Power in Numbers

Reviewed by Emille Davie Lawrence

Power in Numbers: The Rebel Women of Mathematics
By Talithia Williams
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The year 2018 has been heralded by some as “The Year of the Woman,” with record numbers of women candidates in midterm congressional elections and gubernatorial races, as well as an unprecedented

outcry against harassment in the workplace and unequal pay for equal work. This women’s movement has without a doubt been accelerated by our current political climate and an intense desire to fight back against a “boys will be boys” school of thought. We are all aware of the public perception that, for the most part, men hold the keys to mathematical understanding. Thus, Williams’ compilation *Power in Numbers: The Rebel Women of Mathematics* seems especially timely. Even her choice of the word “rebel” in its title is indicative of a certain pushback that is currently reverberating throughout our society.

Upon starting the book, the first thing I noticed was the sheer beauty in each page. Williams clearly sets out not only to educate the reader, but to do so in a visually tantaliz-

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Figure 1. Portrait of mathematician, computer scientist, and rocket scientist Annie Easley.

ing way. In addition to vibrant portraits of each woman she features, every page has one or two mathematical diagrams, photographs, or historical paintings that absolutely make the book a joy to look at (see Figure 1). There are also pages that have random equations, expressions, and diagrams written in the background, which is sure to amuse a general audience and mathematicians, alike.

Williams gives a candid look inside her own mathematical trajectory in the introduction (including a math-inspired pick-up line her husband used

to win over her heart) and makes it clear that the women she chose to spotlight in the book are all women who overcame certain stereotypes and persisted in the face of adversity. Although every woman mathematician has overcome a stereotype, I love the women that Williams chose to feature.

The book is organized into three parts: The Pioneers, From Code Breaking to Rocket Science, and Modern Math Mavens, with each section highlighting different women through short biographies. There is also one woman who is a “Spotlight” in each section, though Williams does not make it apparent why the subject of this Spotlight should necessarily be set apart from all the rest. Part 1 contains only six featured women, and among these there are some usual suspects, such as Sofia Kovalevskaya and Emmy Noether. But I was also glad to see some women who are likely lesser known to the mathematical community, such

Figure 2. This 1910 photograph shows first graders at the Minor Normal School brushing their teeth. Lofton-Haynes attended the same school and graduated with distinction just a year earlier in 1909.

as mathematician, astronomer, and poet Wang Zhenyi from the Qing Dynasty and Euphemia Haynes, the first female African American mathematics PhD. Williams emphasizes how many of these women had to use pseudonyms or submit work anonymously in order to advance in the field—a point that is not surprising, but also not widely known. Two of my favorite photographs appear in *The Pioneers*: a photograph of an all-woman archery team from Bryn Mawr College (one of the places Emmy Noether taught) and an adorable photograph of first graders at the Minor Normal School (see Figure 2), a school that Euphemia Haynes attended. Neither of these photos have a direct connection to mathematics, but they both add to the historical tone I believe Williams is striving for.

Part 2 moves forward to the mid-twentieth century when women were joining the workforce in greater numbers and making significant contributions to computing and space exploration. One of my favorite anecdotes from the book came in the piece on Grace Hopper. Williams describes how Hopper and her colleagues discovered that a large moth caught in the Mark II computer was causing it to malfunction. From that day forward, they began calling any problem with the computer a “bug” and fixing the problem “debugging.” Bonus points to Hopper for contributing to our scientific lexicon! Williams also highlights Katherine Johnson and Dorothy Vaughan, two women who have already been prominently featured in the book and feature film *Hidden Figures*, but thankfully Williams manages to put forth fresh information about both. We also get to know in the book Mary Golda Ross, a Cherokee-American woman who went from teaching mathematics in rural Oklahoma public schools to becoming an engineer who worked on defense missiles at Lockheed.

Part 3 is the longest and features sixteen Modern Math Mavens. All of the Modern Mavens, with the unfortunate exception of Maryam Mirzakhani (see Figure 3), whose profile does not appear until almost the end of the book, are

still making meaningful contributions to their respective fields. Some of the most fascinating stories, I found, were those of Tatiana Toro and Carla Cotwright-Williams. Toro through her own persistence found her way onto Colombia’s IMO team at the age of 17 and went on to earn a PhD and numerous prestigious academic appointments and accolades. Cotwright-Williams has a unique story of growing up in a tough neighborhood in South Central Los Angeles but earned a PhD from the University of Mississippi. After a short career in academia, she made a successful career change to working for the US government and is currently a data scientist for the Department of Defense. Both of these stories really underscore the book’s theme of finding one’s way in the face of opposition. I also especially enjoyed reading about how Ami Radunskaya spent much of her life as a professional cellist and composer but went on to become a professor at Pomona College and is currently president of the AWM. My most favorite quote of the book comes from Chelsea Walton, associate professor at the University of Illinois at Urbana-Champaign: “The only person you should compare yourself with is you yesterday.” I just love that.

Overall, the thirty women that Williams chose for this book are from a diverse array of backgrounds—mathematical and otherwise. Williams has unquestionably done a considerable amount of research on each of these women. This comes through in the level of detail she puts into each biography. I found myself marveling at the personal anecdotes and quotes throughout the book. Furthermore, for those who want an even deeper dive, she gives a list of resources for further reading on each woman at the end of the book.

Power in Numbers is unmistakably a book written for the general public. The explanations of the mathematics to which each of these women contributed are light-handed

Figure 3. The front pages of several Iranian newspapers celebrate Mirzakhani a day after her death on July 14, 2017. Some of them broke cultural taboo, picturing the mathematician with her hair uncovered.

and intended for the casual reader. However, one particularly nice touch is that in each piece there is an inset that gives a bit more detail about the mathematics or history of a certain topic for the more curious reader. For example, there is a short explanation of Fermat's Last Theorem along with a diagram to demonstrate the Pythagorean theorem. There are also diagrams that define the Cartesian coordinate system and give a visual representation of some of the Fibonacci numbers, to name a few. A general reader will undoubtedly be amused by recalling some mathematics from their past and also learning about mathematics they've never seen before. This is not at all to say that the average mathematician will not enjoy reading this book because that is certainly not the case. *Power in Numbers* could be used as a coffee table conversation starter or an additional teaching resource in a History of Math course. It remarkably delivers on the author's self-proclaimed objective of bringing awareness to woman contributors to the mathematical sciences and with hope, will inspire more such women.

This book should not be put on a shelf to gather dust. It is a vital storytelling of revolutionary women that should be shared with your students and amongst your colleagues and loved ones. I, myself, look forward to the day when I can enjoy this book with both my daughter and my son. Williams has with this book given girls and women a bounty of rebel math warriors to admire, emulate, or even surpass.

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Credits

Figure 1 Cover Illustration Annie Easley: Sean Yates.

Figure 2 is courtesy of Library of Congress, Prints and Photographs Division—Goldsberry Collection of open air school photographs.

Figure 3 is by ATTA KENARE/AFP/Getty Images.

Author photo is courtesy of Emille Davie Lawrence.

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