Pre-Mendelian Genetics

Genetik: Grundlagen, Ergebnisse, und Probleme in Einzeldarstellungen. Hans Stubbe. Fischer, Jena, 1963. xii + 232 pp. Illus. Paper, DM. 18.10.

This short history of pre-Mendelian genetics, which also includes a description of the rediscovery of Mendel's own paper, is by far the best account of the subject that we have. It is published as a preliminary contribution to a much larger work, one that will be designed to cover the entire field of genetics. The history thus is relatively brief and condensed, selective rather than exhaustive. The selection, however, seems to have been done with care and, I believe, with excellent judgment. The bibliography of some 500 items makes it easy for the reader to pursue further any phase of the history that interests him.

The work opens with a very brief account of the domestication of animals and plants, and with the changes made in them by our prehistoric forebears. The author next describes, in somewhat more detail, the ideas of heredity held by the Grecian philosophers and by the Roman agriculturists. Next, he quickly traverses the early Middle Ages, but he pauses long enough to call attention to the biological writings of St. Albert the Great, St. Thomas Aquinas, Roger Bacon, and Paracelsus. In the history of the next few centuries, he found, of course, much more that was pertinent to genetics, and he records in adequate detail the contributions made during the 17th century by the early naturalists, physiologists, and microscopists.

The author begins his "modern times" with the 18th century. Here he describes the preformation-epigenesis controversy, and here he includes the many accounts of the naturally occurring and experimentally created plant hybrids. The greater part of the history is devoted, however, to the 19th century and its many plant hybridizers and animal breeders. Here Mendel's own contribution is included. The ideas of heredity held by Charles Darwin and the other evolutionists are important, of course, to any history of genetics, and the author recounts them clearly and in sufficient detail. The narrative ends with an account of the late 19th- and early 20th-century discoveries in cytology and of their bearings on genetics. In this section the author describes how the Mendelian factors, or genes, were located in the chromosomes.

There is but one minor adverse criticism which I feel that I must make. George Sarton [*Isis* **30**, 222 (1939)] has deplored our routine carelessness in our iconography and has insisted that historians of science must be as careful in authenticating their illustrations as they are in checking their quotations. This short history is well illustrated with 35 portrait plates. Those from the classical world, however, can most charitably be described as "traditional." It is true, for example, that the portrait bust labeled "Demokritos" would enliven almost any page, but it was hardly kind to Demokritos to attach his name to it.

CONWAY ZIRKLE
Department of Botany, University of Pennsylvania

Marriage Patterns

Marriage in Tribal Societies. Meyer Fortes, Ed. Cambridge University Press, New York, 1962. vii + 157 pp. $4.75.

This volume, the third in a new series of studies published by the Department of Anthropology of the University of Cambridge, consists of an introduction by Meyer Fortes and four essays, each written by one of Fortes's former students. With one exception, an essay which consists of a reanalysis of some of Malinowski's older Trobriand material from the Oceanic region, supplemented by data subsequently gathered by Powell, the essays are concerned with contemporary marriage patterns among specific African peoples; Esther Goody writes about the Gonja of Ghana, Grace Harris about the Taita of Kenya, while Jean La Fontaine is concerned with the Gisu who live on the slopes of Mount Elgon in Uganda.

As Fortes says, it might seem that, in view of what we know about marriage in various societies, little could be added to our understanding of these matters. But these essays show that this is by no means the case; instead they indicate the great possibilities for further research on a comparative basis in this realm.

One of the virtues of these essays is that marriage is not discussed in general terms; rather it is linked to the life cycles of the individuals concerned. Thus Goody in a fascinating article (fascinating because she deals with a society with a cognatic kinship system not unlike our own), by distinguishing between divorces initiated by younger and older women, is able to argue that divorce is not a symptom of social disorganization but rather a normal process in certain types of social systems in which married life is an intermediate stage in an individual's life and not a permanent and terminal condition as we tend to view it. Again, the authors, and this is particularly noticeable in the essays by Harris and La Fontaine who appear to have been strongly influenced by the work of Edmund Leach, demonstrate how one can discover and interpret implicit norms in the choice of marriage partners, given the goals of the individuals and the rules of the society.

The essays by Goody, Harris, and La Fontaine are of the highest quality and can be read by the nonspecialist with profit, since they are clearly written and free of jargon and terms in the local languages. They demonstrate the standards of field observation demanded by modern social anthropology, and they show how data so collected are utilized to raise and answer problems which transcend those of the particular societies under consideration.

EDWARD H. WINTER
Department of Sociology and Anthropology, University of Virginia

Linear Systems Theory

The Mathematical Theory of Linear Systems. B. M. Brown. Wiley, New York, 1961. xi + 267 pp. Illus. $8.

Linear system theory is the most trivial and the most important subject taught to engineers. Many mathematicians find the subject uninteresting because systems described by linear, constant-coefficient, and differential-difference equations have closed-form solutions with well-known mathematical properties—most mathematicians cannot understand why a major part of a modern engineer's education is devoted to this area. The engineering educator knows, however, that linear models are the only models whose outputs can be

predicted quantitatively and qualitatively for a wide range of inputs. For this reason even inherently nonlinear systems are often approximated by linear models. Thus a book on the mathematical theory of linear systems, written for engineering students, must steer a difficult course.

Brown's volume is well organized. It treats such mathematical topics as differential equations, Fourier analysis, Fourier and Laplace transforms, and singularity functions and such system topics as stability and feedback. Somewhat more advanced work is discussed in the concluding chapters: Wiener-Lee optimization, discrete time functions, and sampled data systems. The material covered is the core of linear system theory; Brown's writing is clear and demands only a modest mathematical background.

Still, something is wrong. Brown is writing a book for all engineers, but by making the discussion independent of particular applications, he has to some extent made it independent of all applications. By writing from the position of a mathematician, he does not exploit the physical intuition and motivation of the engineer. To the engineer, linear system theory is as much a point of view as it is a branch of mathematics; unfortunately, this point of view is not developed.

The book's strongest feature is that it combines otherwise scattered material in an easily understandable form. However, the serious student of linear systems will still prefer to consult those other sources.

RONALD A. HOWARD
Department of Electrical Engineering, Massachusetts Institute of Technology

The Long Cycle

Wildlife's Ten-Year Cycle. Lloyd B. Keith. University of Wisconsin Press, Madison, 1962. xvi + 201 pp. Illus. $6.

The Matamek Conference (1931) represented the first organized recognition on this continent of an old idea: that many of the mammals and birds of the North undergo more or less regular fluctuations in abundance. In 1942 Elton published a monumental study of cycles, *Voles, Mice and Lemmings*; he felt then that causal analysis lay 20 or so years in the future. Some 10 years later Cole created something of a sensation when he claimed that many or all of the available data were inadequate to convince the objective student of their reality [*Journal of Wildlife Management* **15**, 233 (1951); **18**, 107 (1954)]. Keith's book owes its existence largely to these prior events. Its timing, although suggestive, does not warrant the drawing of conclusions.

Keith assembles, surveys, and attempts to analyze the existing evidence for the "long" cycle that allegedly occurs in the larger game and furbearing animals. In collecting much previously inaccessible information, he provides a real service. The uninitiated has some surprises in store. Perhaps his first shock will come when he learns that the best single criterion for the existence of this 10-year cycle is that the average period between successive peaks must be more than 5 years The nature of the evidence is such that conclusions must be highly tentative. Perusal of the multitude of tables is more likely to lead to despair or a belief in numerology than to an understanding of what is going on. Aside from the well-known and remarkable fluctuations of fur returns from the lynx, the best data stem from a few small areas where populations of ruffed grouse and snowshoe hares have been estimated rather intensively for periods of 17 years or less. There are several other cases where regional correlations and concordances between fluctuations in different species are suggestive. There are also instances where fluctuations must be regarded as random.

The critical reader will wonder to what extent data selected to show cycles are admissible evidence for the existence of such cycles. He will, however, also be struck by the many firsthand, subjective accounts of periodicities. Aside from presenting the data and such pieces of analytical information as are available, Keith contents himself with a summary of the theories that have been invoked to explain the phenomena, in the evident belief that the time for synthesis has not arrived.

There are really two partly separate problems: the large fluctuations as such, and their periodicity. Even for the shorter and more frequently studied mouse cycles, causal explanations are far from adequate. What is needed, as Keith points out, is a sustained and concerted study for perhaps 20, perhaps 50, or more years. Quite apart from the difficulties of milieu, ecological research, in our society, is unlikely to get done in this way. If this is an indictment, few areas of human endeavor can escape it.

PETER W. FRANK
Department of Biology, University of Oregon

Applied Mathematics

Advanced Engineering Mathematics. Erwin Kreyszig. Wiley, New York, 1962. xvii + 856 pp. Illus. $10.50.

Kreyszig's *Advanced Engineering Mathematics* is intended to introduce students of engineering and physics to those fields of mathematics which, from the modern point of view, seem to be most important with respect to practical problems. No mathematical background beyond elementary calculus is required.

Two topics receive the most attention —ordinary differential equations and complex analysis—but the book also includes chapters on the Laplace transformation, vector analysis, line and surface integrals, matrices and determinants, Fourier series and integrals, partial differential equations, and special functions. The author's effective scheme for treating numerical analysis is to discuss numerical methods as they are needed in many parts of the book rather than in a separate chapter.

To facilitate the use of parts of the book, the chapters are kept as independent of each other as possible. At the beginning of each chapter the author lists the chapters that are prerequisites, the sections that may be omitted in a shorter course, and an up-to-date set of references.

The book is well written, and both the exposition and the extensive sets of problems reflect a balance between mathematical theory and emphasis on applications. The book is a suitable textbook for a three- or a four-semester course, or, by omitting certain sections, it can be used for a shorter survey course. It can also be used for separate one-semester courses in several areas. It is an excellent reference book for engineers and furnishes a handy guide to the more commonly used mathematical theory, with references to more detailed treatments for those that are interested.

LEON W. RUTLAND
Department of Applied Mathematics, University of Colorado