UC Boulder

8 October 2015
Boulder, CO

Diversity in Physics

Theodore Hodapp
Director of Education and Diversity
American Physical Society
Education and Diversity

• Committees
  • Education (COE)
  • Women (CSWP)
  • Minorities (COM)

• Units
  • Forum on Education (FEd)
  • Topical Group on PER (GPER)
  • Forum on Graduate Student Affairs (FGSA)

• Staff
  • Monica Plisch (Assoc. Dir., PhysTEC)
  • Renee Michelle Goertzen (Project Manager, PhysTEC, Research)
  • Kathryn Woodle (Project Manager, NMC, Bridge Program, PhysTEC)
  • ?? (Project Manager, Bridge Program)
  • Deanna Ratnikova (Committees, CUWiP)
  • Arlene Modeste Knowles (Diversity Liaison)
  • Michelle Campbell (Coord., PhysTEC)
  • Asmaa Khatib (Coord., Bridge Program)
  • ?? (Coord., NMC)
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.
15.X WOMEN IN PHYSICS (coming soon hopefully)
The American Physical Society (APS) believes full participation by everyone, regardless of gender, is important to the health and future achievements of our discipline. The number of women in physics remains disappointingly low, and biases persist. The APS urges its members, physics leaders and policymakers to take action to improve the recruitment, retention and treatment of women in physics at all levels of education and employment.
Physics / STEM Bachelor Degrees

Source: IPEDS Completion Survey

©2015, American Physical Society; Email: hodapp@aps.org
Women in STEM Fields: Bachelors Degrees

Source: NCES/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
Question

At what stage do we lose most underrepresented minorities in the physics “pipeline”?

1. High School
2. Undergraduate
3. Graduate
4. Professoriate
Underrepresented Minorities in Higher Education

Graph showing the percentage of Underrepresented Minorities (URM) in various stages of education and academic careers:

- **College Age Population**: ~1.5M
- **All Bachelor Degrees**: ~200k
- **Physics Bachelor Degrees**: ~450
- **Physics Doctoral Degrees**: ~35
- **Physics Faculty**: ~12

The graph illustrates the disparity between the college-age population and the number of physics degrees and faculty positions held by URM.
9-10% of BS degrees in physics are granted to underrepresented minorities

52 PhDs awarded to minorities in 2010

Only ~30 students!

Sources: IPEDS Completion survey by race, US Census
APS Bridge Program: Key Features

- **Recruiting** through graduate programs (unaccepted students), undergrad programs (promising students)
- **Established** 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** ancillary students (at Partnership Institutions):
  - 46 graduate programs look at “other” applications, recruited additional 7 students (2014); No direct support for students, some travel support
  - “COM approved” Partnership Institutions; national recognition of program
- **Monitor** student/site progress
- **Research**
- **Disseminate / Advocate**
Bridge 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:
• Columbia University
• Fisk / Vanderbilt
• MIT
• Princeton University
• University of Chicago
• University of Michigan

www.aps.org ©2015, American Physical Society; Email: hodapp@aps.org
• Admission decisions ("holistic" criteria)
• Financial support (timing)
• Coursework (induction advising critical, allow advanced undergrad courses)
• Progress monitoring (timing, tutors if needed)
• Multiple mentors (intervention, peer involvement)
• Research (appropriate match)
Bridge Program Achievements

- 6 Bridge Sites (2 others self-funded)
- 95% retention rate
- 5+ institutions self-fund extra students from our pool
- APS does national recruiting, advocacy, collection of best practice
- Increasing by ~30/yr answers national need
- Research into admissions: how are departments using GRE and other measures, correlations with outcomes
- Lots of interest by departments and students
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. Importance of graduate student groups
National Mentoring Community

- Launched April 2015
- Inspired by Math Alliance (600 mentees, 350 mentors)
- Goal: Increasing the number of URM students who receive BS degrees in physics
- 1st Annual conference: Miami, 9-11 October (175 registered)
- Mentor / Mentee recognition (currently 85/34)
- Planned scholarship funds via mentors
- Pairing faculty and URM students
Physics GRE: Impact of Cutoff Scores

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

Source: ETS

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

Score: 650
CUWiP Sites
2016 Conferences Locations
CUWiP Key Aspects

- Focus on professional development, networking, understanding pathways
- Attendance **tripled** since APS became involved (nearly every female physics major will attend)
- Very good URM attendance (~50% above UG completion rate)
- Majority (>50%) of funding provided locally; 3-year grants from DOE, NSF for 2014-2016 conferences
- 9 sites for 2016
- Inspired C-CUWiP, UK-CUWiP
- Possible addition of Canadian sites in 2017
- Directed research efforts to improve messaging to women sees positive changes
- National leadership group; Current chair: Mette Gaarde, LSU; Overseen by CSWP (APS Committee on the Status of Women in Physics)
CUWiP New Site Timeline

• Nov (2015): New site applications
• Jan (2016): Conference (MLK weekend)
• Feb: Sites for next year chosen
• May: Planning meeting for new sites
• Jun-Aug: Initial site planning
• Sep-Dec: Detailed planning
• Sep: Student applications open
• Oct: Student applications close
• Nov: Students informed, student registration opens
• Dec: Student registration closes; sites informed of attendees
• Jan (2017): Conference held
• Apr: Final invoicing
• May: Feedback to future sites
Issues Facing Women in Physics (and other fields)

• Stereotype Threat
• Unconscious Bias
• Imposter Syndrome
• Harassment
Stereotype Threat

The experience of anxiety in a situation where a person has the potential to confirm a negative stereotype about their social group

- Math performance (Male vs. Female)
- Intelligence (Black vs. White)
- Memory (old vs. young)
Female and Male students given a difficult math examination. All students have high math ability.

- Half told it produces gender differentiated scores
- Half told it does not produce gender differentiated scores
Gender in Perceived Math Ability


Score Corrected for Guessing

Gender Difference

No Gender Difference

Male

Female
At what stage do we lose most women in the physics “pipeline”?

1. High School
2. Undergraduate
3. Graduate
4. Professoriate
Percentage of Women in Physics

Sources: NCES/IPEDS, AIP-SRC, HERI
Percentage of Females Interested in a Discipline

- Physics
- Elect. Eng.

- Middle School
- Beg. High School
- Beg. First Sem. College
- Degrees (BS)
Next Steps…

• Long-term sustainability of advances made by Bridge Program

• National Mentoring Community: Can we impact URM success at Bachelors level?

• What are the levers for changing female participation in physics?

• Opportunities for research: diverse communities

Happy physicists ⇒ Great physics
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.