

stand. In places it is not well organized and gives one the impression of being a patchwork quilt of bits of information. Errors are present but these are at least in part due to errors quoted from the literature. At times the author makes contradictory statements which may be traced to conflicts in the literature being reviewed. For example, recent studies of the dissociation energy of the F_2 molecule are discussed on p. 19 while on p. 22 the old value is used without comment as the bond strength in the molecule. The subject index is brief and there is no author index.

The policy of the author and the other editors to make this volume deal largely with topics which are being studied now seems good. It is hoped that it will be continued in the remaining eight volumes of the series.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF WASHINGTON
SEATTLE 5, WASHINGTON

GEORGE H. CADY

Geochemistry. By the late V. M. GOLDSCHMIDT, Professor of Geology, Frederiks University and Museum, Director of the Statens Rastofflaboratorium, Oslo, and edited by Alex Muir. Oxford University Press, 114 Fifth Avenue, New York 11, N. Y. 1954. xi + 730 pp. 16.5 × 24.5 cm. Price, \$11.04.

More than any other man V. M. Goldschmidt was the father of modern geochemistry; during the years 1922-1940 his laboratories in Oslo and Göttingen developed the ideas, the techniques, and the basic data which established geochemistry as a quantitative science and provided the stimulus for the present intense activity in this field. He died in 1947 at 59, his health shattered by his experiences in German concentration camps. This book, written while he spent his last years in British hospitals, is incomplete, but it is characterized throughout by the technical excellence and first-hand familiarity with subject found only in books written by active researchers in a field. It has benefited very greatly from the capable and solicitous editing and annotation of Dr. Muir, and by the help of many other scientists; to these men we owe a debt of gratitude for making the work available at last.

The book is divided into two main sections of general geochemistry and the specific geochemistry of the elements. The first section, dealing with fundamental principles and processes, represents only a fragment which Goldschmidt intended to modernize and make much more extensive. It begins with a discussion of the distribution of the elements during the evolution of the earth, based on the familiar Goldschmidt classification of the elements as siderophil, lithophil, chalcophil, atmophil and biophil, and on the available thermodynamic data for the treatment of phase equilibria. Goldschmidt always accepted the classical picture of an earth condensing from a hot gas cloud and his discussion is necessarily biased along the lines of treating the primitive earth as a huge smelting furnace. Though he understood that the earth's atmosphere and hydrosphere must have evolved as a secondary phenomenon, his views led him to classify as atmophil such elements as Cl, Br, I, B, and even Si as SiO_2 , postulating their presence in the earth's primitive atmosphere. He explained the extremely high concentration of the first four in sedimentary rocks and the ocean as compared to igneous rocks as the result of the residual primitive atmosphere plus later derivation from the earth's interior as volatile emanations from volcanoes and fumaroles.

There follows an excellent short discussion of the evolution of magmatic rocks with special reference to the pattern of distribution of major and minor elements in the early and late crystallizing fractions. Goldschmidt's classic presentation of the quantitative treatment of geochemical processes, based on his development of the concept of geochemical balancing between igneous and sedimentary rocks and the ocean and atmosphere, is taken verbatim from his 1933 article and included as a chapter. This section of the book also includes a brief unsatisfactory treatment of cosmic abundances, and a final extensive chapter on the principles of crystal chemistry which Goldschmidt did so much to help formulate during the first phase of his scientific career at Oslo.

Part II, on the geochemistry of the specific elements, makes up the major part of the book. The elements are arranged by the appropriate groups and their geochemical

cycles discussed in detail. Special attention should be called to the chapters on carbon, the halogens, iron, cobalt and nickel, and silicon, probably the best in the book, in which Goldschmidt writes with superb clarity, organization, and understanding. Iodine actually is an atmophil element to some extent, occurring in concentrations up to 0.012 p.p.m. in air, and the discussion ranges from early theories relating the prevalence of goiter in the Alps to depletion of atmospheric iodine by settling of high molecular weight I_2 (not possible, of course), to the state of equilibrium between the surface of air-borne dust particles and gaseous molecules, and the relationship of regional distribution of iodine deficiency to the pattern of the differing iodine concentrations of air masses of different geographic origin. The chapter on iron contains an excellent treatment of the ferrous-ferri iron equilibrium in magmatic rocks and iron and sulfide ores, and ranges into a discussion of the chlorosis, due to iron deficiency, in Hawaiian pineapples growing on both iron-poor soils derived from coral, and iron-rich lava soils. These examples may suffice to show the extraordinarily wide range of Goldschmidt's interests and knowledge; one can almost sense, as one reads, the keen enthusiasm with which he followed the path of the geochemical cycle of each element.

Probably no other man ever knew as much about all of the geochemistry of his time as Goldschmidt, and with the characteristic tendency for increasing specialization in a progressing science, probably no man ever will. He was the first and last of his kind in his field, and his book, long awaited, will stand as a classic source of ideas, observations and inspiration to be drawn upon by all the sciences.

INSTITUTE FOR NUCLEAR STUDIES
UNIVERSITY OF CHICAGO
CHICAGO 37, ILLINOIS

HARMON CRAIG
HAROLD C. UREY

Starch and its Derivatives. Volumes I and II. Third Edition (Revised). By J. A. RADLEY, M.Sc., F.R.I.C., Chemical Consultant. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1954. xi + 465 pp., xi + 510 pp. 15 × 22 cm. Price, \$10.00, each volume.

Current appetite for technical books on starch chemistry and technology is reflected in the exhaustion of the first and second editions of Kerr, "Chemistry and Industry of Starch" (Academic Press, Inc., 1944, 1950), and Radley, "Starch and its Derivatives," the latter now appearing in a two-volume 3rd revised edition (hereafter referred to as the 3rd ed.). The editorial preface indicates the general purpose is to ". . . focus attention upon recent work, or upon new aspects of old work, and upon their theoretical implications. Such books are written by experts for other experts in related fields of science, or for the well educated layman. . . . It is the first duty of the monograph writer to estimate the value, either actual or potential, of recent work upon the subject of which he writes: he must pick out the plums to save others from the indigestion that follows eating the whole pie. . . ." These objectives are unevenly attained, sometimes quite well, but oftener not at all.

The strength of the 3rd ed. lies in a few good new chapters, written by outstanding workers. For example, the chapter by Dr. T. J. Schoch on starch fractions is critical, interestingly written, unquestionably authoritative, and provided with an excellent set of references to 1949, many with brief abstracts. Throughout, an abundance of references is supplied, though few are very recent.

The greatest single weakness of the 3rd ed. is the delay between the writing of the bulk of the text and its publication. The author's preface does not give any date (as it should) to indicate how recently the literature has been covered, but some idea can be obtained by looking through the most recent references for each of the first ten chapters: 1911, 1951, 1951, 1944, 1944, 1949, 1941, 1950, 1944, 1945. Some of the chapters have been taken from the previous editions (1940, 1943) without appreciable revision. For example, chapter 20 on β -amylase action could stand a bit of dusting off (the most recent reference is 1940). Most of the material on the starch industry is antiquated, with few references since 1944.

As regards digestibility, much of the book consists of statements relating to research findings with little or no attempt to interpret them: ". . . Haerz observed (1905)

that an amylopectin, which he had prepared by the oxidation of starch with chromic acid, consisted of a number of molecular groups of different complexity and density of internal structure. An erythropectin showed similar complexity, whereas an achropectin seemed to possess homogeneity. Chromic acid was used (1905) to solubilize starch. . . . On p. 458 of Vol. I we find the isolated sentence: "M. A. Swanson found the action of salivary amylase on starch to be more random than its action on glycogen and also examined other amylases." Where is the interpretative plum proffered in the editorial preface?

The source of material used is not always given. A passage of nearly one page (Vol. II, p. 364) seemed strangely familiar to this reviewer, and turned out to be a slightly abridged quotation from a section which he had written some 12 years previously for Kerr (1st ed., p. 125-126, 1944). While the reviewer is greatly complimented to see his writing quoted thus, it would have been more appreciated if adequate reference had been made, and if the printing error in the Freudenberg-Kuhn equation had been noticed and corrected before transcribing it into the 3rd ed. Other cases were noticed where passages, data and references seem to have been taken directly from Kerr, without bothering to check on the original source material.

There is an unfortunate abundance of errors, both in transcription and in interpretation. The optical rotations of some starches are listed as negative. A structural formula for starch is written using L-glucose residues. Specific volumes of starch are obtained from ultra centrifugal studies. The writer discussing periodate oxidation seems to have had a particularly bad day: periodate oxidation of methyl D-glucopyranoside gives formaldehyde, L-(+)-erythrose units are produced during the oxidation of starch by hydriodic(sic) acid, the terminal D-glucosyl unit in starch gives formaldehyde, and so on. Such errors of these indicate lack of care in the writing and editing of the book, or undue haste or pressure in some phases of its preparation.

Notwithstanding a substantial amount of well-written and useful material, and several pages of beautiful photographs of starch granules, the two-volume 3rd ed. of Radley cannot be recommended except with considerable reservation, and only to the reader who is already well enough versed in starch science that he can discern for himself that which is reliable and that which is not.

DEPARTMENT OF CHEMISTRY
IOWA STATE COLLEGE
AMES, IOWA

DEXTER FRENCH

Annual Review of Biochemistry. Volume 23. By J. MURRAY LUCK, Editor, Stanford University, HUBERT S. LORING, Associate Editor, Stanford University, and GORDON MACKINNEY, Associate Editor, University of California. Annual Reviews, Inc., Stanford, California, 1954. ix + 636 pp. 16 × 23 cm. Price \$7.00.

This volume continues the high standards set by preceding issues in outlining and evaluating recent advances in the chemical study of living matter. There are 19 chapters compared with 23 in each of the 1953 and 1952 editions. The prefatory chapter by Karl Thomas entitled "Fifty years of biochemistry in Germany" is chiefly an account of personal experiences, including those associated with political upheavals which plagued that country, and contains comments on factors which contribute to success in teaching and research. It traces the changing attitudes of investigators from the static to the dynamic approach to the study of metabolism, and contains many tributes to individuals in this "mother country of physiological chemistry."

Of the remaining 18 chapters, 12 are on the perennially recurring, but rapidly changing, topics: biological oxidation, proteolytic enzymes, non-proteolytic enzymes, chemistry of carbohydrates, chemistry of amino acids and proteins, nucleic acids, nutrition, fat-soluble vitamins, water-soluble vitamins (2 chapters), biochemistry of cancer, and carbohydrate metabolism. The other six topics are biochemistry of muscle, biochemistry of hormones, clinical application of biochemistry, mineral metabolism, thyroid hormone and iodine metabolism, and metabolic antagonists. All of these have appeared at various intervals in previous Annual Reviews.

The omission of the chapters of Lipid and Protein Metabolism and the inclusion of the material otherwise to be

found here under the headings of Carbohydrate Metabolism and Vitamins, is evidence of two trends in modern biochemistry: (1) the integration, overlapping and essential unity of all phases of metabolism and (p. 125) "that the traditional division of metabolism into carbohydrate, lipid, etc., is no longer entirely appropriate to modern Biochemistry" (2) the fundamental role of the vitamins, especially B vitamins, in metabolic processes. The space devoted to water-soluble vitamins is expanded to two chapters, and most of this is concerned with the metabolic reactions in which these vitamins participate. Although no single review can completely cover the subject whose title it bears, and, much less, can any annual volume adequately represent all the advances in the field during that year, the extent of coverage achieved is remarkably good especially when several volumes over a period of 3 or 4 years are taken together. The editors and authors are to be congratulated on the effectiveness, value and wide use of this publication.

The international character of the volume is well-maintained with chapters contributed by 3 British, 2 French, 1 Danish, besides the prefatory German, authors.

The publication is held in high esteem by biochemists throughout the world. It is a ready source of information and references on any aspect of this rapidly expanding subject which is fundamental to medicine and agriculture; it contains critical analyses of many perplexing scientific problems; it is a historical account of an important science during a period when its very foundations are being discovered.

DEPARTMENT OF BIOCHEMISTRY
UNIVERSITY OF CHICAGO
CHICAGO 37, ILLINOIS

MARTIN E. HANKE

Organic Reactions. Volume VIII. By ROGER ADAMS, Editor-in-Chief. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1954. viii + 437 pp. 16 × 23.5 cm. Price \$12.00.

This is the eighth in a series of volumes dealing with organic reactions, issued under the direction of an Editorial Board headed by Professor Adams, together with an Advisory Board and the eleven Associate Editors who are the contributors to this volume. The chapters constitute complete and critical reviews, each one dealing with an important reaction or transformation of organic compounds.

Each chapter includes a brief historical introduction, followed by sections on the mechanism of the reaction, scope and limitations of the reaction, preparation of the reagents, related reactions, choice of experimental procedures. Each chapter includes a tabular survey of all the reactions to be found in the literature. The tables are exhaustive, and they list not only the compounds prepared, but also the reagents, reaction conditions, yields and references to the literature.

The writing is excellent, the style is uniform, clear and concise, yet the fields are covered thoroughly, each one by an authority in the field. It is impossible to single out any chapters as better than the others; all of them meet, in all respects, the very high standard set in the preparation of the earlier volumes. There is a cumulative index, and a cumulative list of subjects, which include all of the eight volumes in the series.

The book is printed on good paper, and the book-making and typography are excellent. The many complicated structural formulas are beautifully set and arranged on the pages; even in the tables, where smaller type is used, the formulas and the arrangement are first rate.

It is regrettable that modern costs of production make it necessary to price such a fine book beyond the means of most of the graduate students and younger chemists who would find it so useful.

The chapters are as follows:

1. Catalytic Hydrogenation of Esters to Alcohols. By the late Homer Adkins; 27 pages, 51 references, 13 pages of tables.

2. The Synthesis of Ketones from Acid Halides and Organometallic Compounds of Magnesium, Zinc, and Cadmium. By David A. Shirley; 31 pages, 146 references, 11 pages of tables.

3. The Acylation of Ketones to Form β -Diketones or β -Ketoaldehydes. By Charles R. Hauser, Frederic W. Swamer, and Joe T. Adams, Jr.; 138 pages, 572 references, 55 pages of tables.