The APS Bridge Program: Changing the Face of Physics Graduate Education

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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.
Hispanic American Bachelor Degrees

Sources: IPEDS Completion survey by race, US Census
African American Bachelor Degrees

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

Sources: IPEDS Completion survey by race, US Census

Only ~30 students!
Bachelor and PhD STEM Degrees

Percentage of URM

- Computer Science: 63 BS, 6 PhD
- Biological Sciences: 78 BS, 639 PhD
- Chemistry: 161 BS, 161 PhD
- Engineering: 386 BS, 386 PhD
- Mathematics and Statistics: 61 BS, 61 PhD
- Physics: 63 BS, 63 PhD
- Astronomy: 6 BS, 6 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)

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)
- Kelly Holley-Bockelmann (Fisk/Vanderbilt)
- Jon Urheim (Indiana)

Research / Assessment
- Geoff Potvin (FIU-Research advisor)
- Rachel Scherr (SPU-Project evaluator)

Funding
- NSF
- APS
- Bridge sites

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Bridge Program Design: Underlying Themes

- Focus on underrepresented minorities (Hispanic American, African American, Native American)
- Base components on published scholarship and operational successes of similar programs
- Design program to avoid “rearranging the deck chairs”
- Bring unique position of APS to bear on the problem
- 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, but uncompetitive 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):
  - 44 graduate programs looked at “other” applications (2016), 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…
Institutional Members

- Member Institutions
  - 108 in 36 states
- Partnership Institutions
  - 26 in 14 states
- Bridge Sites
  - Pre-existing: 4
  - APS: 6
  - Developing: 4

[Map of Institutional Members]

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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)
Bridge Program Achievements

- 23% Female (All: 20%)
- 93% URM (All: 6%)
  - 64% Hispanic
  - 24% African American
  - 5% Native
- 88% Retention (All: 60%)
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 score
- 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 admissions research findings
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)
• Student perspective on admissions
Physics GRE: Impact of Cutoff Scores

- Fraction (White): 0.09 (Black), 0.44 (White)
- Fraction (Hispanic): 0.34 (Hispanic)
- Fraction (Black): 0.09 (Black), 0.61 (Asian)
- Fraction (Asian): 0.61 (Asian)
Undergraduate GPA as a predictor

- Satisfactory
- At Risk
- Dropped
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 (www.aps.org/nmc)
• Better understand graduate admissions and advocate for a better informed process
• Spawning related research efforts in graduate education
• Joint Bridge Program / Graduate Education in Physics Meeting: 10-12 February 2017

Happy Physicists ⇒ Great Physics
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