cultivation, environmental factors that influence growth and sporulation, isolation and preservation, natural and induced variation in the genus, and pathogenicity. The chapter on pathogenicity (including toxicosis) to man, mammals, birds, and insects was written by P. K. C. Austwick. The literature prior to 1964 dealing with aflatoxin is thoroughly summarized. Concern about the presence of this carcinogenic antimetabolite in grains and nuts, and feeds and foods (for example, in peanut butter) derived therefrom, has mushroomed since final preparation of the manuscript.

Each of the 18 chapters that treat a recognized group ends with a subchapter usually entitled "Occurrence and significance." Herein the enzymes, organic acids, antibiotics, pigments, and other metabolic products of various species are thoroughly discussed. The natural habitats of species are indicated (for example, coniferous forest soils for *Aspergillus kanagawaensis*); the roles that different species play in the deterioration of foodstuffs and fabrics, in phytopathology, and in important industrial fermentations are reviewed. Genetic studies involving *Aspergilli* (as *A. nidulans*) are summarized. The bibliography and index complete the work.

With the *Manual* both out-of-print and out-of-date, this text becomes an essential source of up-to-date information on the genus *Aspergillus*. Many other genera of the fungi need similar comprehensive treatment.

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Comparative Endocrinology

Animal Hormones. J. Lee and F. G. W. Knowles. Hillary House, New York, 1965. 192 pp. Illus. $3.

This monograph in the Hutchinson University Library Series discusses the hormones of animals, both vertebrate and invertebrate, in a comparative fashion that "is intended to guide the reader rather than to provide him with a comprehensive account." Within the limitations implied by this statement of intent, this book will be useful to the neophyte in comparative endocrinology; I am such a neophyte, and I found the book interesting and informative.

Vertebrate hormones and the structures that secrete them are discussed, with the emphasis on the endocrines of mammals that one expects in view of the clinical and physiological origins of endocrinology. Each of the major endocrine organs is briefly discussed in a separate chapter, in which a description of anatomy and physiology in mammalian forms is followed by a summary of the organ's structure and function in birds, reptiles and amphibians, fishes, and the lower vertebrates. Hormones secreted in nonendocrine structures (for example, secretin) are treated separately. The hormones of invertebrates occupy a rather large portion of the text, allowing discussion in greater depth of the limited knowledge available in this area. Attention is called to the prevalence of neurosecretion of invertebrate hormones, and a summary chapter emphasizes the central importance of neurosecretion in hormonal regulation in vertebrates as well as in invertebrates. The authors point out that "the study of comparative endocrinology suggests that endocrine control may have arisen in the first place by specialization of certain elements of the nervous system."

The type is legible and only a few typographical errors mar the technical excellence of the volume. There is an adequate index but only a brief bibliography. Illustrations are few and limited almost entirely to anatomical drawings. The text is generally well-formulated and lucid, but there are occasional lapses—"the glucocorticoids promote gluconeogenesis, which, briefly, convert proteins and fats into glucose" and "the growth hormone . . . not only controls the rate of growth, but also the metabolism necessary for this growth." That these lapses appear in sections dealing with the biochemistry of hormone effects is significant, as they reflect a general tendency to treat this area very gingerly or to ignore it entirely.

Animal hormones is a large subject, and this is a small book. This leads to a treatment of the subject that will be too superficial for some, although its brevity is an asset in presenting relationships between the hormones of the various animal forms. I recommend the book to those who are interested in a brief introduction to comparative endocrinology.

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Ocean Surfaces

Wind Waves: Their Generation and Propagation on the Ocean Surface. Blair Kinsman. Prentice-Hall, Englewood Cliffs, N.J., 1965. xxiv + 676 pp. Illus. $23.35.

So rapid have developments been in the past 15 years that a truly useful textbook on ocean wind waves would have been in danger of obsolescence before going to press. However, Kinsman has managed to incorporate all but the very latest developments in the rapidly advancing field of wave research in this long awaited book. Students, engineers, and scientists embarking for the first time on oceanographic study, as well as those who have labored in wave research, will be grateful for this admirably comprehensive work. Kinsman maintains a reasonably detached point of view, perhaps because he was one of the few "spectrum analysts" who did not propose an empirical spectrum of his own. Beginning slowly, he carefully develops the necessary background from classical hydrodynamics and small amplitude theory to ocean waves of finite height. For historical completeness and to show developments leading to the present state of linear wave models, a summary of the Sverdrup-Munk wave forecasting theory is included.

More than half the book is required to bring the reader to the point where the natural seaway is described in terms of a random process, and the realization that the energy spectrum is the necessary statistical parameter to replace the specification of an average wave height and poorly defined wave period value. Considerable space is devoted to the work of Pierson and Neumann, and to the stimulus provided to ocean wave forecasting research by their pioneer efforts to develop a wave spectrum approach. A brief but useful review of some recent measurement techniques is presented, and from this point on (chap. 10) the author prepares the reader for the several mechanisms of wave generation proposed by Phillips, Miles, Hasselmann, and McGoldrick. Here, the going gets a bit rough for the average reader, but Kinsman attempts wherever possible to explain the physical principles expressed by the compact mathematical notation. Even though the author does not mention automated wave prediction techniques and presents only cursory discussion of the empirical spec-

tra proposed by Walden, Roll-Fischer, Darbyshire, and Gelci, he has provided a more than 600-page volume that will be a useful textbook for a good many years. Also, the preface itself contains a most entertaining bit of personal philosophy presaging the delightful style and extensive scholarship which pervade all of *Wind Waves: Their Generation and Propagation on the Ocean Surface.*

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Quantitative Biology

Theoretical and Mathematical Biology. Talbot H. Waterman and Harold J. Morowitz, Eds. Blaisdell (Ginn), New York, 1965. xviii + 426 pp. Illus. $12.50.

This book contains a series of papers dealing with various aspects of the effort to make biology a quantitative science, and it aims to persuade more biologists to adopt analytical techniques in their work.

One can distinguish roughly three categories of papers. Some describe the successful application of analytical techniques in connection with experimental work for the investigation of a specific biological system. Others present some well-known mathematical tools and computer techniques and show how these could be successfully used for the investigation of biological problems. The third category consists of papers that deal with what could be described as philosophical questions about the possibility of making biology a quantitative science.

It is difficult to say how influential this book can be in persuading biologists to adopt the use of quantitative methods. This is so because unawareness of the advantages of such an approach is not the only reason many biologists are reluctant to use such methods.

For the student of biology who is inclined to follow the modern approach, the book is of unquestionable value. Among the contributions are descriptions of "classical" work like the studies on the nerve impulse described by K. S. Cole and the ones on cochlear mechanics by G. V. Békésy. These present excellent examples of successful application of analytical methods in biology. The same can be said about the papers by W. Reichardt (on the limulus eye and the movement perception by insects) as well as about those by B. Chance (transients in metabolism) and others.

In the papers by H. T. Morowitz and N. Rashevsky the reader will find an extensive presentation of the thesis that living organisms are not too complicated to be treated analytically and through general principles.

Although the book is primarily intended for biologists, it is also of interest for engineers and mathematicians who consider working in this field. They may find certain parts of the book uninteresting (for example, the descriptions of elementary computation techniques), but they will definitely benefit from other parts which show particular areas of biology where the application of analytical techniques is especially profitable, although the list is not complete. For example, one important area of quantitative biology (biological clocks) is not considered at all.

A final remark is that one would expect such a book to have a tighter and more systematic interconnection between its various parts. This expectation is especially justified because the presented works are not original but mostly reviews and summaries of work previously published by the contributors.

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Structural Chemistry

Electrons and Chemical Bonding. Harry B. Gray. Benjamin, New York, 1964. xvi + 223 pp. Illus. Paper, $3.95; cloth, $8.

Chemical Bonding. Audrey L. Companion. McGraw-Hill, New York, 1964. xii + 155 pp. Illus. $4.50.

All teachers of college chemistry will wish to peruse these two little books about chemical bonds.

At a level appropriate for well-prepared undergraduates in their first or second year, Gray presents a finely toned and systematic discussion of chemical bonding in a large number of molecules, from diatomics through organic molecules and octahedral complexes. He employs almost exclusively the simple molecular-orbital method. Companion covers almost the same ground, although her treatment is less mathematical. Both books contain discussions of elementary quantum-mechanical concepts, a number of problems, many tables, and very many illustrations. Both books necessarily are somewhat oversimplified. With respect to style, I prefer Gray's, which is straightforward, but some readers will prefer Companion's, which embodies special efforts at readability.

Chemists, a distinguished chemical physicist has remarked, are people who love molecules—for neophyte chemists these books should provide stimulating and helpful reading. Physicists take a more austere view of molecules—for them these books may seem curious. For the undecided, between the two professions, it still is the original research works on chemical bonding that, in my opinion, provide the best prospect of modern structural chemistry.

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New Books

Mathematics, Physical Sciences, and Engineering

Electricity and Magnetism. B. I. Bleaney and B. Bleaney. Oxford Univ. Press, New York. ed. 2, 1965. 780 pp. Illus. $11.20.

Elements of the Theory of Nonlinear Oscillations. N. V. Butenin. Blaisdell (Ginn), New York, 1965. 236 pp. Illus. $7.50.

Geology: A Survey of Earth Science. Edgar Winston Spencer. Crowell, New York, 1965. 692 pp. Illus. $9.50.

Hydrogen in Titanium. V. A. Livanov, A. A. Bukhanova, and B. A. Kolachev. Translated from the Russian edition (Moscow, 1962) by A. Aladjem. Israel Program for Scientific Translations, Jerusalem; Davey, New York, 1965. 208 pp. Illus. $10.25.

Industrial Chemicals. W. L. Faith, Donald B. Keyes, and Ronald L. Clark. Wiley, New York, ed. 3, 1965. 862 pp. Illus. $25.

Inelastic Behavior of Load-Carrying Members. James O. Smith and Omar M. Sidebottom. Wiley, New York, 1965. 461 pp. Illus. $12.75.

Inorganic Chemistry. vol. 1, *Principles and Non-Metals.* C. S. G. Phillips and R. J. P. Williams. Oxford Univ. Press, New York, 1965. 699 pp. Illus. $8.

Instrumental Methods of Analysis. Hobart H. Willard, Lynne L. Merritt, Jr., and John A. Dean. Van Nostrand, Princeton, N.J., ed. 4, 1965. 802 pp. Illus. $10.75.

Introduction to the Atmosphere. Herbert Riehl. McGraw-Hill, New York, 1965. 377 pp. Illus. $8.95.

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