tural adaptations and on physiologic attributes are given scant attention or, in many instances, they are omitted. The bird groups involved are the six avian orders from the loons through the flamingos of Wetmore's sequence. To complete the work, many years of further effort will be required, and it seems likely that ten volumes will be needed to publish the series.

My reactions to this first volume are mixed. I am at once grateful for the many useful features of the handbook and the dedication of the editor in making it a life work. On the other hand, when I see its limitations and defects, I am disturbed by the authoritative position this volume will, by its very nature, assume in the literature. The many nonprofessional students of ornithology, and even those professionals who use it when delving into matters distant to their particular competence, will be inclined to accept uncritically the condensations and selections of facts and be guided inappropriately by some of the general, underlying concepts adopted by the editor. The danger in this direction is enhanced by the statement that the handbook is sponsored by the American Ornithologists' Union. It is true that that organization strongly encouraged the development of the handbook, but it had no effective review of the decisions made by the editor. Indeed, no representative editorial appraisal of the text, or of the policies reflected by the text, was made by the Union or by its Committees.

The most unfortunate feature, for which the editor has taken responsibility, and which is contrary to widely held opinions, is the nomenclature used for plumages and molts. The names adopted imply a doubtful homology and evolutionary system of plumages proposed rather recently by Humphrey and Parkes and which sets aside a series of usages long understood and embedded in the extensive and important literature on molt. The right to propose new interpretations and nomenclature in a paper in a journal, I would defend with vigor, but to adopt for use in a handbook a system of nomenclature which has been severely criticized and whose dubious elements have not yet been resolved by research workers in the field is indefensible. The tragic confusion that will arise from this usage in the handbook is deplorable.

The scientific and vernacular nomenclature of the species treated in this volume does not depart greatly from that of the fifth edition (1957) of the American Ornithologists' Union's *Check-list of North American Birds*. Where it does so in respect to scientific names, the pertinent references and reasons are usually indicated. More changes are to be found in the Procellariiformes than in the other orders. Several improvements in vernacular names are made, and earlier usages are noted in the text to facilitate use by the amateur.

Distribution is recorded, chiefly on maps and with varying degrees of success. For species that have large ranges, the general distribution is indicated but with so much sacrifice of detail, or with the linework so obscured by overlays, that the value of the maps is reduced. Perhaps the only solution to such a problem of presentation is to resort to a number of sectional maps. A stereotyped plan of symbols leads to the use of many large question marks on the maps. Of course, uncertainties should be reflected, but the standard legend used for these queries is "see text." One then encounters much difficulty in pursuing the questions, as apparently they are not all dealt with, are not cross-referenced to the map, and relate to discussions scattered through several subsections.

I find incongruous the refined statistical treatment of the sizes and shapes of eggs when measurements of the specimens of the birds themselves are reported only as means and extremes, often of small samples drawn only from the literature and thus derived from authors whose measuring techniques vary considerably. Better data on size and variability could have been presented, for sufficient specimens of most species are now available in museums. The inclusion of a special statement that gives the number of each species banded and recovered has very limited value. Recoveries of marked birds are to some unknown degree incorporated into the accounts of range and migration, but the mere record of bird-banding effort seems to be without biologic significance.

The treatments, in telegraphic style, of reproduction and habits vary in value according to the ability of the compiler of the particular section with respect to his grasp of the subject and his facility for expression. Thus, one finds a good, authoritative condensation for the slender-billed shearwater, which was written by Serventy, the leading investigator of its biology, but some other accounts lack perception or depend too much on literature of poor quality, such as that of the early writer, W. Leon Dawson. Disparity in accounts cannot be avoided entirely in an undertaking of this kind; nevertheless, it could have been less pronounced.

In sampling sections of the book, one encounters, not rarely, apparent inconsistencies or errors. For example, we find the report that there are six species of flamingos, but in the sections that follow a merging of forms is adopted which would reduce the total to five. The statement is made that the slender-billed shearwater ranges or straggles south on the North American coast only as far as Monterey in central California; but the map shows it extending south to the tip of Baja California, and the literature cited, based on specimen evidence, indicates the southern limit is in northern Baja California. In the treatment of the Laysan albatross, the important findings of Frings and others about salt excretion are not incorporated, although space is given to the rather pointless comment that "the source of crop and gizzard stones is a mystery."

The most valuable aspect of the handbook, in my judgment is the indication of sources of data. A conscientious user will, through the good bibliography, trace down facts, check on them, and form his own opinions. It is hoped that enough warning has been sounded to establish the need for this, so that the serious worker will use the handbook effectively as an introduction to subjects but not as a definitive assemblage of facts and, least of all, not as an interpretation of them.

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A Limited Edition

Experimental Embryology. Techniques and procedures. Roberts Rugh. Burgess, Minneapolis, Minn., ed. 3, 1962. ix + 501 pp. Illus. $9.25.

Teachers of experimental embryology will welcome this new edition of Rugh's useful manual. The text has been revised superficially by limited rewriting, by adding new references and deleting some older ones, and by slightly rearranging the material. There are new chapters on dissociation and reaggregation of cells, basic tissue culture techniques, and the use of mouse embryos. Some new plates have been added, and

the format of the text has been improved. There are a few typographical errors and some incomplete or erroneous references, but these do not detract from the general usefulness of the book. Curiously, "anlage" is consistently spelled as "anlagé," an error not present in the previous edition.

The author quotes W. B. Bean (page 103): ". . . criticism, an open and honest look at the world and at ourselves must be desired actively and courted assiduously. It must become the mistress of the scientist. . . ." If one embraces this mistress, one must say of the present edition that it does not reflect the progress in embryology during the 14 years since the previous edition was published. Few of the recent references that were added at the ends of chapters were incorporated into the text. Unfortunately, many significant recent references were omitted, particularly in the sections on early amphibian development and chemical embryology. Immunological procedures were ignored, and no reference has been made to the literature on the electron microscope. Chromatographic, electrophoretic, isotopic, and immunological techniques can be adapted to laboratory exercises suitable for advanced students, and exercises of this nature should be included in a modern course in experimental embryology.

Nevertheless, advanced undergraduate and beginning graduate students will find the manual useful, and within the framework of limitations outlined above, it is recommended.

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Mathematical Problems

Mathematics Manual. Methods and principles of the various branches of mathematics for reference, problem solving, and review. Frederick S. Merritt. McGraw-Hill, New York, 1962. xxi + 378 pp. Illus. $9.50.

In the preface the author says: "This manual has one aim: to make it easy for you to solve the mathematical problems you encounter in your work and hobbies." The book should be judged in the light of this aim.

The manual is a compendium of axioms, definitions, and theorems, taken from arithmetic, school algebra, synthetic and analytic Euclidean geometry of one- two- and three-dimensional spaces, real calculus, differential equations, matrices, determinants, vectors, tensors, functions of a complex variable, combinatorial mathematics, and statistics. The plan of the work and the arrangement of the material are excellent, and the fields covered are treated fully. There are some cross references in the text.

The usefulness of the book is destroyed, to a large extent, by poor editing. Any work of this kind could hardly be expected to be free of mistakes, but this one contains an inexcusable number of errors, inconsistencies, and unusual definitions. For example, on page 25 we find the statement: "A number or letter without a sign in front of it is assumed to be positive," but, on page 34, $p = -1$. This kind of thing appears on almost every page.

The index is inadequate, and the number of cross references is insufficient to accomplish the declared aim of the work. I experimented by attempting to trace information on certain topics. Frequently I encountered terms for which no cross reference was given and which could not be found in the index; yet these terms were defined elsewhere in the book.

The manual might be useful for finding a specific piece of information, provided the user has a good general knowledge of the mathematics involved, but, even in this case, care would have to be exercised to avoid being led astray by one of the numerous errors. It is doubtful that the book will be of any use to the mathematical novice.

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Notes

Geological Dictionaries

These volumes—the **Dictionary of Geological Terms** (Doubleday, Garden City, N.Y., 1962. 555 pp. Paper, $1.95), which was prepared under the direction of the American Geological Institute, and John Challinor's **A Dictionary of Geology** (University of Wales Press, Cardiff; Oxford University Press, New York, 1962. 241 pp. $5)—have similar titles and general aims, but they are not directly competitive. Students of earth science will find the two books useful supplements as guides to the meaning of words in a vocabulary that grows ever larger and more complex. The second edition of the *Glossary of Geology and Related Sciences* (1960), also prepared under the direction of the AGI, defined nearly 17,000 terms, and the Doubleday paperback is an abridgment of the *Glossary*, with the number of terms reduced to about 7500. Challinor's book, a far more selective list, gives attention to some 1500 items; the author states in the preface that the book is offered as "an essay towards a critical and historical review of a selected ABC of the subject."

A difference in their approach to definitions is pointed out by comparing their treatments of broad, basic terms. The American volume defines geology in less than 50 words, merely outlining the general scope and principal divisions of the science. Challinor's definition, stated in more than 800 words, traces the gradual adoption of the term through more than a century, cites the work of outstanding pioneers, and lists several publications that record stages in the growth of geologic concepts. Similar short historical essays are devoted to the terms *geosyncline, granite, stratigraphy,* and many others. Contrasted with these lengthy definitions are a few that suffer from brevity. Readers who are not familiar with *décollement* get little help from the bare statement that it is "rupture resulting from folding."

Despite the limitations of his shorter total list, Challinor includes a number of terms omitted in the American dictionary; examples are *dendroidea, dinosaur, pterodactyl, Old Red Sandstone, Moine series, Millstone Grit.* Some differences in content reflect the natural diversity of interest among geologists in the two countries. Challinor also defines *clunch, clint, geofault, geogeny,* and other terms now practically obsolete; these definitions will help some readers of early geologic literature.

Aside from a preface and a lengthy list of helpers on the project, the AGI dictionary is devoted to definitions. Challinor's book includes three pages that explain derivations and meanings of prefixes and suffixes common in geologic terms, and a 19-page classified index in which terms are grouped in columns under 48 numbered headings. Since some groups contain more than 100 terms each (and the terms are not in alphabetical order), the list has only limited value as a finding index.

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