Survey of the physics landscape and attempts to improve diversity

Brian Beckford
University of Michigan

APS DPF Meeting, August 3, 2017
Women and URM make up a substantial portion of the US population

- Women are about 50%, Hispanics, 17%, black 13%, Asian, 6%, (American Indian, Alaskan Native, Native Hawaiian, Pacific Islander, and those who reported more than one race 2%. (URM ~ 35%)

Noninstitutionalized resident population of the United States ages 18–64, by race, ethnicity, and sex: 2014

- White men 31.0%
- White women 31.0%
- Asian men 2.7%
- Asian women 3.0%
- Black men 6.1%
- Black women 6.6%
- Hispanic men 8.7%
- Hispanic women 8.3%
- Other men 1.2%
- Other women 1.3%

NOTES: Hispanic may be any race. Other includes individuals not of Hispanic ethnicity who reported more than one race or a race not listed separately.
Underrepresented Minority (URM): Statistically underrepresented group in a field and that is not representative of population. For this talk, the URM is Hispanic-, African-, and American Indian, Alaskan Native, Native Hawaiian, and Pacific Islander.

Science and engineering degrees earned by underrepresented minority women and men: 1995–2014

Percent

Bachelor's, women
Master's, women
Bachelor's, men
Master's, men
Doctorate, women
Doctorate, men

NOTE: Data not available for 1999.
Bachelor’s degrees earned by Hispanic-, African Americans in physical science fields

Hispanic American and African American physics BS accounts for 2-3% of earned degrees, respectively. Native American physics BS is roughly 0.5%.

Source: IPEDS Completion survey by race, US Census
Native American Participation in Physical Sciences and Engineering

Conclusion

Overall, Native Americans are earning physical science and engineering bachelor's degrees at lower rate than the total population. For every 1,000 degrees earned by Native Americans, 41 were earned in engineering and 12 were earned in the physical sciences, compared to 54 and 15 by the total population, respectively. Figure 4 shows the trends in degrees earned by Native Americans in engineering fields and the physical sciences as a percentage of total degrees earned. Reporting the proportion of degrees earned shows a clear downward trend for Native Americans among degree recipients. If trends continue at their current rates, underrepresentation in these fields will only increase for Native Americans.
Physics continues to be the least diverse of the sciences

Initiatives to increase the participation of women in physics has had positive results

The increase in representation of women that have earned degrees is mostly attributed to the increase of degrees earned by white women

Credit: APS/Source: IPEDS Completion Survey & NSF-NIH Survey of Graduate Students & Postdoctorates in Science and Engineering
Putting it in all in perspective

Number of physics degrees earned in physics since 1973 can demonstrate the point

Women who earned physics doctorates (1973-2015)

- Hispanic: 211
- Am. Indian/Alaska Native: 4
- Asian: 2581
- Black: 59
- White: 3582
- Two or more races: 21
- Other or race not reported: 65
- Ethnicity not reported: 475

Men who earned physics doctorates (1973-2015)

- Hispanic: 1411
- Am. Indian/Alaska Native: 42
- Asian: 12848
- Black: 420
- White: 29018
- Two or more races: 103
- Other or race not reported: 505
- Ethnicity not reported: 3920
Putting it in all in perspective

Number of physics degrees earned in physics since 1973 can demonstrate the point

Degrees earned by URM men and women are orders of magnitudes below those of white men and women

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>211</td>
<td>1411</td>
</tr>
<tr>
<td>Am. Indian/Alaska Native</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>Asian</td>
<td>59</td>
<td>12848</td>
</tr>
<tr>
<td>Black</td>
<td>59</td>
<td>420</td>
</tr>
<tr>
<td>White</td>
<td>3582</td>
<td>29018</td>
</tr>
<tr>
<td>Two or more races</td>
<td>21</td>
<td>103</td>
</tr>
<tr>
<td>Other or race not reported</td>
<td>65</td>
<td>505</td>
</tr>
<tr>
<td>Ethnicity not reported</td>
<td>475</td>
<td>3920</td>
</tr>
</tbody>
</table>

Putting it in all in perspective
Putting it in all in perspective

The total number of physics PhDs earned by black men is roughly 500 in US History.

The total number of physics/astronomy PhDs earned by black women is roughly 100.

This image highlights about 1/5 of all black women with a PhD in physics/astronomy.
Addressing diversity
Is the current level of representation of people from diverse backgrounds acceptable? If not, is it solvable?

What can we as a community do to address it?

How do we make it sustainable?
American Physical Society (APS)

❖ CSWIP and CUWiP
  ‣ committed to encouraging the recruitment, retention, and career development of women physicists at all levels.

❖ COM
  ‣ addresses the production, retention, and career development of minority physicists and gathers and maintains data on minorities in physics in support of these objectives

❖ National Mentoring Community (NMC) is a program to increase the number of underrepresented ethnic/racial minority students who complete Bachelor’s degrees in physics.

❖ LGBTQ+: Ad Hoc Committee on LGBT Issues (C-LGBT)
American Institute of Physics (AIP)

- Liaison Committee on Underrepresented Minorities (LCURM)
  - Composed of a designee for nine of the ten AIP member societies and from NSBP, NHSP, and SPS
  - Specifically focused on increasing the percentage of African American who received BS in physics and astronomy
URM trends in physics

Percentage of degrees earned by URM in Physics

US College-age minority population

Bridging this national achievement gap requires roughly about 30 PhDs

63 PhDs on average

©2017, B. Beckford: bobeck@umich.edu
These students would have entered graduate school!
Retention rates in physics graduate programs

- National Average ≈60%
- APS ≈ 93% retained
- Fisk-Vanderbilt ≈90% retained. Started in 2004, the program has admitted 112 students, 90% of them underrepresented minorities (45% female)
Bridge Programs can provide for students from diverse backgrounds the opportunity to excel and become scientists, leaders, and role models of the future.

Implemented best practices can increase diversity in student enrollment and retention, and ultimately the physics community.

OSU Physics Graduate Program Diversity

Dr. Jedidah Isler
First black woman to earn PhD in astrophysics from Yale university was part of the Fisk-Vanderbilt bridge program

Dr. Brittany Kamai
First native Hawaiian woman to earn PhD in physics was part of the Fisk-Vanderbilt bridge program
Change will not come if we wait for some other person or some other time. We are the ones we’ve been waiting for. We are the change we seek.

-Barack Obama
Supplemental
Terms

**Diversity**: Increasing the presence, recognition, understanding, and positive impact of diversity

**Equity**: Actively challenging and responding to bias, harassment, discrimination, and inequity

**Inclusion**: Every individual is valued and feels a sense of belonging and inclusion

**Accessibility**: Enable full participation for all
Intersectionality

**Intersectionality**: Two of more identities that impact each other

Diversity and inclusiveness initiatives must acknowledge intersectionality of:

- Racial/ethnic identity with Gender and Sexual Minorities (GSM),
- Members of the LGBTQ+ community
- Disabled
- Non-traditional students
Goals of APS Bridge Program

APS Bridge Program - National effort to increase the number of PhD earned by underrepresented students in physics.

- Increase the fraction of physics PHDs Awarded to underrepresented minority students to match the fraction of physics bachelors awarded

- Develop, evaluate, and document sustainable bridging experiences that improve the access to the culture of graduate education for all students, with emphasis on underrepresented groups in doctoral physics programs

- Promote and disseminate successful program components to the physics community
Bridge programs in physics

Bridge Program -

- An approach to addressing the underrepresentation of some groups in physics
- Aimed at providing opportunities for students to be successful that may not have had such chances by traditional means

APS Funded Sites:
- Florida State University
- Indiana University
- Ohio State University
- University of Central Florida
- University of South Florida
- Cal. State Long Beach

Other Programs:
- University of Michigan
- Columbia University
- Fisk/ Vanderbilt University
- MIT
- Princeton University
- University of Chicago
- Others under development
The Bridge Program in physics is a very flexible program that will provide you with the tools and experiences to help you achieve your goals. Like any other graduate program, it requires a lot of hard work and will not be devoid of highly rewarding challenges, yet at the same time it is designed to give you the best support to succeed. What advice do you have for aspiring URM physics graduate students? The encouraging news is that to raise the 5-6% up to 10% only requires that we graduate about 30 more URM PhDs each year. This is a goal that the APS believes is attainable, and the premise that the Bridge Program is designed to address. The critical issues are a) finding students who can be successful with appropriate guidance and coursework, and b) finding faculty and departments that are willing to provide this assistance. The APS-BP is on track to eliminate this achievement gap, and is lending assistance to students and faculty willing to take on these challenges.

Member Institutions
- 93 in 36 states
Partner Institutions
- 19 in 14 states
Bridge Sites:
- Pre-existing: 4
- APS: 6
- In development: 4
Bridge Program best practices

Faculty involvement

- 10-15% tenure faculty involvement needed for sustainability

Admissions decisions (holistic approach)

- Decide what are you selecting for? Success? ("Holistic review")

Initial placement

- Academic preparation and skills assessment
- Honest self assessment by student

Financial support

- Secure funding for at least one year for bridging experience (timing)

Mentoring

- Mentor-mentee compact outlining expectations, and multiple mentors (including peer mentoring)
Bridge Program best practices

Coursework

- Flexibility in courses and usage of cross listed courses (induction advising and alternate plan)

Progress monitoring and inductions

- Introduction into graduate life and new culture
- Weekly progress meetings (timing, intervention)

Research

- Appropriate match in research interest. Having a mentoring support system means a poor lab environment does not have to be ruled out
Retention best practices

Mentoring

- Faculty seeking to become better mentors
  - Training on culturally sensitive mentoring
  - Seek others that could be a mentor in a way that you are unable

- Wrap-around mentoring model
  - Peer mentors, PD mentors, advisors, coordinators, mentors outside of department
  - Research evaluation rubric to get feedback on progress
Retention best practices

Mentoring

- Professional development seminars
  - Stereotype threat, imposter syndrome, time management, mental health, care and feeding your advisor, and pushing through to graduation

- Preparation for career
  - Practice for interview talks
  - Job negotiation skills
Resources

AIP Statistical Research Center: aip.org/statistics

APS Bridge Program : www.apsbridgeprogram.org

Fisk-Vanderbilt Bridge Program: fisk-vanderbilt-bridge.org

University of Michigan Bridge Program: Michigan Imes-Moore Fellows program

Stereotype Threat: www.reducingstereotypethreat.org