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David E. Rowe

*Fachbereich 08, Institut für Mathematik,  
Johannes Gutenberg Universität Mainz,  
55099 Mainz, Germany*

*E-mail address:* [rowe@mathematik.uni-mainz.de](mailto:rowe@mathematik.uni-mainz.de)

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## Pursuit of Genius: Flexner, Einstein, and the Early Faculty at the Institute for Advanced Study

By Steve Batterson. Wellesley, MA (A K Peters). 2006. ISBN 978-1-56881-259-5. xi + 301 pp. \$39.00

The book under review, shortened here to *Pursuit*, is topologist Steven Lee Batterson's second foray into the history of mathematics, both inspired by personal associations. The first [Batterson, 2000], a biography of his academic grandfather Stephen Smale, was motivated by a visit with Smale at Berkeley in 1990 to pursue a common interest in the theory of computation. One of the sections in the biography was devoted to the Institute for Advanced Study (sometimes shortened in this review to the Institute or just IAS) and, though Batterson does not state it in his latest venture, he probably developed the idea for the present book while writing the first one. In that work the author described the Institute as “the ultimate ivory tower” [Batterson, 2000, 47] and “a utopia for thought” [Batterson, 2000, 48], where a few select scholars pursue a life of “total immersion in research” [Batterson, 2000, 48]. He also mentioned the Institute's “rich symbiosis” [Batterson, 2000, 47] with Princeton University. At that time, the primary sources available on the history of the Institute were two well-known papers [Aspray, 1989, Borel, 1989] and an unpublished dissertation that examined its establishment in considerable depth [Porter, 1988].

Batterson spent 1980–1981 as a visitor at the Institute 10 years before his inspirational meeting with Smale. Moreover, he devoured the autobiography of the IAS founder [Flexner, 1940] while maintaining a healthy skepticism toward the rosy picture painted in two chapters devoted to its founding and the early staffing. However, attempts to examine archival material were thwarted by the Institute, which, at the time, limited access even to a two-volume, 715-page manuscript of the Institute's history written by Beatrice Stern [Stern, 1964]. Happily, restrictions on access to the Stern manuscript have been relaxed appreciably since then, and today the staff not only willingly provides access to it but readily makes photocopies of requested pages. Drawing on numerous sources, several other archives, and interviews with surviving principal figures, Batterson has produced a book destined to become *the* source on the history of the Institute, particularly its School of Mathematics.

Most of *Pursuit* deals with the founding and initial faculty of the Institute, covering roughly the years up to World War II, with the concluding chapter presenting an overview of the succeeding period. Batterson unveils several new findings, documenting each and analyzing appropriate ones. His intellectually uncompromising approach will appeal to the expert in the history of mathematics, especially those heretofore untold parts dealing with clashing personalities and agendas. Indeed, the rosy hues painted in his Smale biography are challenged vigorously throughout the book. Yet the author's engaging style and the book's formatting of footnotes make it easily accessible to a wide audience.

Perhaps the overarching strength of *Pursuit* is the direct connection it draws between the IAS and the two institutional bastions in the history of mathematics in the United States—Johns Hopkins University (JHU) and the University of Chicago. The major figure in founding the Institute was Abraham Flexner (1866–1959), and Chapter 1 provides a brief biography citing critical ties to JHU. Generally a list of careers shaped by JHU is found by zooming in on Ph.D. recipients, but in Flexner's case one must zoom out to the undergraduate population. The sixth of nine children, and the first to go to college, Flexner attended JHU for only two years, receiving his bachelor's degree in 1886 at age 19. Batterson does not inform us what subjects Flexner studied during this time, but later in the book he states that Flexner had no knowledge of mathematics.

Nonetheless, Flexner came under the spell of JHU president Daniel Coit Gilman, known foremost in mathematics circles for returning J.J. Sylvester to the United States. The enigmatic Sylvester had departed for Oxford some nine months before Flexner enrolled at JHU in the fall of 1884, so Flexner could derive no direct benefit from him, but he later wrote a biography of Gilman [Flexner, 1946]. Following graduation, Flexner taught at his former high school in his hometown of Louisville, but four years later he founded his own secondary school. Over the next 15 years his philosophy of education based on small classes, personal attention, and hands-on teaching became eminently successful in placing graduates in leading universities. Financially secure by 1905, he closed the school to study psychology at Harvard. Disillusioned after only one year, he then studied in Berlin for two more years. The German model of higher education, with its emphasis on research and the training of future researchers, reinforced the Johns Hopkins example he found lacking at other American universities. Although Batterson mentions Felix Klein's success in producing a generation of American mathematicians at Göttingen, he misses the opportunity to note that Flexner's stay in Berlin (1906–1908) coincided with the period in which the last group of American students felt compelled to go abroad for doctoral training in mathematics (mostly under David Hilbert).

Upon returning to the States, Flexner published his first book [Flexner, 1908], a stinging criticism of American higher education, characterizing the lecture method of instruction as merely enabling colleges to handle a large body of students that would be otherwise unmanageable, thus giving the lecturer time for research. Batterson marginalizes this work, and does not even mention it in the bibliography, yet it brought Flexner to the attention of the Carnegie Foundation, which offered him the opportunity to conduct a detailed study of medical education. Ironically, Flexner's brother Simon was a well-known medical educator, whereas Abraham had no expertise in the field at all. Nonetheless, Abraham Flexner succeeded admirably, producing a scathing exposé [Flexner, 1910] that singled out Johns Hopkins as the only medical school in the country requiring an undergraduate degree for admission (others did not even insist on a high school diploma).

This work in turn brought Flexner to the attention of Frederick T. Gates, who, as executive secretary of the American Baptist Education Society, had teamed up with William R. Harper to convince John Rockefeller to bankroll the University of Chicago in 1892. Ten years later Gates became the supervising trustee for the newly founded General Education Board, where he found ammunition in Flexner's book for using Rockefeller largesse to upgrade medical education. Gates brought Flexner onboard in 1911, and over the next 17 years Flexner gained enormous power and made important connections by doling out multi-million-dollar grants. Eventually his dogmatism caused protracted battles with university presidents and eventually even with Gates, resulting in his forced retirement in 1928 at age 62.

The next year was witness to the first of several fortuitous events for mathematics. Just two months before the famous stock crash of October 1929, Louis Bamberger and his twice-widowed sister Caroline Fuld sold their department store for \$11 million cash and another \$15 million in stock in Macy's. Having no close relatives, they sought a worthy cause for their considerable fortune by establishing a medical school in their beloved hometown of Newark, New Jersey. Abraham Flexner was then contacted by representatives of the philanthropists, who arranged a meeting in their New York City mansion in January 1930. There, however, Flexner convinced Bamberger and Fuld that the country was in far greater need of an institution devoted solely to research and the training of future scholars. At the

time Flexner had only an outline of such a plan in mind, but events moved quickly and the memorandum he drafted led to the incorporation of an Institute for Advanced Study in May.

Flexner's initial plan was for the institute to consist of up to six schools, each headed by senior scholars who would conduct unfettered research and also train advanced students. He did not have particular subjects in mind, but adopted the Gilman maxim of "good work in a limited field" (p. 39). And, like Gilman, he scoured America and Europe in pursuit of the names of "men and women of genius" (p. 264). Fortunately for mathematics, as Flexner recalled in his autobiography, "It had become obvious to me that I could secure greater agreement upon personnel in the field of mathematics than in any other subject" [Flexner, 1940, 359–360]. Another fortunate event for mathematics occurred when Flexner became aware of Oswald Veblen's parallel views on the sorry state of higher education in America from a *New York Times* article. Soon Veblen became his primary confidante for mathematics and the first faculty member in the Institute. Hermann Weyl and G.H. Hardy emerged as the best of the Europeans, but it seemed impossible to dislodge them from Göttingen and Cambridge. G.D. Birkhoff was viewed as the best American, but he was in Paris at the time. That posed no problem for Flexner because he had narrowed his first field to either mathematics or economics, and the leading American economist also happened to be in the French capital at the same time. Fortunately Birkhoff made a far better impression, so Flexner chose mathematics to be the Institute's founding school.

Yet another fortuitous event occurred when Flexner visited Cal Tech in 1931 (to consult with a social scientist) and met Albert Einstein on his last day. The following January, on Flexner's second trip to Pasadena, Einstein surprisingly expressed interest in an Institute professorship. Flexner seized the day, negotiating quickly. What a coup for the Institute! But was Einstein really a mathematician? As Batterson explains, there was much less specialization at that time, so the appointment was not as odd as it might seem today. But negotiations with Einstein did not flow easily, and *Pursuit* explores the emotional vicissitudes that Flexner experienced before finally landing him. Batterson raises a tantalizing prospect (p. 112): "The Institute and its Director had established their credibility. Consider the scenario if Einstein had declined."

This development was but one in a series of events during the first few months of 1932 that turned out to be critical for the Institute. Another concerned negotiations with Birkhoff, who initially accepted a professorship in February but requested a release just eight days later. At this same time Hermann Weyl was racked by indecision, causing Flexner to practice the patience he had learned so well from his venerated Gilman. However, laws passed by the National Socialist regime in Germany soon put an end to Weyl's vacillations and landed him permanently in Princeton.

Flexner had also learned from Gilman to be flexible and opportunistic, characteristics he needed to complete the faculty for the School of Mathematics, which opened officially in October 1933. He was certainly opportunistic, yet sensitive, in the hiring of John von Neumann, which carried long-range implications for institutional governance. A problem arose because the Institute had also hired James Alexander from Princeton, so Flexner had to proceed cautiously before snaring yet another member of that mathematics department. The matter was resolved amicably in dealings with department head Luther Eisenhart, whose reputation as a gentleman scholar is firmly established in *Pursuit*. The luring of Marston Morse from Harvard brought membership in the School of Mathematics to six. While Flexner admired the University of Chicago's innovative model for research and higher education, he also learned to avoid Chicago president W.R. Harper's habit of enraging Rockefeller with budgetary overruns, yet he managed to be flexible with his budget. As a result, the School of Mathematics was a phenomenal success.

But matters were not idyllic even when the Institute moved from its rented space at Princeton to the new Fuld Hall on grounds purchased about a mile from the University. Professors in the School of Economics, one of two that opened in 1935, were enraged over faculty appointments made without consultation, mainly because Flexner maintained personal views on the leading figures in economics, unlike in mathematics. This controversy led to Flexner's resignation shortly after Fuld Hall opened in the fall of 1939, but mathematics continued unaffected by the change until retirements began a decade later. *Pursuit* describes the second generation of faculty and the evolution of visitors to the Institute in sufficient detail but comes up short on the nomination of Princeton's John Milnor in 1962. This brought to a head the matters of Institute governance and the lengths to which the IAS and the University could go to hire faculty members from each other. Unfortunately, despite the expiration of the 30-year IAS time-limit, records on this matter remain closed, so the author has been unable to analyze the situation effectively.

The ultimate explication of the Milnor affair would seem to call for a second edition of *Pursuit*, or perhaps a separate volume analyzing the period 1950–2000. Beyond the Milnor case, the putative volume could consider such issues as the impact that Institute mathematicians have had upon worldwide research in mathematics and the establishment

of succeeding institutes (in North America as well as the rest of the world), the relative contributions of professors versus visitors, the roles played by women, the effect of the Institute on teaching loads and research focus within universities, the tension between achieving depth in narrow fields and covering the bewildering breadth of topics that have proliferated since 1960, and, finally, the codification of the rules of governance that were enacted around 1973 and modified 20 years later. Such suggestions for a supplementary volume do not detract from the profundity of the study that Steve Batterson has presented in *Pursuit*, but should be viewed as complementing an impressive first presentation.

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David E. Zitarelli

*Department of Mathematics, Temple University,  
1805 N. Broad St., Philadelphia, PA 19122, USA  
E-mail address: zit@temple.edu*

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## **Arnold Sommerfeld. Wissenschaftlicher Briefwechsel. Band I: 1892–1918, Band II: 1919–1951, CD-ROM: 1892–1951**

Edited by Michael Eckert and Karl Märker. Diepholz (Verlag für Geschichte der Naturwissenschaften und der Technik). 2000–2004. ISBN 978-3-928186-44-5. 129 EUR. 1430 pp.

These volumes present much more than a collection of letters. The essays introducing each of the major sections of the work present carefully constructed overviews of Sommerfeld's scientific work and organizational activities. They also locate his wide-ranging work amid contemporaneous research and introduce central thematic threads that allow the reader to interpret the thematically selected and chronologically organized letters that are located in each section. The authors describe related aspects of the work of Sommerfeld's most significant interlocutors and students. Thus, while not a scientific biography, the section introductions, comprising approximately 284 pages of text, present a detailed and guided entrée to Sommerfeld's scientific efforts. When read together with the letters, the essays afford the reader a capacious picture of Sommerfeld's work.

In developing a picture of Sommerfeld's varied research, informed by a comprehensive knowledge of the history of physics literature, the authors restrict themselves to suggesting key themes and avoid forceful interpretation. The