Guide to Paperbacks

A Guide to Science Reading. Compiled and edited by Hilary J. Deason. New American Library, New York, 1963. 220 pp. Paper, 60¢.

Within 24 hours of the receipt of a review copy of this book, I was able to answer, quite specifically, two requests for information that might otherwise have left me blank-minded. Coincidence, perhaps, but I take it as significant evidence in favor of the endless usefulness of the *Guide* as a reference to inexpensive reservoirs of knowledge, something of great value, surely, to every teacher and student of science.

The *Guide* lists more than 900 paperback books on science, out of some 18,000 in print as of November 1962. The 900 are classified in half a hundred categories arranged according to the Dewey Decimal System. Within each category, the books are listed alphabetically, by author. The vital statistics for each book (publisher, number of pages, price) are given, together with a brief but pithy estimate of the nature and value of its contents.

Perhaps most important of all is the key with which each item closes: the book is classified as 1, 2, 3, or 4. The numbers indicate the general level of complexity of treatment from 1 ("suitable for students in the upper elementary grades") to 4 ("will appeal especially to the advanced college student"). Two indices—author and title—and a list of publishers, close the book.

To anyone interested in science education for himself or for others (and I presume that includes all of us), the book is as essential in this Age of the Paperback as a knife and fork are at a steak dinner. To those who doubt the importance of scientific literacy, four essays are included at the beginning of the book, and each sounds the familiar tocsin of the intimate relationship of science and modern life, of the growth of science and the danger of losing communicative touch, of the importance of a sympathetic understanding between scientist and nonscientist. The most rewarding of the four essays, perhaps, is Warren Weaver's "Science and people," precisely because it recognizes and emphasizes the importance of an understanding, among laymen, of the limitations of science as well as of its capacities.

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Geomathematics

Statistical Analysis in the Geological Sciences. Robert L. Miller and James Steven Kahn. Wiley, New York, 1962. xiv + 483 pp. Illus. $12.75.

Expansion of the geosciences into the salients of geophysics and geochemistry is now being complemented by extension into geomathematics (geostatistics or geometrics), and this is the first textbook devoted to this new development.

The first three chapters (about 12 percent by volume) contain an introduction to probability, probability density functions and moments, and expectation respectively; the next four chapters (about 30 percent) present a thorough discussion of various aspects of statistical inference, with an enlightening treatment of the two kinds of error (α and β errors) that arise in testing hypotheses. The next four chapters (14 percent) encompass linear regression, with application to paleobiometrics, the analysis of variance and covariance, and an example of the synthesis of these procedures in a "real world" problem—the measurement of packing in detrital sediments. Multivariate analysis is treated in the next two chapters (19 percent), and trends and time series analysis in the following two chapters (10 percent). The last two (14 percent) of the 17 chapters contain a miscellany that includes problems in sampling design (the distribution of points on a line and in a plane) and the effectiveness of various procedures for graphic and analytic presentation in mapping variation in the properties of rocks. Each section includes informative annotated references that serve to amplify the discussion. Two appendixes (A and B) describe special applications and propose models for paleontologic research; four short appendixes describe useful special properties of the F and χ^2 distributions respectively, and one is devoted to the Kolmogorov-Smirnov test. Examples of applications are taken from paleontology (paleobiometrics), lithology, stratigraphy, petrology, geomorphology, sedimentology, and geochemistry.

Mistakes are rare, largely misprints: for example, C_1 for C_3 (equation 1.25, p. 12). Perhaps the most serious criticism arises from the contrast that is evident when the brief treatment given to the rather abstruse multivariate analysis (80 pages) is compared with the excellent detail provided for the simpler and more familiar univariate and bivariate procedures (about 275 pages).

The marked contrast between the first 11 and the last 6 chapters suggests a lack of adequate and appropriate formulation for geological "real world" problems, and this is emphasized by the fact that formal models are proposed for paleobiometry but none for, say, sedimentology.

This pioneering book fully achieves the authors' objectives—"to present a reasonably general survey of methods of statistical analysis [and] illustrative applications . . . to a wide variety of problems in the earth sciences" and to survey the relevant literature. It will surely "serve as a general reference for research workers in various branches of [at least] the earth sciences."

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Invertebrate Paleontology

Echinoderms. David Nichols. Hutchinson, London; Hilary House, New York, 1962. 200 pp. Illus. $2.50.

Recent studies in evolution give particular importance to the echinoderms as possible ancestors of the vertebrate animals. Therefore, a synthesis of this significant group is especially welcome at this time. Nichols presents information of interest to the educated layman who may wish to trace his "family tree" to its ultimate origins, as well as to the specialized zoologist who seeks information on fossil and living echinoderms.

The author, David Nichols, demonstrator in the department of zoology at the University of Oxford, is well suited to write a book dealing with both fossil and living echinoderms. He has done significant research on the mode of life of both recent and fossil spatangoid echinoids and on the tubefeet of all echinoids. He is an excellent writer with a lucid and straight-forward style. The book is well illustrated with many line drawings that amplify and emphasize important points.

Approximately half the book is devoted to description of the anatomy and evolution of each of the major classes of echinoderms, including the lesser-known extinct groups. The discussion of anatomy is brief and relatively painless, and there is adequate description

and illustration of important features. The section on evolution is most interesting and includes much new information. This is the first attempt to reconstruct the history of the anatomical changes within some of the classes and to analyze the functional significance of these changes. This discussion is clearly written and well documented. The broad features of the evolution are illustrated with text figures of the important genera, arranged in the suggested phylogenetic order. These sections of the book are most stimulating, and it is hoped they will encourage workers to do more phylogenetic studies. Certainly, specialists in some groups will disagree with Nichols and will be stimulated to search for more evidence to support their own views.

Nichols devotes chapters to the significance and evolution of pentamerous symmetry, spines and pedicellariae, tube-feet, and larval forms. In a brief chapter he describes the phylogeny of the echinoderms and, in a final chapter, the relation of the Echinodermata to other phyla, particularly the chordates. The classification of the echinoderms provided in the appendix includes most of the orders and all of the genera referred to in the text. The extensive bibliography is divided into sections that correspond to the chapters. Although the author included most of the major works in each field, it is surprising that he omitted Jackson's great work, *Phylogeny of the Echini* (1912), one of the classics in echinoid literature.

Not only is this book an excellent compilation of existing knowledge, but it contains many new ideas. It is a valuable source book for the echinoderm worker and for other zoologists. It can be read and enjoyed by the layman, but it can also be used as a text for a graduate course. It is hoped that Nichols will revise and keep the book up to date. The trend in paleontology is toward more phylogenetic studies, and it is very useful to have these results synthesized and available to students and to those who write textbooks on invertebrate paleontology. In the short time since this book was written a significant breakthrough has occurred in knowledge of the carpoids, a peculiar group of primitive echinoderms: the discovery, by Ubaghs, that in some species the structure that had been previously considered to be a stem is in reality an arm used for feeding. Thus, much of the discussion on the orientation and the function of many of the structures of the carpoids is obsolete. Also, after publication of the echinoderm sections of the *Treatise on Invertebrate Paleontology*, there will be much new information that should be incorporated into this book.

This book, by its emphasis on the value of synthesis of paleontological and neontological information, should encourage workers in other animal groups to prepare similar syntheses. In this day of scattered literature and narrow specialization, the broad view is especially difficult to attain. Nichols has performed this task admirably for those interested in the Echinodermata.

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Life Cycles of Parasites

Animal Parasites: Their Biology and Life Cycles. O. Wilford Olsen. Burgess, Minneapolis, Minn., 1962. vii + 346 pp. Illus. $6.95.

This book grew out of the teaching device of multicolored plates used by Wilford Olsen to aid students in understanding the complexities of parasitic life cycles. Here the plates, in black and white on mat surface paper, are clean-lined diagrams showing life history stages, gross and minute, of over 100 characteristic species of protozoa, flatworms, and nematodes.

Trailing the spoor of such details for so many species in and out of cells, tissues, and hollow organs of vertebrate and invertebrate hosts (and in the free-living environment, when that is involved) could easily have resulted in a confusing hodge-podge. Instead, through the author's gift for clarity, and his placement of well-labeled 8- by 11-inch plates opposite their explanatory keys, the net result is an impact from page after page of the wonder of life in a world of animal parasites.

The table of contents presents the taxonomic hierarchy from phylum down to the species illustrated, with an accessory listing of the 107 plates. Five of the latter summarize facts concerning particular groups.

Textual material is mostly limited to introducing characteristic subgroups. (The author has fortunately included a digest of his own extensive work on *Uncinaria lucasi*, the extraordinary hookworm of the northern fur seal).

For many species there is added an "Exercise on life cycle," which points to the utilization of certain forms that may be locally available. Further study is also invited by a few selected references. In the main these are well chosen for the worms, but for the parasitic protozoa they tend to rely heavily on textbooks. I found few errors, although two misspelled genera at the bottom of plate 106 are conspicuous. The index comprises seven pages, triple column.

Relying, as the author does, on an essentially biological approach, he accepts the limitation that his book gives little, except by inference, concerning the great fund of current knowledge on interaction between parasite and host: physiology, pathology, disease, and immunity. Likewise, this is no synopsis of veterinary or medical parasitology. Such deliberate omissions permit the unremitting emphasis on the phenomena of parasitism as seen in the life cycles themselves.

It needs hardly to be added that these numerous life histories, fair samples as they are of all that is known, represent no more than an informative cross-section of discoveries made over the last century of how Mother Nature has contrived to maintain her parasitic species. New and old alike in this beguiling field of interest, however, be they neophyte biologists or professional parasitologists, will be enlightened and enkindled by Olsen's presentation of the intrinsic variety and nuances of adjustment that occur in life cycles of animal parasites.

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Plant Diseases

Insects in Relation to Plant Disease. Walter Carter. Interscience (Wiley), New York, 1962. xiv + 705 pp. Illus. $25.

Following the introduction (chapter 1), this book is divided into three parts. In part 1, which treats plant pathogens transmitted by insects, chapter 2 deals with bacterial pathogens and chapter 3 with the fungal pathogens. Part 2 deals with the toxicogenic insect and phytotoxemia and includes three chapters: "Localized toxic effects," "Primary malformations," and "The systemic phytotoxemias." Part 3, which deals with the plant viruses, is divided into eight chapters and takes up most of the book,