

Zar J H. *Biostatistical analysis*. Englewood Cliffs, NJ: Prentice-Hall, 1974. 620 p.
[Department of Biological Sciences, Northern Illinois University, DeKalb, IL]

This book has served a variety of students and researchers as a text and reference work for applying statistical methods to biological data. It assumes no prior statistical knowledge and covers an array of statistical procedures reflecting the wide range of techniques suitable to biological investigation. [The *SCI*® and *SSCI*® indicate that this book has been cited in over 5,040 publications.]

Statistical Procedures for Biological Research

Jerrold H. Zar
Department of Biological Sciences
Northern Illinois University
DeKalb, IL 60115-2861

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The methods of applied statistics deal with collecting, summarizing, presenting, and analyzing data. Biological scientists have long been interested in the objective acquisition and interpretation of counts and measurements, and a considerable array of statistical procedures now widespread among many disciplines owes its development to the needs of biological research in the first decades of this century. In the 1960s I was initiated into the study of statistical method at the University of Illinois, Urbana-Champaign, in courses with a distinct agricultural orientation exemplified by outstanding books that now have endured to newer editions.^{1,2} After graduate and post-doctoral study I taught a graduate course in biostatistics for 19 years at Northern Illinois University, and within a year of starting in that faculty position, I found myself with a contract to prepare a manuscript on that subject.

My interests as a student were primarily biological, not statistical, and were characterized by a thirst for breadth. As an undergraduate I completed a general major in biology (with a minor in chemistry) and again selected a broad major (with required graduate study in five biological departments) for a master's degree. I succumbed to the expectations for specialization in acquiring the PhD degree but also insisted on pursuing not only a major (zo-

ology) but two minors (physiology and chemistry) and engaging in course work ranging across 11 academic departments, from agronomy to zoology (with stops at botany, chemistry, computer science, entomology, mathematics, microbiology, physiology and biophysics, veterinary medicine, and interdisciplinary biology). In graduate school I was consulted by other graduate students (and a couple of professors) about statistical procedures and their computer execution. At that time I wrote a set of 28 FORTRAN computer programs for statistical analysis (which I called "ZARPAC") for which my department reimbursed me by typing my doctoral dissertation.

My goal in this book was to present statistical techniques in an assortment and depth adequate to encompass the needs of biological investigators in the great variety of biological specialties; to present them in readable fashion, with numerous examples, and under no assumption of previous statistical expertise; and to do this in a manner that would lend the book to use as both a text and a reference. I drew upon my broad background in biology, covered an unusual diversity of methods, placed nonparametric methods throughout the book, introduced topics (such as the handling of circular data) not found in other texts, interjected bits of history, included the most extensive set of statistical tables to appear in a text/reference book, and inserted numerous literature references (the latter resulting in the only technical book I know that cites both Gregor Mendel and Mark Twain).

I am gratified to have had this work cited so frequently, for fewer than one-fourth of the first group of more than 750 *Citation Classics* were methodological works,³ and statistical references are not always cited in research papers unless a relatively unusual procedure is being employed. Criticisms of the book have mostly concerned choice of emphasis; for example, some readers have applauded the comprehensiveness of the tables, while others have suggested their vast scope is unnecessary; and some have wished for inclusion of substantial theoretical or probabilistic background discussion, which I have felt was outside the scope of the work. The 1974 book continues to be cited years after the appearance of the 1984 edition,⁴ and a third edition is in the making.

1. Snedecor G W & Cochran W G. *Statistical methods*. Ames, IA: Iowa State University Press, 1980. 507 p. [Edition 7 (1980) was cited more than 3,500 times; more than 44,400 cites for all the editions of this title. See also: Cochran W G. *Citation Classic* (on edition 5). (Barrett J T, ed.) *Contemporary classics in the life sciences. Volume 2: the molecules of life*. Philadelphia: ISI Press, 1986. p. 251.]
2. Steel R D & Torrie J H. *Principles and procedures of statistics: a biometrical approach*. New York: McGraw-Hill, 1980. 663 p. (Cited 15 times.)
3. Garfield E. *Citation Classics—four years of the human side of science. Essays of an information scientist*. Philadelphia: ISI Press, 1983. Vol. 5. p. 123-34. (Cited 5 times.)
4. Zar J H. *Biostatistical analysis*. Englewood Cliffs, NJ: Prentice-Hall, 1984. 718 p. (Cited 790 times.)

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