**Review of**[17]
**Change is Possible: Stories of Women and Minorities in Mathematics**
**by Patricia Clark Kenschaft**
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# 1 Introduction

In "Change is Possible: Stories of Women and Minorities in Mathematics," Patricia Clark Kenschaft presents an extensive history of a selection of women and minority mathematicians. As evidenced by the title, Kenschaft takes a generally positive and forward-looking approach to the issue. The book includes mathematicians from the nineteenth century to the present and describes their experiences (within both their academic and non-professional lives) by way of facts, anecdotes, and the author's broader opinion of the implications of these experiences. The book is extensively researched from personal interviews with the mathematicians themselves or their relatives, colleagues, etc. One of the first such detailed chronicles, it does not attempt to make generalizations by picking representative examples, but instead provides full stories of the women and minorities profiled.

# 2 Summary

The book begins on a positive note, acknowledging the many mathematicians who are "good white men"[18] and have helped women and minorities to obtain education and jobs. In some cases, mathematics was ahead of other fields when it came to diversity in the nineteenth and early twentieth centuries. The author and some of the subjects of her book theorize that perhaps in some ways it was easier for women and minorities to break into mathematics than other fields since evaluation of their work was more objective. In fact, the first Ph.D. awarded to a woman in the nineteenth century was awarded in mathematics to Sofia Kovalevskaia in 1872.[19] But in some ways women's presence in mathematics decreased in the twentieth century. A higher percentage of women delivered papers at the American Mathematical Society meeting in 1905 than in 1971.[20] (Kenschaft does not hypothesize a specific reason for this, other than a general changing of the times and the presence in the early 1900s of a few prominent women mathematicians who served as mentors for many others.)

One of the restrictions that women mathematicians faced frequently in the twentieth century was due to nepotism laws in place at many universities.[21] A large number of highly qualified female mathematicians were ineligible for academic jobs because their husband worked in or joined that department. Josephine Mitchell, for example, was already a member of the faculty at the University

[17] ©2010, Sorelle A. Friedler
[18] Page 5.
[19] Page 6.
[20] Page 45.
[21] These laws were often applied only to the female member of the couple, and as such evidenced sexism and not just a desire to decrease nepotism.

of Illinois when her future husband was hired. Though they were hired independently and she had been there longer, when they got married the university did not renew her contract.[22]

While most of these official restrictions have been lifted and many more women have entered mathematics, barriers still remain for women who want to become academic mathematicians. For example, as of this book's writing in 2005, Harvard, the oldest institute for higher learning in this country, had never conferred tenure upon a female member of the mathematics faculty. This dubious distinction is no longer true. The past year saw Sophie Morel become the first tenured woman ever in the Harvard mathematics department, more than 370 years after the school's founding.[23]

Until the mid nineteenth century, access to education was minimal for African Americans (even for free black men) due to slavery. Despite this, some black mathematicians were recognized for their mathematical achievements even before the end of slavery. Benjamin Banneker published an almanac in the 1790s containing astronomical calculations marketed as "an extraordinary effort of genius."[24] After the abolition of slavery, discriminatory policies and economic barriers continued to limit access to higher education. The first African American to pursue doctoral studies in mathematics was Kelly Miller. At Johns Hopkins University he experienced intellectual isolation from his classmates due to his race. But it was a raise in tuition from $100 to $125 in 1888 that meant he was never able to graduate. The first black woman to earn a doctorate in mathematics, Euphemia Lofton Haynes, graduated from the Catholic University of America in 1943, 26 years after earning her bachelors from Smith College. She, like many women and minorities in mathematics, found a satisfying career within and outside of academia, teaching high school, college, and eventually serving as the Washington, DC Board of Education president.

Latinos, defined by Kenschaft in the spirit of underrepresentation as people of Latino ancestry born in the United States, have been prominent mathematicians since the mid twentieth century. In addition to racism and a lack of monetary resources contributing to the presence of proportionally fewer Latinos in mathematics higher education and academia, hiring policies at governmental organizations had a discriminatory effect on Latinos due to family ties abroad or settlement near an international border. William Vélez, now a Professor of Mathematics at the University of Arizona, recalls this story about applying for a job at the National Security Agency:

> At the exit interview, they told me that if I worked for them I couldn't have contact with foreign nationals. I told them, "I live on the border. You can't be serious about this." "No," they said. "Here's the rule. Are you willing to comply?"[25]

Many women, African Americans, and Latinos, having faced discrimination in their own schooling, serve as mentors and provide encouragement for students in their communities. One example that Kenschaft profiles, is that of a program for middle and high school students started in Texas by Manuel Berriozábal, a professor at the University of Texas, San Antonio. The Texas Prefreshman Engineering Program (`http://www.prep-usa.org`), founded in 1979, runs a summer math and

[22] Page 74.

[23] Harvard has had women fill a specially created position titled "Professor of the Practice." The tenured faculty with this designation tend to teach only topics up to and including Calculus. For more information about the current situation for women at Harvard, see http://www.nytimes.com/2010/03/06/education/06iht-ffharvard.html. Other elite U.S. institutions have had female full professors in mathematics departments since the nineteenth century, for example Susan Cunningham who was the head of the Swarthmore College mathematics department from 1869 to 1906.

[24] Page 82.

[25] Page 114.

science program with 80% minority students and a slight majority of female students. Longevity studies have shown that participants in the program are more likely to graduate college and to graduate with a major in the sciences.[26] Over 28,000 students have participated in this program.[27]

Kenschaft concludes with a discussion of the state of women and minorities in mathematics today. While more women and minority mathematicians succeed in academia now, and many groups have organized around their minority status to combat discrimination and advocate for themselves, there is reason for both hope and worry. The main problem that Kenschaft identifies for the future of minority mathematicians is that of the failing United States public school system at all levels. Increasing the number of women in mathematics is discussed in the context of broader reforms to education and academia including double-blind reviewing of conference and journal articles, greater access to affordable child care, and increased awareness of subtle discriminatory practices within classroom and departments.

## 3 Opinion

"Change is Possible: Stories of Women and Minorities in Mathematics" gives a detailed accounting of the lives of the mathematicians chronicled. Perhaps due to a desire to record as many of the facts as possible, the recounting is occasionally dry, in the style of a litany of generations. These passages are broken up with poignant, sometimes amusing, illustrative stories from the lives of these mathematicians. It is these vignettes that make up the heart of the book. While the author's own, generally hopeful, analysis of these anecdotes and trends is often insightful, the prose switch from factual recitation to story telling to analysis is not always smooth. Despite this, Kenschaft successfully conveys a sense of the issues and history of women and minorities in mathematics.

The main focus of "Change is Possible" is on mathematicians and not computer scientists. While, of course, computer science finds many of its roots in mathematics, it does have some significant differences when it comes to the state of women and minorities. As one example (not from the book), consider that women made up approximately 45% of undergraduate mathematics degrees awarded in 2006, while only approximately 20% of computer science degrees, and that while the percentage of women in mathematics has been increasing, the percentage of women in computer science has been decreasing since its high of approximately 35% in the 1980s.[28] For those wanting to understand the state of women and minorities in computer science today, Kenschaft helps to provide insight through historical context. As evidenced by Harvard's example, it could be instructive for each of us to examine the situation today at our own institution.[29] The percentage of women and minorities in the department is one important indicator, but consideration of issues such as maternity leave, department environment, and clear communication of policies are also

[26] Pages 128 – 129.

[27] `http://www.prep-usa.org/portal/texprep/generaldetail.asp?ID=107`

[28] The Association for Women in Science maintains statistics of this sort (`http://www.awis.org/`). For more data, including information on race, see the Taulbee survey for computer science (`http://www.cra.org/resources/taulbee/`) and the American Mathematical Society survey for mathematics (`http://www.ams.org/employment/surveyreports.html`).

[29] Unfortunately, the book does not contain an index, so finding the history of your institution requires a more detailed read or another source. For more information on African American mathematicians, consult information about Mathematicians of the African Diaspora at `http://www.math.buffalo.edu/mad/`. Other sources include the professional organizations the Association for Women in Mathematics (`http://www.awm-math.org/`), the National Association of Mathematicians (`http://www.nam-math.org/`), the Council for African-American Researchers in the Mathematical Sciences, and the SIAM Diversity Advisory Committee (`http://www.siam.org/about/com_div.php`).

important and benefit all members of the community. The interested computer scientist or one looking to address inequities in their own department might enjoy a full reading of the book, but for the general reader I recommend skimming the book to read the anecdotes, as these present the issues in a detailed yet entertaining and illuminating way.