Preface

In 2001 I received an email message from Michael Schein, a prize-winning Caltech graduate who was then a 19-year-old, first-year graduate student at Harvard. Michael has taught at Bar-Ilan University in Israel since receiving his PhD in 2006 with a dissertation supervised by Richard Taylor. I have never met this algebraist, but knew his family well. His father, Boris, a Russian mentor for my PhD dissertation, had stayed at my family's house (along with Michael's mother and sister) after immigrating to the United States, where Michael was born shortly thereafter. The younger Schein commented on my paper that had recently appeared in the *American Mathematical Monthly*:

> Thank you very much for sending me a reprint of your article on the development of American mathematics in the first half of the twentieth century. I had wondered how it had grown so quickly from such humble origins and had assumed this was mostly due to the large number of foreign mathematicians who arrived in the thirties. I was very interested to learn that American mathematics had already produced its own infrastructure by then.

Up to that time, I had taught a course on the history of mathematics in America every other spring to complement the more standard general history course I taught annually. Since no book was appropriate for the American course, I used the Parshall and Rowe classic, *The Emergence of the American Mathematical Research Community*, and began to supplement it with my own notes. Michael's message inspired me to expand those notes into book form, totally unbeknownst to him.

The notable mathematician Irving Kaplansky also felt the need for a modern history of mathematics when he nominated Hyman Bass for President of the American Mathematical Society in 1999: "The 'Stone' age was at its peak. (I hope that many *young* mathematicians will be reading this, and I realize they may not have a clue as to what I am talking about.)"[1] I feel that Kaplansky's parenthetical expression could have omitted the adjective "young," because all individuals versed in the first year or two of undergraduate mathematics would benefit from knowing the history of the subject.

Volume 1 covers the period 1492–1930. I hope to complete Volume II covering 1930–2000 in the near future. Overall, the two volumes are aimed at filling a gaping hole in the development of mathematics communities in the United States and Canada. Collectively, I refer to these two countries as "America," matching the sense in which both professional organizations of mathematicians use it—the American Mathematical Society (**AMS**) and the Mathematical Association of America (**MAA**). Indeed, there is no professional organization in the US for historians of mathematics; instead, most

such historians who live in the US belong to the Canadian Society for the History of Mathematics.

Periodization of any historical study is an artificial construct, yet it provides a structure that enhances an understanding of the subject area whose history is being examined. Mathematics is similar: the axiomatic approach provides an external structure to an area that enhances an understanding of the area. The account here is mainly chronological, arranged by periods, called parts. Part I covers the Colonial Era up to 1800, including the establishment of various colleges and universities, as well as original investigations by a limited number of scientists. Part II examines two periods: The first (up to 1838) highlights initial quests to form a mathematical community via organizations and periodicals. The remaining years (up to 1876) were dominated by Benjamin Peirce, who engaged in legitimate research into various mathematical arenas. This latter period also witnessed the growth in the number of individuals who were interested in pursuing higher degrees in mathematics when J.J. Sylvester was hired by Johns Hopkins University to inaugurate the first graduate program. Part III, 1876–1900, saw revolutionary growth in American mathematics in both numbers and quality of contributions to the field.

Overall, my approach presents a bird's-eye view that intertwines descriptions of leading (and secondary) figures in the field, along with thematic developments in the subject. Each of the four parts is followed by a "Transition" section into the next part, based on a topic that reflects the continuous nature of development rather than a discrete break. The one exception might be the "Transition 1876" section, because that watershed year saw a revolutionary leap (a jump discontinuity) in research within the American mathematical community.

I find that the human factor lends life and vitality to any subject, but it is particularly central for mathematics. Consequently, I devoted a lot of time to finding material even about secondary and tertiary figures. Hopefully, this human facet enhances the focus of the book. Major figures are not restricted to white males. Native Americans, African Americans, Chinese Americans, and women appear in the context of the subject when they occur naturally, but sometimes entire sections are devoted to their contributions. Along these lines, it is my fervent hope to make household names out of leading figures like Benjamin Peirce, E.H. Moore, Oswald Veblen, George Birkhoff, R.L. Moore, and Marston Morse, but also Caleb Cheeshahteamuck, Isaac Greenwood, Mary Winston, Anna Pell Wheeler, Li-fu Chiang, Elwood Cox, and William Claytor.

There are two ways in which I have deviated from many standard works on the history of mathematics. For one, I mainly use first names rather than initials. Thus, I cite George Birkhoff instead of G.D. Birkhoff. However, some names are so entrenched with initials—E.H. Moore, R.L. Moore—that it seemed unwise to depart from standard usage. The other deviation refers to dates: I use August 12, 2018, not the more logical 12 August 2018, mainly because it is the form used more often in the US.

In addition to the subject of mathematics and the American mathematicians who took part in developing it, the two volumes take into account external social and political factors that have also impacted advances in, and in turn have been influenced by, the subject significantly—such as changes in education, government support of basic research, and wars.

Nonetheless, this labor of love presents a history of *mathematics*—so it is the development of the subject that guides my presentation. Thus, it might sometimes be

necessary for the reader to skip over unfamiliar topics; the work has been formatted to accommodate such omissions. Indeed, I have not always been confident in some of the fields within mathematics that I have described, so I was compelled sometimes to lean on colleagues for help. I am grateful for having been grounded broadly by Herstein's algebra, Kelley's topology, Rudin's real and complex analysis, and Feller's probability, yet writing about mathematics in the twentieth century presents a formidable task, one I hope I can capture accurately. Although a reader with little formal training in mathematics can gain an overall impression of the development of the subject in America over the past four centuries and an acquaintance with the major figures in that development, the higher the level of attainment in mathematics, the more the reader will understand the development.

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