Equity and Inclusion in STEM: What, Why, How

Meg Urry, Yale University
Rorschach Lecture, Rice University
Harold "Bud" Rorschach, Jr.
1. What?

The statistics of women in STEM
Doctoral Degrees Earned by Women

Source: IPEDS and APS
Percent STEM degrees to URM Women 1991-2010

- Bachelor's
- Master's
- Doctorate

NSF

[Graph showing trends in STEM degrees awarded to URM women from 1991 to 2010.]
Attrition between B.S. and Ph.D. degrees

56% → 45%  All fields

% Bachelor's Degrees to Women 1966-2004

% PhDs to Women 1958-2003

National Science Foundation. Compiled by AIP Statistical Data Services
Attrition between B.S. and Ph.D. degrees

47% → 28% Math

% Bachelor's Degrees to Women 1966-2004

% PhDs to Women 1958-2003

National Science Foundation. Compiled by AIP Statistical Services.
Attrition between B.S. and Ph.D. degrees

43% → 33% Chemistry

% Bachelor’s Degrees to Women 1966-2004

% PhDs to Women 1958-2003

National Science Foundation. Compiled by AIP Statistical Data Project
Attrition between B.S. and Ph.D. degrees

19% → 15% Physics
Doctoral Degrees Earned by Women

Source: IPEDS and APS
Percentage of R&D Done by Women

- Sub-Saharan Africa – 29%
- Arab States – 38%
- South & West Asia – 20%
- East Asia & Pacific – 20%
- Central Asia – 46%
- Central & Eastern Europe – 40%
- North America & Western Europe – 32%
- Latin America & Caribbean – 44%

Huge variations within regions:

- Ethiopia 8%, South Africa 42%
- Saudi Arabia 1%, Egypt 42%
- Nepal 8%, Sri Lanka 37%
- Japan 14%, Myanmar 86%
- Tajikistan 24%, Azerbaijan 52%
- Czech Republic 27%, Latvia 53%
- Netherlands 24%, Portugal 46%
- Venezuela 56%, Honduras 27%

Why should you care about these statistics?

• Excellence of science
• Fairness/justice
• It’s a great life!
  – Taxpayers support science, so should benefit equally
• Health of science profession
  – More scientifically literate (broad) public
  – ⇒ more public support of science
• Workforce needs
• Stopping sexual harassment, racism, homophobia, discrimination, …
2. Why?

Why are we not at parity?
Why do women and other underrepresented groups lag behind parity?

- Statistical career disparities

- Not ability, interest, effort
  - Seymour & Hewitt 1990s, Xie & Shauman 2003, NRC’s 2006 “Beyond Bias and Barriers” study

**persistence in science not correlated with ability**

- Not family issues

- Not conscious discrimination, overt prejudice (or men oppressing women)
Why do women and other under-represented groups lag behind parity?

  - Lower expectations for women
  - Uneven evaluation (“unconscious bias”)
  - Accumulation of disadvantage

→ Tilted playing field
We are not objective

Biernat, Manis & Nelson 1991 – height
Porter & Geis 1981 – leaders at table
Butler & Geis 1990, Geis+ – speaker/leader evaluation
Dovidio et al. 1988 – eye gaze
Uneven Evaluation

• Heilman et al. 2004 – rating asst. VPs
  Women can be friendly or competent, not both
• Norton, Vandello & Darley 2004 – rating resumes for construction job
• Uhlman & Cohen 2005 – shifting criteria and (non)objectivity
• Heilman 1980 – critical mass is ~30%

Valian annotated bibliography:
Moss-Raucusin, Handelsman, et al. 2012 PNAS

- 63 male, 64 female science faculty
  - physics, chemistry, biology
  - 6 research universities: 3 private, 3 public
- CV of graduating senior looking for job as lab manager – “John” or “Jennifer”
- Both men and women:
  - See the male candidate as more competent
  - Were more likely to hire and mentor him
  - Starting salaries ~ $30k for him, $26k for her
Are you objective?

Mahzarin Banaji: implicit.harvard.edu
Career stages are filters

- Education
- Training
- Mentoring
- Evaluations
- Hiring
- Retaining
- Promotion

students enter here

and professionals exit here
Academic evaluations

- publications
- citations
- letters of recommendation
- proposal/funding success
- invited talks
- prizes (nominations)
- teaching evaluations
Sexual harassment of field scientists

Clancy et al. 2014, PLOS One, DOI: 10.1371/journal.pone.0102172

- Sexual harassment common
- Men by peers
- Women by superiors
<table>
<thead>
<tr>
<th>Gender</th>
<th>All*</th>
<th>Trainee*</th>
<th>Employee*</th>
<th>Faculty*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (N)</td>
<td>% (N)</td>
<td>% (N)</td>
<td>% (N)</td>
</tr>
<tr>
<td><strong>Harassment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>71% (361/512)</td>
<td>84% (305)</td>
<td>12% (42)</td>
<td>2% (8)</td>
</tr>
<tr>
<td>Men</td>
<td>41% (56/138)</td>
<td>68% (38)</td>
<td>20% (11)</td>
<td>13% (7)</td>
</tr>
<tr>
<td><strong>Assault</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>26% (131/504)</td>
<td>86% (113)</td>
<td>11% (14)</td>
<td>2% (3)</td>
</tr>
<tr>
<td>Men</td>
<td>6% (8/133)</td>
<td>75% (6)</td>
<td>0% (0)</td>
<td>25% (2)</td>
</tr>
</tbody>
</table>

*Respondent’s status at time of experience. Not all respondents provided an answer to these questions.

Clancy et al. 2014, PLOS One, DOI: 10.1371/journal.pone.0102172
(A) Sources of Comments

Proportion of Respondents (%)

- Local Community Member
  - Men: 6
  - Women: 71

- Inferior
  - Men: 9
  - Women: 34

- Peer
  - Men: 27
  - Women: 88

- Superior
  - Men: 14
  - Women: 168

within the Hierarchy of the Field Site
(B) Sources of Unwanted Contact

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Community Member</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>Inferior</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Peer</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>Superior</td>
<td>2</td>
<td>63</td>
</tr>
</tbody>
</table>

Proportion of Respondents (%)
3. How?

How do we get to equity?
Best practices for objective review

• Develop criteria in advance
• Judge applicants/nominees against criteria
• If possible, blind review
• If not possible, include >30% women in pool
• Do not rank until joint discussion
• Include women on short list
• (Educate colleagues before visit/interview)
Affirmation

• Supporting others in meetings
• Give detailed introductions for speakers (“pre-validation”)
• Strong appointments confer validation
• Same for speaker invitations
“That’s an excellent suggestion, Miss Triggs. Perhaps one of the men here would like to make it.”
Coaching (Mentoring)

Tony DeCicco, U.S. women’s soccer coach
Boston Globe, June 18, 1999
Letters of Recommendation

- *Trix & Penska 2003* – letters for a prestigious medical fellowship
  - Length
  - Specificity
  - Superlatives v. “grindstone” adjectives
  - Doubt
  - Explicit mention of gender, personality, family
    - (Tenure letters: women re women)
- [http://www.tomforth.co.uk/genderbias/](http://www.tomforth.co.uk/genderbias/)
Learn about “stereotype threat”

- **STEREOTYPE THREAT**: performing below ability because of expectations
- Example: “hard” math test
  - Men: 25/100
  - Women: 10/100
  - *Gender gap in math?*
- “This test has been designed to be gender neutral”
  - Women: 20/100
  - Men: 20/100
- Important for minority students
Sanbonmatsu, Akimoto & Gibson 1994
(Evaluation of failing students)

XKCD wisdom at xkcd.com
It is AAS policy that all participants in Society activities will enjoy an environment free from all forms of discrimination, harassment, and retaliation.

If you experience or witness such behavior at this meeting, call 1-202-688-1993 to report the date, time, location, nature of the incident, and persons involved. Be sure to identify yourself and leave a call-back number; we will not follow up anonymous tips.

Complaints will be treated seriously and investigated promptly; confidentiality will be honored as far as possible as long as others’ rights are not compromised.

Read the complete AAS Anti-Harassment Policy at aas.org/harassment
 Mutable: Playing field not level

But tilt can be leveled - consciously
Equal →

Assumes everyone benefits equally from the system.
Equal $\rightarrow$ Equitable $\Rightarrow$

Assumes everyone benefits equally from the system.

Giving equal access by treating people equitably.
Equal  \rightarrow  Equitable  \rightarrow  Equity

Assumes everyone benefits equally from the system.

Giving equal access by treating people equitably.

Systemic barriers removed. No special support or accommodation needed.
11–12 Steps to Success for “Outsiders”

1. Work hard (at something you love)
2. Do interesting, high impact work
3. (If) uneven playing field – don’t be discouraged
4. Reject “lower standards”
5. Mentor up, down, and sideways
6. Network w other outsiders, take turns leading
7. Use your first & last names
8. Prepare an “elevator speech”
9. Practice confidence after brushing
10. Give great talks
11. Own your ambition
12. Watch our for sexual harassment
6 Steps for Leaders

1. Learn about bias
   implicit.harvard.edu
   Beyond Bias and Barriers (NRC Study)

2. Do job **searches**   UW hiring kit

3. Validate women speakers, job candidates, colleagues   *Introductions, appointments*

4. Mentor

5. Equate diversity with excellence

6. Don’t date your trainees
My strategy:

• “Vaccinate”
• Articulate the rewards
• Enable networks of women
• Support affirmative action
• Institutions: step up
• Bystanders: step up
• Keep standards high: hire women and other “outsiders”
Back-up slides
Percent degrees to Women 1991-2010

- Computer sciences MA
- Engineering PhD
- Engineering MA
- Computer sciences PhD
- Engineering BA
- Computer sciences BA

NSF
Percent degrees to Women 1991-2010

- Biosciences BA
- Social sciences MA
- Biosciences MA
- Social sciences BA
- Biosciences PhD
- Social sciences PhD

NSF
Percent Bachelor’s degrees to URM Women 1991-2010

- Psychology
- Social sciences
- Biological sciences
- Computer sciences
- Engineering
- Physical sciences

NSF