Women of Applied Mathematics: Research and Leadership

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## Senior Participants are Women of Accomplishment

- 4 Chaired Professorships
- 4 Program/Center Directors
- 1 Dept Chair
- 1 Associate Dean
- 1 Dean
- 2 Journal Editors
- 9 Editorial Board Members
- 3 National Academy Members
- 1 AAAS Fellow
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- 2 BMS members
- 1 Sloan Fellow

Have these women succeeded because of circumstances or in spite of them?

The Data

Few Women are Tenured/Tenure-Track at the
Top 20 Applied Math Programs
$\begin{array}{llllllllll}0 & 10 & 20 & 30 & 40 & 50 & 60 & 70 & 80 & 90\end{array} 100$ 110


Carnegie Mellon
 Washington Wisconsin GA Tech Chicago
Michigan

Data from Aug 2003. Full details included in handout.

Women are Graduating with PhDs in Applied Math Fields at a Rate of 20\% and Higher


Data from Aug 2003. Thanks to Jim Maxwell at the AMS for providing the data. Further details included in handout.

But Only 13\% of Tenure-Track Assistant Professors are Women


## SIAM's Regular Membership Includes 19\% Women



Data from Aug 2003. SIAM has over 9,200 members. This chart only includes those members for which they have gender data. Thanks to Jim Crowley at SIAM for providing this data.

SIAMM's Current Leadership Measures Up, but its Editorial Boards Miss the Mark 100\%


Data from Aug 2003. All data collected from web pages, except the membership data.

## Women Are Rarely Society Officeers or Major Lecturers

- AMS
- Only 2 women presidents since 1889!
- There has never been a female secretary or treasurer
- Only 3 female "Colloquium Lecturers" since 1889 (awarded annually)
- Only 2 female "Gibbs Lecturers" since 1923 (awarded annually)
- SIAM
- Only 1 female president since 1960!
- Only 1 female "John von Neumann Lecturer" since 1960 (awarded annually)

[^0]
## The Situation is Largely the Same in European Countries

PERCENTAGE OF WOMEN AMONG TENURED MATHEMATICLANS AT UNVERSITY LEVEL


| $\square$ | $0-4 \%$ |
| :--- | :--- |
| $\square$ | $3.10 \%$ |
| $\square$ | $11-20 \%$ |
| $\square$ | $21-30 \%$ |
| $\square$ | $31-40 \%$ |
|  | $41-50 \%$ |

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- Why the disparity?
- http://www.math.helsinki.fi/EWM/tilastot.html


## The Data Says...

- In many instances, women are not represented at a level consistent with their participation in applied math
- Hypothesis: This is a cultural and power issue - not one of availability of women who are interested in applied math


## Impediments to Women in Mathematics: Anecdotal Evidence

- Cultural issues
- Bias
- Institutional backwardness
- Overt discrimination

The following anecdotes are true stories!

## Cultural Issues

- mobility limits
- invisibility
- mistaken identity
- foot-in-mouth disease (FIMD)
- respect


## The Problem

"[T]he lack of social and professional connections available to most women in academic science and engineering departments, in concert with overt and covert gender bias as well as differences in socialization, creates special and unique problems for women."

- Etzkowitz, Kemelgor, Neuschatz, Uzzi, "Restructuring Departments for Equity"


## Mobility Limits

- interviewing / traveling while nursing
- child care / elder care
- part time employ
- traveling to meetings
- dual career (2 body) problem


## secondary effect: no offers, no raise.

## Invisibility (1)

A man and his son are in an auto accident. The man dies, and the son is rushed to the hospital for surgery. In the operating room, the doctor says, "I can't do the operation; this is my son!"

How is this possible?
(Not a true story.)

## Invisibility (2)

Pat: "I hear your husband works at the university?"

Prof. Polly: "My husband and I just started in the math department."

Pat: "Oh, your husband might know my neighbor Prof. Bill."

Prof. Polly: "Yes, we know him; his office is next to mine."

Pat: "I'll tell Bill that I met his new colleague's wife!"

## Mistaken Identity (1)

"Conference Secretary" or "Organization Secretary"
is all too easily misinterpreted as
"Administrative Assistant".

## Mistaken Identity (2)

Scene: Late night in Prof. Polly Gonn's office.

Building Custodian: "What are you doing in Professor Gonn's office!?"

Resolution: Polly eventually had to take him down to the faculty picture wall to convince him that she belonged in the office.

## Mistaken Identity (3)

Scene: Professor Polly visits a top-10 university and has lunch at the Faculty Club with colleagues (male, of course)

Waiter: "You must really be appreciated! We're happy you are here!"

Why: It was Secretaries' Week.

Attitudes evidenced by foot-in-mouth disease (FIMD)

FIMD (1)
What does every applied mathematician want to be told after giving a talk at a professional society meeting?

May I compliment you?
You have the most lovely smile live ever seen!

## FIMD (2)

Scene: Dinner conversation when hosting a woman candidate for a job

Prof. Bill to Prof. John: "Considering Marilyn Monroe and Monica Lewinski, l'd have to say that JFK had much better taste than Clinton did."

## FIMD (3)

- A recent report by the Task Force on the Status of Women Faculty in the Natural Sciences and Engineering at Princeton (2003) found that:
- Nearly 25\% of women reported "unprofessional" behavior occasionally or frequently by their colleagues


## R_e_s $p_{-} e^{e}{ }^{c}-{ }^{t}$

Undergraduates have a hard time saying "Professor" to a woman.

Much more often it is "Mrs.", "Ms.", or even "Ma'am".

## A ubiquitous dataset in the image processing literature



Source: Cropped version of a Playboy centerfold (Miss November, 1972).

## BIAS

## Evidence of Bias in Refereeing

- Study by Swedish Medical Research Council (MRC) discovered gender bias in the way in which research awards were made
- Women had to be about 2.2 times more productive than their male counterparts to be as successful in securing financial support
- The study: Nepotism and Sexism in PeerReview, Nature 1997
- Also see: Why are there so few women in science? by Nancy J. Lane, 1999


## Bias in

## Letters of Recommendation

Women's accomplishments are often devalued or credited to male colleagues, and characteristics that are considered assets in males are considered faults in women:

- Paul is assertive; Polly is pushy.
- Paul is persistent; Polly is stubborn.
- Paul thinks creatively; Polly is easily distracted by tangential ideas.
(Not a true story.)
See Spertus: www.ai.mit.edu/people/ellens/Gender/pap/pap.html


## Bias in Teaching Evaluations

- Student evaluations of college professors: are male and female professors rated differently?, J. Educational Psychology 1987.
- Student evaluations: the role of gender bias and teaching styles, in Arming Athena: Career strategies for women in academe, 1998.


## Bias when Women Assess Women

- P. Goldberg, Are Women Prejudiced Against Women?, Trans-Action 5 (1986), pp. 28-80.


## Bias when

## Women Assess Themselves

- Did I only achieve because of affirmative action?
- Does motherhood (or other outside commitments) mean I am not committed to my career?
- Are my achievements just lucky accidents?


## Instifutional Backwardness

## Excuses for not Interviewing

Prof. Bill's written comment on the hiring file for Polly:
"I know she has a 2-body problem, and doubt whether we can accommodate her partner."

## Arranging Leave

- Bypass surgery and other health concerns: easy.
- Parental leave: may be difficult and may be dangerous.
- From the Princeton 2003 report:
- 6 men and 1 women requested tenure extension for birth or adoption
- $28 \%$ of women think extensions are detrimental versus $4 \%$ of men


## Chilly Climate

# "When enough women are around, the fraternity atmosphere becomes a society, a community." 

-     - C. Sidner, AAAI fellow and a member of the research staff at

Digital's Cambridge
Research Laboratory

Until that point, retention is difficult.

## Mentoring

- Women don't find mentors as easily
- The Princeton report says:
- 64\% of untenured men and $33 \%$ of untenured women report receiving mentoring


## Power

We all know that efforts are made to put a woman on every committee.

Unfortunately, women are underrepresented in decision making positions

## "We in academia are the

problem. We have designed the career path in a way that discriminates against women and minorities." Shirley Tilghman, president of Princeton

Science, 22 Aug 2003 p. 1030

How?

- Lengthy apprenticeship
- Low pay
- Family-unfriendly hours
- Cut-throat competition for grants and other resources


## Overt Discrimination

But surely overt discrimination is a thing of the past?

## US Government math and computer science lab, 1997

- Lab director decides to cut costs.
- Eliminates 2 faculty consultants (women) and keeps 3 (men).
- Was it because of the quality of work?
- "No. I have no idea what she does."
- Decision overturned, but MANY months later.


## MIT 1999

"I have always believed that contemporary gender discrimination within universities is part reality and part perception. True, but I now understand that reality is by far the greater part of the balance."

Charles M. Vest, president of MIT

## Conclusions of 1999 MIT study

Women at MIT:

- are underpaid.
- have unequal access to university resources.
- are excluded from substantive power.


## Conclusions

## Job Satisfaction

- From the Princeton 2003 report:
$-39 \%$ of women vs $63 \%$ of men are very satisfied.
- $7 \%$ of women vs $0 \%$ of men are very dissatisfied.
- The difference persists after adjusting for tenure status, years at Princeton, and department.


## The Conditions that We Face Today Effect the Pipeline

"In short, [women faculty at MIT] said, they were so miserable that any young woman looking up at them would think, 'Why would I want that?'"

Boston Globe, 21 March 1999, p. A01

## Views of reality (1)

"I really don't look for discrimination (life is easier if one doesn't look for insults where they aren't intended).
"However, I'm going to be positive here and say that whether it's common or I'm just fortunate, I've really been treated as I would hope to be treated."

## Views of reality (2)

"Each generation of young women, including those who are currently senior faculty, began by believing that gender discrimination was 'solved' in the previous generation and would not touch them.
"Gradually however, their eyes were opened to the realization that the playing field is not level after all, and that they had paid a high price both personally and professionally as a result."

Committee on Women Faculty in the School of Science,

MIT, 1999

## Reality:

## Somewhere in-between?

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## Workshop Purpose

- We can't change the world in 2.5 days.
- We'll focus on
- tools for success
- networking
- mentoring
- We'll ask how we can make progress more likely.


## Thanks

- DOE MICS Office
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[^0]:    Data Aug 2003, collected from the web.

