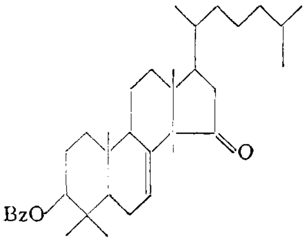
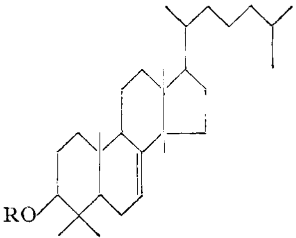


IX



X

(C=O, OC=O) 5.77 μ, 5.83 μ (*Anal.* Calcd. for $C_{37}H_{54}O_3$: C, 81.27; H, 9.95. Found: C, 80.94; H, 9.80), which was converted by Wolff–Kishner reduction under special conditions to Δ^7-lanostenol (β-lanostenol) (X, R = H) (70%), m.p. 162–163° (vac.) (reported,[11] 162°), $[\alpha]_D$ +10° (*c* 1.45) (*Anal.* Calcd. for $C_{30}H_{52}O$: C, 84.04; H, 12.23. Found: C, 83.88; H, 12.15). The *acetate* prepared from synthetic Δ^7-lanostenol had m.p. 146–147°, raised after many recrystallizations to 148–149°, $[\alpha]_D$ +27° (*c* 1.27) (*Anal.* Calcd. for $C_{32}H_{54}O_2$: C, 81.64; H, 11.56. Found: C, 81.44; H, 11.72), and its identity with an authentic sample (m.p. 145–148°, $[\alpha]_D$ +28°) was established through the mixture m.p. 146–148°, and the identity of the infrared spectra of the two samples. When the *benzoate* of Δ^7-lanostenol, m.p. 207–208°, $[\alpha]_D$ +51° (*c* 1.09) (*Anal.* Calcd. for $C_{37}H_{56}O_2$: C, 83.40; H, 10.49. Found: C, 83.29; H, 10.49), was treated with hydrogen chloride in chloroform, a mixture was produced from which Δ^8-lanostenyl benzoate (23%), m.p. 193–195°, $[\alpha]_D$ +71° (*c* 1.80) [authentic sample, m.p. 194–195°, $[\alpha]_D$ +71°; m.m.p. 193–195°], could be isolated by careful chromatography. Hydrolysis of the benzoate gave lanostenol (dihydrolanosterol) (I), m.p. 139–141°, $[\alpha]_D$ +59° (*c* 1.37) [authentic sample, m.p. 193–140°; $[\alpha]_D$ +59°; m.m.p. 139–141°], further characterized as the *acetate*, m.p. 118–120°, $[\alpha]_D$ +60° (*c* 1.54) [authentic sample, m.p. 119–120°, $[\alpha]_D$ +60°; m.m.p. 118–120°].

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RECEIVED APRIL 15, 1954

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[11] Marker, Wittle and Mixon, THIS JOURNAL, **59**, 1368 (1937).

BOOK REVIEWS

Physical Constants of Hydrocarbons. Vol. V. Paraffins, Olefins, Acetylenes and other Aliphatic Hydrocarbons (Revised Values). A.C.S. Monograph No. 78. By GUSTAV EGLOFF, Director of Research, Universal Oil Products Co., Chicago, Illinois. Reinhold Publishing Corporation, 330 West 42nd Street, New York 36, N. Y. 1953. ix + 524 pp. 16.5 × 23.5 cm. Price $20.00.

Volume V of "Physical Constants of Hydrocarbons" is supplementary to Volume I, bringing the literature of the paraffins, olefins and acetylenes from 1939 to approximately mid-year 1951. Melting points, boiling points, densities and refractive indices for some 950 hydrocarbons are listed. Of this number approximately 45% appear for the first time. Critical constants, including temperature, pressure and density are given where the data are available—chiefly for the lower members of the series. Hydrocarbons appearing in both volumes I and V are cross-referred by volume number and page and the corrections to previous listings are made in their proper place. The paraffins cover the range from methane to heptacontane (C_1 to C_{70}), the olefins from ethylene to methyltritetracontene (C_2 to C_{44}), and the acetylenes from ethyne to hexatricontyne (C_2 to C_{36}).

The question arises what is one to do with the multiplicity of values obtained, in the manner, for each physical constant of a hydrocarbon? Using *n*-octane as an example there are listed 16 melting points varying from −56 to −56.61°, 36 boiling points (760 mm.), 30 densities (d^{20}_4) and 29 refractive indices ($n^{20}D$), each spread over a similar range. The author recognizes this problem and has sought to resolve the difficulty by applying least squares to the data obtaining a selected "best value" for each constant. These "best values," printed in bold-faced type, are given in the present volume only where the inclusion of the new data results in a "best value" substantially different from the previous selection. "Whenever possible the values listed in the Tables of Selected Values of Properties of Hydrocarbons, compiled by the American Petroleum Institute's Project 44, were used as a guide in evaluating data."

Petroleum chemists are confronted at this point by a problem not yet shared in equal degree by investigators in other areas of organic chemistry. The above data were collected from papers published in standard scientific periodicals. These papers had been carefully reviewed and the commonly accepted criteria of validity vigorously applied. Why then these variations, which lie outside the limits of experimental error? The variations arise chiefly from two sources; (a) faulty technique in measurement of the constants and (b) impurities in the products on which the measurements were made.

The criteria of validity applied to 'new organic compounds by organic chemistry journals "since the days of Liebig" are ultimate analyses for carbon, hydrogen and other elements. Such analyses have only a limited value in the field of hydrocarbon chemistry. All olefins and all cycloparaffins analyze to the same percentage composition. All isomers upon analysis give the same empirical formula. Combustion analyses do have a limited application among the lower members of the paraffin and acetylene series. But for the higher members of these series the differences in percentage composition between successive members, or for the corresponding members of the different series, fall well within the limits of experimental error. The petroleum chemist must therefore turn to physical measurements for his proof of validity. Spectrograms, cooling and warming curves give unquestioned evidence of both identity and degree of purity. *Ideal* curves for physical constant values and known changes in physical constants with specific variation in the structural pattern of the molecule form valuable aids in forming a considered judgment of the validity of experimentally determined values.

At this point the five volumes of Physical Constants of Hydrocarbons become of inestimable value. Set opposite each datum is a reference number, so that the whole work becomes a bibliography or, more strictly speaking, a collection of bibliographies. By their use it is possible to trace each measured value, or each group of constants back to their source and to appraise the method of synthesis, the method of purification and the technique of measurement. In this manner one may arrive at a well considered judgment as to the degree of purity and even as to the nature of the more probable impurities.

Boiling point °C. (760 mm.), d^{20}_4 and n^{20}d were adopted as standard conditions and these symbols used as column headings in the original volumes. In Volume V, where many of the data come from measurements made under conditions other than standard, an incongruity develops, especially where all the data listed are for conditions other than those indicated by the column heading. Much of this anomaly would disappear if in such cases the column headings were changed to read; b.p. °C. (mm.), d^t_4 or n^tD as the case might be.

The Author is to be complimented and commended for this monumental piece of work, which is of inestimable value to all of those working in the field of petroleum chemistry.

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Principles of Polymer Chemistry. By PAUL J. FLORY, Professor of Chemistry, Cornell University. Cornell University Press, 124 Roberts Place, Ithaca, New York. 1953. xvi + 672 pp. 16 × 24 cm. Price, $8.50.

Polymer chemists, their employers, and the public in general have long been indebted to Paul Flory for the many fine contributions he has made toward a better understanding of high polymers and their behavior. He, probably more than any other one person, has been responsible for putting the physical chemistry of polymers on a sound scientific basis. Now we are again indebted to him for giving us this excellent treatise.

The coverage of the field is thorough and accurate. Although a large proportion of the treatment is based on Professor Flory's own work, that of others is not neglected. Quantitative relationships are expressed mathematically, as they should be, but the mathematics is kept as simple as reasonably possible. Throughout the book, the author shows his gift for making complex subjects understandable.

The reviewer has no hesitancy in recommending this book to anyone seeking authoritative information concerning the whole field or any part of it. The cost of the volume is very small, relative to its value.

RESEARCH LABORATORIES
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ROCHESTER 4, NEW YORK
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Experimental Nuclear Physics. Volume II. By E. SEGRE (Editor), P. MORRISON AND B. T. FELD. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1953. viii + 600 pp. 16 × 23.5 cm. Price, $12.00.

This is the second volume in a series intended to treat the various branches of nuclear physics, a field which has suddenly grown far beyond the scope of a single book. The first volume, which appeared in 1953, has been reviewed by W. F. Libby (THIS JOURNAL, **75**, 4882 (1953)), and the reader is referred to that review for a good description of the character of the series and the contents of the five sections in that volume. The entire series is likely to prove indispensable not only to nuclear physicists but also to the large number of chemists working or interested in the nuclear fields.

This volume, the second, contains two parts: VI, A Survey of Nuclear Reactions, by Philip Morrison (208 pages); and VII, The Neutron, by Bernard T. Feld (379 pages). The part VI is beautifully written, with an easy informality (except for which several sections would have been hard reading). It includes a thorough discussion of the first principles of nuclear reactions, a description of the kinds of data obtained experimentally, and a complete yet simplified account of the theoretical interpretations. An idea of the size of this topic may be had from the author's statement, repeated in several sections, that the treatment is severely condensed; always the literature references needed for detail or for rigor are made available. On the whole this part is a marvelous compromise between the many purposes it might serve, purposes ranging from an introductory account for graduate students to a presentation of nuclear concepts to an otherwise accomplished theorist. The title, Survey of Nuclear Reactions, is most appropriate, and readers with the interests common to many nuclear and radiochemists will probably value most of all the perspective gained from Morrison's writing. It is hoped that additional volumes may contain the compilations of nuclear reaction data not found in this volume.

Part VII is a much more detailed account of all the currently important aspects of neutron physics. In the opinion of this reviewer, the detail is altogether an asset even though it makes this part rather long and involves some duplication of material in the earlier parts, especially I and VI. For chemists, a considerable fraction of this part may be of direct interest only in connection with the use of nuclear chain reactors; some sections, particularly those on neutron sources and neutron diffraction, are likely to be of wider interest.

There are separate tables of references for the two parts. One author and one subject index serve for the volume. Misprints seem to be few; a notable one is the interchange of figures 12c and 13c, pages 103 and 105. The printing, paper, and binding are excellent, likely to stand the heavy use to which the volumes will be put in any book collection. We are eagerly awaiting Volume III.

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Fourth Symposium (International) on Combustion (Combustion and Detonation Waves). At Massachusetts Institute of Technology, Cambridge, Massachusetts, September 1–5, 1952. By BERNARD LEWIS, Chairman, The Standing Committee on Combustion Symposia (Editor). The Williams and Wilkins Company, Baltimore 2, Maryland. 1953. xx + 926 pp. 18.5 × 26 cm. Price, $7.00.

This volume contains the full text of 112 papers presented at the Fourth International Combustion Symposium, which was held at Massachusetts Institute of Technology in September, 1952. Included also are summaries of 2 Round Table Discussions. Papers are grouped under the headings: Survey Papers; Flammability; Ignition; Theoretical and Experimental Studies on Laminar Combustion and Detonation Waves; Cellular Flames and Oscillatory Combustion; Turbulent Flames; Quenching, Flash Back and Blow Off; Stabilization by Flame Holders; Flames of Fuel Jets; Burning of Fuel Droplets; Combustion in Rockets and Engines. There is thus broad coverage of fields of current interest in combustion, with the exception of the kinetics and mechanism of combustion reactions.

Although most of the papers are of more immediate interest to the engineer or technologist, the pure scientist will find much to arouse his curiosity. The successful development of high-speed combustion systems for jet propulsion in the last 15 years has left in its wake a host of unsolved problems of basic import. Many of these will be apparent after a perusal of the "Survey Papers," and will suggest fields for fundamental investigation. As usual, the technologists are far ahead of their academic brethren.

Inevitably, security classification has severely restricted the amount of material which could be presented. Nevertheless enough remains to give a good idea of the state of the art, and also to indicate possibilities of application in chemical processing. Industrial chemists and chemical engineers will want to scan the book with the latter in mind. For those primarily concerned with fuels and combustion, it is a "must."

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