

PREFACE

WARREN WEAVER, a great expositor of science, discussed why science is not more widely appreciated and issued a call in "The Imperfections of Science" (*American Scientist*, 49:113, March 1961):

What we must do—scientists and non-scientists alike—is close the gap. We must bring science back into life as a human enterprise, an enterprise that has at its core the uncertainty, the flexibility, the subjectivity, the sweet unreasonableness, the dependence upon creativity and faith which permit it, when properly understood, to take its place as a friendly and understanding companion to all the rest of life.

As this book makes clear, scientific thinking, most particularly related to statistics, is not restricted to "pure" science, but has many uses in applied fields such as health sciences as well. And most especially, it is necessary to develop what we might call a statistical attitude toward, and manner of thinking about, these disciplines.

To prepare a volume describing important applications of statistics and probability in many fields of endeavor—this was the project that the ASA-NCTM Committee initiated early in 1969 as an effort to close the gap Weaver and others had pointed out. *Statistics: A Guide to the Unknown* (SAGTU) was the result.

During the book's preparation several of us who were working on it and teaching simultaneously found much of the material very useful—even inspirational—to undergraduate and graduate students. It seemed that the book had an additional possible function as an auxiliary textbook. This impression has been confirmed over the years since publication of *SAGTU* as college after college, university after university, and even secondary after secondary school adopted *SAGTU* as an auxiliary textbook for introductory statistics classes.

Instructors and students have reported success in using *SAGTU* as a means of tying techniques and methods, taught necessarily at a simple level with simplified examples, to real problems in the real world. In specialized courses, some teachers wanted sets of essays oriented to their subject matter. Students studying biologic sciences, for example, found themselves only distantly concerned with statistical applications in business and economics. The very diversity of applications that had fascinated us became an impediment to the usefulness of *SAGTU* as an auxiliary textbook within the time constraints of a specialized statistics course. It is for this reason that the decision was taken to compile what we have come to refer to as mini-*SAGTU*'s: each a selection of articles

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from *SAGTU* (and in this volume, one new article) dealing with a particular field of application—*Statistics: A Guide to the Biological and Health Sciences* (SAGBAHS) is the second such volume to appear. (The first was *Statistics: A Guide to Business & Economics*.)

The essays here, and in *SAGTU* itself, do not teach technical methods, but rather illustrate past accomplishments and current uses of statistics and probability. In choosing the actual essays to include, the Committee aimed at illustrating a variety of applications, but did not attempt the impossible task of covering all possible uses. Even in the areas included, attempts at complete coverage have been deliberately avoided. We discouraged authors from writing essays that could be entitled "All Uses of Statistics in . . ." Rather, we asked authors to stress one or a very few important problems within their field of application and to explain how statistics and probability help to solve them and why the solutions are useful to the nation, to science, or to the people who originally posed the problem. In the past, for those who were unable to cope with very technical material, such essays have been hard to find.

When describing work in the mathematical sciences, one must make a major decision as to what level of mathematics to ask of the reader. Although the Joint Committee serves professional organizations whose subject matter is strongly mathematical, we decided to explain statistical ideas and contributions without dwelling on their mathematical aspects. This was a bold stroke, and our authors were surprised that we largely held firm.

There is an old saw that a camel is a horse put together by a committee. Our authors supplied exceedingly well-formed and attractive anatomical parts, but to the extent that this book gaits well, credit is due primarily to a most talented and dedicated Committee. In general, the approach to unanimity in the Committee's critical reviews of and suggestions about essays was phenomenal. And, though they may have occasionally been divided about the strong and weak points of a particular essay, they were constantly united in their purpose of producing a useful book, and in their ability to find something more than 24 hours a day to work on it. This dedication undoubtedly created difficulties for our authors. Nevertheless, our authors persevered and deserve enormous thanks from us, and from the Committee, and from the statistical profession at large.

Our thanks go also to the Sloan Foundation whose grant made it possible to put this book together.

There are others to thank as well: to the office of the American Statistical Association (and, in particular, to Edgar Bisgyer, and John Lehman, and later Fred Leoné) for invaluable help in all the administrative work necessary to get out a book such as this; and similar thanks

to the administration of the National Council of Teachers of Mathematics; to Edward Millman for careful and imaginative editorial assistance; and to other people at Holden-Day, especially Frederick H. Murphy, and Erich Lehmann, our Series Editor; to Mrs. Holly Grano for acting as a long-distance and long-haul secretary; and to the many friends and colleagues both of the Editor and of the Committee members who so often acted as unsung, but indispensable, advisors.

In this new effort to compile *SAGBAHS*, additional thanks go to the original Committee members and to the guiding spirit of Erich Lehmann. We also have additional thanks for John Gilbert, Bucknam McPeck, and Frederick Mosteller, the authors of the one new article appearing in this volume, "How frequently do innovations succeed in surgery and anesthesia?" The supplementary material for study, prepared especially for *SAGBAHS* is the valuable contribution of Haiganoush Preisler and Esther Sid.

Frederick Mosteller
Judith Tanur

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