New Faculty Workshop

17 November 2019
College Park, MD

Resources for Solving Problems

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American Physical Society
Director of Project Development
Senior Advisor: Education and Diversity
Activity

Take out a piece of paper

• Thinking about 5 years from now: What “larger” issue will your department be facing?
Hispanic American Bachelor Degrees

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

US College-Age Black Population

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

Source: IPEDS, US Census, and APS
Bachelor’s Degrees Earned by Women

Source: IPEDS and APS
Physics Teacher Education Coalition (PhysTEC)

**Goal:** Increase the number of highly qualified high school physics teachers; Build a national coalition of universities engaged in this work

**Strategy:** Encourage and support physics departments to work proactively to recruit and educate future teachers. Provide best-practices and advocate for successful strategies (National meeting: 28 Feb - 1 Mar 2020)

**Contact:** Monica Plisch, plisch@aps.org

**Support:** NSF-0108787, 0808790, 1646913, 1707990

**URL:** phystec.org
URM Bachelor and PhD STEM Degrees

- Computer Science
- Biological Sciences
- Chemistry
- Engineering
- Mathematics and Statistics
- Physics
- Astronomy

Percentage of URM Bachelor and PhD Degrees

- Computer Science: 78 BS, 161 PhD
- Biological Sciences: 639 BS, 161 PhD
- Chemistry: 161 BS, 161 PhD
- Engineering: 386 BS, 386 PhD
- Mathematics and Statistics: 61 BS, 61 PhD
- Physics: 63 BS, 63 PhD
- Astronomy: 6 BS, 6 PhD

Enhancing Diversity in Graduate Education
Physics GRE "Correlation" with Grad GPA

$r = 0.24; \ N = 1686$

“Weak” Correlation
**Goal:** Increase the number of underrepresented (URM) students earning a PhD in physics or astrophysics

**Strategy:** Collect applications from URM students not admitted, and make available to departments. Provide best-practices in admissions, mentoring, retention and support (Next Meeting: June 2021)

**Contact:** Erika Brown, brown@aps.org

**URL:** apsbridgeprogram.org

**Support:** NSF-0958333, 1143070
APS Conferences for Undergraduate Women in Physics (CUWiP)

**Goal:** Three-day regional conferences for undergraduate physics majors, to help women continue in physics by providing them with information about graduate school, professional career advice, and networking opportunities with other women in physics (Next events: 17-19 Jan 2020)

**Contact:** Kai Wright, women@aps.org

**Support:** NSF: 1346627, 1622510; DOE: DE-SC0011076

**URL:** aps.org/cuwip
### STEP UP 4 Women

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High School</td>
<td>45%</td>
</tr>
<tr>
<td>College Entrance</td>
<td>15%</td>
</tr>
<tr>
<td>BS (degree)</td>
<td>10%</td>
</tr>
<tr>
<td>PhD (degree)</td>
<td>5%</td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Sources:** NCES/IPEDS, AIP-SRC, HERI
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:** Anne Kornahrens, kornahrens@aps.org

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

**URL:** stepup4women.org

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**Participation of Women in Physics**

- **High School:**
  - Germany: 40%
  - USA: 10%
  - Canada: 20%
  - Australia: 30%
  - Italy: 40%
  - Argentina: 50%
  - India: 60%
  - Albania: 70%
  - Iran: 80%

- **College Entrance (BS degree):**
  - Germany: 35%
  - USA: 15%
  - Canada: 25%
  - Australia: 35%
  - Italy: 45%
  - Argentina: 55%
  - India: 65%
  - Albania: 75%
  - Iran: 85%

- **PhD (degree):**
  - Germany: 30%
  - USA: 10%
  - Canada: 20%
  - Australia: 30%
  - Italy: 40%
  - Argentina: 50%
  - India: 60%
  - Albania: 70%
  - Iran: 80%

- **Assistant Professor:**
  - Germany: 25%
  - USA: 5%
  - Canada: 15%
  - Australia: 25%
  - Italy: 35%
  - Argentina: 45%
  - India: 55%
  - Albania: 65%
  - Iran: 75%
Society of Physics Students

**Goal:** Support the professional development of undergraduate physics majors

**Strategy:** Sigma Pi Sigma – the physics honor society; leadership opportunities; department cohesion; scholarships; internships; outreach awards; undergrad research; conferences

**Strategy:** Careers Toolbox

**Contact:** Brad Conrad, bconrad@aip.org

**URL:** spsnational.org
APS National Mentoring Community

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: Erika Brown nmc@aps.org

URL: aps.org/nmc
Grad School Shopper

**Goal:** Provide information on physics / astronomy graduate programs

**Strategy:** Online resource with data, and comparisons

**Contact:** Yolanda Matthews, ymatthews@aip.org

**URL:** gradschoolshopper.com
Goal: Provide a careers-oriented hallway slideshow for recruitment

Strategy: Slideshow comes out ~2x/semester and features profiles of physicists in industry, national labs, and other non-academic (mostly) careers; focus on individuals without PhDs (students already get information on academic careers); editable to include local information; hundreds of slides available

Contact: Crystal Bailey, bailey@aps.org

URL: aps.org/careers/insight

PHYSICIST PROFILE

Kate McAlpine (Physics BS)
Science Writer and Physics Rapper
CERN—Geneva, Switzerland

Why Physics?
Kate began her adventure with Physics at Michigan State, where she studied to be a science writer.

Since then, Kate has been at the Large Hadron Collider (LHC) doing outreach writing, and managing the news website for ATLAS (one of the experiments running on the LHC).

Kate is also responsible for the infamous "LHC Rap", which has gained worldwide notoriety through the internet!

“My goal is to explain scientific topics in a way that is relevant, interesting, and understandable,” she says. “While accuracy is serious business, the science should still be fun.”

25 SECONDS OF PHYSICS

The Physics of Yoga

Many people associate physics with complex technologies and far-out discoveries—but did you know physics is also an essential principle in yoga?

For every object, there is a point in space where you can imagine all of its mass is concentrated. This point is called the “center of mass” of the object.

In order for a yoga pose to be stable, the yogi’s center of mass must sit directly above the yogi’s point of contact with the ground—as though it was a heavy ball sitting on a support.

As a person moves, their center of mass shifts around in space.

So, mastering a pose involves carefully shifting one’s position so that their center of mass is balanced over their point of support—and that takes physics!
National Reports

**Goal:** Provide best-practice advice on topics relevant to improving and supporting physics departments

**SPIN-UP:** Increase number of majors – aps.org/programs/education/undergrad/faculty/spinup/spinup-report.cfm

**T-TEP:** Improve teacher education – phystec.org/webdocs/TaskForce.cfm

**Phys21:** Enhance career readiness of majors – compadre.org/Phys21

**LGBT+:** Improve climate for LGBT physicists – aps.org/programs/lgbt/

**GradEd:** Improve graduate education – aps.org/programs/education/graduate/conf2013/report.cfm
Goal: Advocate for physicists, and the broader community

Topics: Education
  - Ethics and Values
  - Human Rights
  - Internal Policy
  - National Policy

Education Topics:
  - Undergraduate Research Statement
  - Ethics
  - K-12 Education Statement
  - Career Options for Physicists
  - Advocacy for Science Education
  - Improving Education for Professional Ethics, Standards and Practices
  - Assessment and Science Research in Physics Education

URL: www.aps.org/policy/statements
**Goal:** Provide data to help faculty and departments understand the national picture and make comparisons

**AIP SRC:** Comprehensive data on faculty, students, careers, and diversity – aip.org/statistics

**APS:** Graphics, data, and presentation-ready slides using national sources to inform departments on students, women, minorities, and trends; comparison tool to rank your department – aps.org/programs/education/statistics

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**Physics Bachelors 1 Year Later**
7,430 Recent Degree Recipients

<table>
<thead>
<tr>
<th>Workforce</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector</td>
<td>26</td>
</tr>
<tr>
<td>High School Teaching</td>
<td>4</td>
</tr>
<tr>
<td>College &amp; University</td>
<td>4</td>
</tr>
<tr>
<td>Active Military</td>
<td>3</td>
</tr>
<tr>
<td>Government</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Unemployed, Seeking</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: IPEDS
Portal: Introductory Physics for the Life Sciences

**Goal:** Transformative web site for sharing, testing, and disseminating materials for IPLS and related courses. Being developed by AAPT and eight colleges and universities. Up and running early 2020 (Beta available now)

**Contact:** Bob Hilborn, rhilborn@aapt.org

**URL:** compadre.org/ipls/

**Support:** NSF: 1624185
Partnership for Integrating Computation into UG Physics

Goal: Survey of the current usage of computational work in undergraduate physics programs. Annual Computational Physics Faculty Development Workshop. Computational Physics workshops at AAPT section meetings, and APS and AAPT national meetings

Contact: Bob Hilborn, rhilborn@aapt.org

URL: compadre.org/picup

Support: NSF: 1432363, 1524963, 1505278
Physics Research Mentor Training Seminar

**Goal:** Help research mentors improve their mentoring skills

**Strategy:** Provide a guidebook and materials to facilitate a 10-week seminar for physics researchers. Includes guidance on how to run workshops, directed readings, and strategy tips

**Contact:** Monica Plisch, plisch@aps.org

**URL:** aps.org/link/mentor-training
**Goal:** Develop new approaches to advancing the interests of the physics community

**Strategy:** APS is awarding grants ranging from $25,000-$100,000/year for up to two years to each of 3-5 projects. After two years, funded projects will either end, obtain outside funding, or be deemed important enough to be integrated into APS’s operating budget.

**Contact:** Ted Hodapp, hodapp@aps.org

**URL:** www.aps.org/programs/innovation/fund

**2019 Awards:**

- More Humane APS Meetings through Machine Learning
- APS Network of Diversity Leaders
- Activating the U.S. Physics Community in Nuclear Threat Reduction
- U.S. – Africa Initiative in Electronic Structure
Gordon and Betty Moore Physics Innovation Grants

**Goal:** Stimulate innovative ways to address pressing problems in the physics of fundamental particles and interactions

**Strategy:** APS is awarding lectureships ($2k), extended visits ($5-10k), convening of small groups ($25-75k)

**Contact:** Kathryn Woodle, woodle@aps.org

**URL:** www.aps.org/programs/innovation/moore
Professional Skills Development Workshops

Goal: Improve the negotiation and communication skills for women

Strategy: 1-day workshop at national APS meetings; facilitation by nationally recognized leaders in negotiation and communication strategies

Contact: Brián Clash, clash@aps.org

Support: NSF-0347210, 0752540, 1012585, 1419913

URL: womeninphysics.org
Goal: Provide professional development / networking / career information / mentoring to early career individuals

Strategy: Still developing… but we would like to work with some existing physics graduate student associations

Contact: Ted Hodapp, hodapp@aps.org
CSWP Site Visits to Improve the Climate for Women and Minorities

**Goal:** Improve the climate for underrepresented individuals in physics departments

**Strategy:** 1-2 day site visits resulting in a formal report to the chair; 1-year follow up; focus on Research Universities, National Laboratories, Scientific Collaborations; 79 visits over last 25 years; best-practices in hiring, retention, climate, etc. available on the website; led by the APS Committee on the Status of Women in Physics (CSWP) and APS Committee on Minorities (COM)

**Contact:** Della Richardson, women@aps.org

**URL:** womeninphysics.org
Goal: Improve recruitment and/or retention of women in physics (WiP)

Strategy: Provide mini-grants (up to $1,000) to build, improve, or sustain WiP groups; collect and share ideas on activities

Examples: Workshops on careers, communication, negotiation, leadership, dealing with bias, other skills; high school or middle school classroom visits; lab tours or field trips; research expos; book club or journal club; group lunches, dinners, or social events

Contact: Della Richardson, women@aps.org

URL: womeninphysics.org
Goal: Develop a working document to guide departmental review, assessment, and improvement

Strategy: National task force to design, write, vet, and disseminate a collection of effective practices and guide for self-assessment, along with its inherent review structure to improve undergraduate physics. Although not accreditation at this time, it will form the basis of a document that could be used in this fashion; full guide released in 2020.

Contact: Ted Hodapp, hodapp@aps.org

Support: American Physical Society, NSF: 1738311, 1747563
Tentative Section List: 25 “Executive Summaries”

**Students**
- Recruiting
- Retention
- Mentoring / advising
- Internships
- Undergraduate research
- Career preparation

**Curriculum**
- Implementing research-based instructional practices in your program (overarching)
- Introductory courses for physical science and engineering majors
- Introductory courses for life sciences majors
- Upper-level physics courses
- Non-STEM major courses
- Communications skills
- Laboratory / experimental skills

**Programs**
- Computational skills
- Culminating integrative experiences (Capstone experiences)
- Online education

**Departmental**
- Physical environment: encouraging collaboration and learning
- Departmental climate
- Equity, diversity, and inclusion
- Ethics
Hints for the Future

• Understand the problems of the people “up the chain” (chair, dean, provost, etc.), and solve their problems – this will allow you to gain resources to solve your problems

• Keep leadership informed about your progress relatively often – do not ask for resources when you do this; this develops a relationship and your credibility for the time when you do need resources.

• Don’t go “around” your leaders (chair, dean, etc.), but don’t let a negative response stop you – regroup, or be patient

• Involve your students – they have intrinsic knowledge of context

• Ask for help: mentors, chair, other faculty in or out of department