Erasing the Achievement Gap in Graduate Education for Underrepresented students:
Bridge Programs run by Professional Societies

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American Physical Society
Joint Diversity Statement

08.2 JOINT DIVERSITY STATEMENT
(Adopted by APS, NSBP, NSHP in 2008)

To ensure a productive future for science and technology in the United States, we must make physics more inclusive. The health of physics requires talent from the broadest demographic pool. Underrepresented groups constitute a largely untapped intellectual resource and a growing segment of the U.S. population.

Therefore, we charge our membership with increasing the numbers of underrepresented minorities in physics in the pipeline and in all professional ranks, with becoming aware of barriers to implementing this change, and with taking an active role in organizational and institutional efforts to bring about such change. We call upon legislators, administrators, and managers at all levels to enact policies and promote budgets that will foster greater diversity in physics. We call upon employers to pursue recruitment, retention and promotion of underrepresented minority physicists at all ranks and to create a work environment that encourages inclusion. We call upon the physics community as a whole to work collectively to bring greater diversity wherever physicists are educated or employed.
URM in Higher Education

Sources: IPEDS, US Census, AIP SRC
Bachelor and PhD STEM Degrees

<table>
<thead>
<tr>
<th>Field</th>
<th>BS</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>18%</td>
<td>20%</td>
</tr>
<tr>
<td>Biology</td>
<td>16%</td>
<td>12%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td>Engineering</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td>Math and Stats</td>
<td>10%</td>
<td>6%</td>
</tr>
<tr>
<td>Physics</td>
<td>8%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Source: IPEDS
52 PhDs awarded to minorities in 2010

9-10% of BS degrees in physics are granted to underrepresented minorities

Only ~30 students!

Sources: IPEDS Completion survey by race, US Census
APS Bridge Program: Project Goals

• Increase, within a decade, the number of physics PhDs awarded to underrepresented minority students to match the fraction of physics Bachelor’s degrees granted to these groups

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

• Promote and disseminate successful program components to the physics community
## Leadership / Oversight

### National Advisory Committee
- J.D. Garcia (Arizona)
- Yolanda George (AAAS)
- Wendell Hill (UMCP)
- Anthony Johnson (UMBC)
- Ramon Lopez (UT Arlington)
- Steve McGuire (Southern University)
- Cherry Murray, *chair* (Harvard, APS President 2009)
- Luz Martinez-Miranda (President, NSHP)
- Paul Gueye (President, NSBP)
- Brittany Kamai (Grad student)
- James Mathis (Grad student)

### Architect’s Council
- Marcel Agüeros (Columbia)
- Ed Bertschinger (MIT)
- Andreas Bill (CSU Long Beach)
- Simon Capstick (Florida State)
- Cagliyan Kurdak (Michigan)
- Garrett Matthews (USF)
- Jon Pelz (Ohio State)
- Talat Rahman (UCF)
- Keivan Stassun (Fisk/Vanderbilt)
- Jon Urheim (Indiana)

### Project Leadership
- Brian Beckford (APS, Project Mgr.)
- Theodore Hodapp (APS, Project Dir.)
- Arlene Modeste Knowles (APS)
- Geoff Potvin (FIU-Research advisor)
- Monica Plisch (APS)
- Rachel Scherr (SPU-Project evaluator)

### Funding
- NSF (PHY, DMR, HRD)
- APS

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APS Bridge Program: Key Features

• **Recruiting** through graduate programs (now 115+ institutions, representing 73% of all doctoral students), undergrad programs

• **Establish** Bridge Sites:
  - Year 1: Advanced undergraduate or grad courses, introduction to grad-level research, active mentoring, progress monitoring, social integration into grad school *(Project funds)*
  - Year 2: Take 1st year grad courses, apply to PhD program, research underway *(Department funds)*

• **Place** ancillary students (at Partnership Institutions):
  - 69 graduate programs look at “other” applications, recruited additional 7 students (2014); No direct support for students, some travel support
  - “COM approved” Partnership Institutions; national recognition of program

• **Monitor** student/site progress

• **Research**

• **Disseminate / Advocate**
Bridge Programs in Physics

APS Sites:
• Cal State Long Beach
• Florida State University
• Indiana University
• Ohio State University
• University of Central Florida
• University of South Florida

Non-APS Sites:
• Columbia University
• Fisk / Vanderbilt
• MIT
• Princeton University
• University of Chicago
• University of Michigan
Bridge Sites and Partnership Institutions

- Admission decisions ("holistic" criteria)
- Financial support (timing)
- Coursework (induction advising critical, allow advanced undergrad courses)
- Progress monitoring (timing, tutors if needed)
- Multiple mentors (intervention, peer involvement)
- Research (appropriate match)
Student Recruiting

• Send packets to doctoral programs (~180) asking to send information to URM students who were not accepted
• Send packets to all physics departments (~750) to advise promising students who are unlikely to gain admission to apply
• Visits to MSI to inform faculty and students of the program
• Information spread in other visits, conferences, chair’s meetings, website, etc.
Student Eligibility

- Bachelor’s degree in physics or closely related discipline
- US citizen or permanent resident
- Either:
  - Applied but was not accepted
  - Did not apply to graduate program this year
- Be committed to improving diversity in physics
- Meet individual requirements of the institution
- Students may not be currently enrolled or have an existing physics graduate degree

We review applications AFTER April 15
## Admissions Data

<table>
<thead>
<tr>
<th>Year</th>
<th>Eligible Applications</th>
<th>Bridge Students Selected</th>
<th>Departments Expressing Interest</th>
<th>Remaining Applications Circulated</th>
<th>Additional Students Recruited by “Affiliated” Sites</th>
<th>Total Number of Students Entering Grad Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>28</td>
<td>8</td>
<td>23</td>
<td>12</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>2014</td>
<td>38</td>
<td>18</td>
<td>69</td>
<td>20</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>2015</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35*</td>
</tr>
</tbody>
</table>

*Prediction

None of these students would have entered graduate studies
Bridge Program Achievements

National Achievement Gap

![Bar chart showing progress from 2013 to 2017 with 95% Retention]

- Project Year
- Placed Students
- Project Goal
- Project Achievement

95% Retention
Research Efforts

• Graduate admissions study
  • Doctoral institutions
  • Master’s institutions

• GRE (and other) admissions data: Correlations with student success; impact on diversity

• Holistic admissions practices: practical use of non-cognitive measures or other practical techniques for use by physics graduate admissions faculty (parallel effort by CGS)

Considering:
• Data gathering on MS programs
• Departure paths from physics graduate programs
Physics GRE: Impact of Cutoff Scores

- Fraction (White) at 650: 0.44
- Fraction (Hispanic) at 650: 0.34
- Fraction (Black) at 650: 0.09
- Fraction (Asian) at 650: 0.61
• Graduate student organizations are key, and easy to form
• Sites admit students for 2-year program (APS covers costs for one transitional year)
• APS acting as “matchmaker” for students and programs
• Sites plan on admitting students to their own doctoral program
• Students take advanced undergraduate courses and some grad courses in first year (some take all grad courses)
• Sites are leveraging their actions internally and externally
• Variety of reasons why students are not admitted
Some reasons students are not admitted

**Students:**
- Low Physics GRE scores
- Apply to too few places
- Apply to wrong places
- “Feel” unprepared (self-esteem)
- Inadequate preparation: will fail in grad courses
- Application materials do not tell a predictive story

**Admissions Committees:**
- Members overwhelmed
- Members unaware of scholarship
Key Takeaways

• APS acts as “super-recruiter” for many graduate programs (PhD and MS) – applying for students to more than 70 institutions – at zero cost to students!

• Recruiting on this scale can not be done by universities – need a larger entity acting for the discipline (probably most easily replicated in physics, chemistry, geosciences, and mathematics)

• Program could actually “solve” national achievement gap in physics (very rare!)

• Annual meeting: 9-11 October 2015; Miami, FL at FIU

www.apsbridgeprogram.org
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