Women in STEM

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Overview

* Background on women in STEM. Why the conversation?
* Factors that impact women’s participation in STEM
* Ways to change the situation
Background: My role

- NSF ADVANCE: National Science Foundation program focused on women STEM professors
- Women in Engineering: College of Engineering program focused on graduate students.

Some fun pictures from grad school at UCSB
Women in STEM

WOMEN IN SELECTED STEM OCCUPATIONS, 1990–2013

Percentage of women

1990 2000 2010 2013

Biological scientists
Chemists and material scientists
Computer and mathematical occupations
Engineers

AAUW, Solving the Equation, 2015
Historically underrepresented groups in STEM

Includes black or African American, Hispanic or Latino, and American Indian or Alaska Native. Data are for U.S. citizens and permanent residents only.

ncses.nsf.gov/pubs/nsf19304/digest/field-of-degree-women-men-and-racial-and-ethnic-groups
It's a good question, but the answer is complicated. There are a lot of factors.

www.aauw.org/research/why-so-few/
Outright sexism

* The scientific world has historically been predominately male. Certain attitudes and norms became acceptable and persist today.

* For example—
“Let me tell you about my trouble with girls. Three things happen when they are in the lab: You fall in love with them, they fall in love with you, and when you criticize them they cry.”

-- Biochemist Tim Hunt
Booth Babes (replaced with "fitness models") at tech conferences

Silicon Valley culture
SELECTION COMMITTEE

Selection Committee for the Breakthrough Prize in Fundamental Physics and the New Horizons Prize in Fundamental Physics:

Nima Arkani-Hamed
Alan Guth
Alexei Kitaev
Juan Maldacena
Alexander Polyakov
Nathan Seiberg
Kip S. Thorne
Rainer Weiss
David N. Spergel
Lyn Evans
Joseph Incandela
Maxim Kontsevich
Arthur McDonald
Adam Riess
Ashoke Sen
Cumrun Vafa
Edward Witten
Charles L. Bennett
Michael B. Green
Takaaki Kajita
Andrei Linde
Saul Perlmutter
John H. Schwarz
New Strominger
PAGE JR.
Social Pressures

- Some things are changing, but society still encourages girls to feel responsible for housework and childrearing
- Hedy Lamarr selling war bonds
- Different "standards of beauty"
Social Pressures

* Imposter Syndrome--feeling like you don't belong, despite plenty of evidence to the contrary

* Stereotype threat--the stress associated with the fear that you might confirm a negative stereotype about your group (e.g., women in math). Has been shown to lead to lower performance on tests.
Issues facing the U.S. (scientific) workforce

- Lack of infrastructure to support families
- Long work hours, professional travel → stress on families
- Competitive environment and fixed mindset.
Implicit Bias

- Attitudes or stereotypes that we hold about groups of people, without knowing that we hold them.
- Everyone has implicit bias; it's a byproduct of our life experiences.
- Small effects can add up over time.
- A lot of social science research studies implicit bias and its effects
Lab Manager Study

Moss-Racusin, Dovidio et al. PNAS (2012a). Figure courtesy of AAUW: Solving the Equation, 2015
Researchers noticed that 46% of applicants were women... but only 20% of awardees.

Acquired access to the original applications and reviewer scores.

Developed their own scoring criteria and used it to develop an objective "impact score"

Key result: women had to be 2.5 times as productive as men to receive a fellowship

Why does it matter?

- In this room the question may seem too obvious even to address.
- But that is not true everywhere.
- "Business case" for diversity is often used to justify expense and work
- Fundamentally it's an equity issue.
What are we going to do about it?

- Change can happen!
- A lot of work at K-12 level to get more girls interested in STEM
- Industry diversity work
- My work focuses on academia
Two general approaches

1. Fix the people (information, mentoring programs, etc.)

2. Fix the problem (e.g., cultural shifts, improved policies, etc.)

Approach 1 can be okay, but more significant change will be possible if we focus on approach 2 (or both).
Classroom culture

* Traditional STEM education methods can discourage women and people of color to persist in STEM majors ("If you have to ask that kind of question, you don't belong here!")

* A lot of research being done to create classroom cultures that foster success for more students
An NSF ADVANCE Origin Story: MIT Study

Figure 1. Number of women faculty in the School of Science at MIT (1960-2010).
(Revised from Hopkins, MIT Faculty News Letter, no. 4, vol. XVIII, 2006.)
Lessons

- Leadership is critical. A good leader can make positive changes. But progress can stall when attention is no longer paid to a situation.

- No sacrifice of quality
UD NSF ADVANCE

**Recruitment**
- Workshops for faculty search committees (active recruitment, rubrics)

**Institutional Structure**
- Policies and Procedures
- Resources for faculty & leaders

**Retention**
- Formal Mentoring
- Women's Leadership
How are we doing at UD?

% UD Women T/TT Science & Engineering Faculty

College of Engineering
College of Arts & Sciences-Natural Science
Conclusion

There is a lot more work to be done before women and people of color have critical mass in STEM.

However, progress can be made & the world will be better for it!

Questions & Discussion