Book Reviews

Fundamentals of statistics. Truman Lee Kelley. Cambridge, Mass.: Harvard Univ. Press, 1947. Pp. xvi + 755. $10.00.

This book appears to have a threefold purpose: (1) It attempts to coordinate statistics, psychology, and logic and presents an introduction to the principles of the scientific method and to inductive logic—the foundation of statistical procedures; (2) it presents certain essential and well-known statistical techniques and gives applications of them to scientific research; and (3) it includes many topics, procedures, and formulas, some elementary and some advanced, that may have use in experimentation and research involving quantitative and qualitative measurements.

The book contains 15 chapters and three appendices. Chapter I concerns itself with certain aspects of the Nature of Statistics. Here, the author observes that good common sense is essential and that there exists a quadruple alliance inherent in sound statistical research: phenomena, data; logic, *i.e.* mathematics and inductive logic; human psychology in its power to judge sameness; and human psychology in its power to judge relevance. He observes, further, that occasion for resort to statistics include (a) a desire to prove an hypothesis and (b) a desire to invent an hypothesis, which points out that statistics is the fundamental and most important part of inductive logic and requires mathematics at its highest level as the prerequisite tool. The functions of statistics are: (a) to be purely descriptive, (b) to enable analysis in harmony with hypothesis, and (c) to suggest analyses not thought of previously. In Chapter II we find a classification and some discussion of various types of quantitative and qualitative data as well as certain fundamental statistical processes. Here also it is indicated that a fundamental service of statistics is to obtain *laws of nature.* Chapter III is devoted to a discussion of the character and functions of statistical tables. It is well said by the author that a good table is a shorthand statement of fact. Three types are considered: (a) general purpose, (b) special purpose, and (c) intermediate purpose tables. Chapter IV presents some ordinary methods of graphical presentation of statistical facts and discusses certain fields in which such methods are useful. Chapter V concerns itself with the important concept of phenomena stability that is portrayed by measurements of belonging—to attributes from various sources. It is pointed out that, associated with each type of stability, there are one or more statistics (functions of the measurements) that describe or characterize the phenomenon. In Chapter VI the author discusses the concept of dispersion, a method of describing and explaining differences in measurement. We also find here an introduction to the theory of sampling. It is gratifying to note the inclusion of the important k-statistics and cumulants in addition to the ordinary method of moments, as well as certain aspects of numerical accuracy and precision. We here have presented Gini's *mean difference with repetition.* An error in regard to a most important concept has been noted: On the bottom of page 204 we find: "The unbiased estimate of population variance is a function of the sample variance and number of cases in the sample." This is not correct because an unbiased estimate of population variance is a statistic whose *expected value* is the population variance. However, the *particular* function given is an unbiased estimate. Chapter VII presents the commonly known averages and the definition of an average in general. In addition to averages which are useful in describing frequency distributions, we find the properties kurtosis and skewness of frequency distributions. There also is a brief statement of the meaning of *maximum likelihood.* In Chapter VIII we find a description of the normal distribution with some applications. It is pointed out that the normal distribution is the continuous approximation to the point-binomial. However, it should be emphasized that the normal distribution is based on the postulate of the arithmetic mean. Also, the nonuniversality of the normal distribution should be stressed. We find here an introduction to the t, χ^2, z distributions, and their dependence upon the normal distribution is discussed. The distinction between the distributions of these statistics and of others that are distributed like them should be clearly emphasized. Chapter IX gives, in the reviewer's opinion, an inadequate treatment of the Theory of Attributes. Pearson's mean-square contingency and its relation to χ^2 is indicated. In Chapter X we are introduced to the concept of correlation. Regression and variance methods of approach are given. The emphasis appears to be based on a straight-line relationship. Also, special measures of relationship, such as correlation between ranks and biserial and tetrachoric correlation, are mentioned. Chapter XI concerns itself with the consequences of using semireliable initial measures. Indices of reliability and validity are introduced relevant to certain aspects of psychometrics and econometrics. An introduction to factor analysis is given. The regression, variance, and determinant methods for the study of problems in linear and nonlinear multiple and partial correlation are mentioned. Chapter XII gives certain special methods of solution for a problem in general multiple linear regression. The reader is also introduced to the value of matrices in multiple relationships. Chapter XIII is devoted to a discussion of Time Series. Here, many topics, such as periodicity, trends, periodogram analysis, and the lead and lag problem, are mentioned and very briefly discussed. In addition, we are introduced to the problem of curve fitting by the method of moments, the finding of optimum intervals, interpolation, special machine

methods for root extraction, and sequential analysis. In the reviewer's opinion, these topics are treated too briefly. All the experimentalists can hope to obtain from the exposition given is a superficial background in these topics. Chapter XIV, which presents a heterogeneous mixture of mathematical topics, is definitely inadequate for the experimentalist who wishes to have a thorough knowledge of statistical theory for intelligent use. Chapter XV is an excellent bibliography of statistical tables. In Appendix A, the author gives a Mathematics Background Test; appendix B is essentially a dictionary of symbols; while appendix C is a correlation chart.

The reviewer is not at all certain that the book is practical for use as a textbook in a statistics course. It contains a wealth of very valuable information in condensed and concentrated form, however, and, as a handbook for reference by the experimentalist or collateral reading by the student of statistics, it is excellent and second to none.

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Classification of fishes, both Recent and fossil. Leo S. Berg. (Traveaux de l'Institut Zoologique de l'Académie des Sciences de l'U.R.S.S., Vol. 5, Pt. 2.) Leningrad: Akademiia Nauk, 1940. (Reprinted by Edwards Brothers, Ann Arbor, Michigan, 1947.) Pp. 87–517. Illustrated.) $7.00.

In concluding his review of the original volume of this comprehensive work, Myers (*Copeia*, 1941, No. 4, p. 275) wrote: "... the reviewer wonders if any but the few copies now in this country will ever be available." The present reprint, by photo-offset, fills this important need for ichthyologists as well as for paleontologists, comparative anatomists, and the general worker in zoology.

The paper, reprinting, and maroon cloth binding of this edition are of high quality, superior to that of the original. The entire Russian text (pp. 87–345) is reproduced with the figures and is followed by the English text (pp. 346–500).

The researches by Dr. Berg on fossil as well as living fishes have resulted in the most complete and up-to-date arrangement of the families of fishes that has appeared. The literature was reviewed through May 1937, with additions while in press, and the abundant footnote references to the major works for family and higher groups are indispensable to the modern worker.

In the growing fields of ichthyology and palaeichthyology, teachers will welcome the availability of this volume. Where used as a text in connection with formal course work, many students will find that they can obtain the work under the G.I. Bill of Rights. The publishers, as well as the Michigan group who conceived and carried through the reprint edition, are to be congratulated for making this useful volume generally available.

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Scientific Book Register

BREED, ROBERT S., MURRAY, E. G. D., HITCHENS, A. PARKER, *et al.* *Bergey's manual of determinative bacteriology.* (6th ed.) Baltimore: Williams & Wilkins, 1948. Pp. xvi + 1529. $15.00.

BUHLER, CHARLOTTE, and LEFEVER, D. WELTY. *A Rorschach study on the psychological characteristics of alcoholics.* (Mem. Sec. Stud. Alcohol, Laboratory of Applied Physiology, Yale Univ., No. 6.) New Haven: Hillhouse Press, 1948. Pp. 64. $.75.

DEBRUINE, HARVEY. *Summary tables for comparative chordate anatomy.* (2nd ed.) Ann Arbor, Mich.: Follett's Michigan Book Store, 1947. Pp. 35. $1.35.

EIGSTI, O. J. (with a supplement by P. Dustin, Jr.). *Colchicine bibliography.* Cincinnati: Lloyd Library, 1947. Pp. 65–114. $.50.

FENNAH, R. G. *Notes on neotropical Dictyopharidae and synonymy in two other groups.* (Smithsonian Miscellaneous Collections, Vol. 107, No. 11.) Washington, D. C.: Smithsonian Institution, 1947. Pp. 13. (Illustrated.)

LEVENS, ALEXANDER S. *Nomography.* New York: John Wiley; London: Chapman & Hall, 1948. Pp. vii + 176. (Illustrated.) $3.00.

MICKEY, MARGARET PORTIA. *The Cowrie Shell Miao of Kweichow.* (Pap. Peabody Museum of American Archaeology and Ethnology, Harvard Univ., Vol. XXXII, No. 1.) Cambridge, Mass.: Peabody Museum, 1947. Pp. ix + 83. (Illustrated.) $2.50.

PARSONS, A. B. (Ed.) *Seventy-five years of progress in the mineral industry (1871–1946).* New York: American Institute of Mining and Metallurgical Engineers, 1947. Pp. xii + 817. (Illustrated.) $6.00.

PHILLIPS, E. N., STERNS, W. G., and GAMARA, N. J. *High frequency measuring techniques using transmission lines.* New York: John F. Rider, 1947. Pp. 58. (Illustrated.) $1.50.

REICH, WILHELM. *The discovery of the orgone.* Vol. II: *The cancer biopathy.* (Trans. by Theodore P. Wolfe.) New York: Orgone Institute Press, 1948. Pp. xxi + 409. (Illustrated.) $8.50.

SVOBODA, ANTONÍN. *Computing mechanisms and linkages.* (Massachusetts Institute of Technology Radiation Laboratory Series.) (Ed. by Hubert M. James.) New York-London: McGraw-Hill, 1948. Pp. xii +359. (Illustrated.) $4.50.

WOERDEMAN, M. W., and RAVEN, CHR. P. *Experimental embryology in the Netherlands, 1940–1945.* (Monographs on the Progress of Research in Holland During the War.) New York-Amsterdam: Elsevier, 1946. Pp. xi + 132. (Illustrated.)

WORTHING, ARCHIE G., and HALLIDAY, DAVID. *Heat.* New York: John Wiley; London: Chapman & Hall, 1948. Pp. xii + 522. (Illustrated.) $6.00.