Jan Beran, *Statistics in Musicology*. Boca Raton, FL: Chapman & Hall, 2003. ISBN 1584882190 (hardcover) $84.95.

Many music scholars would benefit from a basic course in statistics. Yet there now exists no textbook that teaches basic statistics concepts with compelling examples from music research. In this respect, music scholarship differs from other applied disciplines, such as psychology, sociology, political science, economics, communications, and education, all of which have developed discipline-specific statistics textbooks.

The title of Jan Beran's *Statistics in Musicology* raised my hopes that this book might fill the void. Alas, it does not. *Statistics in Musicology* is technically adroit, beautifully illustrated, and sometimes musically insightful. It may hold interest for mathematically sophisticated readers with strong musical interests. (The author is a statistics professor who has made recordings as a pianist.) Yet it is not the right book for most music scholars.

Mathematically, *Statistics in Musicology* is far too advanced for the typical music scholar. Beran's first chapter includes a 5-page review of abstract algebra; facility with probability theory, matrix algebra, and differential and integral calculus is simply assumed. Throughout the book, Beran's presentation is quite formal, with chapter 2 alone containing 31 numbered equations and 24 numbered definitions.

The book moves very rapidly, and I doubt that any reader who is not already familiar with the techniques will learn enough to apply them in original work. Each chapter after the first covers a topic that usually requires book length exposition: exploratory data analysis (chapter 2), information theory (3), time series (4), hierarchical or multilevel models (5), Markov models (6), circular statistics (7), principal components analysis (8), discriminant analysis (9), cluster analysis (10), and multidimensional scaling (11). Linear regression, commonly the topic of a one- or two-semester course, is covered in less than three pages (pp. 39-41). Even so, some important topics, such as logistic regression and analysis of variance, are missing. Since comprehensive coverage is not practical, it might have been more useful to cover fewer topics in greater depth, with more detailed examples and interpretation.

Musically, *Statistics in Musicology* is not fully integrated with previous scholarship. The author claims that "applications of statistical methods to questions in musicology and performance research are very rare" (p. 6). Although this claim has some merit, the use of statistics in music research is not quite as rare as Beran's treatment suggests. Indeed, though Beran constructs most of his own examples, some of those examples bear a striking and unremarked resemblance to prior work.

In Figure 2.6, for example, Beran shows that, in four pieces by Bach, Mozart, and Schumann, scale degrees 1, 3, 4, and 5 outnumber the other diatonic scale degrees, which in turn outnumber the chromatics. This has been shown many times in much larger samples of music. The typical distribution of scale degrees is known as the Krumhansl-Kessler profile (Krumhansl & Shepard 1979, Krumhansl & Kessler 1982), which 25 years of research has related not only to compositional practice (e.g., Krumhansl 1990), but to psychological phenomena such as dissonance (Smith 1997), expectation (Schellenberg 1998; Krumhansl 1995; Cuddy & Lunney 1995), and sense of key (e.g., Krumhansl & Schmuckler 1986; Krumhansl 1990; Temperley 1999). Unfortunately, Beran does not cite work on the Krumhansl-Kessler profiles, nor does he make use of its insights.

A running example in Beran's book involves tempo curves from recorded piano performances of Schumann's "Träumerei" (e.g., Figure 2.3; see also Beran & Mazzola 1999). The data come from Repp (1992), though this is not obvious to the casual reader.[1] Beran's analyses of these tempo curves are sometimes without obvious musical motivation; on page 210, for example, he subjects the skewness of the tempos to a principal components analysis. Beran's analyses of "Träumerei" would have greater substantive interest if the author connected them to the two decades of quantitative research on piano performance. Among other things, past research documents how tempo curves (rubato) are used to communicate phrasing and hierarchical structure (Palmer 1989; Windsor & Clarke 1997; Repp 2000). By contrast, Beran's sophisticated analyses do not clarify the musical purposes of rubato.

Beran is not entirely unacquainted with existing research, but his attitude toward it is somewhat dismissive; he suggests that past research "mostly consist[s] of simple applications of standard statistical tools to confirm results or conjectures that had been known or 'derived' before by musicological, historic, or psychological reasoning" (p. 6; for a similar quote see Beran and Mazzola 1999). This characterization is arguable. While there is nothing inherently wrong with "simple" applications of "standard" statistical

tools—indeed, most of the techniques in Beran's book are quite standard—some quantitative music scholars have developed customized tools for encoding and analyzing musical scores (e.g., Huron 1995, 1999) and performances (e.g., Finney 2001). In addition, there is nothing wrong with connecting analysis to musical, historical, or psychological theory. The alternative—analyzing data without benefit of theory, letting the facts speak for themselves—is epistemologically naïve and often fails to produce interpretable results (Chalmers 1999). The researcher's theoretical orientation does not, of course, guarantee that theoretical predictions will be "confirmed." To the contrary, careful research can disconfirm past theories (e.g., von Hippel & Huron 2000; Huron 2001), distinguish between competing theories (e.g., Aarden & von Hippel 2004), or clarify vague theories (e.g., Huron 1991).

In short, for all its methodological sophistication, Beran's book unfortunately makes an ineffective bridge between statistics and music. Statistical readers will not find an adequate review of music research, while musical readers will not find an accessible introduction to statistical methods. Music scholars with an interest in using statistics are advised to take data analysis courses outside the music department (e.g., in psychology, sociology, or statistics). There are many excellent introductions to data analysis; I am particularly fond of the books by Agresti & Finlay (1997), Moore & McCabe (2003) and Watkins, Scheaffer, and Cobb (2005). Application of statistical methods to musical problems must for now be learned from the peer-reviewed literature, perhaps beginning with some of the articles cited in this review.

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Notes

[1] The "Träumerei" data are introduced on page 23. The only mention of Repp (1992) is a vague one on page 6: "Applications of statistical methods to questions in musicology and performance research are very rare (for examples see [a list of eight references including Repp 1992])."

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