Changing the Face of Physics: Bridge Programs and the APS

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Discussion Topic I – Increasing number of minorities in physics

(Wendell) Hill offered to work with a subcommittee of Cherry Murray, David Ernst, Baha Balantekin and Ted Hodapp to look at items mentioned in this discussion and other suggestions, and return to the Executive Board with specific proposals related to increasing the numbers of minorities in physics.
GOAL TWO: To Better Serve the Physics Community

Objective 3: Education and Diversity: Be a leading voice in physics education and diversity programs, creating and partnering in models that can be replicated by other scientific societies.

• Serve physics departments by providing access to knowledge regarding best practices for teaching and learning physics, and for ensuring strong undergraduate and graduate degree programs.

• Coordinate and lead an innovative program to increase the number of underrepresented minorities obtaining a PhD in physics.
Minorities in Higher Education

- College Age Population: ~1.5M
- All Bachelor Degrees: ~200k
- Physics Bachelor Degrees: ~450
- Physics Doctoral Degrees: ~35
- Physics Faculty: ~12

URM Percentage

- All
- Physics
Hispanic Science/Math Majors

US College-age Hispanic population

Chemistry
Biology
Math and Stats
Engineering
Earth Sciences
Physics

Sources: IPEDS Completion survey by race, US Census

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African American Science/Math Majors

US College-age African American population

Sources: IPEDS Completion survey by race, US Census
Percentage of African American Physics Majors from HBCUs/BSIs

- 1995: 70%
- 1997: 60%
- 1999: 50%
- 2001: 40%
- 2003: 30%
- 2005: 20%
- 2007: 10%
- 2009: 20%
- 2011: 10%
52 PhDs awarded to minorities in 2010

Sources: IPEDS Completion survey by race, US Census
URM Physics PhDs to Minority Population

Sources: IPEDS Completion survey by race, US Census

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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)

Funding
• NSF (HRD, PHY, DMR)
• APS

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)
APS Bridge Program: Key Components

- Recruiting through graduate programs across the US (now 115+ institutions, representing 73% of all doctoral students)
- Spend 1-2 years in a “Bridging program”
- Track student progress
- Research into barriers; disseminate successful program elements
- Build a national coalition of departments committed to improving participation
- **APS acts as a national recruiter for URM students**
Bridge Sites

- Recruitment (APS, and institution)
- Admission decisions (criteria, process)
- Financial support (timing, amount)
- Multiple Mentoring (timing, intervention)
- Progress monitoring (coursework, tutors if needed, research “fit”)
- Coursework (induction advising critical)
- Community (induction, socialization)
- Research (appropriate match)
- Application coaching (GRE, statements, schools)
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
Levels of Participation

- Member Institution
- Partnership Institutions
- Bridge Site (graduate only)
Member Institutions

61 Approved
10 Pending
Levels of Participation

• **Member Institution**
• **Partnership Institutions**
  • Accept students into their program (either from APS application pool, or Bridge Fellows)
  • “Approved” by APS Committee on Minorities
  • Advertised on APS website
  • Get access to applicant pool (eventually this may be limited to PI)
  • Follow guidelines of Bridge Programs
• **Bridge Site (graduate only)**
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 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
Admissions Decisions

• 18 [8] students selected in 2014 [2013]
• 23 [12] applications circulated to 69 [23] departments expressing an interest in recruiting these students
• 9 [5] additional students recruited by “Affiliated” sites (8 matriculated)
• 8 [8] students withdrew – most with offers available
• 5 had no offers (that we know of)

26 students total!

None of whom would have entered graduate studies
Bridge Program Achievements

![Bridge Program Achievements Chart]

- **National Achievement Gap**
- **Placed Students**
- **Project Year**
- **Project Goal**
- **Project Achievement**

- 2013
- 2014
- 2015
- 2016
- 2017
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
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
  - Mentoring
Research Efforts

• Graduate admissions study
  • Doctoral institutions
  • Master’s institutions
• GRE (and other) admissions data: Correlations with student success; impact on diversity

Considering:
• 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

![Graph showing the impact of cutoff scores on different racial and ethnic groups.](image_url)
Selected 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 (2 of 8 in 2013)
- Sites plan on admitting students to their own doctoral program
- Students take mostly advanced undergraduate courses in first year
Concerns

- Can we attract enough African Americans to the program? (HS/AA Ratios: 2013: 1.7, 2014: 2.8, BS degrees: 2.3)
- Will graduates 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?
- Will students try to use this program as a “stepping stone” to a better institution?
- Are we insuring that students of the highest need are offered Bridge Fellowships?
- Staff resources to manage program
Next Steps

- Establish Partnership Institutions
- Accept MS students into (separate, non-funded) applicant pool
- Research questions
- Building a better pipeline

National Mentoring Community
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

• Beginning “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