National Science Foundation

7 December 2015
Ballston, VA

APS Bridge Program

Theodore Hodapp
Director of Education and Diversity

Kathryne Woodle
Education and Diversity Programs Manager
American Physical Society
8.2 JOINT DIVERSITY STATEMENT  
(Adopted by Council on November 16, 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.
<table>
<thead>
<tr>
<th>Category</th>
<th>All Bachelor Degrees</th>
<th>Physics Bachelor Degrees</th>
<th>Physics Doctoral Degrees</th>
<th>Physics Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Age Population</td>
<td>1.4M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Bachelor Degrees</td>
<td>360k</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics Bachelor Degrees</td>
<td>570</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics Doctoral Degrees</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics Faculty</td>
<td>~20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9-10% of BS degrees in physics are granted to underrepresented minorities.

52 PhDs awarded to minorities in 2010.

Sources: IPEDS Completion survey by race, US Census
Bachelor and PhD STEM Degrees

Percentage of Minorities

- Computer Science
- Chemistry
- Biology
- Engineering
- Math and Stats
- Physics

BS vs PhD
Leadership / Oversight

National Advisory Committee

- J.D. Garcia (Arizona)
- Yolanda George (AAAS)
- Paul Gueye (NSBP)
- Wendell Hill (UMCP)
- Anthony Johnson (Chair, UMBC)
- Brittany Kamai (Grad student)
- Ramon Lopez (UT Arlington)
- Luz Martinez-Miranda (NSHP)
- James Mathis (Grad student)
- Steve McGuire (Southern University)
- Ritchie Patterson (Cornell)

Funding

- NSF
- APS
- Bridge sites

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)

Research / Assessment

- Geoff Potvin (FIU-Research advisor)
- Rachel Scherr (SPU-Project evaluator)
GOAL TWO: To Better Serve the Physics Community
Objective 3: Education and Diversity:
• Coordinate and lead an innovative program to increase the number of underrepresented minorities obtaining a PhD in physics.
Underlying Themes

• Focus on underrepresented minorities (African American, Hispanic, Native American)
• Base components on published successes of others
• Design program to avoid “rearranging the deck chairs”
• Bring unique position/stature of APS
• Measurable outcomes must be immediately recognizable by an APS member as having significant value
• Must have significant national impact
APS Bridge Program: Key Features

- **Recruit** through graduate programs (unaccepted students), undergrad programs (promising students)
- **Establish** Bridge Sites (6):
  - 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 1\textsuperscript{st} year grad courses, apply to PhD program, research underway (Department funds)
- **Place** additional students (at Partnership Institutions):
  - 46 graduate programs looked at “other” applications (2015), recruited additional students; No direct support, some travel
  - “COM approved” Partnership Institutions; national recognition of program
- **Monitor** student/site progress
- **Research**
- **Disseminate / Advocate**
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 in a graduate program

We review applications AFTER April 15
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
- several others developing…
• Member Institutions
  • 92 in 36 states
• Partnership Institutions
  • 16 in 12 states
• Bridge Sites
  • Pre-existing: 4
  • APS: 6
  • Developing: 4
Bridge Sites and Partnership Institutions

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

<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>
<th>Retained in Physics Graduate Programs</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>
<td>11</td>
</tr>
<tr>
<td>2014</td>
<td>38</td>
<td>18</td>
<td>69</td>
<td>20</td>
<td>7</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>2015</td>
<td>53</td>
<td>22</td>
<td>45</td>
<td>29</td>
<td>6</td>
<td>45</td>
<td>28</td>
</tr>
</tbody>
</table>

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

• 6 Bridge Sites
  • 5 promised
  • 2+ now self funded
• 95% retention rate
  • 60% is average for physics
• Increasing by ~30/year answers national need
• Growing interest by departments and students

![Graph showing National Achievement Gap and Placed Students](Image)

*Project Goal*

Placed Students

Project Year

2013  2014  2015  2016  2017
What we didn’t know…

…and learning this surprised us!

1. Aggregating applications is a powerful tool
2. Graduate programs (most) want to do better
3. Admissions are not what they seem
4. Applications are expensive
5. Importance of graduate student groups
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
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:
• Student perspective on admissions
Physics GRE: Impact of Cutoff Scores

Fraction (White)

Fraction (Hispanic)

Fraction (Black)

Fraction (Asian)

0.09 (Black)

0.34 (Hispanic)

0.44 (White)

0.61 (Asian)
Next Steps…

- Broader implementation of advances made by Bridge Program (admissions, induction, 1st year support, peer and faculty mentoring)
- Interface with APS National Mentoring Community
- Better understand graduate admissions and advocate for a better informed process
- Planning joint Bridge Program / Graduate Education in Physics Meeting: February 2017

Happy Physicists ⇒ Great Physics
This material is based upon work supported by the National Science Foundation under Grant No. 1143070

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.