Book Reviews

pH Measurements, Their Theory and Practice. Victor Gold. Methuen, London; Wiley, New York, 1956. 125 pp. $2.25.

According to the foreword, this little book is "intended for non-specialists, and its object is not only to describe the basic experimental techniques for the measurement of *p*H, but also to help towards a better understanding of the correct significance of the measurements and the limitations of the concept of *p*H." A detailed description of experimental procedures was not possible in the limited space at the author's disposal. The second purpose is, however, admirably fulfilled.

The practical *p*H scale is a compromise between the desire to retain a well-established, convenient experimental method and the desire to allow some theoretical significance to be attached to the results. The lack of exact fundamental meaning is the cause of most of the dissatisfaction with the modern scale. It is hoped that the sections on interpretation of *p*H measurements in aqueous solutions and in mixed solvents will help to dispel the widespread confusion and misunderstanding that have surrounded this subject in the past. They are written with clarity and capability.

In my opinion, however, the author has emphasized a difference between American and British standard practice that does not exist. It is true that the National Bureau of Standards has chosen $-\log [H^+]f_{H^+}$ as the formal definition of the standard value (pH_S), whereas the British standard regards this unit as $-\log [H^+]f_{\pm(1:1)}$. However, the convention on which all of the numerical values of pH_S are based identifies f_{H^+} with $f_{\pm(1:1)}$ for a "typical" strong electrolyte. The author states (page 39): "Although these two points of view appear to be quite different, they do, in fact, lead to the adoption of the same value for the *p*H of the 0.05*M* solution of potassium hydrogen phthalate." This could hardly be otherwise, for both standard methods adopt the numerical values assigned to this buffer solution by Hamer, Pinching, and Acree.

In a little more than 100 pages, this book covers a remarkable amount of material. The nine chapters include a treatment of the theory and role of *p*H in proton-transfer equilibria and in kinetics, theory of galvanic cells, electromotive force and optical measurements, and definitions and interpretation of *p*H in aqueous and nonaqueous media.

In spite of its wide scope, the discussion is rigorous and unmarred by oversimplification, except possibly in the omission of the important effect of indicator charge type on the *p*H measurement by optical means. The index of mathematical symbols is a worthy feature. References to the literature are few in number and generally inadequate. Nevertheless, this volume speaks with competence and authority and should prove useful to student and research worker alike.

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Allgemeine Meereskunde. Eine Einführung in die Ozeanographie. Günter Dietrich and Kurt Kalle. Borntraeger, Berlin, 1957. 492 pp. Illus. DM. 56.

The publication of a new professional book in their field is always a major event for oceanographers. Despite the recent deluge of popular books about the sea, there have been few scholarly attempts since publication of *The Oceans,* 15 years ago, to summarize the present status of fact and theory in marine science. No post-World War II textbook has been designed to replace *The Oceans,* since none attempts so broad a treatment. Instead, there have been numerous specialized discussions of the various individual branches of oceanography. Thus, marine geology has been discussed in Shepard's *Submarine Geology* and Kuenen's *Marine Geology*; marine chemistry, in Kalle's *Der Stoffhaushalt des Meeres* and Harvey's *The Chemistry and Fertility of Sea Waters*; physical oceanography, in Proudman's *Dynamical Oceanography* and Shuleikin's *Fizika Moria*; and marine biology in a number of books, including Hardy's *The Open Sea,* Marshall's *Aspects of Deep Sea Biology,* and Zenkevich's *Fauna i Biologicheskaia Produktivnost' Moria.*

Allgemeine Meereskunde represents a return to the more general treatment. Indeed, the general arrangement of topics is very reminiscent of *The Oceans,* although biological and geological problems are given less emphasis.

The major topics discussed are the geomorphology of the sea floor, physical and chemical properties of sea water, oceanographic instruments and methods of measurement, heat budget, distribution of temperature, salinity and density, geochemistry and biochemistry of the ocean, theory of ocean currents, surface and internal waves, tides, and regional oceanography. In each section the organization is highly systematic, making the book easy to use as a reference. Although the treatment of most topics is traditional, many results of research published prior to 1955 have been included. The selection of examples leans heavily on the works of the authors and their associates, but the examples are always pertinent and instructive.

The long section on chemical processes was written by Kalle, and I believe that it is the best summary of chemical oceanography available today. The section on regional oceanography is one of the first attempts since *The Oceans* to summarize the present knowledge of the circulation and distribution of properties in the world ocean. Although I am distressed by the omission of Montgomery's isentropic analysis in favor of the *Kernschicht* method of Wüst and Defant and by the inclusion of an outdated interpretation of the meridional circulation in the equatorial Pacific, I feel that the general treatment is both instructive and provocative.

The field of oceanography has so broadened during the last 15 years that it is increasingly difficult to compress its basic facts and ideas within the covers of a single, convenient volume. This well-printed and clearly written book is, in many ways, the best general oceanographic textbook available today. It serves as another reminder that the oceanographer must have a command of German (as well as of Russian) to keep up with the latest developments in his field.

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Heterocylic Compounds. vol. 6, *Six-Membered Heterocycles Containing Two Hetero Atoms and Their Benzoderivatives.* Robert C. Elderfield, Ed. Wiley, New York, 1957. 753 pp. $20.

This sixth volume of *Heterocyclic Compounds* has 14 chapters which summarize the chemistry of certain six-membered heterocyclic ring systems. The scope of the material is shown by the following specific chapters: "Monocyclic dioxanes" (59 pages) by C. B. Kremer

and L. K. Rothen; "Benzodioxanes" (16 pages) by R. C. Elderfield; "Sulfur analogs of dioxanes" (26 pages) by R. C. Elderfield; "Pyridazines" (35 pages) by T. L. Jacobs; "Cinnolines" (40 pages) by T. L. Jacobs; "Phthalazines" (48 pages) by R. C. Elderfield and S. L. Wythe; "Pyrimidines" (70 pages) by G. W. Kenner and A. Todd; "Quinazolines" (53 pages) by T. A. Williamson; "Pyrazines and piperazines" (78 pages) by Y. T. Pratt; "Quinoxalines" (41 pages) by Y. T. Pratt; "Monocyclic oxazines" (68 pages) by N. H. Cromwell; "Benzoxazines" (37 pages) by R. C. Elderfield, W. H. Todd, and S. Gerber; "Thiazines and benzothiazines" (23 pages) by R. C. Elderfield and E. E. Harris; and "Phenazines, phenoxazines, and phenothiazines" (103 pages) by D. E. Pearson.

Each heterocycle is treated systematically; nomenclature, numbering, syntheses, and reactions are given. The literature is covered very well. The citations have been selected with care and attention to their importance. The chapters are well written, and the selection of authors is excellent. To assist the reader, each chapter has a complete table of contents, and a good index is provided.

This treatise is a great timesaver for all research chemists in the fields of organic chemistry and biochemistry. Parts of it will be of value to scientists in the fields of chemotherapy and pharmacology, since the authors have mentioned biological activity of important compounds. The book is well printed and edited.

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Water for Industry. A symposium presented 29 Dec. 1953 at the Boston meeting of the American Association for the Advancement of Science. AAAS publ. No. 45. Jack B. Graham and Meredith F. Burrill, Eds. Washington, D.C., 1956. 131 pp. Illus. $3.25, members; $3.75, nonmembers.

This timely little symposium volume contains nine papers by 12 authors who are experts on many of the broader problems of water and water supply. The volume does not cover the complete field of "water for industry," but the included papers fairly sample the kinds of water problems that are confronting industry now and those that are sure to arise in the future. These problems are much broader than those of industry alone. The whole field of water use is involved, because industrial water problems directly or indirectly affect all phases of our national economy. Here are a few of the more significant points made in the symposium papers.

The rapidly closing gap between water supply and demand in many places and the conflicts of interest in water supplies between states, between individuals, and between whole groups of users are forcing increased attention to water supply and water conservation on the part of Government agencies at all levels and of private organizations and citizens' groups. For example, optimum ultimate development of all recoverable water in the United States will be necessary for the national welfare, including national defense. Realistic forecasts of future urban and industrial developments, area by area, must be developed, and water must be reserved or otherwise provided for their supply. The market for farm products is not growing rapidly. Hence, wholesale expansion of agriculture is not the way to expand the national economy. Many thousands of people are drawn yearly from agricultural areas by employment opportunities in industrial centers. Some western areas are promoting local industrial development for purposes of diversifying their economy and holding their population. Many agricultural regions, however, are the very areas which are short of water or have low ceilings on their supplies. In some instances, practically all the water is committed for existing uses, chiefly agricultural. How, then, to supply industry?

Already the economy of certain industrial areas is precarious because of agricultural domination. Lack of planning for industrial and urban development 10 to 50 years hence is one of the greatest deficiencies in river-basin planning. Estimates have been made of urban and industrial requirements up to the year 1975. However, most of these are on a nation-wide or large-region scale and are not tied to specific areas or to river basins. They should be.

In the present stage of our development, water is a compelling influence in all our activities; within the near future it may become a controlling factor. Our national history is the history of a Horatio Alger among nations. We may yet face disaster if we fail to use the knowledge and skill that are now available to provide for optimum harnessing of this prime natural resource, water.

Several papers in the symposium merit special attention. The first, on "The available water supply," was prepared by C. G. Paulsen, retired chief hydraulic engineer, U.S. Geological Survey. In somewhat philosophic vein it analyzes and gives examples of the nation-wide water situation, the causes of varied water problems, and various approaches to their solution, thus establishing an appropriate background for succeeding papers on more specific topics.

Francis A. Pitkin's "Correction of a fluviatile delinquent: the Schuylkill River" is a dramatic historical sketch of the abuse of a watershed by mining, the 200-year deterioration of the watershed and the river, and their recent rehabilitation. One can only comment that man, not the river, was delinquent.

J. R. Whittaker's paper on "Water in the future" is outstanding and is probably one of the best recently published summaries, in simple, everyday language, of present and foreseeable water problems in the United States. The paper also sounds several encouraging notes of optimism. If intelligent planning is done and vigorous action is taken, the next generation may be spared a national problem. Too many problems have already been bequeathed to posterity.

This volume deserves wide reading and study. The analyses of the water problems are scientifically sound but are couched in readily understood, straightforward language.

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Advances in Virus Research. vol. IV. Kenneth M. Smith and Max A. Lauffer, Eds. Academic Press, New York, 1957. 339 pp. $8.

As in previous volumes of this series, the nine articles that comprise volume IV deal with various aspects of virology at a basic level, with considerable emphasis on information derived from application of the methods of physics and chemistry. It is not surprising, therefore, that three of the articles are concerned with plant viruses and two, mainly with bacteriophage, because the nature of these agents has allowed more precise physicochemical studies of the host-virus system in these cases than is possible for other viruses. Two of the articles deal entirely with animal viruses, and two others, with general subjects.

One of the latter, "Factors in virus evolution," by C. H. Andrewes, is a unique attempt to visualize, from accumulated information, the ways in which viruses may have evolved and in which they continue to adapt themselves to changes in their host populations. The question of an arthropod origin of many of the known viruses is raised, and the evidence is examined. Obviously, much of the material presented is highly speculative, but it is based on broad knowledge and experience and contributes to an area that has been largely neglected, that of orienting the viruses in the field of biology as a whole.

Andrewes includes in his discussion the selective effects of the immune state in host populations. An expansion of this theme is included in the article by Keith E. Jensen, "The nature of sero-