Moving Toward Gender Equity in the STEM Workplace

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Fermilab May 26, 2015
Context
Percent of Bachelor's Degrees Earned by Women in Selected Fields, 1966-2009

Class of

PHYSICS

National Center for Education Statistics. Data for class of 1999 were not available.

Compiled by American Institute of Physics Statistical Research Center
Percent of PhDs earned by women in selected fields, 1958-2006

AIP Statistical Research Center. Compiled from data collected by National Science Foundation.
The “scissors plot” summarizing these results reveals a dearth of women physicists.

![Graph showing the 'scissors plot' for physics and STEM](image)

Source: American Institute of Physics Statistical Research Center

This is a problem for Physics... and STEM!
THE FUNDING GAP
Women are earning an increasing share of research grants from the US National Institutes of Health (NIH) but the average size of their awards has consistently lagged behind what men receive.

2002 NUMBER OF NIH RESEARCH GRANTS
- Men: 31,801
- Women: 10,199

2002 AVERAGE SIZE OF GRANT
- Men: $403,047
- Women: $330,169

2012 NUMBER OF NIH RESEARCH GRANTS
- Men: 30,768
- Women: 13,025

2012 AVERAGE SIZE OF GRANT
- Men: $507,279
- Women: $421,385

THE SALARY GAP
Female scientists in the United States earn much less than men, on average, with the difference varying strongly by field.

BIOLOGY
- 2008 median salaries
  - Men: $65,000
  - Women: $50,000

CHEMISTRY
- 2008 median salaries
  - Men: $79,000
  - Women: $62,000

PHYSICS AND ASTRONOMY
- 2008 median salaries
  - Men: $89,000
  - Women: $54,000

18% average pay gap all positions

Nature, Vol 495, 7 March 2013
There are ~190 such departments and the median number of faculty is 29.
Overall, 19% of the faculty members in departments that grant degrees only in astronomy are women, which is larger than the percentage of female physics faculty members (14%) in physics departments. (See Table 3 on the following page.) The percentage of women astronomy faculty members also varies by rank, with full professors having the lowest percentage. As with physics, the reasons for this have to do with the lower percentage of women receiving degrees in the past. In astronomy departments, women are represented among assistant professors (30%) at about the same rate as PhD recipients, which was about 33% in 2007. There are astronomy faculty members in physics departments, and about 20% of these are women. Astronomy also has a greater proportion of women among degree recipients than physics does (Nicholson and Mulvey, 2011).

What is it like to be 1 woman out of 29 employees? Or the only person of color? or the only openly LGBTQ individual?

There are ~190 such departments and the median number of faculty is 29.
Causes for Concern
[adapted from APS Women in Physics site
http://www.aps.org/programs/women/reports/bestpractices/]

No effort to develop a sense of community or improve the climate. Denial that such issues matter to people.

A sub-critical mass of female employees; premature departure of female employees.

Lack of investment in and/or promotion of female employees at all levels. No visible leadership roles for female employees in the unit.

Isolation or marginalization of female employees.

Derogatory comments about female employees to reduce their ability to bring about change (e.g., “difficult” or “troublemaker”).

A highly politicized climate where decision-making processes are not transparent.

Inability on the part of senior female scientists or engineers to get sufficient laboratory space, research funding, or other resources needed to become leaders in their fields.

Strong support for more junior employees who are not in a position to drive change, but weak support for senior female employees who attempt to change the climate.
Causes for Concern
[adapted from APSWomen in Physics site]

What examples have you heard of, witnessed, or experienced, or had to deal with in your role?

No effort to develop a sense of community or improve the climate. Denial that such issues matter to people.

Sub-critical mass of or premature departure of under-represented (UR) employees.

Lack of investment in and/or promotion of UR employees at all levels. No visible leadership roles for UR employees in the unit.

Isolation or marginalization of UR employees.

Derogatory comments about UR employees to reduce their ability to bring about change (e.g., “difficult” or “troublemaker”).

A highly politicized climate where decision-making processes are not transparent.

Inability on the part of senior UR scientists or engineers to get sufficient laboratory space, research funding, or other resources needed to become leaders in their fields.

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Challenges and Solutions
Implicit Bias

The Gender Equity Project, Virginia Valian

• We are all (regardless of our gender) prone to unintentional bias related to gender

Think not? Try the Implicit Associations Test at https://implicit.harvard.edu/implicit/demo

• This affects many decisions we make in the course of our professional duties

• Relevant concepts include:
  – accumulation of disadvantage
  – gender schemas
  – stereotype threat
What are Gender Schemas?

- Gender schemas are hypotheses about what it means to be male or female.
- We all - male and female alike - share these hypotheses.
- Schemas assign different psychological traits to males and females (Martin and Halverson, 1987).
Stereotype threat

When women & minorities feel at risk of confirming a negative stereotype about their group, this can affect their ability to succeed in STEM.

See, e.g., Whistling Vivaldi by Claude Steele
Has time cured this? Alas no... see Moss-Racusin et al., PNAS 12111286109 (2012).
Worse, we are all biased...


Related results in Moss-Racusin et al., PNAS 12111286109 (2012).
• **solutions include:**
  ✴ **leaders** emphasize importance of diversity for achieving institutional goals
  ✴ **institutions** ensure criteria and processes for hiring, promotion and awards are clear, written, and available
  ✴ **HR departments and hiring/award committees**
    ✴ frame searches broadly to attract a diverse pool
    ✴ are trained to recognize and minimize implicit bias
    ✴ explicitly use multiple dimensions to evaluate candidates’ qualifications (e.g. # publications, research impact, patents, projects led successfully)
    ✴ have women interviewees meet women employees
  ✴ **units and professional societies** offer professional development opportunities for women at all levels
What solutions are the National Labs using? What others should they try?

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Family Responsibilities


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*Mason, Stacy, and Goulden, 2004; Data from NSF Survey of Doctorate Recipients 1981-1995*
Leaks in the Pipeline: PhD to Tenure Track Position

For each year after the PhD, Married Men with Children under 6 are 50% more likely to enter a tenure track position than are Married Women with Children under 6!

Mason, Stacy, and Goulden, 2004; Data from NSF Survey of Doctorate Recipients 1981-1995
Everybody is Very Busy

Mason, Stacy, and Goulden, 2004; Data on UC faculty, ages 30-50
POSTGRADUATE POSITIONS
A 2009 survey of postdoctoral fellows at the University of California showed that women who had children or planned to have them were more likely to consider leaving research.

POSTDOCS WHO DECIDED AGAINST CAREERS AS RESEARCH FACULTY MEMBERS (2009)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No children or plans to have them</td>
<td>19%</td>
</tr>
<tr>
<td>No children, but plan to have them</td>
<td>28%</td>
</tr>
<tr>
<td>Children previous to postdoc</td>
<td>19%</td>
</tr>
<tr>
<td>New children since start of postdoc</td>
<td>41%</td>
</tr>
</tbody>
</table>

“The plan to have children in the future, or already having them, is responsible for an enormous drop-off in the women who apply for tenure-track jobs.”
Wendy Williams, Cornell University

EARLY CAREER
Female representation among science and engineering faculty members in the United States has lagged behind gains in graduate education, in part because many women do not apply for tenure-track jobs. But women who do apply are more likely than men to receive interviews and offers.

“At least part of the lack of applications is due to the fact that women look at these careers and don’t see people like themselves.”
Hannah Valantine, Stanford University

<table>
<thead>
<tr>
<th>Field</th>
<th>Female PhDs (1999–2003)</th>
<th>Female applicants for academic jobs</th>
<th>Female interviewees for academic jobs</th>
<th>First job offers that went to women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>45%</td>
<td>26%</td>
<td>28%</td>
<td>34%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>32%</td>
<td>18%</td>
<td>25%</td>
<td>29%</td>
</tr>
<tr>
<td>Physics</td>
<td>14%</td>
<td>12%</td>
<td>19%</td>
<td>20%</td>
</tr>
</tbody>
</table>
solutions include:

球星 employers provide gender-neutral parental leave, promotion-clock adjustment, modified duties for parental or elder care and ensure these will not impact evaluation for promotion

球星 employers (HR) ensure policies are clear, well-advertised, gender-neutral and framed as entitlements, not exceptions [to minimize “bias avoidance” behavior]

球星 unit heads and mentors openly offer support and advice on work-life balance to all new employees, so this is seen as a normal aspect of professional life

球星 units schedule all meetings during business hours

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Dual-Career Couples

• a pervasive issue in physics
  (Dual-Science-Couple Survey, McNeil & Sher, 1998; 1990 APS Survey)
  - 68% (18%) of married physicists have scientist spouses
  - 31% (6%) of all physicists < 31yrs have scientist spouses
  - In 85% of couples, man is older [thus, more senior in job]
  - Dual-science-couples seeking first faculty jobs reported
    • short-term career goals affected by these issues (86%)
    • one partner (usually woman) was under-employed (60%)

• solutions include:
  ✴ Employers advertise clear, gender-neutral partner hire policies
  ✴ Employers support 2nd partner’s career success
  ✴ Employers reframe dual-career assistance as recruitment tool
  ✴ Employers form Recruitment Consortia
  ✴ Senior job candidates raise dual-career issues early [model]
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  ✴ Senior job candidates raise dual-career issues early [model]

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Negotiation

Women Don’t Ask: Negotiation and the Gender Divide (Linda Babcock & Sarah Laschever, 2003)

• Women avoid negotiation because they are
  - unsure what they “deserve”; fear asking too much
  - worried about harm to relationships
  - less optimistic about benefits of negotiation
  - not confident of their negotiation skills
  - relatively risk-averse

• In negotiations, women tend to
  ✴ ask for less -- and therefore receive less
  ✴ use “interest-based” negotiation approach, focused on underlying needs/motives rather than narrow concrete goals

( Getting to Yes: Negotiating Agreement Without Giving In, Roger Fisher & William Ury, 1990)
• Solutions include
  ✴ Professional organizations offer workshops on negotiation skills e.g. APS Professional Skills Development Workshops offered annually at major physics meetings (sponsored by NSF); has impacted > 250 women physicists since 2005 http://www.aps.org/programs/women/workshops/skills/
  ✴ Mentors teach women (and men) that interest-based negotiation is very effective and improves professional relationships
  ✴ Mentors recommend targeted readings such as Ask For It (Babcock/Laschever, 2009) and Getting to Yes (Fisher/Ury, 1990)
  ✴ Employers offer clear directions to job finalists to avoid unintended bias in discussions of salary and hiring packages
Further Challenges:
Intersecting Identities
Race and Gender - I

Number of Hispanic and African-American female PhDs in Physics, 1979-2006.

<table>
<thead>
<tr>
<th>Year</th>
<th>African-American</th>
<th>Hispanic-American</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979 - 1985</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>1992 - 1986</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>1999 - 1993</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>2000 - 2006</td>
<td>21</td>
<td>18</td>
</tr>
</tbody>
</table>

AIP Statistical Research Center compiled from data collected by the National Science Foundation.
Race and Gender - II

Number of Women in Physics and Astronomy Departments, 2012 by Highest Degree Awarded  (faculty members)

<table>
<thead>
<tr>
<th></th>
<th>PhD 2008</th>
<th>PhD 2012</th>
<th>Master's 2008</th>
<th>Master's 2012</th>
<th>Bachelor's 2008</th>
<th>Bachelor's 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>African-American</td>
<td>106</td>
<td>147</td>
<td>14</td>
<td>22</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14</td>
<td>64</td>
<td>7</td>
<td>29</td>
<td>340</td>
<td>411</td>
</tr>
<tr>
<td>Asian</td>
<td>19</td>
<td>74</td>
<td>0</td>
<td>10</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>14</td>
<td>77</td>
<td>3</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are fewer than 75 female physics and astronomy faculty members who are African-American and Hispanic in the entire U.S.

www.aip.org/statistics
Gender and Sexual Orientation

Recent survey of LGBQ faculty (N=389) finds

- LGBQ women are significantly less likely to be out professionally than LGBQ men
- LGBQ women are significantly more likely to observe and experience exclusionary behavior (i.e. being ignored, shunned, or harassed)
- LGBQ women were significantly less likely to report being very comfortable or comfortable in their classrooms or on campus

Rankin, S., Barthelemy, R., Patridge E.!
The Experiences and Persistence of LGBQ Faculty.!
In preparation for The Journal of Diversity in Higher Education
Welcome to the first website for lesbian, gay, bisexual, transgender, intersex, queer, questioning, asexual, pansexual, not-cisgender and not-straight (as well as friendly cis and straight) physicists. This resource website has come out of a need for resources for gender and sexual minority (GSM) physicists. We serve as a networking resource for young GSM physicists and students to find mentors, a place to find resources for laboratories and universities to make their physics departments more GSM friendly, as well as a hosting of information of get togethers of GSM physicists and allies.

Along with the AAS Working Group on LGBTIQ Equality, have recently updated our Best Practices Guide for physics and astronomy departments! It includes a list of suggestions that your department can enact to make it more inclusive and welcoming towards LGBT+ students and faculty.

If you would like to join our mailing list, please join the the Google Group below. If you are a physicist who is either an out GSM or ally, please consider e-mailing us so that we can add you our OutList, which will help other physicists network with you. If you would like to offer your skills and talents towards this cause, please contact us.

We look forward to meeting you and continuing to build this community!

Subscribe to lgbt+physicists
Email:  
Subscribe  

Visit this group

E-mail us at info@lgbtphysicists.org
APS to Study Sexual and Gender Diversity Issues in Physics

By Michael Lucibella, APS News

The American Physical Society announced that it is putting together a new committee to look into issues of discrimination and exclusion in the field of physics based on sexual identity, gender identity, and gender expression.

The Committee on LGBT Issues is charged with preparing a report on ways to make the physics community more inclusive to individuals who identify themselves as lesbian, gay, bisexual, transgender, or other sexual and gender minorities. The report is due out by spring of 2016.

The committee plans to start with a survey of physics institutions across the country. “We’re interested in understanding the climate for LGBT physicists,” said Michael Falk, a physicist at Johns Hopkins University and chair of the new committee. “The first thing we have to do is a lot of fact-finding,” Falk said. “We should try to get a measure of how many of us...there [are], where we are,... [and] the issues that LGBT physicists face.”

Falk added that he expected to see a lot of variation across the country’s physics institutions. “I don’t think it’s necessarily an easy thing to get a simple picture of,” Falk said. “Some places are very welcoming, while other places are very exclusionary.”

In addition, the committee is charged with putting together a list of recommended changes to common policies and practices in the physics community that affect LGBT physicists.

The committee grew out of LGBT+ Physicists, a group founded by Elena Long of the University of New Hampshire. She formed the small, informal forum in 2009 after finding few resources available for LGBT individuals once they completed their academic training. “There was really an entire lack of resources at the time,” Long said. “I thought I would just start collecting them.”

The group started meeting at the APS March Meeting, beginning in 2010. In 2012 the APS Committee on Minorities and the Committee on the Status of Women in Physics donated an invited session with 5 speakers to the group to present and discuss issues faced by LGBT physicists.

“APS and the LGBT+ Physicists group have been working together for a number of years,” Long said. “We’ve kind of been building this relationship with APS from the start.... We’re working to make the field of physics better and more inclusive.”
Summary and Resources
Conclusions

• The Gender Equity Challenge:
  – Women’s participation rate in physics (and other STEM fields) remains low compared to that of men.
  – Social science research implicates numerous causes: family responsibilities, dual-career issues, implicit bias, negotiation skills, isolation, intersecting identities ...

• Research also identifies solutions involving individuals, institutions, HR departments, and funding agencies
  – Clear, known, consistent, gender-neutral family-friendly practices
  – Open discussion of the importance of inclusion
  – Role models, skill-building and mentoring

• The National Labs can use these tools to improve inclusion of women and other under-represented groups in STEM.
FOR FURTHER INFORMATION

American Institute of Physics Statistical Research Center:  www.aip.org/statistics/

American Physical Society

Faculty Family Friendly Edge:  ucfamilyedge.berkeley.edu/

Gender Equity Project:  www.hunter.cuny.edu/genderequity/

Guide to Inclusive Hiring:  http://wiseli.engr.wisc.edu/searchguidebooks.php

Books and Articles:
• L. Babcock and S. Laschever [Negotiation],  Women Don’t Ask  and  Ask For It
• S.E. Page [Diversity and Teams]  The Difference
• C. Steele [Stereotype Threat]  Whistling Vivaldi
• Nature  special issue:  Vol. 495, 7 March 2013
• Inside Higher Ed,  Mend The Gap  [Career Advice Column by E.H. Simmons]

NSF ADVANCE Portal Website:  www.portal.advance.vt.edu/
Michigan State’s ADAPP-ADVANCE Project:  www.adapp-advance.msu.edu/