Physiology Broadly Defined

Physiology of the Amphibia. John A. Moore, Ed. Academic Press, New York, 1964. xii + 654 pp. Illus. $18.

In 1931, G. K. Noble presented a masterly synthesis of the information then available on amphibians in his now renowned book, *The Biology of the Amphibia*. The present brave effort at a modern synthesis, *Physiology of the Amphibia*, is not the closely knit product of a single hand, but rather a compilation of authoritative articles prepared by different individuals. What the volume lacks in skillful transition from topic to topic is more than amply made up by the uniformly high quality of the individual contributions. The ten reports have been prepared by investigators who are actively working in the areas that they discuss, thus affording the reader a searching appraisal of what we know and of what we need to know.

A wealth of information has been gleaned from published works and the extensive experiences of the authors. The topics have not been restricted to areas usually included in the conventional domain of physiology. Students of developmental biology will find lucid and stimulating discussions of embryonic development (L. J. Barth), metamorphosis (W. Etkin), and regeneration (S. M. Rose). Endocrinologists will be pleased with the penetrating analysis of amphibian hormones prepared by A. Gorbman. The volume also contains a copious, carefully executed treatment of metabolism (G. W. Brown, Jr.), a critical consideration of water balance (I. J. Deyrup), and instructive expositions on digestion (W. G. Reeder), blood and respiration (G. E. H. Foxon), cardiology (A. J. Brady), and muscle physiology (B. C. Abbott and A. J. Brady).

I must register a protest against the majestic pronouncement made by Academic Press on the book jacket—"the book covers the physiology of the entire life cycle of the amphibians." This is certainly an extravagant statement, and, indeed, for a treatise on physiology there are some curious omissions. Physiologists who have forsaken the exquisite axon of the squid to delve into the nerves of the frog or salamander will be understandably miffed at the failure to treat the nervous system. Another conspicious major gap is the complete absence of any consideration of reproductive physiology. The word "reproduction" doesn't even find its place in the subject index. These are most unfortunate exclusions which mar an otherwise highly satisfactory performance.

Despite these rather unique faults of omission, the volume is unquestionably a valuable reference book. The contributors have thoughtfully digested for us the sizeable and, to many of us, unmanageable body of data that has rapidly accumulated. Advances in recent years have been well integrated with early information. Each section is thoroughly documented; the volume contains more than 2000 references. The book is indispensable for advanced students of the Amphibia and eminently worthwhile for any inquisitive biologist who wishes to keep abreast of developments in selected areas of amphibian physiology.

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Palynology

Textbook on Pollen Analysis. Knut Faegri and Johs. Iverson. With a chapter by H. T. Waterbolk. Hafner, New York, ed. 2, 1964. 237 pp. Illus. $6.25.

The favorable reception accorded the first edition of this well-known and widely used book together with the rapid expansion of interest in palynology necessitated its revision so that the more important recent advances could be included. This book provides the basic information that will enable one to collect samples, process them, tabulate and graph the data, and finally interpret the results. The major theme in several chapters is the variety of errors that can be and have been made in the analysis of sediments, the construction of pollen diagrams, and the interpretation of the latter. Pollen production of different species, long-distance transportation, over- and under-representation, and differential preservation, are some of the items discussed in these warnings, many of which have gone unheeded by some recent investigators. The book also contains an analytical key for identifying the pollen of North Central Europe, with primary division into 24 master classes, each of which is usually subdivided to the generic level. This system of classification is capable of expansion, and it has been the basis of several schemes for the identification and classification of fossil pollen into form genera.

A new chapter "Pre-Quaternary analysis," contributed by H. T. Waterbolk, mentions the use of pollen for stratigraphic correlations for the coal and oil industries. Additional details on the processing of shales and other hard sediments and a short discussion of the nomenclature of fossil grains are included. Comparison of the two editions shows an increase from 168 to 237 numbered pages. However, a greater increase resulted from the change in the type face, which is not only more readable but also has more characters per line. The bibliography has been materially expanded and carefully selected to include representative or important contributions in all phases of palynology, but not every paper by a given author. Citations pertaining to central European literature are most abundant. In many chapters only trivial changes have been made—for example v. Post to von Post. Other chapters have been updated by citing recent literature that support concepts advanced in the first edition. The chapter on field techniques lacks an illustration of a piston type sampler, which in many respects is better than the highly touted Hiller sampler. The chapter on laboratory techniques has been rewritten to mention many of the newer processes. The illustrations of sculpturing and structural types and the diagrams of the master pollen classes have been placed in the back of the book after the index, a less convenient location than in their respective chapters.

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Mathematics

Concepts of Real Analysis. Charles A. Haynes, Jr. Wiley, New York, 1964. xii + 190 pp. Illus. $6.50.

The book, *Concepts of Real Analysis*, is an outgrowth of a course given by the author in a National Science Foundation summer institute for college teachers of mathematics. It, like certain other recent books [see, for example, *Sets, Sequences, and Mappings: The Basic Concepts of Analysis*, by Kenneth W. Anderson and Dick Wick Hall (Wiley, New York, 1963)] is designed to help bridge the gap be-

tween calculus and advanced calculus, between "intuitive" and "rigorous" mathematics.

The treatment is based on set theory; it includes rigorous proofs of theorems, and it maintains a high degree of precision in notation and in the statements of axioms, definitions, and theorems. The treatment is detailed and abstract; the entire book contains only five figures. There are 394 exercises; they are collected in sets at the ends of the seven chapters. The following chapter titles indicate the range of topics treated: "Elements of set theory," "The real number system," "Finite and infinite sets," "Sequences and convergence of real-valued sequences," "Sequential limit theory in the extended real number system," "Definition by induction," and "Functions of a real variable: Limits and continuity."

Chapter 1 contains a partial development of set theory; although somewhat deeper than most elementary treatments, the subject is not developed axiomatically. Chapter 1 includes also a treatment of ordered pair, relation, and function; a function is a special type of relation and thus a set of ordered pairs. Chapter 2 characterizes the real numbers, but it does not construct them; it is assumed that they exist already. Chapter 3 treats finite and infinite sets in general, and sets of real numbers in particular; it contains a proof of the Bolzano-Weierstrass theorem. Chapter titles describe the topics treated in the remaining chapters.

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Electron Spin Resonance

Electron Paramagnetic Resonance. S. A. Al'tshuler and B. M. Kozyrev. Translated from the Russian edition (Moscow, 1961) by Scripta Technica. Charles P. Poole, Jr., Ed. Academic Press, New York, 1964. x + 372 pp. Illus. $13.50.

Electron spin resonance has become highly sophisticated during its 20-year life span and a vast amount of literature has accumulated on the subject. This volume, a translation from the Russian edition, is an excellent compilation of early literature. Presentations of theoretical results by Al'tshuler and of experimental results by Kozyrev are well integrated and organized for easy reference. It is unfortunate, however, that the book was translated 3 years after it was first published in Russian and apparently 6 years after the manuscript was completed. As a result, the material must be taken in the context of electron spin resonance as it was 6 years ago. Some of the work has been superseded, and some of the concepts, particularly those related to organic free radicals and to masers, have advanced considerably beyond those presented here. For example, in the chapter on free radicals, the confusion of early 1958 between electron density and electron spin density is evident, and often the two densities are incorrectly used interchangeably. The student who uses this book as a guide to electron spin resonance must be cautious in some respects. He must realize that most of the unsolved problems evident throughout the book are no longer problems. In passing, it should be noted that the historical introduction to this volume finally gives Zavoisky his deserved credit for the discovery of the spin resonance phenomenon.

The subjects treated touch all phases of electron spin resonance. It is apparent, however, that most emphasis has been placed on those areas in which the authors have personal interest. For example, discussion of the theoretical developments in free radicals is not accorded the detailed presentation that is given crystal field ions. The discussion of crystal field spectra, relaxation phenomena, metals and semiconductors, and the early theories of nuclear polarization are exemplary. The literature references (1083), perhaps one of the most complete sets of references in electron spin resonance in print, are particularly useful. The complete reference is also cited in each chapter or table in which it is mentioned. This procedure provides rapid identification of the author and the publication without searching through the book for a reference made in earlier chapters. Another notable feature is the myriad of experimental results on transition and rare earth ions presented in easy-to-read tabular form.

There are remarkably few typographical errors (I have counted 11), particularly for a translation, and only rarely does peculiar grammatical usage result from too literal translation. A detailed table of contents is unfortunately offset by a too brief and virtually useless subject index. Also on the negative side are the tables of equations. Although these tables are complete and potentially extremely useful, they are poorly reproduced. Apparently the publisher reproduced them directly from the original Russian text, and in my copy blemishes and light impressions have obscured some of the vital symbols contained therein.

There are a number of mathematical equations presented as a statement of fact without derivation or reference. Perhaps derivation of these equations can be found in related references, but this is not always obvious. Some of these equations may be the result of private work of the authors and their derivation therefore unavailable to the scientific community.

Those minor deficiencies do not detract from the general excellence of this book, which I highly recommend as a review of the first 14 years of electron spin resonance.

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Science and Engineering

Non-Linear Wave Propagation. With applications to physics and magnetohydrodynamics. A. Jeffrey and T. Taniuti. Academic Press, New York, 1964. x + 369 pp. Illus. $12.

This book consists of two parts, the first of which will be of interest to most physicists and mathematicians who are concerned with the dynamics of continuous media; the second half will be of interest largely to specialists in magnetohydrodynamics. The first half gives a detailed treatment of the general theory of hyperbolic partial differential equations—in particular, of quasi-linear first order systems in several variables. The method of characteristics is developed, starting from first principles, and the conservation laws and generalized Rankine-Hugoniot relations are deduced. Shock waves are introduced as "weak" solutions (solutions that may be discontinuous on sets of zero measure), and an "evolutionary condition," involving only some very plausible restrictions on the manner of dependence of solutions on their initial data, is proposed as a selection principle for discriminating against unphysical weak solu-