Geophysical Encyclopedia

International Dictionary of Geophysics. Seismology, Geomagnetism, Aeronomy, Oceanography, Geodesy, Gravity, Marine Geophysics, Meteorology, the Earth as a Planet and Its Evolution. S. K. RUNCORN *et al.*, Eds. Pergamon, New York, 1967. 2 vols., xxiv + 1728 pp., illus.; book of maps. $120.

If I had not been sent a review copy and if a library were not within five minutes' walking time, I would personally buy this dictionary despite its fantastic price. This is the highest compliment I can pay it. Some entries are only one or two sentences long, but most of the topics are dealt with in the manner of concise encyclopedia articles. Although the stalwarts of geophysics are on the editorial board and contribute major articles, the editors have made heavy use of the talent that resides in the young set of geophysicists who have entered the field in the past five or ten years. As with many encyclopedias, the articles are uneven, there is overlap, and many entries bear strange titles. (However, a well-organized index helps here.) The strength of the work is in the large number of beautifully written articles in which concise descriptions of important topics are given. Some of these are classic pieces which will survive for a long time. They contain illustrations, tables, and references in just the right amount.

Many of the articles will no doubt be assigned for classroom reading in connection with university courses. I also predict that many articles will appear in references in scholarly works. This is indeed a tribute. Perhaps the most important function of the work is to serve the specialist who needs a concise review and bibliography of an adjacent field in geophysics which starts impinging on his own. Prior to the appearance of this dictionary, obtaining such material involved at best an inefficient search in the library.

The dictionary is truly international; the contributors are drawn from all over the world, albeit most heavily from the United States, western Europe, the Soviet Union, and Japan. The choice of contributors is excellent, and most of them have taken their assignments seriously.

According to the dust jacket there are more than 700 articles supplemented by over 700 illustrations contributed by some 300 individuals. The contents cover the following general topics: origin of the earth, studies of the ocean floor, physics of the seas and oceans, meteorology of the lower atmosphere, seismology, aeronomy, geodesy, magnetism of the earth's interior, tectonophysics, astronomical data in geophysics. The book of maps is nothing more than a hard-cover folder containing the physiographic diagrams of the South Atlantic Ocean and the Indian Ocean by Heezen and Tharp.

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Element No. 8

Oxygen and Oxidation. Theories and Techniques in the 19th Century and the First Part of the 20th. EDUARD FARBER. Washington Academy of Sciences, Washington, D.C., 1967. viii + 111 pp., illus. Paper, $4.25.

This is a book that will have a more immediate appeal to the professional chemist who is interested in research on oxygen and oxidation since 1800 than to the historian of science.

Farber has compiled an enormous amount of information within its hundred pages, citing 217 references in the original literature together with 47 more titles in a bibliography covering the period 1930 through 1966. The book opens with a general introduction on oxygen and the course of oxidation research (pp. 1–33) and then deals with two major topics, oxygen and color (pp. 34–66) and partial combustion (pp. 67–101). It is a vast field, and Farber has selected his material from a wide range of sources—academic and technical journals, and the patent literature.

The professional chemist can pick out subjects akin to his research interests very readily—peroxides and peroxygen, hydration and dehydrogenation, oxidation in a reducing medium, the beginnings of artificial dyestuffs, oxidation state and the color of metal compounds and inorganic nitrogen compounds, oxidation as electron donation, the production of formaldehyde and acetylene, polymerizations connected with dehydrogenations. Farber makes great use of short quotations from original sources, giving the book a lively quality and a sense of close contact with the past.

However, its very fragmentary nature and the frequent juxtaposition of observations and ideas having very different origins in time, place, and circumstance make it difficult to appreciate and understand the factors that have shaped the present state of knowledge in the field. Moreover, from the time of Lavoisier onward there has been a reciprocity between continuing studies on oxidation and the growth of inorganic chemistry, organic chemistry, physical chemistry, and biochemistry to an extent that is probably unique among research topics. The way in which these studies have contributed to the growth of chemistry and the central role that oxidation processes play in biochemistry still remain for critical historical evaluation in both breadth and depth. But documentation of the kind that Farber has so carefully put together is essential, and the book should be most useful in stimulating enquiry in the subject.

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ESSA and Its Components

The Environmental Science Services Administration. Including the Coast and Geodetic Survey, the Weather Bureau, the Institute for Telecommunication Sciences and Aeronomy, and Other Related Services. ROY POPKIN. Praeger, New York, 1967. x + 278 pp., illus. $5.95. Praeger Library of U.S. Government Departments and Agencies.

In recent years the organization of scientific activities within the federal government and the relationships among federal scientific agencies, the universities, and industry in the areas of science and technology have been the subject of repeated investigation and continuing study. The result of one such series of investigations was the reorganization of the scientific activities of the Department of Commerce, in which the Weather Bureau, the Coast and Geodetic Survey, and part of the Bureau of Standards were brought together in 1965 into the Environmental Science Services Administration (ESSA). There were proposals to include agencies from other departments in ESSA, for instance the Geological Survey. However,

departmental jealousies and bureaucratic inertia, together with valid doubts about the merits of the changes, combined to prevent their adoption.

Only two years have elapsed under the new organizational setup, so that a critical evaluation of the success of the reorganization in increasing the efficiency and effectiveness of the component agencies is premature, and indeed the author of the work under review does not attempt to make one. Rather he devotes himself to accounts of the history of each of the agencies (Coast and Geodetic Survey, Weather Bureau, and Central Radio Propagation Laboratory); a description of their reorganization under ESSA; and discussions of their roles in serving aviation, participating in the nation's war efforts, warning against environmental hazards, including hurricanes, tornadoes, floods, and earthquakes, and cooperating with other nations and international agencies in the study of the physical environment.

The United States government entered scientific activities in 1807, under President Jefferson's administration, when Congress authorized and appropriated funds ($50,000) for surveying the coasts of the United States. For many decades the Coast Survey and its successor after 1878, the Coast and Geodetic Survey, followed a rocky course to do an adequate job with restricted authority and insufficient funds. The federal weather service was established in 1870, although there were meteorological activities during the first half of the 19th century under the Army Surgeon General, the Naval Observatory (at Matthew Maury's initiative), and the Smithsonian Institution (directed by Joseph Henry). Initially under the Signal Corps of the War Department, in 1891 it became a civilian agency in the Department of Agriculture. In 1940, with the growth to dominance of its service to aviation, the Weather Bureau was transferred to the Department of Commerce. The third component agency of ESSA, the Central Radio Propagation Laboratory (renamed Institute for Telecommunications Sciences and Aeronomy under ESSA) was not established until 1946, although radio propagation studies had begun in the Bureau of Standards in 1909.

Under ESSA parts of the component agencies remain under their original designations, but other parts have been separated from them and brought together into new groupings. For instance, the research activities formerly conducted by the Weather Bureau have been put under the Institutes for Environmental Research, and the climatological section and national weather records center have been shifted to the Environmental Data Service. The coordination of research and weather records with the forecasting and observational activities is thereby shifted from an internal level in the Weather Bureau to an interbureau level. Whether the ease of coordination of research and operational activities is thereby reduced, and whether bringing the research activities of the Weather Bureau together with those of the other agencies under the Institutes for Environmental Research results in benefits which offset the reduction, remain to be seen.

The book is one of a series, the Praeger Library of U.S. Government Departments and Agencies, written to give the general reader an understanding of the development, scope, and operation of the components of the executive branch of the U.S. government. It succeeds reasonably well in this objective, although the scientific operations are mostly listed rather than described. The histories of the agencies include some interesting though brief accounts of some of the colorful personalities who contributed to their development. The discussion of the impact on the public of the hurricane and tornado warning services of the Weather Bureau is the most graphic part of the book, perhaps because the author, as an official of the National Red Cross, has had personal experience in using the warnings to reduce the human suffering resulting from these disasters.

No important errors of fact were obvious to the reviewer. However, such careless errors as the acknowledgment in the preface to "Dr. Leonard Machta," whose name really is Dr. Lester Machta, the statement on page 78 that "Robert S. White was named to head the [Weather] Bureau" (although in other places the present ESSA Administrator's name is given with the correct middle initial, M.), and the contradictory statements on page 83 regarding the number of districts the flood forecasting system was reorganized into just prior to World War II (eight in line 6 and nine in line 30) make one just a little uneasy about the reliability of other information in the book.

An appendix is devoted to a description of career opportunities in ESSA.

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Microwave Spectroscopy

Rotational Spectra and Molecular Structure. JAMES E. WOLLRAB. Academic Press, New York, 1967. xvi + 468 pp., illus. $20. Physical Chemistry Monographs, No. 13.

This is primarily an expository review of the theory developed to deduce molecular parameters from microwave spectra. The scope of the book is fairly deliberately bounded. Less than 30 pages are devoted to instrumentation and to the frequently difficult problem of identifying observed spectra. The observed, measured, and identified spectral lines are taken as features to be fitted by the theory. This theory, which fills the remainder of the book, permits evaluation of such molecular parameters as rotational constants, nuclear quadrupole coupling coefficients, and molecular dipole moments. Interpretation of molecular parameters and molecular structures in chemical terms is not a concern of the book, so that listings of structures and molecular parameters appear rarely and only incidentally.

In his preface the author places particular emphasis on those subjects which have developed significantly since 1955, when Townes and Schawlow's excellent *Microwave Spectroscopy* (McGraw-Hill) appeared. It is worth remarking that even though most of the relevant theory had been developed prior to this and is adequately covered in the earlier work, it is included by Wollrab. The treatment of the rigid asymmetric rotor by King, Hainer, and Cross which, quite properly, provides Wollrab's review of the rigid asymmetric rotor spectrum was published before the first high-resolution microwave spectrum was observed. Again, the early microwave spectrum studies showed that phenomena different from those previously encountered were involved and that substantial development was required. As early as 1948 Bardeen and Townes presented the theory required to interpret the nuclear hyperfine structure, carrying their treatment far enough to include the complicated spectra which characterize a molecule having two nuclei with comparable quadrupole moments. Wollrab's treatment follows theirs.

As the field of microwave spectroscopy has matured, problems of more complexity and difficulty have been approached and mastered. The influence of molecular vibrations on molecular structure determinations has been extensively studied. The Kivelson-Wilson