Chapter 6 is an analysis of radiation hazards, chapter 7 discusses maximum permissible levels, and chapter 8 is an outline of radiation protection methods.

The remaining seven chapters briefly cover remote handling and shielding, containment, transport of active material, waste disposal, ionizing radiation and the law, emergency procedures, reactor hazards and design, and planning for radiation protection. Short appendices are devoted to atomic energy legislation (British, of course), toxicity of radioelements, shielding calculation, surface finishes, and a summary of methods of radiation detection and measurement. There is also a general bibliography.

Without examining the companion books in the series, it is difficult for me to judge how good a picture of the field the budding reactor engineer would get, but I think the picture would be adequate. This book is accurate, and it is clearly written. My chief criticisms are that the title is perhaps overly ambitious, and that the non-British reader will find that many of the literature references are not readily available. And some of the material—for example, that on legislation—is generally inapplicable. I was a little surprised to note that the journal *Health Physics* is not cited in the bibliography. To sum up, I feel the book is a good one for its intended purpose, but that it will not be very useful as a general reference.

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Bryology

The Mosses of Michigan. Henry T. Darlington. Cranbrook Institute of Science, Bloomfield Hills, Mich., 1964. xii + 212 pp. Illus. $12.

In spite of laments from biogeographers that state boundaries rarely if ever relate significantly to floristic and faunistic distributional patterns, state floras and faunas continue to be published. Occasionally there are sound reasons for their publication. A manual of the mosses of Michigan can probaby be justified. The moss flora of Michigan may well be the best known of any state flora, thanks to the activities of such able bryologists as Nichols, Steere, Fulford, Sharp, and Crum and to the activities of the many students at the University of Michigan and its summer field station at Douglas Lake. The largest center of bryological activity in North America continues to be the summer program in bryology at the University of Michigan Biological Station, and the present book should serve as an indispensable aid to the many students of mosses who study there. In addition, because the moss flora of Michigan is representative of the entire Great Lakes region and of much of Eastern North America, the book will be useful over a wide area of the United States and Canada.

A short preface that strains to justify the study of mosses on economic and ecological grounds (isn't it enough that they exist?) precedes an introduction which gives an interesting account of bryological exploration of Michigan, a list of collectors, a physiographic and climatic description of the state, the life history of a moss, and some brief remarks on how to collect mosses and how to prepare specimens. A generic key to all of the known genera in Michigan is followed by the systematic treatment. Brief and, happily, nonrepetitive diagnostic descriptions are given for each order, family, genus, and species. Under each family there are keys to both genera and species. Habitat and substrate information are included for each species and localities are cited by county and collector. The failure to indicate where the specimens are located will not be appreciated, however, by the critical student of plant geography who may wish to examine material of rare and critical species.

The book is remarkably free of errors. It was carefully edited, and much of it rewritten, by Howard Crum (National Museum of Canada) who brought the nomenclature up to date, checked the authorities, tidied up the keys, and otherwise made the book acceptable. Nearly all the species are illustrated by line drawings taken directly from older manuals, mainly those by Braithwaite, Sullivant, and Limpricht. The illustrations are reproduced superbly, and in most instances they have been chosen wisely.

This will be a very useful book. In many ways it is one of the best of the several state moss floras. The typography is attractive, and the text is organized in a way that is pleasing and useful. It was obviously written to be used to identify mosses and to summarize the known collections in the state. To this end it will serve admirably. No synonyms are given, and reasons for merging or segregating species are omitted. The beginning student will have the pleasing but ephemeral sensation that there were never any taxonomic problems with respect to Michigan mosses, or else that they have all been solved, and the less discerning beginner could easily become a "manual laborer."

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Evolution of Man

The Basis of Human Evolution. Bertram S. Kraus. Harper and Row, New York, 1964. xii + 384 pp. Illus. Paper, $4.75; cloth, $6.50.

There ought to be an understandable general discussion of the evolution of man and his closest relatives, and Kraus has attempted to write it. His viewpoint is not biased by any special theories of the origin of man. He presents facts and a variety of possible interpretations, but, unfortunately, little seems to be known about primate evolution. The reader, while left with an appreciation of the problems and the techniques of physical anthropologists, may be dumbfounded that so much work has settled so few questions.

The book begins with descriptions of the processes of evolution and of certain scientific techniques now used in its study. This is followed by a discussion of primate, and particularly of human, evolution, and ends with an examination of the effects of modern culture on these processes. Kraus's sentence and paragraph structure are excellent. Words flow smoothly at all points. In a particularly enjoyable section (starting on page 182) he discusses the difficulties that beset humans because we impose a bipedal gait on organ systems that evolved in our quadrupedal ancestors. However, the ability to write fluently has not been coupled with the ability to write lucidly. Undefined terms course by in a stream that occasionally becomes torrential. A number of the figures and tables are barely mentioned in the text, and those that are discussed are not

always made understandable. The organization of many sections of the book is not obvious, and often they seem neither to hold together nor to lead in a definite direction. Kraus has missed his goal of writing a good description of the evolution of man.

As a geneticist, I was particularly annoyed by the abominable discussion of genetics. A large proportion of the errors in the diagram of a DNA molecule are in the sugar. The description of crossing over is based on what appears to be a set of errors unique to this author. The introduction to population genetics has been done so badly that it cannot possibly be understood by the uninitiated, or informative to the intermediate student. It would be tedious to detail these complaints, but they (and many others) occur on a number of adjacent pages that present an intelligent reader with difficulties in interpretation, mixed with misinformation. Omission of the sections on genetics would have been a definite improvement.

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Systematics Today

Taxonomic Biochemistry and Serology. Charles A. Leone, Ed. Ronald, New York, 1964. x + 728 pp. Illus. $16.50.

The systematic classification of organisms is perhaps the most ancient discipline in the life sciences, if not in all of natural philosophy. Indeed, its naive beginnings are probably lost in the dark of prehistory in the form of correlative communication among hunters and food gatherers. The discipline and the scope of the science have evolved, of course, along with man's cumulative knowledge and his successive philosophies concerning the structure and organization of nature; but the practical purposes have remained the same—to provide a means for accurate communication and to suggest natural correlations.

The International Conference on Taxonomic Biochemistry, Physiology, and Serology, the communications to which are collected in this volume, was held in 1962 at the University of Kansas. As in all publications of this nature, there are the more rewarding as well as the disappointing contributions. There are usually some that appear to belong in the proceedings of some other conference, and there are always those that simply puzzle.

Few single reviewers are likely to be so broadly expert that they can critically evaluate all the material collected and edited by Leone. Part 1, a symposium on the principles of systematics, and part 2, a survey of the several approaches to the use of molecular systems in taxonomy, are particularly interesting because of their general and introductory nature. Ernst Mayr's discussion of modern systematics stands out in this regard. Especially meaty and stimulating is a treatment of comparative biochemistry, by Marcel Florkin, in which phylogenetic and evolutionary relationships are emphasized. The subject matter in parts 3 through 8 ranges from structural studies of macromolecules to the distribution of plant pigments, from immunochemical analysis of lens proteins to biochemical genetics of bacteria.

Two of the more rewarding papers deserve special attention. William Boyd presents a lengthy, pertinent, well-documented, and copiously illustrated chapter on human genetics, evolutionary mechanisms, and modern ideas on race. He concludes that genetically analyzed metabolic and serological traits are far more useful than morphology in determining the relationships among the races of man. A. C. Wilson and N. O. Kaplan discuss enzyme structure and its relationship to taxonomy. This chapter should be among the most useful to students and investigators interested in the phylogeny or taxonomic relationships of proteins. Although it deals largely with lactic dehydrogenase, the alternative methods of approaching such problems are well illustrated with experiment results.

Comparative biochemistry and systematic serology are by no means new areas of endeavor. However, with the remarkable advances made in biochemistry and immunochemistry during the past 10 years, and with the demonstration of their relationships to genetic mechanisms, which in turn arbitrate the characteristics of organisms, this is a timely volume to add to the biology shelf. The fact that several symposia have been held since this conference attests to the growing interest in this field.

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Textbook

Elements of Ordinary Differential Equations. Wilfred Kaplan. Addison-Wesley, Reading, Mass., 1964. xii + 270 pp. Illus. $7.50.

This is a well-planned text for use in teaching a first course in differential equations in the classical tradition. Essentially it is Kaplan's earlier book, *Ordinary Differential Equations*, cut down to manageable proportions. Although more difficult proofs are omitted, existence theorems are stated and references given.

The general pattern of the book is similar to that of most elementary texts in the subject. Kaplan's treatment, however, emphasizes the development of understanding of the problems and methods, as well as the acquiring of manipulative skill. He points out that, in addition to the problem of "determining all the solutions of a given differential equation," there is a second more fundamental problem, that of determining "properties of the solution . . . from the differential equation itself." This point of view is evident, for example, in his treatment of the geometric interpretation of the first-order differential equation; in his discussion of the properties of solutions of linear first-order equations, which includes the case in which the input function is a step function; and in his discussion of stability and transients in relation to second-order equations, which is more thorough than that found in some texts of this type.

From the point of view of technique, the major emphasis is on linear equations. In chapter 5 operational methods are discussed systematically and in detail, and a comprehensive table of rules for inverse operators is given. Laplace transforms are mentioned briefly in this connection. Chapter 7 is devoted to systems of linear differential equations. Although matrix notation is not used here, characteristic roots are defined.

Throughout the text, the material is motivated by well-chosen examples related to the physical sciences. There is a good collection of exercises, although one might prefer that not all the answers to these had been included. This text should have a strong appeal, especially in institutions where applied mathematics and engineering are emphasized.

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