Book Reviews

Important Years in Mathematics

Social History of Nineteenth Century Mathematics. Papers from a workshop, Berlin, July 1979. HERBERT MEHRTENS, HENK BOS, and IVO SCHNEIDER, Eds. Birkhäuser, Boston, 1981. xii, 302 pp. $24.95.

The 19th century was an exciting time in the history of mathematics. Besides the rise of modern theories associated with names like Cauchy, Weierstrass, Gauss, Riemann, Cantor, and Dedekind, it was marked both by the emergence of the ideal of pure mathematics and by applications of mathematics on an unprecedented scale. The century also saw the first mathematics journals, the splitting of the mathematics community into specialized disciplines, and large-scale public funding of institutions for mathematics teaching and research.

In his brief but masterly introductory essay for this book, Dirk Struik surveys and documents these prominent developments and describes them as part of the general "pioneering, renovation and rebellion" in all aspects of 19th-century European life. But to understand precisely how social context helped produce the flowering of 19th-century mathematical thought, it is not enough merely to assert that there was a relationship; the key question is, what are the mechanisms? or as Struik puts it, "how to argue the connection?"

Of the 16 papers in this book, three stand out as contributions to our general understanding. Philip Enros convincingly analyzes the institutional causes of the decline of mathematics in 18th-century England and the largely institutional reasons for its revival in the 1820's. Thomas Hawkins demonstrates the explanatory power of the concept of mathematical schools—groups sharing common views on what kind of mathematics is worth doing and how to do it—by showing that the approach taken by the Berlin-trained Frobenius and Killing, in their respective work on matrix algebra and on the structure of Lie algebras, stems from the Weierstrassian tradition of analyzing all possible special cases. Hawkins tellingly contrasts Killing's Weierstrassian approach to geometry with the more intuitive approach of Felix Klein, trained in the schools of Plücker (Bonn) and Clebsch (Göttingen). The strength of this paper flows in part from Hawkins's complete mastery of the mathematical developments involved.

David Bloor asks why, since W. R. Hamilton and George Peacock confronted essentially the same technical algebraic questions, they nevertheless came to quite different conclusions about the nature of algebra. As Thomas Hankins has recently demonstrated, Hamilton was deeply interested in the Idealist philosophy of men like Kant, Novalis, Carlyle, and Coleridge and in the conservative political ideas that accompanied this philosophy. By contrast, Bloor argues, Peacock was a rationalist, as were his associates Babbage, Herschel, Airy, and de Morgan, who took issue with traditional authority, first in mathematics teaching, later in a wider social context. Bloor sees Hamilton's view that algebra is the science of pure time as "irradiating algebra with spirit," symbolizing an organic social order of the kind advocated by Idealist philosophers; Peacock's formalistic view of algebra meant that mathematics was self-sufficient, indicating a freedom from authority and from dependence on the past in mathematics—and elsewhere. The extensive evidence Bloor cites for the relationship between Hamilton's and Peacock's contrasting philosophies and their mathematics deserves to be taken seriously even if one does not accept Bloor's explanation.

Among the other papers, some make large methodological or philosophical claims based on too little evidence; others are sketchy or cover relatively familiar ground. A few make modest additions to our knowledge. For instance, Gert Schubring discusses, in somewhat episodic fashion, the influence on Jacobi and Crelle of Humboldt's educational reforms, the "research imperative" in Prussian universities, and the neo-Kantian philosophy of mathematics of J. F. Fries. A. C. Lewis briefly documents the influence of Schleiermacher's dialectical philosophy on Grassman's approach to mathematics. Horst-Eckart Gross discusses, albeit briefly, the actual "working process" of mathematically trained people in the insurance industry. The 16-page bibliography prepared by Mehrtens is a mixture of diverse, interesting, and sometimes unexpected materials, though some important works, like Joseph Dauben's 1979 *Georg Cantor* (which may have appeared only after the bibliography was compiled) and J. T. Merz's seminal *History of European Thought in the Nineteenth Century* (1896–1914), are omitted.

The principal value of the present volume lies in Struik's fine short account of the major themes in the social history of 19th-century mathematics and in the polished and documented studies of Hawkins, Enros, and Bloor—methodologically so different from one another—as examples of what can be done to illuminate the connections between the development of mathematics and the social context in which that development takes place.

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The Grassland Ecologists

Saving the Prairies. The Life Cycle of the Founding School of American Plant Ecology, 1895–1955. RONALD C. TOBEY. University of California Press, Berkeley, 1982. x, 316 pp., illus. $25.

Among historians who try to grapple with groups or "schools" of scientists the currently fashionable goal is to relate a group's "cognitive" work to its social (and preferably quantifiable) characteristics, such as the origins of its doctorates and its correspondence networks, publications, coauthorships, citation patterns, employers, and location. This kind of sociology of knowledge is concerned with why particular people would have had particular ideas and worked on particular problems perhaps for decades when others, with many of the same characteristics, did not.

Ronald Tobey has applied this kind of analysis to the school of grassland plant ecologists that flourished in the American Midwest in the first half of the 20th century. At the University of Nebraska at Lincoln, Frederic Clements and Roscoe Pound (later dean of the Harvard Law School), both students of Charles