Book Reviews

Dynamical Oceanography. J. Proudman. London: Methuen; New York: Wiley, 1953. 409 pp. Illus. $8.50.

When one considers the extensive publicity given oceanographic expeditions by the press, the astonishing success of popular books concerning the marine sciences, the large sums expended in oceanographic research (about $5,000,000 a year), he will be surprised to realize that Professor Proudman has provided us with the *first* text on theoretical oceanography in the English language. It is now possible for any physical scientist to obtain an idea of the theoretical framework of oceanography in terms that he can appreciate. Until the publication of this work, a physicist seeking information about the ocean was without an adequate guide to such theoretical literature as does exist and might easily suffocate in the mass of qualitative reasoning that characterizes so much of the professional literature.

The only prior English language treatise that does exist (*The Oceans,* Sverdrup *et al.,* Prentice-Hall, 1942) is a compendium covering all branches of marine science (biology, chemistry, etc.) in which the physical portions are written in a form more suited for meteorologists and the professional oceanographer than for physical scientists.

The first three chapters of *Dynamical Oceanography* are an introduction to the hydrodynamical equations in a rotating reference frame. Chapter 4 is concerned with the standard gradient current approximation so much used for computing the field of motion from the observed density structure. Chapter 5 treats various examples of stationary accelerated current systems. Chapters 6 and 7 deal with the subject of ocean turbulence and mixing processes. A very original treatment of the role of friction in the dynamics of parallel currents is introduced in Chapter 8. The following chapter begins with an ingenious explanation of the asymmetry of the wind-driven surface circulation, discusses the classical wind-drift current theory of Ekman and the many subsequent studies inspired by Ekman's work. Chapter 10 is unique in the oceanographic literature: it grapples with the difficult thermodynamical circulations in the ocean.

In Chapters 11–14 Professor Proudman enters into the subject of tides, where he is the world's foremost authority. Chapter 15 is an exposition of internal tides and waves. The final chapter is a brief summary of the main results of classical surface wave theory.

The exposition is clear and concise, and the book is so arranged that one may read any chapter at will without having to refer constantly to equations in previous chapters. Many readers will be glad to hear this.

This book should prove particularly useful for teachers of oceanography because each subject is discussed in a series of examples of increasing complexity, and in most cases the proofs and demonstrations are entirely original and novel. There is a short history and bibliography at the end of each chapter. These references contain few works of recent date, but this was perhaps a necessary restriction in order to maintain a well-balanced presentation of the entire subject, many aspects of which are so difficult that little progress has been made for many years. For example, a satisfactory model of the meridianal thermohaline circulation has never been investigated chiefly because of the essentially nonlinear nature of the transfer equations. Or, as another example, it has been impossible to integrate the linear tidal equations for the real oceans because the geometry of the ocean basins is so irregular. There is also a great deal to be said for giving references to original works, rather than to recent elaborations, no matter how old the original works happen to be.

The serious reader will find it desirable to supplement his study of Proudman's book with reading of a more descriptive nature. This reviewer recommends for this purpose the chapter on "water masses" in Sverdrup's *The Oceans.*

For years physical oceanography has been something of an ugly duckling among other prouder, established sciences. To many an academic scientist it seemed a species of geographical exploration, an expensive hobby for amateurs like the Prince of Monaco, or a minor adjunct to marine ecology. This unfortunate impression was largely due to the chaotic state of its theoretical framework. Professor Proudman's book presents this material in an orderly, understandable fashion and ought to do much in attracting the attention of capable mathematicians and physicists to the many perplexing theoretical problems of the ocean. Publication of this splendid volume makes one feel that oceanography has at last come of age.

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Fundamentals of Limnology. 2nd ed. Franz Ruttner; trans. from German by D. G. Frey and F. E. J. Fry. Toronto: Univ. Toronto Press, 1953. 242 pp. Illus. $6.50.

Usually a foreign text is translated some years after its appearance, by which time it is already beginning to show signs of age. This might have been the fate of this translation had the translators been unable to work from the manuscript of Ruttner's revised edition. The result is an up-to-date English version, published within a year of the new German edition, a circumstance as rare as it is welcome

The virtues of a text are often not apparent until it has been subjected to use by a group of students; the faults, such as major errors and omissions, may be apparent immediately. There are few omissions in

this concise book unless the comparatively sparse treatment of springs and streams as compared with lakes is considered an omission, but then this is intended to be a treatment of the *fundamentals,* not the details, of limnology, with particular reference to water as an environment. The use of European examples is of course natural, but the translators might have added a few more footnotes (they have not, incidentally, clearly separated their own from those by the author in all cases) citing examples to round out the work for use on this continent. Although that might be considered the duty of the lecturer who uses this for a text, it must be remembered that such a book is also consulted and read by students unable to take a course in limnology. It is interesting to note, by the way, that European cognizance of the extensive Russian literature in this field is as incomplete as our own. The book includes a glossary of terms, as well as a list of German-English equivalents, a condensed bibliography, and a very good index.

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Cold Spring Harbor Symposia on Quantitative Biology: The Neuron, Vol. XVII. Cold Spring Harbor, L. I., N. Y.: Biological Laboratory, 1952. 323 pp. Illus. $8.00.

This is the most advanced text on a general physiology of the neuron to appear in the international literature. It covers largely physiological investigations on the neurons of vertebrates but the anatomical aspects of the problem of the synapse have not been neglected and several papers deal with experiments on invertebrates.

Bodian discusses the amazing variety in the structural basis of the synapse while Chang correlates anatomical and physiological data in cortical dendrites. Tobias shows that optical changes are associated with nerve conduction and probably related to osmosis. The classical problem of nerve conduction is analyzed by Frankenhaeuser, Gasser, and Tasaki. Hodgkin and Huxley present a summary of their outstanding work on the role of Na and K ions in the process of excitation.

Electrotonic changes in nerves and dorsal roots are studied by Therman, Lloyd, and Lorente de Nó. Brink, Bronk, and their collaborators discuss their ingenious experiments on O_2 consumption of the resting and active nerve and show that half a million impulses may be conducted without an increase in the oxygen uptake of the nerve. In addition, Larrabee and Bronk review their extensive work on the metabolism of excised sympathetic ganglia with emphasis on the role of oxygen and glucose. Hunt gives a lucid summary of his work on stretch receptors with emphasis on the role of the small diameter efferent fibers. Two outstanding papers deal with retinal processes. Hartline continues his work on *Limulus* and discusses his beautiful experiments on a single ommatidium under the influence of light. Kuffler introduces new methods for the study of single action potentials in the mammalian retina and emphasizes the organization of the receptive retinal field. Skoglund contributes to the theory of neurohumors by studying the effects of acetylcholine and adrenalin on action potentials in spinal reflexes.

The book is well printed and illustrated. Unfortunately, the discussion is very limited. This is surprising in view of the fact that a relatively large international group of experts in neurophysiology participated in this Symposium. Is this an expression of a rather unhealthy state of specialization?

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Scientific Book Register

Centennial of Engineering. History and proceedings of symposia of American Society of Civil Engineers, 1852–1952. Lenox R. Lohr, Ed. Chicago: Museum of Science and Industry, 1953. Illus. + plates.

Basic Bacteriology: Its Biological and Chemical Background. Carl Lamanna and M. Frank Mallette. Baltimore: Williams & Wilkins, 1953. 677 pp. Illus. $10.00.

Electrical Engineering: Essential Theory and Typical Applications. 2nd ed. Fred H. Pumphrey. New York: Prentice-Hall, 1953. 404 pp. Illus. $6.00.

Pituitary Chromophobe Adenomas: Neurology, Metabolism, Therapy. A clinical study of the sellar syndrome. John I. Nurnberger and Saul R. Korey. New York: Springer Pub., 1953. 282 pp. Illus. $7.00.

Railroad Engineering, Vol I. William W. Hay. New York: Wiley; London: Chapman & Hall; 1953. 483 pp. Illus. $7.50.

The Pluripotency of the Hypophyseal Hormones and the Consequences for Endocrinology and Cancerology. Jules Samuels. Amsterdam: N. V. Cycloscoop, 1953. 296 pp. 37 guilders.

Basic College Chemistry. 2nd ed. Joseph A. Babor. New York: Crowell, 1953. 766 pp. Illus. + chart. $5.00.

Laboratory Problems in General Chemistry. Howard Nechamkin. New York: Crowell, 1953. 274 pp. Illus. $2.50.

College Physics. 4th ed. Frederick A. Saunders and Paul Kirkpatrick. New York: Holt, 1953. 603 pp. Illus. + plates. $6.25.

Child Training and Personality: A Cross-Cultural Study. John W. M. Whiting and Irvin L. Child. New Haven: Yale Univ. Press; London: Geoffrey Cumberlege, Oxford Univ. Press, 1953. 353 pp. $5.00.

Sectional Radiography of the Chest. Irving J. Kane. New York: Springer Pub., 1953. 154 pp. + plates. $7.50.

The Revolution in Physics. A non-mathematical survey of quanta. Louis de Broglie; trans. by Ralph W. Niemeyer. New York: Noonday Press, 1953. 310 pp. $4.50.

Condensed Pyridazine and Pyrazine Rings (Cinnolines, Phthalazines, and Quinoxalines). Chemistry of Heterocyclic Compounds, Vol. 5. J. C. E. Simpson. New York–London: Interscience, 1953. 394 pp. $12.50.

Trigonometry. John F. Randolph. New York: Macmillan, 1953. 220 pp. Illus. $3.00.

Organic Chemistry. 2nd ed. Ray Q. Brewster. New York: Prentice-Hall, 1953. 855 pp. Illus. $7.00.