuous carbon-sulfur skeleton of biotin.

CONVERSE MEMORIAL LABORATORY
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R. B. WOODWARD
R. H. EASTMAN

RECEIVED APRIL 20, 1944

NEW BOOKS

The Chemistry of Organic Medicinal Products. By GLEN L. JENKINS, Dean and Professor of Pharmaceutical Chemistry, School of Pharmacy, Purdue University, and WALTER G. HARTUNG, Professor of Pharmaceutical Chemistry, School of Pharmacy, The University of Maryland. Second Edition. John Wiley & Sons, Inc., New York, N. Y.; Chapman and Hall, Ltd., London. iv + 675 pp. 14.5 × 12 cm. \$6.50.

The second edition of this excellent compilation of organic medicinal compounds according to the accepted scheme of chemical classification is, in many respects, a much improved revision of the first planographed edition of 1941. Care has been taken to eliminate the trivial typographical errors, misspellings, misuse of words and phrases, and careless punctuation which marred the initial text. Rearrangement of the material into more compact paragraphs and better classified sections, and the gathering of the literature references into terminal chapter bibliographies have made the matter more easily and pleasantly readable. New material has been introduced and in many sections the explanatory text has been expanded, particularly in the chapter on Stereoisomerism where an excellent discussion of *cis-trans* isomerism about the ethylene bond is presented; a matter of some present importance in view of the recent revival of interest in the vitamin properties of the unsaturated fatty acids. A novel and interesting chapter entitled "Some Physical Chemical Properties of Medicinal Products" has been added. It is realized that a critical review and discussion of all theories and hypotheses is beyond the scope of this book but one would have liked to have seen some mention of the importance of physical chemical factors in the evaluation of the sulfonamides. This present text is intended for students in the more advanced courses in pharmaceutical, chemical, biological and medical science but will undoubtedly prove of great value and interest, not only to practitioners in these

fields, but to the growing army of workers in the medicinal chemical industry.

C. R. ADDINALL

The Extra Pharmacopoeia. By MARTINDALE. 22nd Edition in Two Volumes. Published by Direction of the Council of the Pharmaceutical Society of Great Britain. The Pharmaceutical Press, 17 Bloomsbury Square, W.C. 1, London, England, 1943. xxxiii + 1217 pp. 11.5 × 18 cm. Price, 27/6; postage 6d. extra.

The first edition of "The Extra Pharmacopoeia" appeared in 1883 as a manual of 313 pages. The latest edition, the 22nd, published by direction of the Council of the Pharmaceutical Society of Great Britain, consists of two volumes: volume I, published in 1941, contains 1289 pages; volume II, the subject of this review, is a book of 1217 pages. It hardly seems possible to account for the 60-year existence and the continual growth in size of this particular "pharmacopoeia" except by the explanation that there has been a steady demand for a work of this nature, and that these volumes have satisfied the demand.

"The Extra Pharmacopoeia" is a repository of a vast amount of important, interesting and up-to-date information, and has been written particularly for the pharmacist, the physician, and the chemist who deals with foods and medicinal products. A rough estimate of the number of very diverse subjects, listed in the common index for the two volumes, is 13,000. Although too much space would be required to mention all of the chapter headings for volume II, 42 in number, the following examples will convey some idea of the nature of the topics which are discussed: Proprietary Medicines, Nomenclature of Organic Compounds, Chemotherapy, Polarographic Analysis, Nutrition and Food Values, Notes on Water Analysis, X-Ray Diagnosis and Actinotherapy.

Naturally, due to its brevity, the chapter which deals with some particular subject is hardly apt to contain information which will be new to the specialist in that field. However, this very brevity will be appreciated by the specialist who may wish to review very rapidly the developments and most outstanding facts in some cognate field with which he is only partially acquainted.

It is to be regretted that so much of the text appears in very fine print; probably any improvement in this respect is not feasible because of economic factors.

F. F. BLICKE

Supplement to The Extra Pharmacopoeia, Vol. I, 22nd Edition, 1941. By MARTINDALE. The Pharmaceutical Press, 17 Bloomsbury Square, London, W.C. 1, England, 1943. 48 pp. 11 × 17.5 cm. Price 2s., postage 2d.

The best manner in which to describe this Supplement is to mention a few of the fifteen subject headings listed in the table of contents: Summary of the Principal Changes made by the 4th, 5th and 6th Addenda to the British Pharmacopoeia, 1932, Additions in the 2nd, 3rd, 4th and 5th Supplements to the British Pharmaceutical Codex, 1934, Deletions from the British Pharmaceutical Codex, 1934, Amendments in the 2nd, 3rd, 4th and 5th Supplements to monographs of the British Pharmaceutical Codex, 1934, Preparations of the National War Formulary, 1943, Articles added to the United States Pharmacopoeia (U. S. P. XII) and Volume I Corrigenda.

It seems evident that the information in this booklet will be of especial importance to those who manufacture and dispense pharmaceutical products.

F. F. BLICKE

Semimicro Qualitative Analysis. A Course in Applied Chemical Equilibrium. By JOHN F. FLAGG, Ph.D., Assistant Professor of Chemistry, and WILLARD R. LINE, Ph.D., Professor of Chemistry, The University of Rochester. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y., 1943. viii + 140 pp. 2 figs. 14.5 × 22.5 cm. Price, \$1.50.

This book is another addition to the already large list of semi-micro texts with chapters on related theoretical and factual matter. Its six preliminary chapters deal with the definition and field of qualitative analysis, chemical equilibrium, homogeneous equilibria, heterogeneous equilibria, oxidation-reduction reactions and technique of semi-micro qualitative analysis, all in 56 pages. The treatment of the topics is clear and readable, but necessarily brief.

The analytical part takes up cation, anion and alloy analysis. The cations are separated and identified in much the usual way, some interesting points being: separation of the acid sulfide group with sodium sulfide reagent; separation of lead and bismuth with ammonia from copper and cadmium; use of salicylaldoxime to divide copper and cadmium; the precipitation of zinc as sulfide in a formate buffer prior to the rest of the alkaline sulfide family; and the separation of calcium and magnesium nitrates with methyl alcohol from barium and strontium. The anion analysis is not treated very systematically. The alloy section deals very briefly with certain alloys, giving the appropriate methods, including additional ones needed for silicon, tungsten, molybdenum, vanadium and titanium.

Although it should prove to be a good average text for the student, the book suffers from bad planning and poor style editing. The trimmed head margin is $\frac{3}{8}$ " , the side margin $\frac{1}{8}$ " , while the bottom is $1\frac{1}{8}$ " , giving a distinctly "short-skirted" appearance which belies the prominent statement that production was carried out in line with war economy. There are several places where additional section heads might well have been used, especially on pp. 95 and 99. A good and consistent editorial style seems almost absent, resulting in numerous irregular and unsightly details, such as: bold, roman and italics for

mathematical symbols, formulas instead of names, the use of P for procedure, and the space-wasting use of bulky text type for illustrative chemical and mathematical formulas.

ALLEN D. BLISS

Pyrotechnics, Civil and Military. By G. W. WEINGART. Chemical Publishing Co., Inc., Brooklyn, New York, 1943. xii + 220 pp. 96 figs. 14.5 × 22 cm. Price, \$5.00.

Books on fireworks are rare. Weingart's book, so far as the reviewer knows, is the only book devoted entirely to this subject which has been published in the United States since the three volumes of Faber's "Military Pyrotechnics" were issued by the Government Printing Office in 1919. The present revision is really a third edition, or, more exactly, a fourth if the early mimeographed edition is counted. It contains more and better pictures than its predecessors, and new formulas which the author has tried for himself. Its price seems rather high. It lacks a much needed index. The glossary is important and useful. The List of Pyrotechnical Books which terminates the volume gives titles which are too much abbreviated, does not indicate which books are translations, and fails to show the places of publication. It does not by any means furnish "a complete record of the development of the art of pyrotechny up to the present time." Except for a few passing references to military uses, the book deals entirely with recreational fireworks and contains nothing which justifies the assertion on the title-page that it deals with military pyrotechnics as well.

Weingart's book is a practical book by a practical man. Recognized as such, it is extremely valuable. It summarizes an experience of about fifty years. Its principal parts deal, respectively, with I. Ingredients, with II. Manipulation, Tools and Appliances Used, with III. Articles of Manufacture and Formulas, and with IV. Exhibition Fireworks. It contains many observations, sometimes homely but always useful, on safety, on procedure, on the properties of substances. It tells the amateur how to construct fireworks pieces, and it shows the chemist what the tricks and contrivances are by which a few rather ordinary chemical substances are made to produce some extraordinary audible and visible effects. The same devices are applied in military as in civil pyrotechnics—and Weingart's book will supply a needed acquaintance with them to anyone who may have to work with explosive and pyrotechnic instruments of war.

TENNEY L. DAVIS

The Optical Properties of Organic Compounds. By ALEXANDER WINCHELL, University of Wisconsin. University of Wisconsin Press, Madison, Wisconsin. 1943. xiii + 342 pp. 157 figs., 1 chart. 17.8 × 26.2 cm. (Photo offset.) Price, \$5.00.

While optical methods have been widely used in identifications of natural and synthetic inorganic compounds they have seldom been applied to organic compounds. This limitation has several causes, among which are: faults of an educational scheme, some difficulties in application, and absence of a summary of previous observations. Professor Winchell has successfully answered the last need.

Optical data for about 1700 compounds are tabulated, in a determinative scheme, according to their mean refractive indices and n_{D20} are plotted on a chart, according to their birefringences and mean refractive indices. The limited numbers and types of compounds are disappointing from the point of view of usefulness in determinative organic chemistry, but the lists are quite complete as far as published data are concerned and previously unpublished values are included. Alkaloids are the most numerous class treated, being represented by 280 compounds. Optical properties are listed for approximately 250 salts.

The designation of refractive indices is confusing and does not follow the widely accepted usage of α , β and γ .

Since the book is strictly a tabulation of constants the untrained worker must look elsewhere for methods of measurement.

S. B. HENDRICKS

Synthetic Resins and Rubbers. By PAUL O. POWERS, Chief, Organic Research, Armstrong Cork Company. John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1943. v + 296 pp. 49 figs. 13.5 × 21.5 cm. Price, \$3.00.

This little book gives a clear and interesting account of the chemistry of more important synthetic resins and rubbers. It opens with a general historical and statistical introduction, including a table listing the name, structural formula, physical properties and source of the raw materials from which the industrially important resins are derived. The next chapter discusses the mechanism and kinetics of polymerization and the distinction between linear and cross linked polymers and the behavior of catalysts and inhibitors of polymerization. This is followed by separate chapters describing the more important classes of resins now in use industrially. Trade names are avoided throughout. Finally there is a very brief summary of solvents and plasticizers and of the technique of molding and the use of resins in formulating protective coatings. Each chapter is followed by review questions and a few additional references, but there is no attempt to cite a literature reference in support of every statement in the text.

This book does not compete with the larger books available in completeness, in detail and in giving numerous references. It does not give enough numerical data as to properties of the commercially available resins to be of much help to anyone trying to choose the best resin for a particular application. However, this book can be recommended to a chemist who has not specialized in the field but wishes a readable and reliable general introduction to synthetic resins and synthetic rubbers.

GRINNELL JONES

Principles and Applications of Electrochemistry. Volume II. Applications. By W. A. KOEHLER, Professor of Chemical and Ceramic Engineering, West Virginia University. Second Edition. John Wiley and Sons, Inc., New York, N. Y., 1944. v + 573 pp. 260 figs. 14.5 × 21.5 cm. Price, \$5.00.

This volume on applications of electrochemistry is intended for use in conjunction with Prof. H. J. Creighton's volume dealing with the principles of electrochemistry. The author has included the following new topics in the second edition: continuous tin strip plating, magnesium from sea water, hydrogen peroxide manufacture, fluorescent lamps, induction heating of non-conducting materials, new carbon bisulfide furnace, new phosphorus furnace, and nickel-cadmium alkaline storage battery.

The second chapter, "Review of Theoretical Electrochemistry," leaves some confusion in the reader's mind regarding the relative merits of the Arrhenius theory and the complete dissociation theory. The author presents both theories and then arbitrarily chooses the Arrhenius theory for the balance of his discussion.

The descriptions of the various applications are as complete as is practical in one volume. The descriptions are, for the most part, accurate; there are numerous errors that will no doubt be corrected in the subsequent printings. One of the more notable errors is the statement on page 175: "the platinum metals go into solution in the electrolytic parting." They remain in the slimes along with gold, but go into solution in the gold refining cell.

The book is well illustrated with photographs and line drawings of the various types of equipment used and operating data given for all of the important applications. This is supplemented with numerous references to the literature for the use of the reader interested in any one particular application.

The following classes of applications are discussed: primary and secondary cells, electroplating, refining and electrometallurgy of metals, electrolysis of halides, electrolytic oxidation and reduction, hydrogen and oxygen, corrosion, electroanalysis, electric furnaces, electronics, ozone, nitrogen fixation, separation by electrical means, and miscellaneous electrochemical processes (such as anodizing, electrolytic polishing, etc.).

The revised edition is now up to date and will no doubt continue to serve the same purposes as the first edition, that is, as a text for college students and a reference for those in the industry.

HENRY B. LINFORD

A Short Course in Quantitative Analysis. By HOBART H. WILLARD, Ph.D., Professor of Analytical Chemistry, University of Michigan, N. HOWELL FURMAN, Ph.D., Professor of Chemistry in Princeton University, and JOHN F. FLAGG, Ph.D., Assistant Professor of Chemistry, University of Rochester. D. Van Nostrand Company, Inc., 250 Fourth Ave., New York, N. Y., 1943. ix + 253 pp. 15 × 22 cm. Price, \$2.50.

This book is intended as a text for brief, one-semester courses in elementary quantitative analysis for premedical, agricultural, and certain classes of engineering students, and not for students concentrating in chemistry. As the authors state in the Preface the book is more or less an abbreviated version of the two senior authors' well-known "Elementary Quantitative Analysis," and a number of the good features of the latter text have been retained.

The first three chapters, I, Introduction; Fundamental Theory, II, Introduction to Laboratory Work, and III, The Measurements of Quantitative Analysis, furnish a concise introduction to techniques that are common to both gravimetric and volumetric analysis. As an example of one way in which brevity has been attained it may be noted that in Chapter III in connection with the discussion of the analytical balance and weighing no mention is made of the use of calibrated weights, nor of correction for air buoyancy. Such omissions are probably necessary in short courses for which the book is intended.

The following eight chapters are devoted to the theory and practice of volumetric analysis. Procedures are given for the following volumetric determinations: Sodium Oxide in Soda Ash; Replaceable Hydrogen in an Acid; Nitrogen in Organic Compounds by the Kjeldahl method; Chloride by the Mohr, Fajans (adsorption indicator), and Volhard methods; Iron in ores by the permanganate, dichromate, and ceric sulfate methods; Calcium Oxide in "calcium carbonate"; Available Oxygen in Pyrolusite (oxalic acid-permanganate method); Available Chlorine in Bleaching Powder (iodometrically); Copper in ores; and Arsenic in "arsenious oxide" (iodometrically). These determinations illustrate most of the important types of volumetric methods. Considerable emphasis has been placed on the theory of protolytic titrations (the illustrative titration curves on pages 58 and 59 are excellent), on the interpretation of oxidation-reduction titrations in terms of the oxidation potential, and on the use of modern oxidation-reduction indicators.

Most of the procedural details appear to be quite satisfactory. As one of the few exceptions may be noted the recommendation on p. 155 that ammonium thiocyanate be used to metathesize cuprous iodide in the iodometric copper determination; ammonium thiocyanate may not be used because it usually contains impurities which consume iodine, and the potassium salt should be employed.

Gravimetric analysis is discussed in the last three chapters, and procedures are provided for the following determinations: Chloride; Sulfate in a soluble sulfate; Magnesium Oxide; Phosphoric Anhydride in a soluble phosphate; and an abbreviated analysis of limestone for loss on ignition, siliceous matter, "R₂O₃," calcium oxide, and magnesium oxide. Among the few novelties noted in the gravimetric procedures is the employment of calcium carbonate as the final weighing form for calcium, which avoids

the difficulty of weighing ignited calcium oxide, but which usually is not attempted in elementary courses because it requires rather careful control of temperature (electric furnace) during the ignition of the calcium oxalate.

In keeping with its intended use in abbreviated courses the text contains no mention of electrolytic, colorimetric, or other special analytical methods.

Most of the chapters conclude with sets of problems which, in the words of the authors, "have been roughly arranged in order of increasing difficulty, with answers to about one-third included."

In the reviewer's opinion one undesirable feature of the text is the consistent disregard of the actual molecular and ionic states of the substances involved in the reaction equations which are given. For example the equation " $\text{Fe}^{+++} + 6\text{KCNS} = \text{Fe}(\text{CNS})_6 + 6\text{K}^+$ " given on p. 96 leads to some rather weird conclusions when interpreted literally. The same is true of numerous other equations throughout the text, of which the following on p. 115 is typical: " $5\text{Na}_2\text{C}_2\text{O}_4 + 2\text{KMnO}_4 + 8\text{H}_2\text{SO}_4 = 10\text{CO}_2 + 5\text{Na}_2\text{SO}_4 + \text{K}_2\text{SO}_4 + 2\text{MnSO}_4 + 8\text{H}_2\text{O}$." Since equations of this sort are misleading, and serve only to obscure the real reactions that take place as well as the essential equilibria involved, the reviewer cannot agree with the statement on p. 104 that they "are very useful in understanding the fundamental stoichiometry of a process."

The Appendix contains an outline of the general literature of analytical chemistry, a section on Mathematical Operations, a list of stock solutions of protolytic indicators, a table of dissociation constants of the commoner acids and bases, a table of solubility products, and a five-place logarithm table.

Since the reviewer has the highest regard for Willard and Furman's "Elementary Quantitative Analysis," which has contributed so much to the maintenance of high standards in the teaching of quantitative analysis, he cannot become very enthusiastic over this emasculated version.

JAMES J. LINGANE

Industrial Chemistry of Colloidal and Amorphous Materials. By WARREN K. LEWIS, Ph.D., Professor in the Department of Chemical Engineering, Massachusetts Institute of Technology, LOMBARD SQUIRES, S.M., Chemical Engineer with E. I. du Pont de Nemours Company, Wilmington, Delaware, and GEOFFREY BROUGHTON, Sc.D., A.I.C., Chemical Engineer with the Eastman Kodak Company, Rochester, N. Y. The Macmillan Company, 60 Fifth Avenue, New York, N. Y., 1942. xi + 540 pp. Illustrated. 16 × 24 cm. Price, \$5.50.

The authors of this very interesting and well-written manual set out to write a text on the industrial chemistry of colloidal and amorphous materials. These they list as emulsions and foams, thermoplastics, glass, paper, plastic fibers, leather, rubber, clays, synthetic resins and plastics, and textile fibers.

The technology of each of these materials is clearly and briefly discussed, together with the scientific interpretation of each process and product. For example, the X-ray diagrams and other physical chemical data are correlated with the industrial procedures. This provides a very interesting and clarified conspectus such as is hardly to be found elsewhere.

In order to lay a foundation for this treatment, the authors devote the first half of the book to a review of physics and of colloid science, beginning with structure of liquids and proceeding through viscosity, surface tension, orientation, adsorption, suspensoids, amorphous solids, emulsoids, electrochemical behavior of colloids, gelation, to plastic distortion and flow.

The treatment as well as the choice of the data is orthodox, and in accordance with the earlier development of the subject. For example, there is no mention of the essential stabilizing agent in the whole chapter on suspensoids, whereas a stabilizing agent is as necessary here as it is in the formation of emulsions or foams. On the other hand, the authors have rationalized for themselves the

subject matter that they discuss, and this is done so clearly that the reader is shown the facts as well as the way in which the authors interpret them. The explanations are reasonable and appeal to the engineering mind. The reader is invited by the authors to formulate his own opinions.

The authors state—"In a specific problem knowledge of the facts is often inadequate and occasionally in dispute, while understanding of underlying causes is limited and uncertain. Experts disagree on the explanations of phenomena of fundamental importance. In such a situation the scientist tends to withhold judgment but the technologist is faced with the necessity of making decisions and taking action. Many individuals prefer a purely empirical approach, but it is the conviction of the writers that it is best to submit each problem to a careful, theoretical analysis, even though in the nature of the specific case this may be known to be inadequate. A major purpose, therefore, is the introduction of the student to such a method of attack." To assist in this purpose they supply numerous cross references and append a bibliography to each chapter.

The book has stood the test of time, embodying the results of twenty-five years teaching of the subject at the Massachusetts Institute of Technology. The preparation of the manuscript was begun over a dozen years ago by Dr. P. K. Frolich and it has been constantly revised because of the very rapid developments in most of the fields discussed.

This admirable book is not only an excellent text but is a unique contribution to the advancement of science and industry.

JAMES W. MCBAIN

Laboratory Manual of Spot Tests. By Dr. FRITZ FEIGL. Translated from the German manuscript by Ralph E. Oesper, Ph.D., Professor of Chemistry, University of Cincinnati. Academic Press, Inc., 125 E. 23d Street, New York, N. Y., 1943. xii + 276 pp. 46 figs. 15.5 × 23.5 cm. Price, \$3.90.

To one familiar with Dr. Feigl's previous books on spot reactions the first question prompted by this book is its relation to the earlier works. The other two translations—that by Matthews in 1937 and that by Oesper in 1940—covered, respectively, the practical and the theoretical parts of the German edition, "Qualitative Analyse mit Hilfe von Tüpfelreaktionen." Whereas they are primarily reference monographs, this book, containing both old and new material, is a laboratory manual based upon them, designed for teaching the analytical applications of the principle of accomplishing a chemical reaction within the volume of one drop of solution.

To achieve best pedagogic results with it, Dr. Feigl recommends a special course following elementary training in inorganic, organic, and physical chemistry. The possibility of adding much of this undoubtedly meritorious technic to our present curricula seems to the reviewer unpromising. Educational institutions in the United States are moving in the opposite direction. In the course of buying, making, using, and selling commodities and products, chemical industry and research are applying more and more analytical methods and apparatus, of greater and greater complexity. But perhaps even more rapidly analytical chemistry is being accorded less and less academic importance. If we are to reverse the process and incorporate new technics into our courses, analytical teachers having breadth of training and interest in the subject must be selected, and they must have better support of administrators.

The opening summary of the theoretical foundations of spot test analysis (22 p.) is followed by an adequately illustrated section on technic (40 p.). The appendix lists the reagents and includes a floor plan of a spot test laboratory.

There follows a section on surface and capillary effects (38 p.), especially interesting in connection with the use of filter paper as a medium for observing the reactions. Some

thirty experiments are described which, quite apart from spot tests, should prove suggestive to demonstratively inclined instructors.

The portion devoted to actual analytical applications covers the following divisions: (a) inorganic analysis (69 p.), including inorganic and organic reagents, masking and catalytic reactions, and induced precipitations; (b) organic analysis (29 p.), including selected elements, groups and compounds; (c) rocks and minerals (16 p.); (d) technical products (17 p.); (e) biological material (12 p.); and (f) spot colorimetry by means of a standard series technic (16 p.). In the first two of these divisions the material is arranged systematically under the headings chemical basis, procedure, identification and concentration limits, and application in the presence of other materials.

Although mistakes noted are rare, a few items of usage seem to the reviewer to be questionable. Illustrative of his preference to that of the author are the following examples: (a) the spellings buret, pipet, and dichromate; (b) the I. U. C. names biacetyl, 2,2'-bipyridyl, and 1,10-phenanthroline; (c) the names recently recommended by an international committee for various inorganic complex ions; and (d) consistency in the formulation of heteropoly compounds, preferably in accordance with Keggin's work (including naming in terms of the central atom).

As a whole, the selection, arrangement, and treatment of material seems well done for teaching purposes. The smoothly reading translation renders American chemists indebted to Professor Oesper for making the information readily available. The book should prove valuable, not only for teaching but also as a source of ideas for practical analysts and research workers.

M. G. MELLON

The Organic Chemistry of Sulfur. Tetravalent Sulfur Compounds. By CHESTER MERLE SUTER, Director of Chemical Research, Winthrop Chemical Company, Formerly Professor of Chemistry, Northwestern University. John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y., 1944. v + 858 pp. 14.5 × 21.5 cm. Price, \$10.00.

Chemists, academic as well as industrial, are indebted to Dr. Suter, who has been prominent as a university professor and as a director of industrial research, for a comprehensive review of this important field.

This book covers organic compounds of the types: RO-SO₂-OR, R-SO₂-OR, R-SO₂-R and R-SO₂-X in which R is either aliphatic or aromatic and X is -OH, -Cl, -NH₂, -NHR, etc. Sixty per cent. of the space is devoted to aromatic sulfonic acids and their derivatives, 93 pages to esters of sulfuric acid, 101 pages to aliphatic sulfonic acids and 117 pages to sulfones which include aliphatic, aromatic and mixed. There are about 4700

numbered references, but as there are frequently five, ten or twenty references under one number the total may pass ten thousand. *Chemical Abstracts* references are given for patents. This vast amount of material is arranged in an orderly way and presented clearly.

Aromatic sulfonic acids and their derivatives have been an important part of the old organic chemistry and aliphatic sulfates and sulfonates are of intense present interest as wetting agents and detergents; the old and the new are here brought together. This book is an important addition to chemical literature; no chemical library can be complete without it.

E. EMMET REID

BOOKS RECEIVED

March 10, 1944-April 10, 1944

HARRY BARRON. "Modern Synthetic Rubbers." Second Edition, Revised and Enlarged. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 355 pp. \$6.50.

G. GAMOW. "Mr. Tompkins Explores the Atom." The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 97 pp. \$2.00.

EMIL HEUSER. "The Chemistry of Cellulose." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 660 pp. \$7.50.

MARTINDALE. "Supplement to The Extra Pharmacopoeia, Vol. I, 22nd Edition, 1941." The Pharmaceutical Press, 17 Bloomsbury Square, London, W. C. 1, England. 48 pp. Price 2s., postage 2d.

FOREST RAY MOULTON, Editor. "Surface Chemistry." Publication of the American Association for the Advancement of Science, No. 21. American Association for the Advancement of Science, Smithsonian Institution Bldg., Washington, D. C. 160 pp. Price to members, \$2.75; to others, \$3.25.

CHARLES ELI REED. "Chemical Engineering." Bellman Publishing Company, Inc., 6 Park Street, Boston, Mass. 20 pp. \$0.75.

JOSEPH REILLY AND WILLIAM NORMAN RAE. "Physico-Chemical Methods." Volumes I and II. D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 610 + 585 pp. \$17.50.

"Synthetic Menthol. A Collection of the Literature Concerning its Pharmaceutical Properties and its Uses." Givaudan-Delawanna, Inc., 330 West 42nd Street, New York 18, N. Y. 238 pp.