The APS Bridge Program: Changing the Face Of Graduate Education

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PNACP
Bothell, WA
Departmental Programs

- PhysTEC
- APS Bridge Program
- Conferences for Undergraduate Women in Physics (CUWiP)
- National Mentoring Community
- Best Practices in Undergraduate Physics Programs
- STEP UP 4 Women
- New Faculty Workshops
- Physics chairs meeting
- REU site leaders
- Professional skills development workshops
- Conferences
- Advocating for physics education
- Childcare at meetings
- Mentoring seminar materials
- Ethics case studies
The National Mentoring Community (NMC)

**Mission:** To increase the number of underrepresented ethnic and racial minorities who complete a physics BS degree

**Program components:**
- Pair undergraduates with local faculty mentors
- Email prompts
- Workshops/PD
- BEAM fund
- Annual meeting

**URL:** [www.aps.org/nmc](http://www.aps.org/nmc)
**Email:** NMC@aps.org
**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 2019, 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

[www.aps.org/cuwip](http://www.aps.org/cuwip)

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### US Female Physics Degrees

<table>
<thead>
<tr>
<th>Year</th>
<th>Degrees</th>
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<tbody>
<tr>
<td>2006</td>
<td>200</td>
</tr>
<tr>
<td>2008</td>
<td>400</td>
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<tr>
<td>2010</td>
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<td>2012</td>
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<tr>
<td>2014</td>
<td>1000</td>
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<tr>
<td>2016</td>
<td>1200</td>
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### CUWiP Attendance

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</tr>
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**2018 CUWiP Conference Site Locations**

If you have any questions, please email women@aps.org

Indicates location of conference within regional area.
Phys21: Preparing Physics Students for 21st Century Careers

This report provides guidance for departments considering revising the undergraduate curriculum to improve the education of a diverse student population.

Download a free copy at www.compadre.org/JTUPP
STEP UP 4 Women

**Goal:** Close the gender gap in undergraduate physics degrees

**Strategy:** Enlist large numbers of high school physics teachers to directly recruit women to pursue a physics degree

**Contact:** Kathryne Sparks Woodle, woodle@aps.org

**Support:** NSF: 1720810, 1720869, 1720917, 1721021

**URL:** www.stepup4women.org
Hispanic American Bachelor Degrees

Bachelor's Degrees Earned by Hispanic Americans

Source: IPEDS, US Census, and APS
African American Bachelor Degrees

Bachelor's Degrees Earned by African Americans

- Biology
- Chemistry
- Math & Stats
- Engineering
- Physics
- Earth Sciences

US College-Age Black Population

Source: IPEDS, US Census, and APS
Percentage of Women in Physics

Source: IPEDS
Underrepresented Minority (URM) BA degrees

Bachelor's Degrees in Physics

- Hispanic
- African American

Source: IPEDS
URM Physics degrees (BA & PhD)

Sources: IPEDS Completion survey by race, US Census

Only ~30 students!

66 PhDs on average
Bachelor and PhD STEM Degrees

Percentage of URM

<table>
<thead>
<tr>
<th>Field</th>
<th>BS</th>
<th>PhD</th>
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<tr>
<td>Computer Science</td>
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<tr>
<td>Mathematics and Statistics</td>
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<td>63</td>
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<tr>
<td>Physics</td>
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<td>6</td>
</tr>
<tr>
<td>Astronomy</td>
<td></td>
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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.
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 (25):
  - 45 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**
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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Student Eligibility

- App: **Opens December 1** and **Closes: Late March**
- In order to eligible to apply to the Bridge Program, students must:
  - Have a bachelor’s degree in physics or a closely related discipline
  - Be a U.S. citizen or permanent resident (or be part of DACA)
  - In the current academic year, either:
    - Did not apply to a physics graduate program; or
    - Applied to one or more physics graduate program, **but not accepted by any program**.
  - Be committed to improving diversity in physics
  - Meet an additional requirements that individual bridge sites may have, including minimum GPA.

  **We review applications AFTER April 15th**
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
- Illinois Institute of Technology
- 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
- University of Texas, San Antonio
- University of Virginia

*Master’s degree is highest awarded
Institutional Members

**Member Institutions**
- 125 in 38 states

**Partnership Institutions**
- 31 in 18 states
- 24 PhD
- 7 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%)

135 Students making progress towards PhDs
Where did the 46 students go (2017)?

- Bowling Green State University
- CSU Long Beach (2)
- CSU Los Angeles (3)
- 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 or GPA
- 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**
  - Doctoral institutions (Phys. Rev. PER 13, 020142 (2017))
  - Master’s institutions (in preparation)
- **Admissions data (GRE, GPA, etc.):**
  - Correlations with student success; impact on diversity (submitted)
- **Holistic admissions practices:**
  - Use of non-cognitive measures and other techniques by physics graduate admissions faculty (parallel effort by CGS) (Phys. Rev. PER 13, 020133 (2017))
- **Student perspectives**
  - Barriers to admissions (PERC, 10.1119/perc.2017.pr.018)
  - On admissions (in preparation)
  - In bridge programs (in preparation)
Next Steps...

• Replicate process in chemistry, astronomy, geosciences, and materials research sciences
• Mentoring / tracking students into careers / postdoc positions
• Broader implementation of advances made by Bridge Program (admissions, induction, 1st year support, peer and faculty mentoring)
• Spawning related research efforts in graduate education
• Interface with **APS National Mentoring Community** ([www.aps.org/nmc](http://www.aps.org/nmc))
  - New fund for emergency aid to NMC undergrads (**BEAM**: Bringing Emergency Aid to Mentees)
• Planning Joint Bridge Program / National Mentoring Community Meeting: **November 16-18, 2018**
Want to Learn More?

The American Physical Society Bridge Program (APS-BP) and the National Mentoring Community (NMC) are efforts by APS to increase the number of physics degrees earned by underrepresented minority students, defined by the project as African Americans, Hispanic Americans, and Native Americans.

To learn more, visit: aps.org/programs/minorities/nmc

CONFERENCE

APS will host a combined conference of the APS Bridge Program and National Mentoring Community. This conference will focus on strengthening mentor relationships, building firm foundations to create a successful Bridge student experience, and providing knowledge through discussions on topics such as:

- Preparing Students for the Workforce
- Culturally-Sensitive Mentoring Practices
- Effective Retention Practices
- Lessons learned from Bridge Programs
- And more!

www.aps.org
Thanks!

Email: brown@aps.org, Phone: 301-209-3248
Website: apsbridgeprogram.org

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