Women in Mathematics - Challenges and Opportunities

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Women in Math Panel

IWOTA St Louis

July 19, 2016
Plan of the talk

- A bit of history
- Why the drop-off?
- Challenges: past and present
- Progress to date and changes in the air
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Standout women in the history of mathematics

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- Maryam Mirzakhani (1977 - )
Unsung heroes: “Top secret Rosies”

- Female computers of World War II

*Top Secret Rosies*, c. 2010, Producer/Director: LeAnn Erickson, Still 1
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The drop-off: where does it begin?

- Stereotype threat in high school; common perception of mathematics as a male domain.

- Fewer women score at the right tail in GRE math - reducing their chance of acceptance into math-intensive graduate programs where GRE-Q scores are an important consideration.

- Even among high-scoring women students with analytical aptitude, fewer prefer to enter math, opting instead for more organic, people-centric fields.

- Fewer women opt to compete for tenure-track positions upon receipt of their doctorates.

- More women leave the field for family reasons.
The way we learn: Jo Boaler’s experiment

In a high school classroom, Boaler noticed that

- many boys worried about getting all the correct answers, racing through the textbook and finishing before everyone else.

- Girls asked about the reason of efficacy of certain methods, their genesis and their context, sometimes without adequate response from the teacher.

- In a survey, 91% of the girls chose understanding as the fundamental component of learning math, as opposed to 65% of boys.
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Unconscious bias

Figure: From “Women in mathematics: Addition of difference” by Claudia Henrion
What is Unconscious Bias?

- A bias that we are not aware of, whose occurrence is beyond our control
- Results in quick, unfounded judgements of people and situations
- Almost always rooted in our background, cultural norms and personal experiences
- Women are as likely to commit acts of unconscious bias as men!
Common challenges for the working woman

Four patterns observed by Joan Williams and Rachel Dempsey:

- Prove-it-again!
- The Tightrope
- The Maternal Wall
- The Tug of War
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Prove it again!

- Men are judged on their potential, women are judged on their achievements.

- Men's successes are attributed to skill, while women's are overlooked or attributed to luck. With mistakes, it’s just the opposite.

- Women have to prove themselves over and over again, much more so than men, in order to be seen as equally competent.
“I was born a woman. Thirteen years ago, at the age of 40, I decided to change my sex. ...”

“By far, the biggest difference I have noticed is that people who do not know that I was a woman treat me with far more respect .... ”

“I have heard ...” Ben Barres gave a great seminar today, but then his work is much better than his sister’s work”.”
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The Tightrope

- A double-bind situation that stems from assumptions about how women *should* behave.

- Women often find that if they behave in traditionally feminine ways, they tend to be judged as low on competence but high on warmth and are often treated kindly but not taken seriously - exacerbating Prove-It-Again! problems.

- If they behave in traditionally masculine ways, they are seen as lacking social skills and penalized as such. Strong, independent, decisive women often get stuck with reputations as difficult to work with, which in turn leads to decreased opportunities.

- One facet of the tightrope: sexual harassment.
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The Maternal Wall

- Strong negative assumptions about competence and commitment, triggered by motherhood - “mothers should be at home or working fewer hours”.

- Women with children are routinely pushed to the margins of the professional world. They are often seen as “flight risks”, which means that they may not be given the same institutional support as men or assigned to high-responsibility or high-visibility positions.

- This, in turn, makes them more likely to check out.
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- Occurs as each woman tries to navigate her own path between assimilating masculine traditions and resisting them.

- Women’s different strategies divide them. Some women are tomboys, wanting to play the game as the boys play it. Others want to preserve more of the traditions of femininity.

- Varying strategies in the professional arena often pit women against each other; as do workplaces that communicate that there is room for only one woman.
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The good news: Increased opportunities and resources

- Even though women are yet to achieve the required critical mass, there are now sufficiently many successful women in our respective spheres who serve as great role models.

- Good mentorship from someone who has seen it all is invaluable.

- Mentorship of women is not just “a women’s burden”. There is an increasing trend of both men and women acknowledging their blind spots of gender bias and making a conscious effort of mentoring younger women.

- Research institutes like MSRI, ICERM, AIM, Fields, PIMS and BIRS now include representation of women and minority in their events as part of their mandate, and implement this actively. NSERC has established the Women’s Chairs in Science and Engineering.
Association for women in mathematics (AWM)

- A nonprofit organization founded in 1971.

- The purpose of the AWM is to
  - encourage women and girls to study and have active careers in the mathematical sciences
  - promote equal opportunity and the equal treatment of women and girls in the mathematical sciences

- Currently more than 3000 members (women and men) representing a broad spectrum of the mathematical community - from the United States and across the world.

- Research and travel grants and awards for women researchers

- Mentorship and networking opportunities
A personal experience: Waterloo Summer School 2014

- Two-week undergraduate summer school for women in math: University of Waterloo 2014.

- Targeted to second or third-year undergraduate women who love math but do not know what it’s good for

- Components of the program:
  - Two introductory mini-courses on research level topics
  - Talks from researchers as well as non-academics who hold a mathematics Ph.D. and use mathematics as an integral part of their jobs
  - Field trips to research institutes and companies that routinely hire mathematicians at all levels
Concluding message

Pay it forward
Thank you!