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David Rowe: Buchbesprechungen

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Karen Hunger Parshall: *The New Era in American Mathematics, 1920–1950* (Princeton University Press, Princeton:NJ, 2022, 640 Seiten, Paperback ISBN 9780691235240, eBook ISBN 9780691233819).

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David E. Zitarelli: *A History of Mathematics in the United States and Canada: Volume 2: 1900–1941*, edited by Della Dumbaugh and Stephen F. Kennedy. (MAA Press, an imprint of the American Mathematical Society, Providence, Rhode Island, 2022, 547 Seiten, Softcover ISBN 9781470467302, eBook ISBN 9781470467305).

These two large-scale books (both over 500 pages) are, in fact, sequels to two earlier studies. Karen Parshall's volume picks up from the earlier book she and I published on research mathematics in the United States during the era 1876–1900 [4]. Although she refers to that account in numerous places, her new book argues for a sharper picture, one that underscores the strength of the American community before the arrival of many talented European émigrés in the 1930s. Parshall makes her case for this by drawing on an impressive display of evidence, much of which she found through diligent combing of archival sources. Part 1 discusses the state of mathematical research throughout the 1920s, whereas Part 2 focuses on the challenges American leaders faced during the years of the Great Depression, a time during which Central Europe underwent a brain drain of staggering proportions. Part 3 then describes how the community took various initiatives to support the country's war effort as well as its role in promoting Big Science during the postwar years.

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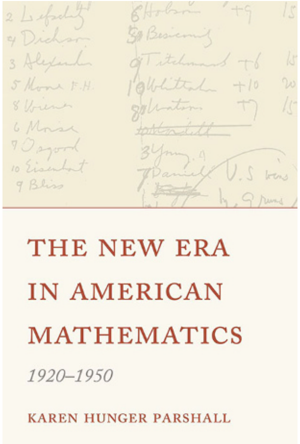
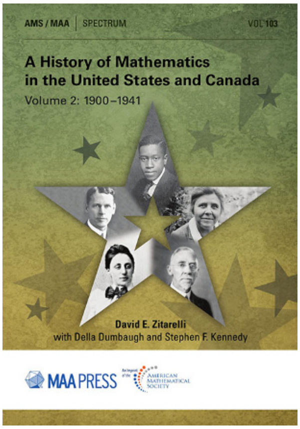


Volume 2 of David Zitarelli's massive undertaking appears three years after publication of the first volume [7], which came out only after the author's unfortunate death in 2018. Adding to this misfortune, the editors who completed this project appear to have been more interested in embellishing Zitarelli's manuscript than in making it more readable or correcting its many mistakes. They say very little, however, about how they went about modifying the text. The back cover proudly advertises these two volumes as "the first truly comprehensive and thorough history of the development of mathematics and a mathematical community in the United States and Canada." That may have been the author's intention, as one often senses a desire to leave no stone unturned, but this book lacks a coherent framework and in many places the text just rambles on. Karen Parshall, who focuses far more directly on the growth and development of the American *research* community, explicitly states that her goal, certainly ambitious enough, was to offer a *representative* rather than a *comprehensive* picture (*p*. xvi). The editors of the Zitarelli volume only add to the confusion, for example, by claiming that the period 1900–1941 represents the "opening of the community to previously excluded populations," specifically women and blacks. The book itself actually points out, among other things, that Princeton's first black student only entered in 1945 through the agency of the US Navy (p. 281).



Stylistically, the Zitarelli volumes aim to enliven history by means of biographical vignettes, anecdotes, and storytelling. Volume 1 has three parts: Colonial Era and Period of Confederation, 1492–1800; New Republic, 1800–1876; and Research Community, 1876–1900. A great deal of supplemental information for these three parts appears on the author's website https://davidzitarelli.wordpress.com/volume1/.

Volume 2 continues with parts 4 and 5, entitled Consolidation and Growth, 1900–1930 (Chap. 8 to 11) and Internationalization, 1930–1941 (Chap. 12 to 14). David Zitarelli liked to entertain readers, and for those who already know a good deal about the main characters in the present book, he offers even more information by drawing on lesser-known secondary sources. Thus, in Chap. 9 on mathematics during World War I, he describes the unlikely career of the cryptologist William Frederick Friedman. Later, among the panoply of topics taken up in Chap. 14 (The Thirties), he writes about the construction of the Golden Gate Bridge in connection with engineering mathematics. His hero in that story, Joseph Baermann Strauss, was neither a mathematician nor an engineer but rather a "mixture of conflicting traits:

promoter, mystic, tinkerer, dreamer, tenacious hustler, publicity seeker, and recluse" (p. 593). Zitarelli saw Strauss, in one respect at least, as resembling Abraham Flexner, the architect of Princeton's Institute for Advanced Study (IAS), because both "surrounded themselves with professionals with the right stuff" (*ibid.*).

For readers interested in how Flexner managed to launch the IAS, Zitarelli's Chapter 12 provides a detailed account of the unusual circumstances involved. He mentions in passing Flexner's well-known book, *Universities: American, English, German*, published in 1930, but without commenting on its obvious relevance for the IAS. Instead, he compares Flexner with two influential university presidents from decades earlier: Daniel Coit Gilman at Johns Hopkins and William Rainey Harper at Chicago. Reading about such institutional success stories, one might easily imagine that these celebrated educational innovators simply had more money to spend than did leaders of rival institutions. Harper certainly did, but Gilman simply had no competitors back in the late 1870s. Still, as Zitarelli's account shows, even Flexner's lucrative offer to G.D. Birkhoff ultimately failed to lure America's most distinguished mathematician away from Harvard.

Parshall strikes a similar chord in describing how Chicago's later president, Robert Maynard Hutchins, tapped Marshall Stone to rebuild its mathematics department after World War II. She makes no mention of Hutchins' influential, though highly controversial ideas for reforming education in the United States; these became widely known after 1936 when his book *The Higher Learning in America* came out. As a traditionalist, Hutchins staunchly opposed John Dewey's philosophy of education, ideas that Zitarelli associated with E.H. Moore's teaching approach at Chicago in the 1890s (p. 172). Parshall touches on later efforts in the early 1930s made by leading members of the Mathematical Association of America (Arnold Dresden, Earle Raymond Hedrick, and E.T. Bell) who hoped to defend mathematics and science education in the face of eroding support in schools (pp. 237–241). Neither of these two books, though, delves deeply into these educational debates; one might perhaps conclude that these were only sporadic concerns within the community of research mathematicians.

Although her account also relies heavily on anecdotal information, Parshall chooses her stories carefully; they nearly always make a larger point or support the overall narrative. Let me mention a typical example from the beginning of *The New Era*. A major motivating theme—"catching up to Europe"—had long been on the minds of Birkhoff and Oswald Veblen, though Parshall rightly dismisses Steve Batterson's claim in [1] that the U.S. was "on the verge of parity" already in 1913. As an illustration of this, she offers a vivid impression of the atmosphere J.R. Kline found at the Yale mathematics department in 1918. Kline, who later served as secretary of the AMS, emerges as a major figure in both books, but Parshall emphasizes his culture shock on arriving at Yale. As a student of the topologist R.L. Moore, Kline embodied the "research ethos" that had only begun to spread from the three leading mathematical centers in the US: Chicago, Harvard, and Princeton. On arriving at Yale, he was appalled to find barely any trace of this among his colleagues, despite the presence of James Pierpont. Drawing on anecdotes like this, Parshall drives home a larger point. Lesser-known figures, like Kline, joined in battle with their more visible allies at the Big Three universities, a truly uphill fight once the

Great Depression depleted financial resources for higher education. Zitarelli's book reinforces that theme, but in his account, the point loses its force amid all the other topics touched on therein.

John Kline succeeded his former mentor at Penn in 1920, when Moore left to assume a professorship at the University of Texas. That year marks the birth of R.L. Moore's school in point set topology; its first graduate was Raymond L. Wilder, later a mainstay on the faculty at the University of Michigan. Another Moore product, Gordon Whyburn, brought research mathematics to the University of Virginia. Parshall pays close attention to the roles of these four men, not only at their respective institutions but also on the national scene as well. Wilder sought to mediate the inherent conflict that divided affiliates of the Moore school from the Princeton topologists, a group headed by Veblen, J.W. Alexander, and Solomon Lefschetz. By the 1930s, algebraic topology had begun to make inroads at universities in the east; whereas elsewhere point set topology was on the rise. Ultimately, Wilder's efforts proved unsuccessful. At the 1950 ICM held in Cambridge, representatives of the Moore school (Whyburn and Kline) were dismayed to see that the organizers had left their field out in the cold. In noting this discord, Parshall reflects on how trends in topological research were shifting away from traditional analysis situs and toward algebraic and differential topology. In discussing earlier plans for the 1940 ICM, later cancelled due to the war, she presents a tentative list of invited plenary speakers, only four of whom were native-born Americans (p. 275). One of these happened to have been R.L. Moore (the other three were A.A. Albert, Marston Morse, and M.H. Stone). A decade later, the ICM organizers saw no need to include Moore-style topology on the program.

Parshall highlights the fact that Adrian Albert, Chicago's leading algebraist, stood "shoulder to shoulder" with Emil Artin on that preliminary 1940 program. Artin had since left Hamburg for the US, and in 1946 Lefschetz brought him to Princeton. That same year, they joined in hosting the Bicentennial Conference on "Problems of Mathematics" (pp. 432–442), at which Artin chaired the algebra session. Referring to a presentation in it by Richard Brauer, Parshall notes the praise he won for his contribution to class field theory (p. 436). Elsewhere, though, she writes very little about class fields, a topic of central importance not only for Artin and Brauer but also for Helmut Hasse and Emmy Noether.

Parshall also skirts examining the tensions between "German" and "American" algebra, a complex matter touched upon in a special section of Zitarelli's book entitled "Transition 1930: Albert vs. Hasse" (pp. 335–348). This may represent an editorial insertion, since Della Dumbaugh and Joachim Schwermer wrote about this in [2], but if not, then the text should have been heavily edited (though one wonders whether it even belongs in this book). The tendentious account of that episode goes to absurd lengths in an effort to dramatize the story, the gist of which appears in ([5], Chap. 6). The best and most thorough account of the surrounding events is Peter Roquette's "The Brauer-Hasse-Noether Theorem in Historical Context," long available online (https://www.mathi.uni-heidelberg.de/~roquette/brhano.pdf). Neither that article nor the correspondence between Hasse and Noether, published in [3],were referenced in the Zitarelli volume.

Unfortunately, Zitarelli's penchant for popularization and hero(ine) worship led him to make pronouncements without any sound historical basis. Now that Emmy Noether's fame as the "mother of modern algebra" has fallen into the shadows, thanks to the recent hype surrounding her contributions to modern physics, Zitarelli decided to jump on this new bandwagon. He begins by citing an article in the *New York Times*, which suggested that Noether's Theorem might be just as important as Einstein's theory of relativity! This magical confluence of names then inspired him to imagine that "Einstein benefited from her discoveries, formulating several concepts in his work on the general theory of relativity based on her results in invariant theory" (p. 397). For a brief account of what actually transpired during that early phase in Noether's career, see ([5], Chap. 3).

Zitarelli wrote at considerable length in Chap. 12 about the careers of Noether and Artin, though with little to say about their respective impact on mathematics in the United States. However, his discussion of Richard Brauer, who spent the academic year 1934/35 at the IAS before moving on to the University of Toronto, is far more rewarding. Indeed, insofar as this book qualifies as a history of Canadian mathematics, its claim to that title largely rests on the portrayal of two central figures: Brauer and J.C. Fields. Zitarelli takes up the story of Fields' career in Chap. 11 (pp. 281–307), whereas Brauer's years in Toronto come up later (pp. 414–429). Every mathematician today knows about the Fields Medals, so many will enjoy reading about how their namesake almost single-handedly organized the 1924 Toronto ICM after representatives of the AMS pulled out for political reasons. As a talented organizer, Fields managed to pull off this event with money to spare. At his death in 1932, he bequeathed $47,000 for a medal honoring the highest levels of mathematical achievement. Brauer's talent, by way of contrast, was research and mentoring, and he exerted a major impact on Canadian mathematics through his students. Nine of them took their doctorates under him during the period 1937 to 1948, after which he went on to the University of Michigan.

Another major theme in Karen Parshall's *New Era* concerns the issue of "saturation" in the U.S. job market during the 1930s, particularly after 1933 when Europeans were desperately fleeing from Nazi Germany. For the world of mathematics, Reinhard Siegmund-Schultze described this dramatic rupture in [6]. In 1938, the AMS celebrated the semicentennial of its founding, providing G.D. Birkhoff the occasion to deliver a lecture reflecting on "Fifty Years of American Mathematics." As is well known, he took this opportunity to voice his concern about the sustainability of European immigration in the face of a bleak job market in the United States. While doing so, he rattled off a long list of eminent mathematicians who had taken positions in the U.S. during the preceding 20 years. Assuredly, Birkhoff's nativism and conservatism stood in sharp contrast with Veblen's liberal views and his activism on behalf of displaced scholars. Yet, as Parshall notes, Veblen himself felt that the American mathematical community was already approaching a saturation point by the end of 1933! (p. 212). Her reflections on his pessimism point to the vulnerability of Flexner's undertaking as an enterprise built on Jewish philanthropy, a novel development in Princeton. Moreover, she underscores the fact that soon after Birkhoff's speech an even larger second wave of immigration took place. This arose during concurrent negotiations that led to the founding of *Mathematical Reviews* in 1940. Although the general outlines of these events are well known, Parshall's probing analysis in a section entitled "Geopolitics and Mathematical Reviewing" (pp. 323–334) draws out the underlying tensions and difficulties in a masterful way.

Both of these books, to be sure, contain a tremendous amount of information, some of it new or at least very difficult to access. Obviously, the foregoing remarks are only selective and cannot possibly do justice to the many topics found between their covers. For anyone who understands history as more than just facts and dates, however, Karen Parshall's *New Era* is in every respect superior to David Zitarelli's posthumously edited second volume. Drawing on a wealth of new evidence, she offers a rich picture of mathematical activities on many different levels, set forth in a sustained argument that she lays out from the very beginning. Her book adopts a clear and transparent structure, covering three decades in as many parts, each of which forms a coherent whole. Together these constitute three stages in a larger development that reveals not only how quickly research mathematics grew in the United States between 1920 and 1950 but also how the contours of the American community evolved qualitatively. While telling this complex story, she sprinkles short quotes and footnotes into nearly every paragraph. A reader cannot help but be impressed by such scholarly acumen and the care that went into this study. Yet, despite the density of information conveyed, she managed to make this a very readable book—certainly not a bestseller, but a work that will undoubtedly take its place as a standard account for decades to come.

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