(e.g. Dewey's *Logic: the theory of inquiry* or *An introduction to reflective thinking,* by the Columbia Associates) or in experimentalism (e.g. E. A. Singer, Jr., "Philosophy of Experiment," *Symposium,* I, 2).

RUSSELL L. ACKOFF

Wayne University

Our plundered planet. Fairfield Osborn. Boston: Little, Brown, 1948. Pp. xiv + 217. $2.50.

It was Fairfield Osborn's father who, some 20 years ago, called our present era the end of the age of mammals, if my memory is not tricking me. In this book the son makes compellingly clear that, in the march toward oblivion, mankind has placed itself near the head of the procession. As the only animal that deliberately destroys the environment on which its survival depends, man has used his magnificently developed forebrain to heighten the effectiveness of that destruction. The result, as Mr. Osborn shows, is a shambles; while populations increase, the means of satisfying their needs steadily diminish.

The story is told through more or less random samples that show parallel developments of the relationship between man and his environment on the five continents and Australia. Nearly everywhere man's destruction of vegetation has disrupted the hydrologic cycle, with resultant soil erosion, floods, siltation, falling water tables, vanishing wildlife—essentially, though he does not stress the fact, falling human living standards. And, as the earth disease progresses, more and more of the organism-environment is involved, and treatment and cure become more difficult and more costly.

He has assembled so many valuable data that space limitations require omission of even reference to most of them. He does an especial service by reminding us of the role of the Mesta—the Spanish Wool-growers' Association—in wrecking their country. He points out that "nature gives no blank endorsement to the profit motive" and recommends world-wide planning. He sets forth, eloquently, that "science" is not yet ready to synthesize the adequate environment visualized by some technicians and many economists; we still need the "back forty." He recognizes, as many international do-gooders still cannot, that cultural limitations prevent the use of modern technology in countries dominated by backward, illiterate, and/or exploited populations.

The reviewer has only one serious quarrel with the book: Mr. Osborn repeatedly refers to excessive populations but does not suggest doing anything about checking their increase. He makes many a convincing plea for better use of the land. The uninformed reader might conclude that improved land-use would take care of mankind, even after we were piled three deep. Direct checks on human reproduction are at least as indispensable as forest management and contour plowing.

This is a book that should be widely read; almost anyone reading it will want to recommend it to others. It tells perhaps the most important story of our day—and tells it well.

WILLIAM VOGT

Pan American Union, Washington, D. C.

Introduction to mathematical statistics. Paul G. Hoel. New York: John Wiley, 1947. Pp. x + 258.

This book furnishes a panoramic view of the aims, ideas, and methods of mathematical statistics. It "was designed to serve as a textbook for a two-semester course in mathematical statistics for which elementary calculus is a prerequisite," and in writing it an attempt was made "to keep in mind the needs of applied statisticians for a modern reference book on the fundamental methods of mathematical statistics. The material treated was selected to give the beginner a fairly broad introduction to both classical large-sample and modern small-sample methods." The author also states that "a number of topics have been treated very briefly," since he "did not care to incorporate more material than experience indicated could be satisfactorily covered in a two-semester course." As guides to supplementary reading, annotated references are provided at the end of each chapter.

Noteworthy features of this book are: (1) Its broad coverage of the ideas and techniques of statistical inference, especially those found to be most effective in industrial experimentation, quality control, and acceptance inspection. Thus, in addition to treatment of the material found in most elementary statistics texts, the reader is introduced to such topics as discriminant functions, statistical tolerance limits, and testing for randomness by runs and serial correlations. (2) The effective use made of moment-generating functions to obtain elementary proofs of many of the basic theorems of modern statistical inference. Granted certain fundamental properties of these generating functions, the proofs given are not only complete, but throw light on the character of the approximations involved, if any. (3) The collections of well-chosen exercises at the end of each chapter which provide the reader with opportunities for trying out the methods to which he has been introduced.

A major shortcoming of the book is its failure to make the reader feel "at home" in the application of the methods presented. It falls in that intermediate zone between a purely formal mathematical treatment, on the one hand, and a manual of procedures, on the other, where it is difficult to strike a satisfactory balance between mathematical rigor in the proofs and stimulating illustrations of the scope and power of the applications. The author has tended to favor rigor of development, at the expense of giving the reader a "practical feel" for the applications. As anyone who has made the attempt knows, the latter is more difficult to achieve. As W. Edw. Deming has so admirably put it, ". . . it is fairly easy to write mathematical books and papers, and even easy to make the exposition clear, but . . . it is quite a different matter to try to explain *how to use theory in practice.* This is *very difficult.*" Also, the reference material cited is insufficient and inadequately tied in with the text material. For example, in connection with discriminant functions, B. L. Welch's "Note on Discriminant Functions" (*Biometrika,* 1939, **31**, 218–220) is not cited. This important note relates the problem of constructing an optimal "discriminant function" to Bayes's Theorem and to the Neyman-Pearson likelihood ratio test for

choosing between one of two admissible hypotheses, and is essential to an adequate background of the subject. In addition, the reader is occasionally left without further guidance; thus, on page 15 it is stated that the measure of skewness a_3 "can be zero without the distribution's being symmetrical," and a similar caution is given in connection with a_4 as a measure of peakedness. However, the reader is given no hints on the nature of these exceptions, to enable him to judge whether they are "pathological" or not, nor is he told where such exceptions are discussed in the literature. Explicit citation in the text of especially pertinent references given at the end of the chapter would be very helpful in numerous instances, as would also the referencing of such material in the index under author and subject.

This reviewer obtained the impression, as he read along, that he was being "talked down to." Instead of a feeling of being guided through new vistas by an enthusiastic statistician engaged in a bit of proselyting, or the feeling of being "shown the way" to a new "religion" by a penetrating thinker with wide experience, he felt that the narrator was condescending to tell him a few of the things regarded as commonplace by those "in the know."

As a textbook for a first course in mathematical statistics, its mathematical level is likely to render it unsatisfying to students of mathematics, and its atmosphere of noncontact with practical applications may limit its effectiveness among practical workers who seek on-the-job guidance. There is, however, at present no other book of comparable size that provides such a broad introduction to statistical inference.

CHURCHILL EISENHART

National Bureau of Standards

Theory of servomechanisms. Hubert M. James, Nathaniel B. Nichols, and Ralph S. Phillips. (Eds.) (Massachusetts Institute of Technology Radiation Laboratory Series.) New York-Toronto-London: McGraw-Hill, 1947. Pp. xiv + 375. (Illustrated.) $5.00.

In the first four chapters of this volume one finds a short history of servo design technique, some performance specifications, and a brief introduction to the mathematics used in the analysis of servo systems. The servo is likened to a linear filter and is characterized by either of the following: (a) its weighting function, (b) its frequency response, (c) its transfer function. Servo elements and networks are described, and Nyquist Criterion of stability is introduced. The fifth chapter deals with filters subjected to pulsed data, their transfer functions, and their stability. Pulsed servos and their characteristics are discussed in this chapter.

The last three chapters are concerned with the mathematics of statistics and statistical methods applied to control. A new design technique based on the minimum root mean square error in the presence of extraneous noises and inputs is described and applied.

There is correlation between the various chapters, and the sequence of topics discussed is well chosen. Illustrative examples and diagrams are presented throughout.

The 8 chapters of this book, written by 10 members of the Radiation Laboratory, constitute a valuable contribution to the science of servomechanisms.

E. M. SABBAGH

Purdue University

Methods of algebraic geometry. (Vol. I.) W. V. D. Hodge and D. Pedoe. Cambridge, Engl.: at the Univ. Press; New York: Macmillan, 1947. Pp. viii + 440. $6.50.

The volume before us, which, it is announced, will be followed shortly by a second volume devoted to the theory of algebraic varieties and to the study of certain loci which arise in many geometric problems, is divided into two books. Book I is devoted to Algebraic Preliminaries, and Book II, to Projective Space. As the title implies, no attempt has been made to build up a body of geometric theorems. Though the projective group is necessarily fundamental, no discussion of its invariants is given except as these may appear incidentally in reductions to canonical forms. The polar operator is mentioned, but its invariance is not stressed. Yet the necessarily restricted choice of material is excellent, and the volume is a very welcome addition to the literature in this field.

In Book I the four chapters deal, respectively, with integral domains, rings, fields, and factorization; with linear algebra, matrices, and determinants; with algebraic dependence, field extensions, and their effect on factorization; and with algebraic equations, including Hilbert's "basis" and "zero" theorems and the theory of resultants. In the second half of this book, from the point at which determinants are introduced, the basic field is assumed to be commutative. Fields with characteristic are considered only incidentally, and algebraically closed fields are employed only as circumstances demand.

In Book II, Chapters V and VI, respectively, give an algebraic and a synthetic definition of a "projective space." In these two chapters a noncommutative field is basic and commutativity is shown to be a consequence of the validity of the Pappus theorem. Essentially, the objective here is to show that the projective spaces obtained by either approach are identical. The remaining three chapters, based entirely on commutative fields, deal with Grassmann coordinates, with collineations, and with correlations including polarities and null systems. The customary reduction of pencils of such forms to canonical forms is exhaustively treated.

Much of the presentation is preliminary to Chapter VI, in which the projective space is obtained axiomatically. This particular chapter, almost one-fifth of the entire volume, seems somewhat foreign to the general purpose. Even the authors appear to share this feeling to some extent, for, in a footnote to the chapter heading, we read that "this chapter is almost completely independent of the rest of the book, and may be omitted at a first reading." Much greater unity might have been attained by omitting this chapter and using only commutative ground fields. Noncommutativity might well have been restricted to operations, such as permutations and matrix multipli-