treated paper can be used to locate colorless bands on the columns.

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RECEIVED JANUARY 31, 1950

THE ISOLATION OF A CONJUGATED UNSATURATED ACID FROM THE OIL FROM *XIMENIA CAFFRA* KERNELS

Sir:

We have examined kernel oils from *Ximenia caffra Sond.*, *X. caffra var. natalensis Sond.* and *X. americana var. microphylla Welw.* The absorption spectra all showed a well defined maximum at *ca.* 230 mμ, and subsidiary maxima at *ca.* 268 and 280 mμ. The specific extinction coefficients at 229 mμ for the three oils were, respectively, 15.4, 12.6 and 12.0. The oils thus appeared to contain a considerable proportion of a conjugated dienoic acid and a smaller amount of a conjugated trienoic acid. Previous workers[1,2] have not reported the presence of such acids.

The acids from *X. caffra oil* were subjected to low-temperature crystallization. The fraction soluble in ether at −40° and insoluble in acetone at −60° was esterified and fractionally distilled. Fractions, b. p. 157–168° (0.1 mm.), with specific extinction greater than 40, were resaponified and the acids recrystallized from acetone at −15°, yielding a white solid m. p. 35°; four recrystallizations from petroleum ether yielded white plates, m. p. 40–41°; specific extinction at 229 mμ, 58.3; neut. equiv. 281.2; iodine value (Woburn, one hour[3]), 142.9. *Anal.* Calcd. for $C_{18}H_{30}O_2$: C, 77.65; H, 10.86; neut. equiv. 278.4. Found: C, 77.68; H, 10.81. The *p*-phenylphenacyl ester had m. p. 61.5–62°. *Anal.* Calcd. for $C_{32}H_{40}O_3$: C, 81.31; H, 8.53. Found: C, 81.31; H, 8.66. In a catalytic hydrogenation, 3.07 moles of hydrogen were absorbed, two moles immediately and the third during two to three hours. The product was stearic acid.

From these chemical data and the relatively low specific extinction at 229 mμ ($\Delta^{10,11,12,13}$-octadecadienoic acid has a maximum at 234 mμ and a specific extinction coefficient of 119[4]), it is postulated that this acid is a C_{18} acid with a double and a triple bond either in conjugation with one another or with one of them in conjugation with the carboxyl group. To locate these bonds the acid (1.7 g.) was oxidized with potassium permanganate.[5] There were isolated *n*-heptoic acid (0.5 g.) and azelaic acid (1.01 g.); and oxalic acid (0.18 g.) was determined volumetrically. The unknown acid, for which the name Ximenynic acid is proposed, could thus have one of the following structures:

$CH_3(CH_2)_5CH{=}CHC{\equiv}C(CH_2)_7COOH$
$CH_3(CH_2)_5C{\equiv}CCH{=}CH(CH_2)_7COOH$
$CH_3(CH_2)_5CH{=}CH(CH_2)_7C{\equiv}CCOOH$
$CH_3(CH_2)_5C{\equiv}C(CH_2)_7CH{=}CHCOOH$

From the spectral data, it is present in the oils in a concentration of *ca.* 25%. Full studies of ximenynic acid, and the ximenia oils will be recorded later.

We thank the South African Council for Scientific and Industrial Research for permission to publish these data, and Mr. F. Schoening for carrying out the elementary analyses.

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(1) S. V. Puntambekar and S. Krishna, *J. Indian Chem. Soc.*, **14**, 268 (1937).

(2) H. A. Boekenoogen, *Fette und Seifen*, **46**, 717 (1939).

(3) J. von Mikusch and C. Frazier, *Ind. Eng. Chem., Anal. Ed.*, **13**, 782 (1941).

(4) B. A. Brice, M. L. Swain, B. B. Schaeffer and W. C. Ault, *Oil and Soap*, **22**, 219 (1945).

(5) W. B. Brown and E. H. Farmer, *J. Chem. Soc.*, 761 (1935).

FATS, WAXES AND PROTEINS UNIT OF THE NATIONAL
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RECEIVED JANUARY 19, 1950

NEW BOOKS

Boron Trifluoride and Its Derivatives. By HAROLD SIMMONS BOOTH, Hurlbut Professor of Chemistry, Western Reserve University, and DONALD RAY MARTIN, Assistant Professor of Chemistry, University of Illinois. John Wiley and Sons, Inc., New York, N. Y., 1949. ix + 315 pp. 40 figs. 14 × 22 cm. Price, $5.00.

The principles of electron-donor-acceptor bonding, which are necessary to the understanding of many catalytic processes and unpredictable aspects of valence theory, are so well illustrated by the chemistry of boron trifluoride that the publication of a complete summary of this subject is an event of major interest. The new book by Booth and Martin thoroughly covers the literature (to January, 1948) of compounds containing the B–F bond, including substitution derivatives, addition compounds and complex ions. The first three chapters describe the early history, preparation and manufacture, and physical properties of boron trifluoride, with an introductory summary of its chemical properties. The reader thus is prepared for the longer chapter on the coördinating power of boron trifluoride, the full presentation of the fluoborates and their substitution derivatives, and the very useful summary of the applications of boron trifluoride as a catalyst. The remaining chapters, on analytical methods and practical techniques, should assist research workers in learning to work with such materials; in fact one finds throughout the book many practical aspects which now become available through the close contact of the authors with the fluorine industry.

The book is valuable chiefly as a source of facts and methods, but it presents the literature mostly in a neutral manner, leaving the reader to sort out what is true and significant from such errors of fact, conclusions without supporting evidence, or ideas for which the evidence is persuasive but not conclusive, as a thorough study of the original papers may reveal. This may be just as well, for the authors' own opinions sometimes outrun the facts, especially when the question of coördination is involved. For example, the supposed compounds of argon with boron trifluoride are said to owe their existence to coördinate bonding rather than to lattice energy, but the reader could argue the contrary view from the facts presented, were it not for more recent evidence that argon forms no such compounds, and is not even miscible with boron trifluoride in the liquid state.[1] Equally absurd is the reiterated assumption that the carbonyl group in aldehydes or ketones is not the unit through which boron trifluoride is held by such compounds. Some parts of the book are not consistent with others; thus boron trifluoride is regarded as "the most powerful acceptor molecule known" (p. 81) but sulfur trioxide is called a stronger Lewis acid (p. 167). Perhaps the mature reader will understand that the order of apparent receptor strength varies with the donors to which the various acceptors are to be attached, and with the bonding power of the solvent.

On the positive side, it is possible to gain from the book numerous ideas for new lines of research, and the final effect may well be a strong impetus toward the development of important new knowledge.

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(1) Wiberg and Karbe, *Z. anorg. Chem.*, **256**, 307 (1948).

ANTON B. BURG

Fluorescence and Phosphorescence. By PETER PRINGSHEIM, Argonne National Laboratory, Chicago, Illinois. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. xvi + 794 pp. 219 figs. 190 tables. 15.5 × 23 cm. Price, $15.00.

This monograph will be welcomed especially by those research workers who have for a long time depended on Dr. Pringsheim's former books in the field of luminescence. The present volume brings this field up to date in a comprehensive and authoritative manner, and in addition it is unusually well written. The author is able to make familiar fundamental experiments which were done twenty or more years ago appear as fresh and interesting as reports on current research. The recording of hundreds of experiments and their interpretations could have degenerated easily into a catalog of isolated facts, but Dr. Pringsheim has given instead a connected, and on the whole a logical, account of all the important phases of a complex subject.

The general pattern of the author's earlier "Struktur der Materie" monograph (Julius Springer, 1928) is followed, but the present volume is completely rewritten and greatly expanded. An introductory section includes general theory and description of general experimental techniques. The main portion of the monograph is divided into two parts: (1) "Fluorescence of Gases and Vapors" and (2) "Fluorescence and Phosphorescence of Condensed Systems." The subject matter of the first part is in a more complete state, and a more thorough treatment is given, especially of the theory of luminescence of atoms and diatomic molecules. In general the interpretations given by the original investigators is followed without critical evaluation.

The variety of phenomena treated in the second part is much greater, and it becomes more difficult to classify the experimental results in terms of the title, even with the added concept of "slow fluorescence." It is also naturally more difficult to make general statements about the phenomena. Recent experiments on luminescence of organic compounds in solid solution (Lewis and Kasha) are briefly, but critically discussed. The subject of crystal phosphors is treated from a fundamental standpoint. The omission of many details of technical interest appears reasonable in a book of this nature, since these details are best treated in technical reviews.

The bibliography, which contains over two thousand references, is complete up to about May, 1948. This bibliography is certainly one of the most valuable features of the book, and furnishes an invaluable reference for research workers in the fields of luminescence, photochemistry and spectroscopy.

A. B. F. DUNCAN

Titanium, its Occurrence, Chemistry and Technology. By JELKS BARKSDALE, Ph.D., Polytechnic Institute. Former Research Chemist, National Lead Company, Titanium Division. The Ronald Press Company, 15 East 26th St., New York 10, N. Y. xii + 591 pp. Illustrated. 17 × 24 cm. Price $10.00.

This book, which is a review with bibliography, is the first volume on titanium since Thornton's was published in 1927. The relative size of the two volumes reflects the growth of titanium technology during the intervening 22 years.

The book is well written in clear, direct style, which makes for easy reading. The author claims exhaustive coverage of the literature up to the time of going to press. Sampling of several chapters and checking against bibliographies available within the titanium industry indicated this claim to be substantially correct.

Chapter 11, Hydrolysis of Titanium Sulfate Solution is particularly well done. The problems in writing this chapter must have been numerous in view of the complex nature of the patent literature.

In view of the rapidly developing interest in titanium metal Chapter 6 might have been expanded. The section on enamels, Chapter 25, definitely falls wide of the mark. Contrary to the statements made in that section, highly satisfactory titania-bearing frits have been developed and titanium dioxide is widely used in the enameling industry. The objections cited by Barksdale were overcome several years ago.

Dr. Barksdale has exhibited considerable skill in weaving the complex literature of titanium into a compact volume. This book does a real service to titanium technology in supplying a well organized, quick, access to the technical literature of an element which is important and continuing to grow in importance. It should find ready and frequent use by titanium technologists and students.

R. DAHLSTROM

Quantitative Organic Analysis via Functional Groups. By SIDNEY SIGGIA, Ph.D., Research Analyst, Central Research Laboratory, General Aniline and Film Corporation, Easton, Pa. John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y. (Chapman & Hall, Ltd., London). 1949. vi + 152 pp. 27 figs. 15 × 22 cm. Price, $3.00.

This laboratory manual takes up in orderly fashion the quantitative analysis of functional groups in organic compounds containing oxygen, nitrogen, sulfur and unsaturation. The methods employed are predominantly titration procedures. Thus direct alkalimetric titration procedures are used for the determination of organic acids and their derivatives, as well as for epoxide compounds. Indirect alkalimetric methods are applied in the determination of carbonyl compounds and their hydrolyzable derivatives (sodium sulfite and hydroxylamine procedures), while for hydroxyl compounds (alcohols, water and phenols) and amines, acylation, followed by back-titration of excess reagent is utilized. Acidimetric procedures are used in the direct determination of sufficiently basic amino compounds, with suitable extension to include also isocyanates and mustard oils.

Iodometrically are determined alkoxy (including vinyl ethers) alkimide and mercapto groups, peroxides and unsaturation. Other methods involve argentometric (acetylenic hydrogen), thiocyanate (nitro, azo and hydrazo compounds) and bromate titrations (thio-ethers). Quantitative procedures are also given for brominations, diazotizations and coupling reactions. Gas-volumetric procedures are used for the determination of unsaturation (hydrogen up-take), active hydrogen (methane formation) and diazonium salts (nitrogen evolution). Potentiometric (salts of carboxylic acids), as well as gravimetric procedures (salts of sulfonic acids) complete the major portion of the manual, which also contains useful suggestions for fractional distillation, for electrodialysis, electrophoresis, chromatography and the determination of certain physical constants, such as refractive index, density, light absorption and optical activity. The amounts of substance used are expressed either in "equivalents" or "mols" and vary from 0.0001 (active hydrogen) to 0.02 mols (carbonyl compounds) and from 0.002 (unsaturation) to 0.1 equivalent (amines).

The methods follow a clear and concise pattern (principle, reagents, apparatus, procedure, calculation) and breathe thoroughness and reliability backed by long standing industrial analytical experience, which makes this manual invaluable in organic research and control work.

JOSEPH B. NIEDERL

The Chemistry of Organic Medicinal Products. By GLENN L. JENKINS, Dean of the School of Pharmacy and Professor of Pharmaceutical Chemistry, Purdue University, and WALTER H. HARTUNG, Professor of Pharmaceutical Chemistry, University of North Carolina. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. (Chapman and Hall, Ltd., London), 1949. ix + 745 pp. 15.5 × 23.5 cm. Price, $7.50.

With the appearance of the third edition, this textbook becomes by far the best and most up-to-date single volume reference to a rapidly advancing subject. Investigators in the field of organic medicinal products and many related subjects will welcome its appearance and congratulate the authors on its general excellence. As stated on the dust jacket, many sections have been rewritten and a remarkable amount of recent material and numerous original references have been added. The volume is well printed and pleasantly free of typographical errors.

Like the previous edition, the material is organized according to organic chemical classification. This arrangement should be of particular value when the book is employed in teaching. Any system of classification inevitably leads to some incongruities, and the reader may be surprised to find enzymes discussed in the chapter on Natural Mixtures which includes oils, fats and resins. Because of the fundamental importance of the subject, a separate chapter on enzymes and proteins would have been more appropriate. Similarly, the section dealing with antibiotics falls under the chapter heading, Amines and Amine Derivatives.

Some of the same qualities which make this volume invaluable as a reference work may make it more difficult for the student. It is so filled with factual information that there is insufficient space remaining for an adequate discussion of current theories and interrelationships. For example, while several vitamin antagonists are mentioned, no adequate explanation of the important concept of antimetabolites is provided. Under enzyme inhibitors no mention is made of those structurally related to the substrate, and the brief discussion of the Woods–Fildes theory of the mechanism of action of the sulfanilamides ends with the statement: "However, it is now believed that the sulfonamides affect bacterial oxidation–reduction systems in some manner." Such a conclusion is not only contrary to that generally accepted, but it is likely to leave the student quite confused.

The discussion of purines makes no mention of their important relationship to the nucleic acids and nucleoproteins. Elsewhere, the Bergmann theory of the recurrence of amino acids at regular intervals in a protein molecule is presented in such a manner that it could easily be mistaken for an established fact rather than a stimulating hypothesis.

In spite of any deficiencies the volume may have as a textbook, every student of organic medicinal products, as well as the advanced worker in this and related fields, should have a copy in his possession. Its value as an authoritative reference work is out of all proportion to its size.

RICHARD O. ROBLIN, JR.

Russian–English Technical and Chemical Dictionary. By LUDMILLA IGNATIEV CALLAHAM. John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. (London: Chapman & Hall, Ltd.), 1947. xvii + 794 pp. 19.5 × 14 cm. Price, $10.00.

After her graduation from Barnard College with a degree in chemistry Mrs. Callaham began to translate technical Russian articles and to abstract them for American journals. For her own convenience she compiled a vocabulary of technical terms which soon outgrew chemistry and began to include words from all the related scientific and engineering fields. This dictionary is the result of a systematic expansion of that vocabulary.

The volume consists of a short introduction to the Russian alphabet and to the structure of Russian words and sentences, together with a list of common Russian technical word endings, and then proceeds directly to the 794 pages of word listings. The dictionary naturally assumes a fair reading knowledge of Russian and therefore does not undertake to teach the Russian language but only to list the various types of words expected to appear in technical articles devoted to aeronautics, radio technology, meteorology, agriculture, medicine, physics, chemistry and mathematics. The various branches of chemistry are given the most complete coverage, but the volume lives up to its general title.

The type, format and paper are good, and the dictionary undoubtedly would be a valuable addition to the library of the present-day chemist. It is perhaps unfortunate that the cost of setting up so complete a dictionary in Russian type, plus the large amount of labor required in the compilation and proof reading, requires so high a retail price; most chemists will find it somewhat steep for personal acquisition but may be in a position to recommend purchase of the dictionary for use in chemical libraries. The reviewer recommends it highly for this purpose.

EUGENE G. ROCHOW

BOOKS RECEIVED

February 10, 1950–March 10, 1950

ADALBERT FARKAS (edited by). "Physical Chemistry of Hydrocarbons. Volume I. Academic Press, Inc., Publishers, 125 East 23rd Street, New York, N. Y. 1950. 453 pp. $8.50.

R. HOUWINK (edited by). "Elastomers and Plastomers." Volume I. General Theory. Elsevier Publishing Company, Inc., 215 Fourth Avenue, New York 3, N. Y. 1950. 495 pp. $7.00.