

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.

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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 , 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-ferric 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.

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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)