MRSEC Education Networking

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Boston, MA

Promoting Diversity in Physics
Graduate Education

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American Physical Society
Director of Education and Diversity
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.
Physics / STEM Bachelor Degrees

Source: IPEDS Completion Survey
US Population

Source: US Census
Hispanic Science/Math Majors

Sources: IPEDS Completion survey by race, US Census

www.APSBridgeProgram.org

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African American Science/Math Majors

US College-age African American population

Sources: IPEDS Completion survey by race, US Census

www.APSBridgeProgram.org ©2014, American Physical Society; Email: hodapp@aps.org
Percentage of African American Physics Majors from HBCUs/BSIs

20% 30% 40% 50% 60% 70%

1995 1997 1999 2001 2003 2005 2007 2009 2011
Underrepresentation in Physics

Source: IPEDS, US Census

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52 PhDs awarded to minorities in 2010

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

US College-age minority population

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)
• Ximena Fernández (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)
• Keivan Stassun (Fisk/Vanderbilt)

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

Funding
• NSF (PHY, DMR, HRD)
• APS
APS Bridge Program: Key Features

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

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

• Ancillary Students (Partnership Institutions):
  • 69 graduate programs look at “other” applications, recruited additional 8 offers to these students (2014)
  • Beginning approval of APS “COM approved” Partnership Institutions; national recognition of program
  • No direct support for students, some travel support possible

• APS monitors progress of all students; conduct research
Bridge Sites and Partnership Institutions

- Admission decisions (criteria, process)
- Financial support (timing, amount)
- Coursework (induction advising critical, allow advanced undergrad coursework)
- Multiple Mentoring (timing, intervention)
- Progress monitoring (coursework, tutors if needed, research “fit”)
- Community (induction, socialization)
- Research (appropriate match)
Getting Involved

• **Member Institution** (any institution)
  Free; receive information / updates; reduced fees for APS-BP conferences (~70 institutions)

• **Partnership Site** (graduate only)
  APS COM approval process; recommended site for Bridge Fellows (and others) to attend; demonstrate effective practices in graduate student support

• **Bridge Site** (graduate only)
  Receive significant funding from APS; build sustainable program; prepare 2+ students each year for graduate study; significant institutional commitment
Member Institutions

61 Approved
10 Pending
Participation Institutions

- Accept students into their program (either from APS application pool, or Bridge Fellows)
- “Approved” by APS Committee on Minorities (COM)
- Advertised on APS website
- Get access to applicant pool (eventually this may be limited to Partnership Institutions)
- Follow guidelines of Bridge Programs
- “Recommended” by URM student advisors
Bridge Programs in Physics

Non-APS Sites:
- Columbia University
- Fisk / Vanderbilt
- MIT
- University of Michigan

APS Sites:
- Cal State Long Beach
- Florida State
- Ohio State
- South Florida

APS adding 2 more in 2015
- RFP in progress
- Selection by March 2015
- 3-years of funding to build a sustainable bridge program
Bridge Site Selection

• Physics Doctoral or Master degree granting department
• APS-BP Member Institution
• Able to absorb 2 bridge students into research program annually
• Institution and department support and commitment
• Sustainability
• Geographic/Research Field breadth
Bridge Site Selection

- NSF-style pre-proposal/full-proposal process; external and internal readers; APS Committee on Minorities representation
- 2013: Ohio State, South Florida
- 2014: Florida State, Cal State Long Beach
- Expect 2 more sites in 2015
Student Eligibility

- Bachelor’s degree in physics or closely related discipline
- US citizen or permanent resident
- Either:
  - Did not apply to graduate program this year
  - Applied but was not accepted
- 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
Student Recruitment

• Packages sent by doctoral programs to URMs not given admission

• Participating Departments:
  • 2013: 106 (62%);  2014: 115 (67%)
  □ “Good luck with the program, we are all pulling for you.”
     Meg Urry, Yale University
  □ “Thanks for coordinating this great program!”
     Andrew Gavrin, IUPUI
  □ “Thank you for your important work on this issue.”
     Andrew Layden, Bowling Green State University

Generating significant good will
Student Recruitment

- Packets also sent to all other physics departments:
  - BS: 500; MS: 82; PhD: 171

- Total packages sent: 725 (2013), 886 (2014)

- Advertisements (newsletters, publications, websites)

- Applicant pool shared with all physics bridge programs

Results:

2013
- 64 Started application
- 29 Completed
- 93% URM
- 18% Female

2014
- 77 Started application
- 41 Completed
- 93% URM
- 32% Female

APS in unique position to do this
Admissions Decisions

<table>
<thead>
<tr>
<th>2013</th>
<th>2014</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>18</td>
<td>Bridge students selected</td>
</tr>
<tr>
<td>23</td>
<td>69</td>
<td>Departments expressing an interest in recruiting these students</td>
</tr>
<tr>
<td>12</td>
<td>23</td>
<td>Remaining applications circulated</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>Additional students recruited by “Affiliated” sites (8 matriculated)</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Students withdrew – most with offers available</td>
</tr>
</tbody>
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26 students total! None of whom would have entered graduate studies
Admissions Decisions

• Each bridge site uses their own criteria
• Physics GRE not used
• APS provides support for students who meet our criteria – insures we increase the number of URM students
• Increasing use of “non-cognitive” assessments – explored through Skype or in-person interviews
  • Self-concept
  • Realistic self-appraisal
  • Long-range goals
Bridge Program Achievements

National Achievement Gap

<table>
<thead>
<tr>
<th>Year</th>
<th>Placed Students</th>
<th>Project Goal</th>
<th>Project Achievement</th>
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<tbody>
<tr>
<td>2013</td>
<td>5</td>
<td>5</td>
<td>10</td>
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<tr>
<td>2014</td>
<td>10</td>
<td>20</td>
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<td>2016</td>
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<td>2017</td>
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Site Progress

- Site visits to all 4 doctoral sites that accepted students
  - Each site has developed a “team” to address multiple components of admissions/advising/mentoring/research
  - USF has change in leadership
- APS contact with students ~1/semester
- Ohio State reports that URMs in their regular applicant pool went up substantially
- Interactions continue with all sites
Concerns

• Can we attract enough African Americans to the program?
• Will students be perceived as having the same level of quality?
• How will bridge students be treated by their peers?
• How will this be sustained at bridge sites, post funding?
Annual Meeting

• 25–27 June 2014, ACP
• 68 attendees; 43 institutions
• Themes:
  • Role of Master’s degrees in promoting URM students
  • Mentoring
  • Non-cognitive variables
  • Building bridge programs
• Next meeting: October 2015
  • Held in conjunction with 1st meeting of National Mentoring Community
Research Efforts

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

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

Considering:
• Holistic admissions practices; practical use of non-cognitive measures for physics graduate admissions faculty
• Data gathering on MS programs
• Departure paths from physics graduate programs
Physics GRE: Impact of Cutoff Scores

- Fraction (White)
- Fraction (Hispanic)
- Fraction (Black)
- Fraction (Asian)

Scores and Fractions:
- 650: 0.09 (Black), 0.34 (Hispanic), 0.44 (White), 0.61 (Asian)
GRE Physics Scores: Impact of Cutoff Scores

Source: ETS

Fraction (F) 0.25 (F)
Fraction (M) 0.46 (M)

Score: 650
Selected Project Findings

• Students either don’t apply or apply to too few places to be successful
• There are departments who are very willing to work with students who lie outside of the standard acceptance criteria
• Sites admit students for 2-year program (APS covers costs for transitional year)
• Some students offered direct admissions to PhD program (7 of 13 in 2013, 10 of 26 in 2014)
• Sites plan on admitting students to their own doctoral program
• Students take mostly advanced undergraduate courses in first year
Next Steps

• Establish APS “COM Certified” Partnership Institutions
• Accept MS students into (separate, non-funded) applicant pool (יֵעַנְטָא)
• Add two more bridge sites
• Research questions
• Building a better pipeline

National Mentoring Community
National Mentoring Community (NMC)

Plans (established 22 November):

- Increase URM degree completion in physics
- APS identifies / connects mentors
- Mentors recruit mentees (locally)
- Provide an annual gathering of mentors and mentees to:
  - Spread best-practices; conduct professional skills workshops; connect students and their mentors with others (October 2015)
- Provide merit-based honors
- Needs-based scholarship program
- Track student progress
- Math Alliance has developed a network of 350+ mentors providing local mentoring to 600+ undergraduates
Key Takeaways

• Program could actually “solve” national achievement gap in physics (very rare!); APS in unique position to advance solution
• Significant goodwill generated by the program
• Now recruiting first “Partnership Institutions”
• ACS already interested in possible replication; AMS also showing interest
• Role of MS programs evolving
• Annual meeting evolving
• Long-term investment by APS lies in student recruiting, best-practice dissemination
• National Mentoring Community arising from COM