Book Reviews

Lectures in Statistics

Probability, Statistics and Time. A Collection of Essays. M. S. BARTLETT. Chapman and Hall, London, and Halsted (Wiley), New York, 1976. viii, 148 pp. $12.75. Monographs on Applied Probability and Statistics.

M. S. Bartlett, recently retired as professor of biomathematics at Oxford University, has in the last 45 years or so made basic contributions over the whole fields of statistics and stochastic processes. Since World War II he has been the dominant figure on the English scene. It is my impression that in the United States he is not read as much as he should be, perhaps because of his style. I recall finding his book *Stochastic Processes* (1953) very difficult when it appeared and regretting that the fascinating and novel material in it was not presented with the clarity of Feller's famous textbook first published in 1950. Even so, Bartlett's book and his papers have, at least as much as anyone else's, spurred the development of the statistical theory and applications of stochastic processes to scientific problems. While this may be his greatest achievement, his contributions to "classical" statistics are manifold. He was one of the first good mathematicians to take up the subject and immediately made his mark in multivariate analysis. In his early days Bartlett suffered the enmity of the late Sir Ronald Fisher because he quietly differed with Fisher on the nature of statistical inference.

Bartlett's first book of essays appeared in 1962. Three of the essays dealt with statistical inference, one with multivariate analysis, three with stochastic processes, and one with irreversibility in statistical mechanics. In this collection, the mix is similar. In both cases, most of the essays are lectures that marked some auspicious occasion and that have been published before.

Reading the second collection drove me back to the first. Despite my early experience, I am now a fan of Bartlett's. Statistical books have become boringly technical, and it is a great relief to read broad accounts written in fine prose and with a sense of history. A quotation from the preface to Bartlett's first set of essays gives a further justification for reading both books.

> Survey articles and lectures usually receive scanty attention from reviewers and abstracters, being dismissed as expository, or even without comment at all. Yet among the welter of new research contributions much represents temporary and even useless activity, which a little more general reflection might have avoided. Moreover, there is not often much opportunity to indicate one's general philosophy and outlook in research papers.

It might be remarked that many of these "survey" articles contain new material or treatments and that Bartlett has a new book coming out this year on the statistical analysis of spatial pattern. With this warning not to be misled by his modesty, we turn to the present volume.

The nine essays vary greatly in depth and style. "Probability, statistics and time," an inaugural lecture to University College, London, gives a brief history and some examples of work on stochastic processes (including a nice discussion of caves) and concludes with a nontechnical discussion of probability, entropy, and the paradoxes of statistical mechanics. Bartlett returns to this latter topic in the context of quantum theory in "The paradox of probability in physics." In "R. A. Fisher and the last fifty years of statistical methodology," the first R. A. Fisher Memorial Lecture to the American Statistical Association, Bartlett gives a very just summary that begins, "I have always tried to combine my profound admiration of [Fisher's] scientific achievements with a reluctance to be blinded by their brilliance." After a lengthy discussion of Fisher's main contributions he notes that it is strange that Fisher did not do more with time series analysis. It may be worth mentioning that in a 1920 paper on the variation of crop yields with time, Fisher makes a study of the serial correlation of the residuals from polynomial regression. "Inference and stochastic processes" is mostly about inference except for two technical appendices. "Biomathematics" is Bartlett's Oxford inaugural address and deals largely with population genetics—one assumes it was given before rather than after a good dinner. By contrast, "Epidemics" gives a very easy introduction to the subject. "Equations and models of population change" treats both epidemics and genetic examples rather technically. In "When is inference *statistical* inference?" Bartlett tries to put in a nutshell his own views on Bayesian methods and likelihood ratios. Other aspects of this appear, of course, in his essay on Fisher. Bartlett's attitude is, in fact, like Fisher's early view—that statistics, as a subject, "cannot from its very nature be concerned with single individuals or events as such." The final essay, "Some historical remarks and recollections on multivariate analysis," is unfortunately short and technical. Since this topic is receiving a great deal of attention nowadays there is great justification for a much longer article.

Everyone will profit from reading these essays.

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General Knowledge in the Populace

The Enduring Effects of Education. HERBERT H. HYMAN, CHARLES R. WRIGHT, and JOHN SHELTON REED. University of Chicago Press, Chicago, 1975. x, 315 pp. $12.50.

Compared with the unfavorable conclusions of many recent research reports about the American educational enterprise, this volume—166 pages of which are tables—is highly laudatory. The title, however, promises more than the contents produce, for only one effect of education, "general knowledge," is studied. This of course is one fundamental purpose of education.

Evidence on the accomplishment of this purpose has been somewhat restricted to academic subjects covered in testing programs with students or recent graduates, except for the 1969 excursion of the National Assessment of Educational Progress into a sample of adults aged 26 to 35. Compilations of evidence on a national scale covering information