Bachelor’s Degrees Earned by Women

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

Source: National Center for Education Statistics and APS
Hispanic American Bachelor Degrees

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

Only ~30 students!

US Graduate-Age URM population

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

<table>
<thead>
<tr>
<th>Field</th>
<th>BS</th>
<th>PhD</th>
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<tbody>
<tr>
<td>Computer Science</td>
<td>78</td>
<td>6</td>
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<tr>
<td>Biological Sciences</td>
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</tr>
<tr>
<td>Chemistry</td>
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<td>Engineering</td>
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<td>Mathematics and Statistics</td>
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<td>6</td>
</tr>
<tr>
<td>Astronomy</td>
<td>6</td>
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</tbody>
</table>
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)
- Maria Womack (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)
- Geraldine Cochran (Rutgers-Researcher)

This material is based upon work supported by the National Science Foundation under Grant No. 1143070. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Bridge Program: Key Features

• **Recruit** students from entire country (application aggregation)
• **Establish** Bridge Sites (6):
  • Identified first universities that would commit to close attention to Bridge students through:
    • Induction into graduate student community / life / expectations
    • Constellation mentoring
    • Flexible curricula to prepare student for graduate coursework
    • Progress monitoring
    • Financial support.
• **Certify** Partnership Institutions (36):
  • APS Committee on Minorities reviews applications from physics graduate programs to ensure proper support for Bridge Students
  • Approved Partnership Institutions gain access to Bridge Student applications
• **Monitor** student / site progress
• **Research**
• **Disseminate / Advocate**
Member Institutions
- 137 in 38 states

Partnership Institutions
- 37 in 18 states
  - 24 PhD
  - 7 MS
Bridge Program Achievements

Bridge Program
Physics PhDs

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

137 Students making progress toward PhDs

- All traditionally excluded

URM PhDs reach same fraction as undergrad degrees

Students

<table>
<thead>
<tr>
<th>Year</th>
<th>Left Program</th>
<th>Placed/Retained</th>
<th>Project Funding</th>
</tr>
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<tr>
<td>2013</td>
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<tr>
<td>2017</td>
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</tbody>
</table>
Where did the 46 students go (2017)?

- Bowling Green State University
- CSU Long Beach (2)
- CSU Los Angeles (4)
- 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 (4)
- 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
Critical Lessons

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
Research Efforts

• Graduate admissions
  • Doctoral institutions (Phys. Rev. PER 13, 020142 (2017))
  • Master’s institutions (in preparation)

• Admissions data (GRE, GPA, etc.):
  • Correlations with success; diversity impact (in press: Science Adv.)

• Holistic admissions practices:
  • Use of non-cognitive measures and other techniques by physics graduate admissions faculty (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)
Physics GRE: Impact of Cutoff Scores

- Fraction (White)
- Fraction (Hispanic)
- Fraction (Black)
- Fraction (Asian)

- 0.09 (Black)
- 0.34 (Hispanic)
- 0.44 (White)
- 0.61 (Asian)
GRE Physics Scores: Impact of Cutoff Scores

Source: ETS

- Fraction (F): 0.25
- Fraction (M): 0.46

Score: 650
Physics GRE "Correlation" with Grad GPA

$r = 0.24; N = 1686$

"Weak" Correlation
Making physics more inclusive

Theodore Hodapp and Erika Brown explain how the American Physical Society is helping to recruit and retain PhD students from under-represented minorities.

African Americans, Hispanic Americans and Native Americans make up about one-third of university-age citizens in the United States. Yet less than 11% of bachelor’s degrees in physics are awarded to people from these groups. At the doctoral level it is even worse, with only about 7% of physics PhDs granted to US citizens from racial and ethnic minority groups — not 65-70 students each year. This is one of the lowest rates in the sciences. Chemistry, by comparison, awards 17% of bachelor’s and 11% of doctoral degrees to these groups (see “Doctoral dearth”). The proportion in physics has hardly risen over the past 15 years, while the percentage of US university-age students from minorities has grown by 18%.

This is morally questionable and disastrous from a practical point of view. The discipline of physics, and society as a whole, are missing out on talent. Students are often judged on the prestige of their undergraduate institution or the preparation they received at school, rather than on what really matters: their aptitude, drive and ingenuity.

Physicists cannot fix all of society’s ills, but the community can and must provide more equitable pathways into research. This does not mean lowering the bar, but showing what really matters: their aptitude, drive and ingenuity.

For the past five years, the American Physical Society (APS) has been taking the first steps by working with physics departments across the United States to balance the doctoral and bachelor’s graduation rates for under-represented students. Given that the numbers of students are small, interventions at a limited number of universities can drastically change the landscape. To effect this change, the APS has directed resources to overcoming admissions barriers and ensuring that graduate programs where students are admitted have adequate support to help them remain on track. These support structures benefit all students.

The APS Bridge Program (funded in part by the US National Science Foundation) asks physics faculty members to consider and recruit graduate students from under-represented minorities whom they think would do well in a doctoral programme but who, for whatever reasons, have not...

House Resolution

• Supporting APS Bridge Program

Nature Comment published Last Wednesday

• Recommendations:
  • Re-think admissions
  • Provide a supportive culture
  • ACS, AGU, AAS, MRS should also do this
IGEN Alliance Proposal

Major Components

- APS, ACS, AAS, AGU, MRS
- APS continuing application aggregation
- Replication of APS program in chemistry (ACS)
- Application aggregation in Geosciences (AGU)
- APS runs application aggregation for AAS, MRS
- Tracking graduates into National Labs / private-sector; mentor training curriculum
- Inclusive practices workshops throughout the US (holistic admissions, retention strategies, professional development)
- Support for adoption leaders; training of facilitators in each discipline
- National meeting; support for minority-serving organizations
- Research (USC)
**Goal:** Increase the number of African American, Hispanic American, and Native American undergraduates obtaining physics bachelor’s degrees

**Strategy:** Connect students with local faculty mentors and provide support and resources. Emergency financial aid fund to mentees (BEAM Fund). National recognition of mentoring service (coming).

**Contact:** Monica Plisch nmc@aps.org

**URL:** www.aps.org/nmc

**Conference:** 16-18 Nov 2018 (Google / Stanford)
CUWiP Attendance

US Female Physics Degrees

CUWiP Attendance
Quiz Time:
Percentage of Women in Physics

1

2

3

www.aps.org
©2018, American Physical Society; Email: hodapp@aps.org
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)
NSF funding received May 2017 ($3M)

• Zahra Hazari, Geoff Potvin, Laird Kramer (FIU)
• Robynne Lock (TAMUC)
• Rebecca Vieyra (AAPT)
• Kathyne Woodle, Theodore Hodapp (APS)

This material is based upon work supported by American Physical Society, and the National Science Foundation under Grant Nos. 1720810

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STEP UP for Women
Supporting Teachers to Encourage Pursuit of Undergraduate Physics for Women

• 4+ year project; 3 Phases:
  • 2017-18: Pilot (10 Master teachers across the US)
  • 2018-19: Controlled study (26+ randomly selected in 3 states)
  • 2019-20: National rollout (15,000 teachers)

• Designing curriculum/classroom strategies for high school teachers to encourage women to study undergraduate physics:
  • Lessons:
    • Discussion of underrepresentation
    • Discussion of careers in physics
  • Classroom strategies:
    • Personal recruiting
    • Public recognition of women in classroom
• **Rollout (Phase 3):** Pilot ideas in 2017, 2018
  - APS CUWiP workshops and “challenges”
  - APS sponsored Women in Physics Groups
  - SPS Chapters
  - National, state, and regional meetings for science teachers
  - Establish teacher networks
  - Develop Professional Development “lessons”
  - Website: tools, video, resources
  - Assessment: rate of adoption, problems of implementation, etc.
It is the policy of the American Physical Society (APS) that all participants, including attendees, vendors, APS staff, volunteers, and all other stakeholders at APS meetings will conduct themselves in a professional manner that is welcoming to all participants and free from any form of discrimination, harassment, or retaliation. Participants will treat each other with respect and consideration to create a collegial, inclusive, and professional environment at APS Meetings. Creating a supportive environment to enable scientific discourse at APS meetings is the responsibility of all participants.

Participants will avoid any inappropriate actions or statements based on individual characteristics such as age, race, ethnicity, sexual orientation, gender identity, gender expression, marital status, nationality, political affiliation, ability status, educational background, or any other characteristic protected by law. Disruptive or harassing behavior of any kind will not be tolerated. Harassment includes but is not limited to inappropriate or intimidating behavior and language, unwelcome jokes or comments, unwanted touching or attention, offensive images, photography without permission, and stalking.

Violations of this code of conduct policy should be reported to meeting organizers, APS staff, or the APS Director of Meetings. Sanctions may range from verbal warning, to ejection from the meeting without refund, to notifying appropriate authorities. Retaliation for complaints of inappropriate conduct will not be tolerated. If a participant observes inappropriate comments or actions and personal intervention seems appropriate and safe, they should be considerate of all parties before intervening.
Next Steps

- Apply to become a Partnership Institution (Bridge Program)
- Locate teacher leaders (STEP UP)
- Support undergraduates attending CUWiP; upon return, invite them to help you in retention strategies (CUWiP)
- Replicate / spread Bridge Program to other disciplines (APS)
- In talks with ETS to change how they report GRE Scores (APS)
- Interface with APS National Mentoring Community (www.aps.org/nmc) (NMC)
- Planning joint Bridge Program / National Mentoring Community Meeting: 16-18 November 2018: Stanford/Google

Happy Physicists ⇒ Great Physics