Bridge Programs as an approach to increasing diversity in physics

Brian Beckford
University of Michigan
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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

Chemistry

Physics and Earth Sciences
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
URM Trends in Physics

Percentage of degrees earned by URM in Physics

US College-age minority population

- BS
- PhD

63 PhDs on average

Bridging this gap is roughly about 30 PhDs

Sources: IPEDS Completion survey by race, US Census

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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
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
my research skills by working in Prof. Johnston-Halperin’s group. All these preparations have given me the confidence to become a more complete and strong PhD candidate.

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.

played a significant role in helping to prepare him for a PhD in physics. He found the professors at FSU enthusiastic about helping him achieve his goals as well as very caring about students' well-being.

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.”

SILVA

CONTINUED FROM PAGE 2

California State University Long Beach
8 students
Established 2014

Florida State University
5 students
Established 2014

University of South Florida
9 students
Established 2013

Ohio State University
8 students
Established 2013

Indiana University
2 students
Established 2015

University of Central Florida
4 students
Established 2015

MINORITIES CONTINUED FROM PAGE 1

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.

The APS-BP has seen about as many causes as we have students, and nearly every student we have admitted to a doctoral program through the APS-BP has risen to the occasion. In many cases they just need to take an advanced undergraduate class at a higher level of rigor, for others, it just took recognition and guidance by concerned faculty members to mentor a student onto a proper path. 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.
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!
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)

APS Bridge Program

<table>
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<th>Project Year</th>
<th>Students Entering Graduate Programs</th>
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<td>2015</td>
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<table>
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<tr>
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<th>2015</th>
<th>Actions</th>
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<td>28</td>
<td>38</td>
<td>53</td>
<td>Eligible applications</td>
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<td>18</td>
<td>22</td>
<td>Bridge students selected</td>
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<td>23</td>
<td>69</td>
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<td>Departments expressing an interest in recruiting these students</td>
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<tr>
<td>12</td>
<td>20</td>
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<td>Remaining applications circulated</td>
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<td>7</td>
<td>6</td>
<td>Additional students recruited by “Affiliated” sites</td>
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<tr>
<td>13</td>
<td>25</td>
<td>28</td>
<td>Total number of students entering grad studies</td>
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<tr>
<td>11</td>
<td>24</td>
<td>28</td>
<td>Retained in physics graduate programs</td>
</tr>
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</table>
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
Additional
ETS Guidelines

ETS guide on use of scores

What are the impacts cut off scores?

- A score should not be the sole criteria of denial of admission
- Any department considering using a cut-off score should have a rationale justifying the use of the score in regards to the following
  - evidence that the proposed score usefully distinguishes between individuals that are likely to be success in graduate school and those that are not
  - the impact of the proposed score on the institution’s goals related to diversity
Physics GRE: Impact of Cutoff Scores

Use of minimum acceptable GRE score negatively impacts diversity in STEM.

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**Physical Sciences, US Citizens**

From ETS document: "Factors that can influence performance on the GRE general test 2006-2007".

- **Asian American**: $N = 1474$
- **White**: $N = 14957$
- **Other Hispanic**: $N = 393$
- **Mexican American**: $N = 398$
- **Native American**: $N = 90$
- **African American**: $N = 1055$
- **Puerto Rican**: $N = 260$

**Median (NRC; Physics):** 760

**GRE Quantitative Scores (2006-2007)**

- 75%
- 25%
- 50%

- **Men**: $N = 12492$
- **Women**: $N = 7104$

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Use of minimum acceptable GRE score negatively impacts diversity in stem
US PhD Physics Programs

There are around 180 graduate programs listed in the AIP graduate book.

- 96% require the general GRE with 1/4 stating a minimum score for admission (700)
- 46% require Physics GRE with 1/2 stating a minimum score for admission (600)
Other Reasons Students are Not Admitted

Admissions Committee:

- Members overwhelmed
- Not up to date on recent findings on admission research
- Not trained in selection

Students:

- Low GRE scores
- Applied to few schools (financial challenge)
- Application materials do not convey a predictive story
- Inadequate preparation
- “Feeling unprepared”
Present admission practices

- Traditional filters- GPA, GRE scores, and undergrad institution
- Qualitative - letters, statements, past research experience
Holistic Admissions

Best Practices

- Holistic admission practices

  - Interview candidates (takes time and effort)
  
  - Look at the whole story to discern research and leadership potential, enthusiasm, grit, and passion
  
  - Clearly decide the goals of admissions

  - Smart students, passing course, match for your research program with potential for great research?
Lowered Quality

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 by definition.
- It also perpetuates feelings associated with imposter syndrome.
- And bar for what?
Other Factors

Be aware of climate effects

- Stereotype threat
- Imposter syndrome
- Implicit bias
Physics is the least diverse of the sciences
### Top Producers (BS)

#### URM Undergraduate Physics Degrees: Bachelor’s Degree Institutions 2011-2013

<table>
<thead>
<tr>
<th>Institution</th>
<th>Average Degrees/Year</th>
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<td>California State Polytechnic University Pomona</td>
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#### URM Undergraduate Physics Degrees: Master’s Degree Institutions 2011-2013

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<tr>
<td>University of Texas at Brownsville</td>
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<tr>
<td>University of Puerto Rico Rio Piedras</td>
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#### URM Undergraduate Physics Degrees: PhD Degree Institutions 2011-2013

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<td>Arizona State University Tempe</td>
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# Top Producers (MS & PhD)

## URM Master’s Physics Degrees:
### Master’s Degree Institutions 2011-2013

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<td>North Carolina Central University</td>
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<td>University of Puerto Rico Mayaguez</td>
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<td>California State University Northridge</td>
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<td>Christopher Newport University</td>
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<td>University of Houston Clear Lake</td>
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## URM PhD Physics Degrees:
### PhD Degree Institutions 2011-2013

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<td>Stanford University</td>
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<td>Massachusetts Institute of Technology</td>
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<td>California Institute of Technology</td>
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<td>New Mexico State University Main Campus</td>
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<td>Rice University</td>
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<td>Texas A &amp; M University College Station</td>
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