accumulate because acceptance of the higher figure led to justifiable termination of pregnancy.) Study of the 1957 epidemic of Asian influenza emphasized the high mortality among pregnant women. Other investigations were concerned with the potency of vaccine preparations and with the preventive effect of gamma globulin on various infections.

An additional value is the presentation of plans and protocols that are models of honesty and clarity. Greenberg's outlines of the practice and theory of epidemiology were intended primarily for education and to improve the practitioner's outlook. He also provided stimulating instruction to students of epidemiology at Columbia University. The many examples of sound philosophy and of well-conceived productive effort make this book a valuable asset for the student of epidemiologic methodology. It contains much valuable information as well.

Forewords contain tributes from three commissioners under whom Greenberg served. They express an appreciation that can be shared by those who become acquainted with Morris Greenberg through his selected works.

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Electrochemistry

Electrochemistry. Proceedings of the First Australian Conference (Sydney and Hobart), February 1963. J. A. Friend and F. Gutmann, Eds. Pergamon, New York, 1965. xvi + 954 pp. Illus. $30.

As a record of a very successful conference on electrochemistry this book is a valuable contribution to the literature. It is especially noteworthy as a compendium of recent electrochemical work done by the scientists down under and by those scientists who traveled there to discuss problems of mutual interest. The individual contributions are grouped in 12 sections that correspond to the 12 conference sessions: Solid-State Chemistry (7 papers); Thermodynamics of Electrolytes (6 papers); Corrosion (4 papers); Theory of Double Layers (4 papers); Electroanalytical Methods (7 papers); Applications—Electroplating, Anodizing (8 papers); Non-aqueous Electrolytes (5 papers); Molten Salts (6 papers); Fuel Cells (6 papers); Electrode Processes (7 papers); Electrochemical Processes (5 papers); and Electrowinning and Electrorefining (8 papers). In general, the scope of the sections is broader than the titles indicate. Three papers in the section on nonaqueous electrolytes deal with electrode processes in nonaqueous media rather than nonaqueous electrolytes per se. The section on thermodynamics of electrolytes contains a paper on electrode potentials and one on electrode phenomena in addition to four papers that deal strictly with electrolytes. In the section on solid-state chemistry there is a paper on the solid-aqueous interface of germanium with a discussion of the liquid phase. These examples emphasize the fact that the book covers a wider range of topics than is indicated by the section titles. There is also some overlapping of subject matter between sections, but this adds to rather than detracts from the overall presentation.

Theory constitutes about 65 percent of the book; the remaining 35 percent is devoted to applications of electrochemical principles to electrolytic extractions, corrosion control, chemical analysis, energy production, metal deposition, and thin-film formation. The technology and fundamentals of fuel cells and the intrinsic properties of molten salts, topics that are currently of much interest, are given good coverage. Polarography and potentiometric titrations are emphasized in the section on electroanalytical methods.

The papers, with three exceptions, are of nearly equal length (12 pp.). The longer papers are concerned with the theory of the double-layer equilibrium (49 pp.), the structure of charged interfaces (32 pp.), and the mechanism of hydrogen evolution at metal surfaces (30 pp.) Accordingly, a large portion of the book deals with the electrode-solution interface; in fact, the book begins with a discussion of solid-state chemistry which has an important bearing on an understanding of the fundamentals of electrode processes.

With few exceptions, the papers are of high quality and carefully edited. This fine book belongs in the library of all who have a serious interest in electrochemistry.

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Ultrasonic Studies

Physical Acoustics: Principles and Methods. vol. 2, pt. A, *Properties of Gases, Liquids, and Solutions*. Warren P. Mason, Ed. Academic Press, New York, 1965. xviii + 476 pp. Illus. $17.

Ultrasonic studies can give detailed information on molecular processes in gases and liquids, and in particular on relaxation phenomena associated with the rate of energy exchange and of structural changes in fluids. Although this subject was rather neglected in books on ultrasonics published prior to 1959, three treatments have since appeared: *Absorption and Dispersion of Ultrasonic Waves* by Herzfeld and Litovitz (1959); *Dispersion and Absorption of Sound by Molecular Processes* (Proceedings of the International School of Physics "Enrico Fermi") edited by D. Sette (1963); and now part A of the second volume of the comprehensive series on physical acoustics being edited by W. P. Mason of Bell Telephone Laboratories.

The first three chapters of the present volume deal with the application of ultrasonics to understanding the properties of gases. All three are expanded versions of brief treatments given by the same authors in the "Enrico Fermi" volume. M. Greenspan, in his treatment of transmission of sound waves in gases at very low pressures, reviews the theories of translational dispersion and absorption in gases, with only a brief discussion of experimental methods and results, the latter restricted to monatomic gases. Utilizing the methods of thermodynamics of irreversible processes, H.-J. Bauer treats in detail the phenomenological theory of relaxation phenomena in gases, with emphasis on multiple relaxation processes. Comparison of this theory with experiments on polyatomic molecules is presented in a chapter by H. O. Kneser. This latter chapter in particular is outstanding for its clarity and succinctness of presentation; the nonexpert should read it first, rather than last, of the three chapters on gases.

The final three chapters deal primarily with relaxation effects in liquids. J. Lamb treats of thermal relaxation accompanying the propagation of a compressional wave through a liquid; his brief theoretical discussion is followed by an interpretation of the ex-

perimental results in terms of chemical reactions. A chapter by T. A. Litovitz and C. M. Davis complements that of Lamb by treating structural and shear relaxation processes in liquids, in which discussion of theory is accompanied by detailed comparison with experimental results. The last chapter, by J. Stuehr and E. Yeager, discusses the use of ultrasonic velocity and absorption measurements in providing information concerning the arrangement of matter in electrolytic solutions, emphasis being placed on ultrasonic relaxation effects in these solutions.

Typical of the volume is a profusion of graphs, diagrams, and tables which add a great deal to the presentation. References are appended to each chapter, and there are both author and subject indices for the entire volume. The book bears the mark of careful editing; where overlapping treatments occur, these appear to be intentional, and free (and helpful) use is made of cross-references among the six chapters. This volume constitutes an excellent, up-to-date, scholarly review of the use of ultrasonics in determining the properties of and the interactions between molecules of gases and liquids.

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Recent Research in Marine Meteorology

Physics of the Marine Atmosphere. H. U. Roll. Academic Press, New York, 1965. 434 pp. Illus. $15.

This book provides an organized summary of recent research in marine meteorology. There is no comparable book, so this one will serve a useful purpose in permitting research scientists and students to survey efficiently many limited subjects within the broad field. Discussion of research covering about 600 papers and books is organized under observations, chemistry and electricity, wind field and sea surface, and distribution of temperature and humidity. The book represents an admirable piece of scholarly work, and the author's extensive contributions to marine meteorology qualify him uniquely for his task.

The best parts of Roll's book are those devoted to interpretations of observations of the wind, temperature, and humidity above the sea. References to all observations and interpretations relevant to these subjects are included, and all significant aspects are discussed.

The emphasis given to data is consistent with Roll's belief, stated in the final chapter, that greater understanding of the physics of the marine atmosphere is to be achieved through more and better data. If this means more and better *generalized* data, it seriously misses the mark, in my opinion. The critical data requirements arise from theory; they are for the instrumental capability and observations needed to answer certain specific questions.

Theoretical works are referred to in the book, but in most cases so briefly that the accounts are of little value. For example, the theories of surface wave generation of J. W. Miles, O. M. Phillips, and K. Hasselmann represent probably the most significant advance in the last decade in marine meteorology. Brief qualitative accounts of some aspects of these contributions are given, but the reader cannot learn the present state of the theory of wave generation from this book. At one point we read that "we shall abstain from going into detail but merely present the resulting formulae"; unfortunately, this reluctant brush characterizes the author's treatment of much theoretical material.

Roll's book fills the need for an organized summary of recent research in marine meteorology; the need is also great for another kind of book, a creative book that simplifies and unifies the subject, a book that is capable of infecting the reader with stimulating insights. Such a book should be organized around clear statements of the fundamental problems, and it should contain illuminating analyses of complex problems. It should draw sharp distinctions on the basis of quality of research and fertility of ideas, and its effect should be to prepare capable students to strike out enthusiastically on fruitful paths. It is disappointing to have to note that in marine meteorology, such a book has not yet been published.

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The Growth of Microbiology

Three Centuries of Microbiology. Hubert A. Lechevalier and Morris Solotorovsky. McGraw-Hill, New York, 1965. viii + 536 pp. Paper, $4.95.

The authors have "attempted to reconstruct the growth of microbiology, stressing the main lines of its development" by summarizing the work of Pasteur and Koch, and by outlining the development of knowledge in nine fields. Of these, seven are largely or exclusively concerned with the interrelation of microbiology and medical science, and two, "From soil microbiology to comparative biochemistry" and "Genetics," with what some call "basic microbiology." The themes are developed by the use of frequent and extensive quotations from the original literature, with orienting comments and interpretations by the authors serving as cement to bind the fragments into a logical and cohesive whole. Thumbnail biographical sketches of the major, and many of the minor, figures are generously interlarded in the text. These are replete with choice tidbits on the genealogy, disposition, character, financial circumstances, and sins (venial) of the protagonists.

If not considered as a critical contribution to the history of science, which it is not, the book for the most part is eminently successful. The authors have done a fine job in selecting the material to be quoted and in providing a smooth, readable text. They perhaps make value judgments too facilely and deal too superficially with complex individuals, but this is a book not to argue with but to enjoy. I spent as much time in the library as in the laboratory during my student days, but I was nevertheless introduced to papers somehow passed by or never pertinent to my work. It was a pleasure, for example, to read excerpts from Raulin's "Chemical studies on growth," or the cold, precise case histories of Reed and Carroll's human volunteers. It was amusing to learn that Behring and Höchst euchered Ehrlich out of his share of the royalties from diphtheria antitoxin, or that Erwin Smith's second wife was "strongly versed in Latin and Greek." The book should prove enjoyable to all microbiologists and to many laymen as well. It should be particularly valuable as a gift to the young enthusiast for whom any article not in the current issue of the *Proceedings of the National*