Book Reviews

The Concern with Numbers

A Calculating People. The Spread of Numeracy in Early America. PATRICIA CLINE COHEN. University of Chicago Press, Chicago, 1983. x, 272 pp. $22.50.

Perhaps the question that interests contemporary historians more than any other is when and how the change from traditional to contemporary society occurred. Heretofore, historians have traced the shift through the Industrial Revolution, extraordinary demographic changes, the emergence and evolution of science and technology, and the rise and spread of literacy. This study adds widespread numeracy as one more item that distinguishes the world of the past from modern society. Its special frame of reference is American history, though the author is clearly conscious of the fact that increased numeracy occurred elsewhere as well.

What is numeracy? At its minimum, it is a skill with numbers, just as literacy involves a skill with words. However, numeracy also involves the degree of skill that individuals have in manipulating numbers, as well as memory, reasoning ability, and spatial relationships. Cohen also is concerned with distinguishing between levels of numeracy in both individuals and societies, since relatively few individuals may have extraordinarily high levels of skills in manipulating numbers or people may commonly possess skills in calculating learned by rote memorization involving little actual understanding of what it is they are doing.

A second main theme is the expansion of what Cohen refers to as the domain of numbers, that is, the areas to which numerical analysis is applied by those people who are interested in and have numerical skills. Cohen traces the expansion of the domain of numbers from the 17th to the middle of the 19th century and demonstrates how historians can use this expanding domain to explore not only social structures at various points along the way but also the values that society maintains.

The book reads much like a morality play. In 17th-century England, where Cohen's story begins, we are introduced to a society in which numbers were often greeted with apathy. In America, an 18th-century interest in both acquiring skills and applying numerical analysis to a wider domain was transformed by the early 19th century into a rather remarkable faith that numbers would enable individuals and governments to describe problems in a neutral fashion and help establish a clear path to a better future. The story ends with a remarkable loss of innocence connected to the highly politicized Census of 1840. This morality play unfolds via a number of specific episodes that mark not only the emergence and evolution of numeracy but also the expansion of the domain of numbers. All these episodes are carefully and extensively researched and are thoughtfully presented with style and grace.

The detailed exploration of the rise of numeracy starts in 17th-century England, where a handful of curious men showed increased interest in acquiring numerical skills and in applying them to an ever-widening range of problems. This interest reflects both the beginnings of the scientific revolution and the result of wider commercial activity that brought with it a perceived need to determine profit and loss on a more accurate basis. During this period the English developed an interest in counting the population of the American colonies, first of all in Virginia in the 1620's as a result of the extraordinary catastrophes associated with the initial efforts to populate that colony and later on in other colonies as a result of imperial and commercial efforts to establish tighter control.

After 1721, numerical analysis in America began to be used in more sophisticated fashions, at least in part because of the controversy that emerged in Boston in that year revolving around whether inoculation against smallpox was a safe procedure. Yearly totals of deaths in Boston had been published since 1704, but prior to 1721 little interest had been shown in analyzing those data. The collection and analysis of statistics on mortality from inoculation eventually persuaded the residents of Boston, and probably some of the other colonists in the Americas as well, that inoculation was valuable in saving lives. This demonstrates not only that a number of practitioners of numerical skills had developed their techniques to a fairly sophisticated level but also that the population could be presented with statistical data and persuaded to act in certain ways by the conclusions to which the data apparently pointed.

By means of a discussion of the spread of numerical education in late-18th-century America, Cohen makes two important points. First, she demonstrates that numeracy was not always taught in the same way. The sequence in which skills were taught and the aspects of numeracy that were stressed varied over the years. Second, it was at this time that gender differences with regard to education in numeracy began to emerge. When numerical education stressed logic over the simple manipulation of numbers, numeracy was increasingly identified as a male domain. Women were not seen as needing logical skills, nor in fact were they considered capable of developing such abilities without threatening their health. The identification of numeracy with males was reinforced by its association with commercial activity, a distinctly male part of the economy.

In the early 19th century, statistics became even more important in American society. Originally statistics were defined as anything that had to do with the state. This meant that not all statistics were numerical and not all numbers were statistical. Gradually concern turned more and more toward the collection of numbers, which were seen as true and unambiguous facts from which policy could easily be determined. Many early-19th-century Americans developed a faith that if only adequate, accurate information could be acquired and presented to the American people, who by this time were presumed to have at least minimal understanding of numbers, then there would be no difficulty in determining the best path that the United States government should follow.

The story ends with the 1840 Census, a document so deficient in its level of accuracy and so caught up in politics that Americans were forced to admit that numbers could not always be trusted to point an unambiguous way into the future. Data from the 1840 Census suggested that under conditions of freedom in the north black Americans suffered from levels of insanity far higher than those of southern slaves. Advocates of slavery quickly concluded that freedom was dangerous to blacks and slavery was beneficial. Cohen demonstrates that this particular pattern of census findings probably had its origins in enumerator error related to complex census forms. How-

ever, the southerners who were in charge of taking and publishing this census found these results so useful in defending southern society from northern attack that they deliberately sabotaged efforts to re-examine the data. Although Americans' uncritical faith that numbers could solve their social problems was weakened, the capacity of highly numerate Americans to criticize numerical techniques and data increased.

The book ends with a broad discussion of what historians can learn about American society and ultimately about any society from looking at its level of numeracy and the domain of numbers. A society is reflected not only in what it counts but in what it chooses not to count. Similarly, the kinds of numerical skills that are stressed reflect the values it attaches to such activities as logical analysis or rote memorization. It is important for us to study who was expected to be able to manipulate numbers and symbols and why. Perhaps the most important conclusion of Cohen's book is that, although numbers themselves may be neutral, the means by which they are determined and the uses to which they are put are closely connected to the culture that surrounds them. This is an important lesson not only for the history of numeracy but also for those of us who are concerned with numerical analysis today.

ROBERT V. WELLS
Department of History,
Union College,
Schenectady, New York 12308

A Woman Mathematician

Little Sparrow. A Portrait of Sophia Kovalevsky. DON H. KENNEDY. Ohio University Press, Athens, 1983. x, 342 pp. Cloth, $25.95; paper, $12.95.

In *Little Sparrow: A Portrait of Sophia Kovalevsky*, Don H. Kennedy has provided the first book-length biographical account in English in many years of an outstanding 19th-century mathematician and advocate of equal educational opportunity for women. Sophia Kovalevsky (née Korvin-Krukovsky) was a member of a Russian noble family and grew up in an atmosphere charged by the emancipation of Russian serfs, the Polish uprising, and radical and gentry politics. In 1869 she left Russia by arranging a marriage of convenience with a promising paleontologist, V. O. Kovalevsky, and succeeded in receiving special permission to study at Heidelberg at a time when women were denied access to most European universities. She was then 18. She became the first woman accepted as a private student by the Berlin mathematician Karl Weierstrass, and eventually the first woman professor of higher mathematics (at Stockholm) and the first woman elected as a corresponding member of the Russian Academy of Sciences, although she was not permitted to attend its meetings.

For the caliber of her work alone, Kovalevsky merits attention. Three research papers written during her study with Weierstrass in Berlin earned her a Göttingen doctorate *in absentia summa cum laude*. One of these papers contains her reformulation of Cauchy's problem, expressed in what is now known as the Cauchy-Kovalevsky theorem, a cornerstone in the general theory of partial differential equations. Her work on the motion of a rotating solid body, the so-called "mathematical mermaid," won the prestigious Prix Bordin in 1888. In her brief career (she died in 1891) she also studied the refraction of light in crystals, the theory of Abelian integrals, and Laplace's theory on the form of Saturn's rings.

Kennedy's book clearly illustrates the richness of experience and personality woven into Kovalevsky's life. She moved in exciting intellectual and scientific circles and traveled widely. In Russia her friends included Dostoevsky and Turgenev, as well as the first woman physician and first woman lawyer in that country. At the home of George Eliot in England she debated the cause of women in mathematics with Herbert Spencer. She studied under Kirchhoff, Bunsen, and Koenigsberger at Heidelberg and later enjoyed fruitful scientific contact with such eminent mathematicians as Hermite, Poincaré, and Mittag-Leffler.

In his portrait of Kovalevsky ("Little Sparrow" was her nickname as a child), Kennedy has drawn primarily on works cited in the bibliography, including published memoirs and correspondence, as well as on recollections passed down through families related by marriage to Kovalevsky's. Nina Kennedy, the author's wife (herself a distant relative of Kovalevsky), translated much of the Russian material for Kennedy's use. In the interest of including a wealth of information gleaned from the numerous letters and memoirs, the author sometimes sacrifices a graceful prose style, and the sources of quotations are not always clearly identified.

In part because of Kovalevsky's own introspection, the personal nature of much of the surviving correspondence, and the character of her friends' reminiscences, Kennedy often dwells on psycho-emotional issues. He has not really attempted an analysis of her mathematical work; instead he includes as an appendix Weierstrass's letter of recommendation for his prize pupil, sent to Lazarus Fuchs when Kovalevsky was seeking a Göttingen degree. The letter admirably summarizes her work, but only up until 1874. What is still lacking in English is an integrated study of both the life and the works of Sophia Kovalevsky. In the meantime, Kennedy's book offers an intriguing account of the forces that shaped her career.

ROBIN E. RIDER
History of Science and Technology Program, University of California, Berkeley 94720

Delinquents in Adulthood

Physique and Delinquent Behavior. A Thirty-Year Follow-Up of William H. Sheldon's *Varieties of Delinquent Youth*. EMIL M. HARTL, EDWARD P. MONNELLY, and ROLAND D. ELDERKIN. Academic Press, New York, 1982. xiv, 588 pp., illus. $49.50. Personality and Psychopathology.

William H. Sheldon single-handedly carved out a niche in American science for constitutional psychology. Following a pertinacious search for the connection between physique and temperament, Sheldon undertook in 1939 a practical application of his discoveries and attempted to provide comprehensive "psychological biographies" of 200 delinquent boys. Published in 1949 as *Varieties of Delinquent Youth*, these biographies include detailed physical, psychiatric, and behavioral assessments along with the more typical social history information and culminate in Sheldon's personal prognosis for each boy. This work may be Sheldon's finest achievement. Not only did he establish the predominance of mesomorphic body builds among delinquents, a finding subsequently replicated by Glueck and Glueck (among others), he gave a compelling account of the development and exercise of delinquency among the boys he lived with and studied intently between 1939 and 1942.

A careful reading of this classic work will surprise many who think constitutional psychology translates as "biology is destiny." Sheldon lambastes society, and social science in particular, for failing to recognize the inherent delinquency of social institutions and, additionally, for failing to appreciate that only incompetent predation is labeled delin-