Syracuse University
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The APS Bridge Program:
Changing the Face of Graduate Education

Theodore Hodapp
Director of Project Development
Senior Advisor to Education and Diversity
• APS Bridge Program
• PhysTEC
• Conferences for Undergraduate Women in Physics (CUWiP)
• National Mentoring Community
• New Faculty Workshops
• Best Practices in Undergraduate Physics Programs
• STEP UP 4 Women
  • Physics chairs meeting (7-9 June)
  • REU site leaders
  • Prof. skills development workshops
  • Graduate education conference
  • Advocating for physics education
  • Childcare at meetings
  • Mentoring seminar materials
  • Ethics case studies
Percentage of Women in Physics

Source: National Center for Education Statistics and APS
Percentage of Women in Physics

Sources: NCES/IPEDS, AIP-SRC, HERI
Undergraduate Physics Degrees Awarded to Women

Hazari, Potvin, Lock, Lung, Sonnert, and Sadler, "Factors that affect the physical science career interest of female students: Testing five common hypotheses," PRST PER 9 020115 (2013)
APS Conferences for Undergraduate Women in Physics (CUWiP)

- Focus on professional development, networking, understanding pathways
- Attendance more than tripled since APS became involved in 2012
- Very good URM attendance
- Departments using CUWiP as retention event for 1st year students
- Support from NSF, DOE
- 11 sites for 2018, plus 1 in Canada
- Directed research efforts to improve messaging to women sees positive changes
- National leadership group; Current chair: Pearl Sandick, Utah; Overseen by CSWP
- Site applications due 1 November for 2019 conferences
1. Develop a guide for self-assessment of undergraduate physics programs founded on documented best practices linked to measurable outcomes
   • provide a physics-community-based resource to assist programs in developing a culture of continuous self-improvement, in keeping with their individual mission, context, and institutional type
   • include considerations of curricula, pedagogy, advising, mentoring, recruitment and retention, research and internship opportunities, diversity, scientific skill development, career/workforce preparation, staffing, resources, and faculty professional development

2. Recommend a plan for ongoing review and improvement of this guide under the oversight of the APS COE
Hispanic American Bachelor Degrees

Source: National Center for Education Statistics, US Census, and APS
African American Bachelor Degrees

US College-Age Black Population

Source: National Center for Education Statistics, US Census, and APS
Underrepresented Minority (URM) Physics degrees

Only ~30 students!

Source: National Center for Education Statistics, US Census, and APS
Bachelor and PhD STEM Degrees

Percentage of URM

<table>
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<tr>
<th>Field</th>
<th>BS</th>
<th>PhD</th>
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<tbody>
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<td>Biological Sciences</td>
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<tr>
<td>Astronomy</td>
<td>6</td>
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</table>
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
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 (23):
  • 65 graduate programs looked at “other” applications (2017), recruited additional students; No direct support, some travel
  • “COM approved” Partnership Institutions; national recognition of program

• **Monitor** student/site progress

• **Research**

• **Disseminate / Advocate**
Institution Involvement

- **Member Institution** (any institution, 125)
  Free; receive information / updates; reduced fees for APS-BP conferences

- **Partnership Site** (graduate only, 29)
  APS COM approval process; recommended site for Bridge Fellows (and others) to attend; demonstrate effective practices in graduate student support

- **Bridge Site** (graduate only, 6)
  Receive significant funding from APS; build sustainable program; prepare 2+ students each year for graduate study; significant institutional commitment

**APS Bridge Partnership Sites**

Bowling Green State University  
California State University Long Beach  
California State University, Los Angeles  
Columbia University  
Delaware State University  
DePaul University  
Embry-Riddle Aeronautical University  
Fisk-Vanderbilt  
Florida International University  
Florida State University  
Illinois Institute of Technology  
Indiana University  
MIT  
North Dakota State University  
Princeton University  
Texas State University  
The Ohio State University  
University of Central Florida  
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 North Carolina at Chapel Hill  
University of Rochester  
University of South Florida  
University of Texas at Arlington  
University of Virginia
Member Institutions
• 125 in 38 states

Partnership Institutions
• 29 in 17 states
  ▪ 23 PhD
  ▪ 6 MS
Principles for Bridge 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

Students

2013 2014 2015 2016 2017

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Where did the 48 students go (2017)?

- Bowling Green State University
- CSU Long Beach (2)
- CSU Los Angeles (5)
- Delaware State University (2)
- DePaul University
- Fisk-Vanderbilt University (3)
- Florida State University (6)
- Indiana University (2)
- Ohio State University (3)
- Texas A&M University, Commerce
- Texas State University
- University of Central Florida (5)
- University of Cincinnati (3)
- University of Connecticut
- University of Houston, Clear Lake (3)
- University of Kansas (2)
- University of Massachusetts Dartmouth
- University of Minnesota Duluth
- University of North Carolina, Chapel Hill
- University of Rochester
- University of South Florida (2)
- University of Virginia
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

Fraction (White): 0.44
Fraction (Hispanic): 0.34
Fraction (Black): 0.09
Fraction (Asian): 0.61
Traditional Admissions Parameters Limit Access of Women, Racial Minorities, and US Citizens to US Physics PhD Programs but fail to Predict Doctoral Completion

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5American Physical Society, One Physics Ellipse, College Park, MD 20740
(Dated: March 1, 2017)

Admissions data for students entering a wide variety of physics PhD programs during 2000-2010 was collected and analyzed with respect to their ability to predict PhD completion. The data set corresponds to about 20% of students admitted to PhD programs in those years. Logistic regression analysis was conducted to determine the extent to which admission requirements, such as undergraduate grade point average and standardized tests, are predictive of PhD completion. Undergraduate GPA was the only statistically significant model, though that was limited to only males at programs with NRC rank of 20 or above; it’s practical significance is limited, though, because finishers and non-finishers have very similar GPA distributions. Notably, none of the Graduate Records Examination (GRE) tests was predictive in any combination of PhD completion. This is particularly relevant because the GRE Physics Subject test is a prominent tool used to admit students to PhD programs. Together with these results and the well documented and strong GRE score differences based on the race, gender, and citizenship of the test taker, the use of the GRE exams in physics admissions should end.
Thanks!

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