

Advanced Textbook

Invertebrate Zoology. Robert D. Barnes. Saunders, Philadelphia, Pa., 1963. xiv + 632 pp. Illus. \$10.

Although courses in comparative vertebrate anatomy are fairly well standardized in content and organization, those in invertebrate zoology are notoriously variable and range from the most superficial to the detailed and scholarly. This volume by Barnes will do much to strengthen and improve the situation, since it is the first important textbook, intended for use in advanced undergraduate and graduate work, to appear in many years.

The treatment is by phylum, and it is complete in that all phyla, even the "minor" ones, are considered. The author has done a good job of organizing and balancing such topics as morphology, physiology, taxonomy, and ecology. The book is obviously intended chiefly for use in a two-semester course.

The "type method" is discarded as being too "distorted and narrow"—a viewpoint with which I disagree, especially if careful laboratory work is a part of the course. Upon first opening this book, most zoologists will hopefully leaf through it quickly, looking for fresh, carefully done figures. But they will be disappointed. About 95 percent of the figures are borrowed or redrawn from old sources; often they have been embellished with uncritical shading that gives an effect akin to the Ben-Day process. The remaining 5 percent are original but mostly simple and diagrammatic. Apparently the day of new, accurate, detailed line drawings is gone, even though we may clamor for high-quality text figures of, for example, a longitudinal section of a sea anemone, of a cross section of a leech, or of the anatomy of the sea stars, nematodes, acanthocephalans, clams, and gastropods.

Except for passing mention, the Sporozoa, Trematoda, Cestoda, and Insecta are omitted; Barnes contends that these groups are "not usually studied in invertebrate courses." Many zoologists will strongly disagree with this idea, and indeed the omission of the first three of these groups is probably the greatest weakness of the book. Many will also object to the continued (and fallacious?) usage of the "Phylum Aschelminthes" concept. The chapter

on the origin of Metazoa would be greatly improved by a few figures that illustrate the chief theories. If each chapter had a short introductory paragraph giving the salient features of the particular phylum being considered the book would be much more useful to students. The critical reader may object to certain items of which the following are randomly selected examples: "Encystment is characteristic of the life cycle of almost all protozoans." "Syncytial refers to the histological condition in which cell membranes are absent between adjacent cells" (nuclei!). There are no "true tissues" in sponges. "Two types of body cavities exist in the animal kingdom—the coelom and the pseudocoel." "Statoblasts are continuously formed during the summer and fall."

Despite its shortcomings, the book is generally well done. The section on arachnids is probably the best and most complete treatment in an American textbook. Typographical errors are infrequent. I confidently predict that this volume will be used in the majority of the courses in invertebrate zoology taught in American colleges and universities.

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Essays Honoring Pólya

Studies in Mathematical Analysis and Related Topics. Essays in honor of George Pólya. Edited by Gabor Szegő and others. Stanford University Press, Stanford, Calif., 1962. xxiv + 447 pp. Illus. \$10.

This volume, dedicated to George Pólya on the occasion of his 75th birthday, begins with Pólya's photograph and a summary of his career, together with a list of his publications. This list, which comprises 217 papers and six books or monographs, is illuminating, since the topics include (i) probability and statistics, molecular physics and crystallography, and astrophysics, and (ii) such matters as industrial inspection, the teaching of mathematics, logic, and guesswork. All of that is in addition to a more conventional mathematical *repertoire* which consists of subjects far too numerous to list here. No films of Pólya's lectures are mentioned, but

unless someone has been guilty of gross neglect, such films are available.

The main part of the book now consists of 60 short essays dedicated to Pólya, the longest of which occupies 18 pages. The essays, contributed by 70 authors, range over as many subjects as Pólya's own bibliography, although they do not attempt, as a rule, to stray much outside the setting of conventional mathematics. The main exceptions are Plancherel's note, which relates to the laws of taxation, and one by the Lehmers on heuristics.

Some seven essays which treat geometrical questions are challenging but essentially elementary in character, the sort that Pólya himself takes pleasure in. Two of these are concerned with Kakeya's famous problem, and this is perhaps no coincidence, for that particular problem is not unrelated to the tantalizing one of parking a car. A similarly challenging arithmetical question, first studied by Erdős, is treated by Besicovitch in a new way. Moreover a series of algebraic conjectures, which is concerned with groups, is discussed in a paper by Richard Brauer, while a note (by Eckmann, Ganea, and Hilton) treats a generalization, in algebraic topology, of the elementary notion, so dear to Pólya, of the mean of n quantities.

The main group of essays treats questions of classical analysis. These are concerned with special functions, zeros of polynomials and trigonometric polynomials, deficiencies of entire or meromorphic functions, lacunary power series, the growth of subharmonic functions. Another group considers various applied topics, such as statistical mechanics, probability and statistics, astrophysics, the vibration of membranes, the use of symmetrization in partial differential equations and in fluid flow with cavitation.

Finally, a few papers are devoted to distributions, neutrices, Banach algebras, and various miscellaneous topics.

The book as a whole may be regarded as a composite version of a sequel to Pólya and Szegő's *Aufgaben und Lehrsätze*, somewhat wider in scope, and in part deeper, and therefore, generally, a mine of information for advanced graduate students and their professors.

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