

era, he used the platform of the Moscow International Congress of Mathematicians in 1966, where he was conferred his Fields Medal, to stage a controversial press conference comparing the American intervention in Vietnam to the Soviet tank operation in Budapest in 1956. A biography of Smale is a golden opportunity for examining the development of central fields of mathematics in relation with the political and social context of Cold War United States.

Unfortunately, this is not the topic of Steve Batterson's book. Instead, the author of this authorized biography, himself a mathematician whose thesis advisor, Joe Frank, was a student of Smale's, wants to provide us with "a case study in the development of a great mathematician." This book was written with the goal of making the understanding of this process accessible to "nonmathematicians." Batterson, however, is not an especially gifted science popularizer, and most of his discussion of mathematics is either too general to make much sense or cast in technical terms that will fail to speak to nonspecialists. (His definition of a dynamical system on p. 55 strikes me as one of the most infelicitous ever included in a book aimed at a wide audience.) Whether examining Smale's minerals collection, his appetite for physical risks (sailing and mountaineering), his political activities, or his mathematics, Batterson remains at the same level of generality, his only aim seemingly being to show that Smale's "greatness" is due to his "requisite audacity and confidence as well as the intellectual power to develop his own approach and make it work."

The historian of mathematics will nonetheless be grateful to Batterson for his careful factual research on Smale's life and the convenient—if sometimes tedious—account it provides of a number of episodes which are significant of larger trends in the history of mathematics, university politics, and relations between science and government in the United States. More than is usually the case in biographies of contemporary mathematicians, many contextual issues are raised. And all are fascinating: Communism under McCarthy, graduate student training and daily work in modern mathematics, the Free Speech Movement in Berkeley, NSF politics, or gender conflicts in the community. But by focusing too much on individual accomplishments, Batterson fails to convey the implications of these activities. In a talk he gave at a statistical physics meeting in 1971, Smale for example tantalizingly suggested the relationship he saw between mathematics and politics, wondering "whether I should explicitly direct my work toward socially positive goals." Significantly, Batterson does not discuss this influential talk, nor the relationship between the various aspects of Smale's life, which thus appears oddly compartmentalized. For years, Smale dreamed about (and started writing) his autobiography. In many ways, Batterson has written it, but one wishes he had spent less time on justifying Smale's conduct in old debates and more on assessing their wider significance.

doi:10.1006/hmat.2002.2370

George Boole: Selected Manuscripts on Logic and Its Philosophy. Edited by Ivor Grattan-Guinness and Gérard Borner. Basel/Boston/Berlin (Birkhäuser Verlag), Science Networks, Historical Studies, Vol. 20. 1997. lxiv + 236 pp. ISBN 0-8176-5456-9.

Reviewed by Karen Hunger Parshall

Departments of History and Mathematics, University of Virginia, Kerchof Hall, P.O. Box 400137,
Charlottesville, Virginia 22904-4137
E-mail: khp3k@virginia.edu

George Boole (1815–1864) is perhaps best known today for the area of *Boolean* algebra that bears his name, but in his lifetime, he made his reputation through his work both on the algebraization of the differential and integral calculus and on logic. This handsome edition by Ivor Grattan-Guinness and Gérard Borner deals with the latter aspect of Boole's research and seeks to fill in some of the gaps in our understanding of the evolution of Boole's thought by making available a number of his unpublished manuscripts.

Boole's work in logic falls naturally into three periods: the years up to 1847 and the publication of his first book, *A Mathematical Analysis of Logic*; the seven years from 1847 to 1854 and the publication of his next and now most famous text, *An Investigation of the Laws of Thought*; and the decade from 1854 to his death, when he was at work on what would have been a third treatise on "The Philosophy of Logic." The editors have arranged their selecta—all of which are augmented by explanatory notes—into three parts: manuscripts written (or estimated to have been written, since almost none of Boole's papers is actually dated) in the years between the publication of the first two books, those composed after the publication of *The Laws of Thought*, and those dealing with the third, unfinished text. An additional part contains a miscellany of manuscripts (pp. 157–178), fragments (pp. 179–190), and letters from Boole to Arthur Cayley, Sir John Lubbock, and John Penrose (pp. 191–202). The editors preface the whole with a detailed introductory chapter in which they provide an overview of Boole's life and thought as well as a discussion of his particular variant of psychologism, that is, the sense in which he understood the relationship between the mind and its logical and linguistic products (see, especially, pp. xlvii–viii).

In their opening chapter, the editors place Boole's work in logic in the context of the British revival of interest in the area beginning in the 1820s. Following the publication in 1826 of the *Elements of Logic* by Richard Whately, a number of British scholars—most notably the Scottish philosopher, Sir William Hamilton, and the English mathematician, Augustus De Morgan—debated not only issues of priority but also the underlying principles of logic. It was in response to these debates that Boole published his own ideas in his 1847 book. Although none of the manuscripts presented in this edition deals with the years before 1847—apparently no working papers survive to shed light on Boole's thinking prior to that year—the three included from the first "inter-book" period show a restless mind at work. In the first, entitled "The Nature of Logic" (pp. 1–12) and estimated to have been written in 1848, Boole began the process of improving on what he viewed as his over-hastily prepared first book. The second, an "Elementary Treatise on Logic Not Mathematical Including Philosophy of Mathematical Reasoning" (pp. 13–41), finds him occupied some time before 1849 on a treatment of logic in which he emphasized not forms as in the *Mathematical Analysis of Logic* but signs. Boole followed up on the themes of these two manuscripts in a series of essays or mere paragraphs written between 1849 and 1850 in a notebook, extracts from which close Part A of the present edition.

Part B treats the period immediately following the publication of Boole's *Laws of Thought* and consists of four manuscripts: a "Prolegomena" (pp. 51–62) written after 1854,

“On the Foundations of the Mathematical Theory of Logic and on the Philosophical Interpretation of Its Methods and Processes” (pp. 63–104) composed around 1856, some “Preparatory Notes” (pp. 105–111) from between 1854 and 1856, and a “General Summary” (pp. 112–116) dating, like the “Prolegomena,” after 1854. In all of these manuscripts, Boole expounded on his philosophical analysis of logic based on the sign tradition.

Concurrent with these musings, Boole also planned a third treatise on “The Philosophy of Logic,” and it is manuscript material pertinent to this text that comprises the edition’s Part C. Boole apparently had this book well under way by 1857, but his textbooks on differential equations (published in 1859) and on the calculus of finite differences (published in 1860) seemingly diverted his attentions, and he had stopped work on the new treatise on logic by 1860. The editors include the book’s intended “Preface” (pp. 119–120) written around 1857, its “Table of Contents” (pp. 121–122), another revised preface entitled “The Philosophy of Reasoning” and dated after 1854 (pp. 123–125), and a lengthy tract called “Logic” written after 1855 but perhaps as late as 1860 (pp. 126–153). Of especial interest in these manuscripts is Boole’s criticism of the traditional, syllogistic methods of logic of Aristotle, Sir William Hamilton, and De Morgan. In Boole’s view, syllogistic logic not only wrongly emphasized forms over signs and the words to express them but also suffered from an overly limited scope.

All interested in logic and its history will find much of value in this edition by Grattan-Guinness and Bornet. In particular, its readers will come away with a much more nuanced appreciation of the development of the thought on logic of one of the 19th century’s principal figures in the field.