APS Graduate Education and Bridge Program Conference
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College Park, MD

The APS Bridge Program

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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.
Leadership / Oversight

National Advisory Committee
• Emilio Codecido (OSU, Grad student)
• J.D. Garcia (Arizona)
• Yolanda George (AAAS)
• Wendell Hill (UMCP)
• Renee Horton (NSBP)
• Anthony Johnson (Chair, UMBC)
• Ramon Lopez (UT Arlington)
• James Mathis (UM, Grad student)
• Steve McGuire (Southern University)
• Jesús Pando (NSHP)
• Ritchie Patterson (Cornell)

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

Research / Assessment
• Deepa Chari (FIU-Postdoctoral Assoc.)
• Geoff Potvin (FIU-Research advisor)
• Rachel Scherr (SPU-Project evaluator)

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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
Hispanic American Bachelor Degrees

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

Sources: IPEDS Completion survey by race, US Census

Population
Chemistry
Biology
Math and Stats
Engineering
Physics
Earth Sciences


169 169
182 182

0% 2% 4% 6% 8% 10% 12% 14% 16%

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Underrepresented Minority (URM) Physics degrees

Sources: IPEDS Completion survey by race, US Census

Only ~30 students!

66 PhDs on average

US College-age minority population

Degrees Earned by URMs [%]

- Bachelor's
- PhD

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Bachelor and PhD STEM Degrees

Percentage of URM

- Computer Science: 22%
- Biological Sciences: 18%
- Chemistry: 16%
- Engineering: 14%
- Mathematics and Statistics: 12%
- Physics: 10%
- Astronomy: 6%

BS
PhD
APS Bridge Program: Key Features

- **Recruit** students through graduate programs (unaccepted), undergrad programs (promising but uncompetitive, or unsure)
- **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 1st year grad courses, apply to PhD program, research underway (*Department funds*)
- **Place** additional students at Partnership Institutions (21):
  - 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**
Bridge/Partnership 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:
- Bowling Green State University*
- Cal State Los Angeles*
- Columbia University
- Delaware State University
- DePaul University*
- Embry-Riddle Aeronautical University
- Fisk-Vanderbilt
- Florida International University
- MIT
- North Dakota State University
- Princeton University
- Texas State University*
- University of Chicago
- University of Cincinnati
- University of Connecticut
- University of Hawai'i at Manoa
- University of Houston, Clear Lake*
- University of Michigan
- University of N. Carolina, Chapel Hill
- University of Rochester
- University of Texas, Arlington

*Master’s degree is highest awarded
Institutional Members

Member Institutions
• 112 in 38 states

Partnership Institutions
• 27 in 16 states
• 21 PhD
• 6 MS
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

Bridge Program Physics PhDs

• 23% Women (20%)
• 93% URM (6%)
  • 64% Hispanic
  • 24% African American
  • 5% Native
• 88% Retention (60%)

National Achievement Gap

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<th>Students</th>
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<th>2014</th>
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<th>2016</th>
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<td>Left Program</td>
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<td>Placed/Retained</td>
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<td>Project Funding</td>
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What we didn’t know…

1. Aggregating applications is a powerful tool
2. Admissions data are not what they seem
   a. GRE is a big factor
   b. Students’ perceptions are different than faculty
3. Applications are expensive
4. Importance of graduate student groups
Some reasons students are not admitted

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

**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

Enhancing Diversity in Graduate Education

0.09 (Black)
0.34 (Hispanic)
0.44 (White)
0.61 (Asian)
Examples of national BP objectives that have potential for scaling nationally and require regional implementation include, but are not limited to: all high schools in a state offer advanced placement courses in calculus, computer science, and engineering; a disciplinary organization launches a major initiative designed to significantly improve the diversity of PhD graduates in that discipline; creating preK-20+ pathways in major urban centers involving universities, community colleges, local schools, surrounding communities, not-for-profits, museums and science centers, local businesses and industries, and science-rich institutions designed to enable success for students from underrepresented and low socio-economic groups.

The goals of NSF investments in graduate education:

- **Advance Science and Engineering (S&E) Research:** Support graduate students and graduate education to enable long-term contributions of new knowledge at the frontiers of science and engineering.

- **Broaden Participation to Promote Excellence in Research and Build the Next Generation STEM Workforce:** Recruit graduate students from a variety of geographic, demographic, social, and educational backgrounds to promote the advancement of science and a highly qualified professional workforce.

- **Build Effective Models of Graduate Education and Workforce Development:** Support the development and use of innovative models and evidence based approaches in graduate education, including education and research about promising practices and program effectiveness.

Federal STEM Education 5-Year Strategic Plan

- **Better serve groups historically underrepresented in STEM fields.** Increase the number of underrepresented minorities that graduate college with STEM degrees in the next 10 years and improve women’s participation in areas of STEM where they are significantly underrepresented.

- **Design graduate education for tomorrow’s STEM workforce.** Provide graduate trained STEM professionals with basic and applied research expertise, options to acquire specialized skills in areas of national importance and mission agency’s needs, and ancillary skills needed for success in a broad range of careers.
Revitalizing Graduate STEM Education for the 21st Century

• Conduct a systems analysis of graduate education, with the aim of identifying policies, programs and practices that could better meet the diverse education and career needs of graduate students in coming years (at both the master's and Ph.D. levels—understanding the commonalities and distinctions between the two levels), and also aimed at identifying deficiencies and gaps in the system that could improve graduate education programs.

• Chair: Alan Leshner

http://sites.nationalacademies.org/PGA/bhew/graded
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