Guiding Principles

Programs and activities are guided by Committees. Activities are based primarily in physics and closely related disciplines, are designed to have impact on national or international scales, and receive public recognition of APS efforts. Staff and volunteers actively evaluate programs for relevance, audience, and impact – modifying or restructuring as appropriate. As a member society, we insist on transparency and accountability in our actions and in the philosophical underpinnings of our programs.

• Use our unique position
• Leverage action
• Meet significant needs
• Assess impact
High school classes taught by teacher with degree in the field

Source: Schools and Staffing Survey
Physics / STEM
Bachelor Degrees

Source: IPEDS Completion Survey

www.aps.org/programs/education/statistics

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Percentage of Women Earning Undergraduate STEM Degrees

Source: IPEDS
Percentage of Women Earning Graduate STEM Degrees

Source: IPEDS
Hispanic American Bachelor Degrees

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

Sources: IPEDS Completion survey by race, US Census
URM Physics PhDs to Minority Population

Sources: IPEDS Completion survey by race, US Census

Only ~30 students!

66 PhDs on average
Bachelor and PhD STEM Degrees

Source: IPEDS

Percentage of URM

<table>
<thead>
<tr>
<th>Field</th>
<th>BS</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
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<tr>
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<td>Physics</td>
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<td>639</td>
</tr>
<tr>
<td>Astronomy</td>
<td>639</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.
PhysTEC Member Institutions
PhysTEC Project Outcomes

Number of Teachers (3 year totals)

Pre funding
Y1-Y3
Y4-Y6
Post funding
Post funding

Site (funding period)

Arizona (2001-2007)
Arkansas (2001-2008)
W. Michigan (2001-2007)
Cal Poly (2003-2006)
Colorado (2004-2007)
Non-PhysTEC*

*Number of physics certifications averaged over 319 institutions in 15 states. Note that all PhysTEC teachers are more highly qualified than the minimum standard in most states.
APS Bridge Program: Key Features

- **Recruit** through graduate programs (unaccepted students), undergrad programs (promising, but uncompetitive students)
- **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):
  - 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**
Institutional Members

• Member Institutions
  • 108 in 36 states
• Partnership Institutions
  • 26 in 14 states
• Bridge Sites
  • Pre-existing: 4
  • APS: 6
  • Developing: 4
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

- **23% Female (All: 20%)**
- **93% URM (All: 6%)**
  - 64% Hispanic
  - 24% African American
  - 5% Native
- **88% Retention (All: 60%)**

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.

### National Achievement Gap

<table>
<thead>
<tr>
<th>Year</th>
<th>Students</th>
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</thead>
<tbody>
<tr>
<td>2013</td>
<td></td>
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<tr>
<td>2014</td>
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<tr>
<td>2015</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
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</tbody>
</table>

- **Left Program**
- **Placed/Retained**
- **Project Funding**

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What we didn’t know…

…and learning this surprised us!
1. Aggregating applications is a powerful tool
2. Graduate programs (most) want to do better
3. Admissions are not what they seem
4. Applications are expensive
5. Importance of graduate student groups
Some reasons students are not admitted

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

Admissions Committees:
• Members overwhelmed
• Members unaware of admissions research findings
Physics GRE: Impact of Cutoff Scores

Source: ETS
APS Conferences for Undergraduate Women in Physics

- Focus on professional development, networking, understanding pathways
- Attendance more than tripled since APS became involved
- Very good URM attendance
- Awarded 3-year grants from DOE, NSF for 2014-2016 conferences; applications pending to support 2017-2019
- 9 sites for 2016, 10 in 2017
- Inspired C-CUWiP, UK-CUWiP
- Coordination of Canadian site in 2017
- Directed research efforts to improve messaging to women sees positive changes
- National leadership group; Current chair: Kate Scholberg, Duke; Overseen by CSWP
2017 SITES

- Harvard
- Montana State
- Princeton
- Rice
- UCLA
- University of Colorado
- University of Wisconsin
- Virginia Tech
- Wayne State
- McMaster (Ontario)

aps.org/cuwip
• Increase the number of underrepresented ethnic/racial minority students who complete Bachelor’s degrees in physics
• Support mentoring relationships between undergraduate physics students and local physics mentors
• 100+ mentors, mentees
• Support for travel to National Mentoring Conference
• Bringing Emergency Aid to Mentees (2017)
Common Job Titles for Physics Bachelors

- Systems Engineer
- Electrical Engineer
- Design Engineer
- Mechanical Engineer
- Project Engineer
- Optical Engineer
- Manufacturing Engineer
- Manufacturing Technician
- Laser Engineer
- Associate Engineer
- Application Engineer
- Development Engineer
- Engineering Technician
- Field Engineer
- Process Engineer
- Process Technician
- Product Engineer
- Product Manager
- Research Engineer
- Test Engineer
- General Engineer
- Technical Services Engineer
- Software Engineer
- Programmer
- Web Developer
- IT Consultant
- Systems Analyst
- Technical Support Staff
- Analyst
- High School Physics Teacher
- High School Science Teacher
- Middle School Science Teacher
- Research Assistant
- Research Associate
- Research Technician
- Lab Technician
- Lab Assistant
- Accelerator Operator

Source: AIP SRC
Recommendations

- Flexible majors
- Emphasize applications throughout
- Add contemporary lab skills
- Encourage industry-relevant capstone projects
- Interweave communications throughout
- Consider interdisciplinary experiences/majors
- Internships / co-op experiences
- Seminars on career preparation
- Engage alumni
- Have events with industrial/applied topics
- Fields trips / site visits
- Tap career resources on campus
- Encourage mentoring
Integrating Research and Best Practices into Physics Program Assessment and Review

1. Develop a guide for self-assessment of undergraduate physics programs founded on documented best practices linked to measurable outcomes

   The guide should 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. The guide should 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