various other topics. Moreover, there is an extraordinarily large number of references that are so successfully linked to the tables that the source of specific items in the tables can be readily identified.

The enormous effort that created this monograph was under the joint sponsorship of the U.S. Air Force, Army, Navy, and Atomic Energy Commission, but the direction of the enterprise was the responsibility of the Committee on the Handbook of Biological Data, a unit of the American Institute of Biological Sciences.

Because a tremendous amount of data were handled in the preparation of the monograph, it is little wonder that there are some errors and some contestable interpretation of knowledge as portrayed in some of the diagrams. For example, the summation of lipid digestion and absorption (p. 179) is at least slightly erroneous, and it is questionable that fat per se is needed only as a source of essential fatty acids (p. 67). There may be additional needs for fat. Some errors were noted in the references. On the whole, however, the monograph appears to be remarkably accurate.

Biological scientists in general may be expected to have occasional need for this handbook, and students will find that many of the diagrams are unusually illuminating.

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Human Heredity. James V. Neel and William J. Schull. Univ. of Chicago Press, Chicago, 1954. vii + 361 pp. Illus. $6.

This new textbook on the formal genetics of man has a refreshingly different approach. It does not replace the older books on this subject but supplements them by covering much ground not adequately reviewed elsewhere. It will very probably satisfy an important need in this field for many years.

The presentation of the principles of monofactorial inheritance departs from the traditional method by including sex-linked, partially sex-linked, and holandric genes along with the general discussions of autosomal dominant and recessive genes. This has the advantage of placing the emphasis on the physiologic action of the gene rather than on pedigree form. From the teaching viewpoint, there are also advantages to a separate discussion of sex linkage. Fortunately, the book is so organized that an instructor could use either approach by making appropriate assignments in the text.

Probably the best feature of the presentation is the constant attention given to the statistical problems that are essential to an understanding of the subject. The authors state that they wish to emphasize the methodology of human genetics, and this they do very well. They warn that the reader without preparation in the calculus and biometry may experience difficulty, but they offer no apology and insist that such knowledge is essential to the serious student of human genetics. Although this may place a part of the text beyond the reach of many students and restrict its use to advanced courses, it also makes it a much more valuable work for advanced students and investigators.

In view of the wide variety of special statistical tests that have been proposed to test genetic hypotheses under varying conditions of data collection and to estimate various useful parameters, the authors have done an admirable job of generalizing and choosing the most useful methods for discussion. Maximum likelihood methods of estimation are used wherever possible, often to the exclusion of less efficient procedures. Several procedures are described that are not widely known and are difficult to find elsewhere. For example, Penrose's ϕ-statistic is a useful tool whose potentialities are rarely recognized. Owing to limitations of space, the worked examples omit most of the computational steps; but, since the correct results are stated, this should serve as a challenge to the student. Well-selected problems are given at the ends of most chapters, and several abridged tables useful in computation are included.

The discussions of genetic principles as applied to man are clear and concise. Population genetics, mutation, physiologic genetics, and other topics are treated as adequately as would seem possible in the available space, with intelligent choice of topics. In a number of places the authors indicate their opinions on the probable value of various possible avenues of future research. It is of interest to contrast their enthusiastic evaluation of many of these with their rather pessimistic view of the possibilities in linkage studies and twin studies.

The practical applications of genetics to human problems are grouped in the last three chapters under the headings of genetic counseling, medicolegal applications, and eugenics. The chapter on advice to families is excellent, with a realistic and understanding view of the many complex factors that must enter into any genetic counseling problem. On the other hand, the chapter on eugenics discloses a surprisingly conservative approach, and the authors are apparently under some misapprehensions concerning the modern "eugenics movement."

In summary, this book is generally of excellent quality. It will be quite useful as a textbook to advanced students in human genetics and to investigators in this field. It should also be of particular interest to medical investigators whose research leads them into areas where genetic factors are of importance. The mathematical training required will limit its use as a textbook by medical students and beginning students of genetics. The book is well indexed and is bound and printed in an attractive format.

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An Introduction to Molluscan Ecology. Distribution and population studies of fresh-water molluscs. Alan Mozley. Lewis, London, 1954. x + 71 pp. Illus. 9s.

The title of this book is a little misleading, since it is more a brief and partial summary of the ecology of a very few species of mollusks rather than an introduction to this vast subject. In fact, most of the data given are limited to a few fresh-water pulmonate snails of northern latitudes and a somewhat more detailed account of a few African pulmonate snails responsible as vectors for bilharziosis (schistosomiasis). Although the book has a subtitle of "Distribution and population studies of fresh-water molluscs," there is hardly any mention of fresh-water bivalves or fresh-water Prosobranchs. These two groups together outnumber the pulmonates by 10 to 1. Nevertheless, there are many observations made by an experienced field man on the ecology of these animals and methods of control of the disease-carrying forms.

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Fishes of the Western North Atlantic. Sawfishes, guitarfishes, skates, rays, and chimaeroids. Henry B. Bigelow and William C. Schroeder. Sears Foundation for Marine Research, Yale Univ., New Haven, Conn., 1953. Memoir 1, pt. 2. xvi + 588 pp. Illus. $15.

This book, carefully and accurately prepared for the layman and the specialist, forms part two of an ambitious project supported by the Sears Foundation for Marine Research. The general treatment and format are the same as those for part one, which was published in 1948 and included lancelets, cyclostomes, and sharks. The printed date of publication "1953" is in error since part two was not distributed until 1 Dec. 1954, the date it was mailed from Denmark.

Under each species the following sections occur: study material, distinctive

characters, descriptions, color, size, developmental stages, habits, relation to man, abundance, range, details of occurrence in the western Atlantic, synonyms, and references. On pages 187–194, Merriman, Olsen, Wheatland, and Calhoun record the life-history and habits of *Raja erinacea*.

Those who use part two will be amazed to find 1388 footnotes on 562 pages. This distracts the reader who must search for the footnotes; at least 80 percent of this material would be better included in the text.

This book includes 27 genera and 67 species, which make a total of 66 genera and 137 species for the two big volumes. On the basis of an estimate of 1000 fish species in the "western North Atlantic," the present rate of completion of this project will occupy the indefinite future, with a minimum of 13 more volumes. The editorial board may need to alter present plans sufficiently to expedite the completion of this important undertaking in a reasonable length of time.

Some ichthyologists may question the authors' concept of a species in parts one and two, since in those few cases where many specimens were available, a statistical appraisal of morphologic characters used in distinguishing closely related forms is lacking. This cannot be considered as a too serious weakness in the first two volumes, for where large fishes are involved, such as sharks and rays, only a few specimens of a species, sometimes only a single specimen, are preserved in museums. Whereas, when small species of bony fishes are involved usually extensive series from numerous localities are available for statistical studies.

However, those who use part two may have complete confidence in this work. The classification and nomenclature are conservative, and the drawings were expertly prepared. The discussions, descriptions, and conclusions were written with mature judgment and are presented with deliberate and painstaking care.

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Feeding Poultry. Gustave F. Heuser, Wiley, New York; Chapman and Hall, London, ed. 2, 1955. viii + 632 pp. Illus. $7.50.

In this edition the author has provided an almost new textbook in that it has been nearly rewritten. It brings together the practices of feeding and the science of poultry nutrition.

On the whole, the book is well organized and clearly written. It begins with the feeding problem and the objectives in poultry feeding, then moves on to a discussion of the nutrients and ingredients used, the essential factors in a poultry diet, and systems and practices of feeding. The last part deals with the feeding of chickens for specific functions and the feeding of turkeys, waterfowl, and other species of birds. A number of recommended rations is included in the appendix.

Although no attempt is made to include all the poultry nutrition studies reported in the literature, an extensive list of references is given at the ends of the chapters for the interest of those who wish additional information. The author has attempted to evaluate contradictory information, thus saving the reader the time and effort of interpretation.

Heuser states that the book is designed to meet the needs of poultry students, practical poultrymen, feed dealers, and others interested in poultry feeding. Since he has emphasized the practical more than the technical phases, he has accomplished his objective.

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Linear Equations in Applied Mechanics. H. F. P. Purday. Oliver & Boyd, Edinburgh–London; Interscience New York, 1954. xiv + 240 pp. Illus. $3.50.

Much of the mathematical structure underlying the physical theories that the engineer deals with in the fields of mechanical vibrations, flow of fluids, heat, electricity, automation, and so forth, is linear analysis. The common structure of linear algebraic equations and functional equations of various kinds has been recognized and exploited for a long time.

According to the author's preface, "The object of this book is to help readers with an elementary knowledge of the calculus to get acquainted with the easier aspects of linear algebraic equations, difference equations, ordinary and partial differential equations, and integral equations as well as the associated ideas of matrices, determinants, invariants, vectors, tensors, conjugate functions, orthogonal functions, series, etc." This is a very worth-while undertaking, and the book is the more valuable because it includes an account of the more elementary methods of solution by numerical, mechanical, and electric means of computation. A good deal of numerical work applied to actual engineering problems is given in full.

No attempt is made at mathematical rigor, and mathematical proofs are almost entirely absent. This is as it should be in a book of this kind. On the other hand, one would expect that strict mathematical reasoning would be replaced by appeal to intuition, by emphasis on analogies, and by extensive motivation of the procedures described. However, there is very little of this in the book. Tensors are introduced as quantities that transform according to a certain rule, but why this rule is chosen and no other is nowhere explained. The product of matrices is defined as an arbitrary convention with no mention of the fact that it follows logically from the result of successive linear substitutions.

The unifying concept of all linear analysis, that of linear transformation, is not discussed at all, and the term *linear operator* is not even mentioned. Matrices are employed only for convenience of notation, with no allusion to their operational aspect. Because of this lack of logical integration and motivation, the book has the character of a technical manual. One also questions the didactic value of its organization. The elementary arithmetic of complex numbers is taken up in some detail close to the end, with a two-page treatment of integral transforms including Laplace's following a few pages later and a few brief paragraphs on the theory of linear integral equations at the end.

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Le Magnétisme des Corps Célestes. vol. 1, **Magnétisme Solaire et Stellaire Couronne Solaire et Lumière Zodiacale.** vol. 2, **Variations et Origine du Géomagnétisme.** parts II and III of *Physique Cosmique*. A. Dauvillier. Hermann, Paris, 1954. vol. 1, 171 pp. Illus. + plates. Paper, F. 1600. vol. 2, 161 pp. Illus. + plates. Paper, F. 1500.

These two volumes by the well-known professor of cosmic physics at the University of France have as their object "to present succinctly what is known about cosmic magnetic phenomena and attempt to coordinate it . . . to try to bring some clarity into a little known and very controversial subject." In accomplishing the first of these three objectives, the author is fairly successful, and consequently the two volumes serve a useful purpose for those who would like a summary of some of the literature in this field during the past few decades. Although the books are written in French, the style and language employed present little difficulty for an English reader who has a limited ability with that language.

The subject matter covers a very wide range. The first volume begins with an excellent presentation of the Störmer theory of the motion of high-energy charged particles in the field of a magnetic dipole and continues with discussions of the magnetic fields of the sun and stars, of the solar corona, and of the