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REVIEW

Edited by Catherine Goldstein and Tom Archibald

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Stephen Smale: The Mathematician Who Broke the Dimensional Barrier. By Steve Batterson. Providence, RI (American Mathematical Society, 2000). \$35.00. 306 pp. ISBN 0-8218-2045-1.

Reviewed by David Aubin

One would be hard pressed to find, among contemporary mathematicians, a more promising candidate for a biographical study than Steve Smale. While no one will deny that the young boy from Flint, Michigan, has had an interesting life, as has the globetrotter and minerals collector that he later became, it is the imprint he left on several important fields of mathematics and his antiwar political activism in the sixties that will draw most attention. Smale is widely recognized in mathematics for having “turned the sphere inside out” in 1957, proved the Poincaré conjecture in dimensions 5 and greater, and, most of all, launched the modern era of dynamical systems theory which culminated in the emergence of “deterministic chaos.” Not only did his famous conjectures and classification schemes structure the development of the field, he also came up with an iconic image of chaos, his famed “horseshoe,” which made clear that chaotic systems could be structurally stable. The prolific school of dynamical systems he established in Berkeley (where he trained many of the leading representatives of the next generation) pioneered the use of topology in mathematical modeling and set up research agendas for decades to come.

Smale furthermore was, with Jerry Rubin, a leading figure in organizing early protests against the Vietnam war in Berkeley in 1965. A former communist during the McCarthy 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.