Oceanography

The Dynamics of the Upper Ocean. O. M. PHILLIPS. Cambridge University Press, New York, 1966. 269 pp., illus. $11.50.

There is a great deal of theory and information on the dynamics of the upper ocean that need to be put together, as is evidenced by the fact that all but a handful of the more than 200 references upon which this elegantly written treatise is based were published after 1950, and the majority have appeared since 1960. (The earlier references are the classics of such scientists as Fjeldstat, Kolmogorov, Lamb, Proudmann, Taylor, and Wilton.) Phillips has accomplished such an integration by combining hydrodynamics, similarity theory, tensor analysis, and time-series concepts to describe wave dynamics, ocean surface waves as generated by the wind, internal waves, and atmospheric and oceanic turbulence.

The equations governing fluid motions are expounded, at an advanced level, so as to derive the Boussinesq approximation and the Reynolds stress. There follows the description of the dynamics of surface waves, including particle motions, effects of molecular viscosity, conservation equations, wave interactions, and various applications. These results are then applied to ocean surface waves in an analysis of wave generation by wind and the coupling between wind and waves. The equilibrium range in the spectrum, spectral growth, and ripples are analyzed. Air flow over the sea in non-neutral conditions is discussed in the last part of the book. Internal waves are treated for all ranges of period and mode. The effect of a weak mean shear is discussed. The chapter on turbulence deals with all kinds: isotropic, in stably stratified media, in unstably stratified media, and entrainment. It is pointed out how much has yet to be learned.

The mathematical derivations and the results obtained in the book are not simple. The reader will be required to follow the presentation carefully and to supplement many derivations by intermediate steps, but the result will be a fuller understanding of the subject. The reader will benefit, also, from study of additional material so as to see how the "upper" ocean relates to the total ocean and the entire atmosphere and so as to acquire a more quantitative knowledge of the subject.

Work from Europe is not fully represented. Some aspects of spectral analysis are treated lightly. Finally, dissenting opinions on some of the theories presented are not mentioned. For example, the drag coefficient according to some authors has not yet been satisfactorily related to the wind speed even for neutral conditions. (Very recent Russian work is most suggestive here.) Also, it may well turn out that the section on the theory of third-order nonlinear wave interactions will need considerable revision in a few years.

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Malariology

Malaria Parasites and Other Haemosporidia. P. C. C. GARNHAM. Blackwell, Oxford, England; Davis, Philadelphia, 1966. 1132 pp., illus. $35.

In spite of the vast amount of money, time, and manpower which have been directed toward eradication of malaria, the disease still exists. The recent discovery of drug-resistant parasites has called for renewed efforts in malaria research and has stimulated enthusiastic interest in the problem. P. C. C. Garnham's book therefore appears at an opportune time. It is unique in being an up-to-date morphological treatise on malaria parasites and their close relatives; it includes details of new strains, new species, and both vector and vertebrate stages of recent finding. The compilation of this material is done painstakingly and in a systematic and orderly manner.

The book covers mammalian, avian, and saurian malaria parasites (family Plasmodiidae) and even doubtful forms probably misidentified originally. The two other families of the Haemosporidiidea, Haemoproteidae and Leucocytozoidae, are also given thorough treatment. Running throughout the text is an interesting historical narrative of the discoveries and early descriptions of the organisms. Systematic classification is emphasized with great detail in a general chapter and reiterated in specific ones. Schemes of classification proposed by the author are utilized in the main, but discussion of other methods is presented. Keys and tables help with the delineations, but some confusion does result when the criteria set forth are not adhered to. The introductory chapter to the mammalian subgenera is particularly weak in this regard.

The hypothetical evolutionary patterns of malaria parasites are considered at great length. Factors involving vertebrate hosts, that is, pathology and immunology, are not stressed, but outstanding work along these lines is cited. Biochemistry and studies in vitro are also considered rather briefly. Reference is made to pertinent papers, however. A techniques chapter provides practical information on a wide range of topics from methods of constructing an insectary to use of the indirect fluorescent antibody test.

The main emphasis of the book is morphology. Colored plates, most of which are original drawings, of parasites in all stages of development are numerous. Current information allows for a more complete treatment of the life cycles with special reference to exoerythrocytic stages. The plates are spaced at intervals throughout the book in an arrangement that does not facilitate study. The paucity of electron micrographs is conspicuous and disappointing. The few that are included are generally not reproduced well and in most cases are not referred to in the general discussion on morphology and life cycle where a point of reference would be helpful.

The book is clearly written for the experienced malariologist, but a glossary of terms and diagrams of life cycles make it useful to the less sophisticated student. It serves well as a protozoological reference source on the Haemosporidia.

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Boron Compounds

Organoboron Chemistry. Vol. 2, Boron-Nitrogen and Boron-Phosphorus Compounds. HOWARD STEINBERG and ROBERT J. BROTHERTON. Interscience (Wiley), New York, 1966. 588 pp., illus. $25.

Volume 1 of this treatise [reviewed in *Science* **145**, 477 (1964)] covered the boron-oxygen and boron-sulfur compounds, and volume 3 will treat boron-carbon compounds. In volume 2, the authors deal, in 12 chapters, with all aspects of boron-nitrogen compounds in which (with the exceptions of some borazine and pseudohalogen derivatives) there are no boron-carbon or boron-silicon bonds present. The literature is covered up to September