APS Programs to Promote Diversity and Inclusion

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Director of Education and Diversity
American Physical Society
APS Education and Diversity Programs

• Conferences for Undergraduate Women in Physics (CUWiP)
• New Faculty Workshop
• Physics Chairs Meeting
• REU Site Leaders Conference
• Professional Skills Workshops
• Graduate Education Conference

• LGBT Climate in Physics report
• Mentoring seminar curriculum
• Ethics case studies
• Joint Task Force on Undergraduate Physics Programs report
• Physics education posters
• More...
Committees:

- Committee on Minorities (COM)
- Committee on the Status of Women in Physics (CSWP)
- Committee on Education (COE)

Units:

- Forum on Education (FEd)
- Forum on Graduate Student Affairs (FGSA)
- Topical Group on Physics Education Research (GPER)
- Forum on Diversity and Inclusion (organizing)

Staff:

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- David May
- Monica Plisch
- Anne Richard
- Tekora Scruggs
- Heather Styer
- Kathrynne Woodle
- Rose Villataro
Participation of Underrepresented Minorities (URM) in Physics

Source: US Census, IPEDS, AIP, and APS
National Mentoring Community (NMC)

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

Program components:

- Pair undergraduates with local faculty mentors
- Annual conference
- Email prompts
- Mentor training
- BEAM fund

Sign up now!

- [www.aps.org/nmc](http://www.aps.org/nmc)
- Email: [NMC@aps.org](mailto:NMC@aps.org)
Mentoring Matters

• The most important factor in degree attainment was positive mentoring experience (Solorzano, 1993)

• The desire to pursue a PhD is influenced by a strong mentee-mentor relationship (McGee and Keller, 2007)

• Mentoring increases persistence in science, career satisfaction and productivity (reviewed in Sambunjak, Straus and Marusic, 2010)

• Mentoring has been linked to enhanced science identity, sense of belonging and self-efficacy (Palepu et al, 1998; Garman et al, 2001; Paglis et al, 2006; Lopatto, 2007; Bland et al, 2009; Feldman et al, 2010; Cho et al, 2011; Chemers et al, 2011; Thiry and Laursen, 2011)

• Mentoring and research training cannot be separated from scientific research for anyone in postdoctoral or graduate student positions and should not be considered as separate objectives (National Academy of Sciences, 2005)
## Elements for Effective Mentoring Relationships

<table>
<thead>
<tr>
<th>Skill Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter/Disciplinary Research Skills</td>
<td>Knowledge, techniques, collaboration, responsible conduct of research</td>
</tr>
<tr>
<td>Interpersonal Skills</td>
<td>Listening actively, aligning expectations, building trust</td>
</tr>
<tr>
<td>Culturally-Focused Skills</td>
<td>Promoting inclusion, reducing bias and stereotype threat</td>
</tr>
<tr>
<td>Psychosocial Skills</td>
<td>Providing motivation, developing a sense of belonging</td>
</tr>
<tr>
<td>Sponsorship Skills</td>
<td>Fostering independence, promoting professional development</td>
</tr>
</tbody>
</table>
NMC Participants

• NMC mentors (physics faculty)
  • 190 mentors (15% Hispanic, 11% Black, 1% Native American)
  • Mentors in 18% of all US physics departments
  • Mentors in departments that educate 34% of all physics majors

• NMC mentees (physics students)
  • 238 mentees (53% Hispanic, 29% Black, 1% Native American)
  • Need ~800 more BS degrees/year to double URM participation
Biggest concerns with finishing a physics degree

<table>
<thead>
<tr>
<th>Concern</th>
<th>Percent of Mentee Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>My ability to be a physicist</td>
<td>21%</td>
</tr>
<tr>
<td>Getting into graduate school</td>
<td>20%</td>
</tr>
<tr>
<td>Completing courses/GPA</td>
<td>16%</td>
</tr>
<tr>
<td>Job opportunities</td>
<td>14%</td>
</tr>
<tr>
<td>Finances</td>
<td>13%</td>
</tr>
<tr>
<td>Finding research/area of interest</td>
<td>5%</td>
</tr>
<tr>
<td>Finding support/Combating isolation</td>
<td>4%</td>
</tr>
<tr>
<td>Nothing</td>
<td>7%</td>
</tr>
</tbody>
</table>
NMC Outcomes

• All mentees reported the program was useful, and it helped them gain confidence, knowledge, and opportunities.

• One-third of mentees reported the mentoring significantly increased their intent to complete a BS degree in physics.

• Mentees’ intent to go to graduate school increased significantly due to the program.
• “[The NMC] opened my chances for opportunities I thought I would never have. I mean that with the deepest sincerities.”

• “[The NMC] connected me to other physicists and afforded me visibility of our diversity. Physicists get typecast into a certain demeanor, look, and nature, but NMC brought together various physicists of all types. It bolstered the self-confidence that I had knowing that we are unified by the pursuit of answers, but otherwise diverse.”
Participation of US minorities in physics

Sources: IPEDS, US Census, APS.
Growth in physics BS degrees over a 15-year period

HBCU = Historically Black Colleges and Universities
BSI = Black Serving Institutions
HSI = Hispanic Serving Institutions

Source: IPEDS, APS
Question: What are key challenges affecting your department?

Overwhelming response: Lack of students

- Lack of exposure to physics by students and parents, little awareness of opportunities and careers in physics
- Students often have financial need, but departments lack resources to employ students and support them financially
- High teaching load leaves little time for faculty to apply for grants and engage students in research
- Competition with majority institutions that have more resources to attract students
- Low student retention due to poor preparation
- Few African American or female faculty to serve as role models
Recommendations for APS

1. Strengthen relationships with HBCU/BSI physics chairs
2. Convene HBCU/BSI physics chairs periodically and build a network to foster discussion
3. Disseminate effective practices for recruitment and retention of physics majors
4. Support threatened HBCU/BSI departments through advocacy
Underrepresented Minority (URM) Physics degrees

Only ~30 students!

Source: National Center for Education Statistics, US Census, and APS

US Graduate-Age URM population

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Bachelor and PhD STEM Degrees

Percentage of URM

<table>
<thead>
<tr>
<th>Discipline</th>
<th>BS</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>78</td>
<td>61</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>639</td>
<td>386</td>
</tr>
<tr>
<td>Chemistry</td>
<td>161</td>
<td>63</td>
</tr>
<tr>
<td>Engineering</td>
<td>386</td>
<td>61</td>
</tr>
<tr>
<td>Mathematics and Statistics</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>Physics</td>
<td>63</td>
<td>6</td>
</tr>
<tr>
<td>Astronomy</td>
<td></td>
<td>6</td>
</tr>
</tbody>
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APS Bridge Program: Key Features

- **Recruit** students not accepted to graduate programs
- **Place students in Bridge Programs** (6):
  - Coursework, research, mentoring, induction, progress monitoring
  - For students who demonstrate potential but underprepared
- **Place students at Partnership Institutions** (29):
  - “COM approved” programs
  - Students directly admitted to doctoral program
- **Monitor** student/site progress
- **Research**
- **Disseminate / Advocate**
APS Bridge Program Achievement

National Achievement Gap

<table>
<thead>
<tr>
<th>Students</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
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<tbody>
<tr>
<td>Left Program</td>
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<tr>
<td>Placed/Retained</td>
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<td>🟢</td>
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<tr>
<td>Project Funding</td>
<td>⁁ ⁁</td>
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Some reasons students are not admitted

Students:
- Low physics GRE score
- Apply to too few or wrong places
- "Feel" unprepared (low self-efficacy)
- 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
Physics GRE:
Impact of Cutoff Scores

- Fraction (White): 0.44
- Fraction (Hispanic): 0.34
- Fraction (Black): 0.09
- Fraction (Asian): 0.61

Scores:
- 650
Physics GRE: Impact of Cutoff Scores

Source: ETS

Frac1on (F) = 0.25
Frac1on (M) = 0.46

Score = 650
Research Efforts

• **Graduate admissions study**
  • Master’s institutions (in preparation)

• **GRE (and other) admissions data:** Correlations with student success; impact on diversity (submitted for publication)

• **Holistic admissions practices:** practical use of non-cognitive measures or other practical techniques for use by physics graduate admissions faculty (parallel effort by CGS) (Phys. Rev. Phys. Educ. Res. 13, 020133 (2017))

• **Student perspective on admissions** (in preparation)
Participation of Women in Physics

Physics Degrees Earned by Women

- Bachelor's
- PhD

Source: IPEDS and APS
APS Conferences for Undergraduate Women in Physics (CUWiP)

- Focus on professional development, networking, career pathways
- Student travel support available
  
  www.aps.org/cuwip

Participation tripled since APS became administrative home

DOE, NSF grants for 2014-2020

Email: women@aps.org

US Female Physics Degrees

CUWiP Attendance

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LGBT Climate in Physics Report

- Survey of 300+ LGBT physicists:
  - Many experienced isolation, exclusionary behavior
  - Many at risk for leaving school or workplace
- Recommendations endorsed by APS Council (April 2016)
- Report featured by Nature, AAAS, Physics World, others

“I was very out [as an undergraduate]…. I know that all of the other students, literally all of them, studied together and did their homework together and all of that. And I tried to participate in these things and was often, you know, given the run around on the times, and I just stopped trying after a while and stopped interacting with them socially.”

www.aps.org/programs/lgbt