T.M. Porter, The Rise of Statistical Thinking, 1820-1900. Princeton: Princeton University Press, 1986. xii + 333 pp. £23.40.

In this book, Theodore Porter tells a broadly-conceived story of the evolution of statistics in the social and natural sciences in the nineteenth century. He chronicles the non-probabilistic numerical science of society that became known as statistics in the early nineteenth century, and he argues for the influence of this early social science, and the "statists" who practiced it, on the development of mathematical probability during the latter half of the century. He argues in particular that the statists' population thinking made possible both the work of Francis Galton and Karl Pearson in mathematical statistics and the work of James Clerk Maxwell and Ludwig Boltzmann in thermodynamics.

This book should interest philosophers and statisticians, as well as social scientists who want to understand the roots of their statistical methods. The writing is clear and informative. Porter summarizes mathematical work clearly, so nicely that the book is worth owning for its descriptions of the work of Maxwell, Boltzmann, Galton, and Pearson alone. His extensive discussion of the statists is pleasingly fresh, and his brief treatment of early nineteenth-century views on the meaning of probability may be the best available.

Porter makes an important contribution to the history of statistics merely by the questions he raises. He juxtaposes the mathematical development of probability not only with the thinking of the statists but also with other relevant currents of philosophical and social thought. His effective chronicling of these currents forces us to ask how probabilistic mathematical statistics was affected by them and puts historians in a much better position to answer this question than they have been heretofore.

The historical relation of social science to probability is a puzzle, because the successful application of probability to social science came so late. From its beginning in the context of games of chance, in the late seventeenth century, mathematical probability was seen as a potential tool in the political, economic and moral sciences. Yet before the twentieth century, its only real successes were in insurance and in the natural sciences: astronomy, physics, natural history, meteorology, and finally, at the end of the nineteenth century, biology. In retrospect, the population thinking of the statists seems to bridge a gap between error theory, the principal scientific application of probability at the beginning of the nineteenth century, and the statistical modeling of populations that became so prominent in Galton's work at the end of the century. Yet this statistical modeling also succeeded in the natural sciences before it found its role in contemporary social science.

Porter's contention that the population thinking in the natural sciences was inspired by the example of social statistics is far from convincing. Particularly unconvincing is his thesis, which Porter emphasizes repeatedly, that both Maxwell and Galton were directly and strongly influenced by social science.

Porter acknowledges that Maxwell and Galton had encountered probability and statistical thinking in the natural sciences. Maxwell knew probability from Laplace's *Théorie analytique* and its application to error theory. Galton studied Airy's text on error theory and used statistics for many years in meteorology. Porter pushes these and other influences aside, however, to grasp thinner reeds upon which to base a claim for the salience of social science: Maxwell and Galton's use of social analogies, and their knowledge of the work of Adolphe

Quetelet, the Belgian meteorologist and astronomer who so enthusiastically tried to found a *physique sociale* on the fit of social statistics to the normal distribution.

It is true that Maxwell and Galton used social analogies to explain probability. But analogies are deliberate didactic devices, and writers choose their analogies with an eye more to their audience than to their intellectual debts. Galton's analogy between the random sampling of the “gemmules” that he thought responsible for inheritance and the random sampling of men liable for conscription may say something about the concerns of his younger readers, but it is weak evidence for the influence of Quetelet.

In making his case for the influence of Quetelet on Maxwell, Porter emphasizes Maxwell's use of John Herschel's derivation of the normal distribution, which Herschel published in a review of Quetelet's work. From this borrowing, Porter concludes that Quetelet's *physique sociale* inspired Maxwell's conviction that molecular velocities are normally distributed. The borrowing is intriguing, and it illuminates the relative unimportance of disciplinary boundaries in the nineteenth century. But so isolated and shallow a connection cannot bear the weight Porter puts on it. Herschel was an astronomer. His derivation is and was singularly inapplicable to social science examples, and Maxwell decided later that it was unconvincing in physics as well.

The weakness of the arguments for a thesis so prominently displayed raises larger questions: how could so unconvincing an analysis be taken seriously by careful readers, not to mention Princeton University Press? The answers, I think, lie in contemporary intellectual currents and in struggles over academic terrain. Mathematicians and natural scientists who delve into the history of their fields are often interested only in internal explanations. Given the weight of their authority, they have often been able to brush aside historians who point to external influences. Recently, however, the historians have been having their day, charging the scientists with intellectual myopia. It has become the order of the day to demonstrate how even natural science can be shaped by the wider culture of the scientist (see, e.g., Stephen Jay Gould's *Wonderful Life: The Burgess Shale and the Nature of History*, New York, 1989). Unfortunately, every intellectual movement creates its own myopia, and the attractiveness of Porter's thesis appears to have substituted for evidence.

It should be added that this thesis plays a relatively superficial role in Porter's book. Though he emphasizes social science, Porter also tells us much about the development of statistical thinking in the natural sciences. He calls our attention to Fourier's rationale for the normal distribution in physics, Spottiswoode's study of variation in geography, and the evolution of population thinking in meteorology. These topics deserve a closer look, but Porter shows us where to look.

A fuller understanding of the development of mathematical statistics in the nineteenth century will require, I believe, a combination of the broad view of intellectual climate that Porter offers with the closer examination of applications that we find in Stephen Stigler's *The History of Statistics: The Measurement of Uncertainty before 1900* (Cambridge, Massachusetts, 1986). Stigler is able to provide more convincing explanations for mathematical developments, because he looks more closely at the scientific problems that motivated these developments. But Porter's overview makes it clear that Stigler's work is only a beginning. A fuller understanding will require us to study a broader domain of nineteenth-century scientific problems, with attention both to the details of the problems and to the external forces that influenced the choice of these problems and may have constrained the solutions.

When we have reached a fuller understanding, we may well conclude, contrary to Porter, that the development of mathematical statistics in the nineteenth century was driven primarily by problems in what we now consider the natural sciences. Will it then follow that Porter was mistaken to write a book that emphasizes nineteenth-century social statistics so heavily?

I think not. I do think that Porter is mistaken to justify his attention to social statistics in terms of its contribution to mathematical theory. Today, as in the nineteenth century, statistics is more than techniques based on probability. Broadly interpreted, statistics includes the science of demography, as well as methods of measurement in the social and natural sciences, techniques of management science and accounting, and principles of political argument. All the nineteenth-century intellectual currents Porter describes are relevant to understanding this broader contemporary picture.

The mathematical theory that now dominates university departments of statistics, and which appears in Porter's book as the culmination of "the rise of statistical thinking," may actually be pushing these departments to the edge of extinction. New and exciting at the beginning of this century, this theory now often appears baroque, confining, and simply boring. Statistics must, as an academic discipline, once again broaden its intellectual basis beyond mathematics. In this context, Porter's demonstration of the historical roots of a broader conception of statistics is invaluable.

G.R. SHAFER, School of Business, Summerfield Hall, University of Kansas, Lawrence, Kansas 66045