Bridge Programs as an approach to increasing diversity in physics

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Contents

Introduction/Statistics

Bridge Programs

Best Practices

Outcomes

Conclusion/Outlook
Bachelor’s Degrees Earned by African Americans in Physical Science Fields

African American Physics BS accounts for 2-3% of earned degrees

Percentage of BS degrees earned by African Americans by Major

Sources: IPEDS Completion survey by race, US Census
Bachelor’s Degrees Earned by Hispanic Americans in Physical Science Fields

Hispanic Americans Physics BS accounts for 6-7% of earned degrees

Percentage of BS degrees earned by Hispanic Americans by Major

Sources: IPEDS Completion survey by race, US Census
Physics is the least diverse of the sciences

Credit: APS/Source: IPEDS Completion Survey & NSF-NIH Survey of Graduate Students & Postdoctorates in Science and Engineering
Percentage of degrees earned by URM in Physics

US College-age minority population

- BS
- PhD

Bridging this gap is roughly about 30 PhDs

63 PhDs on average
Diversity in Physics Faculty

Where do most URM have positions?

- 50% of African American faculty are employed at HBCUs
- HBCUs account for roughly 4% of physics departments
  - most physics students have never had/seen black faculty on their academic path

**Number of African-American and Hispanic Physics Faculty by Highest Degree Awarded by Department, 2012**

<table>
<thead>
<tr>
<th>Year</th>
<th>PhD</th>
<th>Master's</th>
<th>Bachelor's</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>64</td>
<td>5229</td>
<td>815</td>
</tr>
<tr>
<td>2008</td>
<td>66</td>
<td>5204</td>
<td>721</td>
</tr>
<tr>
<td>2012</td>
<td>68</td>
<td>5196</td>
<td>665</td>
</tr>
<tr>
<td>2004</td>
<td>29</td>
<td>29</td>
<td>2,562</td>
</tr>
<tr>
<td>2008</td>
<td>50</td>
<td>56</td>
<td>78</td>
</tr>
<tr>
<td>2012</td>
<td>32</td>
<td>50</td>
<td>88</td>
</tr>
<tr>
<td>2004</td>
<td>2,229</td>
<td>60</td>
<td>82</td>
</tr>
<tr>
<td>2008</td>
<td>1,130</td>
<td>65</td>
<td>82</td>
</tr>
<tr>
<td>2012</td>
<td>1,41</td>
<td>82</td>
<td>82</td>
</tr>
</tbody>
</table>

African-American
Hispanic
Other (Including White)

**Race and Ethnicity of Physics Faculty**

<table>
<thead>
<tr>
<th></th>
<th>Physics</th>
<th>All Disciplines*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2004 (%)</td>
<td>2008 (%)</td>
</tr>
<tr>
<td>African-American</td>
<td>2.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Asian</td>
<td>10.6</td>
<td>13.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>White</td>
<td>82.2</td>
<td>80.0</td>
</tr>
<tr>
<td>Other</td>
<td>2.2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

* Data for all disciplines (which includes non-science disciplines) found at [http://nces.ed.gov/fastfacts/display.asp?id=61](http://nces.ed.gov/fastfacts/display.asp?id=61)

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Bridge Programs in Physics

Bridge Program -

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

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

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
Goal of APS Bridge Program

APS Bridge Program

๏ 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**

**APS Bridge Program Institutions**

- **Ohio State University**
  - 8 students
  - Established 2013

- **Indiana University**
  - 2 students
  - Established 2015

- **University of Central Florida**
  - 4 students
  - Established 2015

- **California State University Long Beach**
  - 8 students
  - Established 2014

- **Florida State University**
  - 5 students
  - Established 2014

- **University of South Florida**
  - 9 students
  - Established 2013

**APS Bridge Sites**

- **APS Bridge Sites**
- **Additional Bridge Sites**
- **APS Partnership Sites**
- **APS Affiliate Sites**
- **APS Member Institutions**

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**What advice do you have for aspiring URM physics graduate students?**

The Bridge Program 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.

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**Daniel**

Daniel’s interest was developed while working in Prof. Johnston-Halperin’s group. All these preparations have given me the confidence to become a more complete and strong PhD candidate.

**Upon completion of his PhD, Daniel plans to work in the private sector in his chosen field of interest, Condensed Matter Research. He is currently working on spin systems, specifically long-range vs. short-range interactions.**

Daniel believes the Bridge Program is “a great opportunity for anyone interested in pursuing a graduate education in physics.”

**SEVERAL CHALLENGES IN HER OWN ACADEMIC CAREER, COCHRAN IS SENSITIVE TO THE NUMEROUS CHALLENGES THAT UNDERREPRESENTED STUDENTS FACE IN THEIR ACADEMIC CAREER INCLUDING, BUT NOT LIMITED TO ACADEMIC, PERSONAL, FINANCIAL, AND FAMILIAL. IT IS COCHRAN’S GOAL TO POSITIVELY CONTRIBUTE TO THE APS BRIDGE PROGRAM AS IT CONTINUES TO MAKE A POSITIVE IMPACT ON THE NUMBER OF UNDERREPRESENTED STUDENTS RECEIVING DOCTORAL DEGREES IN PHYSICS.**

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**APRIL 2015**

[10 students](#)
Best Practices

Faculty Involvement

- 10-15% tenure faculty involved is needed for sustainability

Admissions decisions

- Decide what are you selecting for? (“Holistic review”)

Financial support

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

Mentoring

- Mentor-mentee contracts outlining expectations, and multiple mentors (including peer mentoring)

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
None of these students would have entered graduate school!

Over 100 students have been placed into Bridge or Graduate programs in physics.

None of these students would have entered graduate school!
Major Achievements

Placement
- APS ~ 66 students entered grad programs
- 36 scheduled for fall 2016

Retention rates
- APS ~88%
- Fisk Vanderbilt ~80%
- University of Michigan ~90%
- National average ~60%

U of Michigan Bridge to Doctorate Program (interdisciplinary)
- 97% of students completed the Bridge Masters (61/63)
- 70% of those that completed matriculated into a PhD program (43/61)
- 24 students entered UM PhD program (56% of those entering PhD programs)
Diversity does mean that standards of quality are lowered.

- Diversity does not have to come at the expense of quality.
- Lowering the bar only perpetuates stereotypes
- It also perpetuates feelings associated with imposter syndrome
- And bar for what?

Lowered Quality?
Conclusion/Outlook

If we care about science, then we must also care about scientists!!

Bridge Programs can be implemented to increase diversity in student enrollment and retention, and ultimately the physics community

Implementing best practices benefit all students

Bridge Programs provide an opportunity and access for students to be successful

Diversity and inclusiveness initiatives must acknowledge intersectionality (Gender and Sexual Minorities (GSM) and members of the LGBTQ+ community)
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
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