

Bridge Programs as an approach to increasing diversity in physics

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Contents

Introduction/Statistics

Bridge Programs

Best Practices

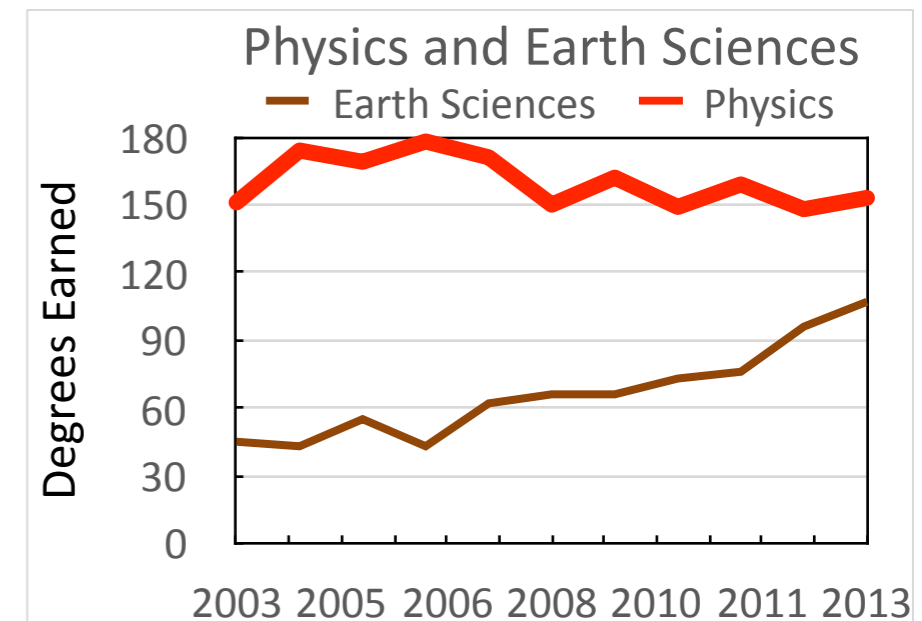
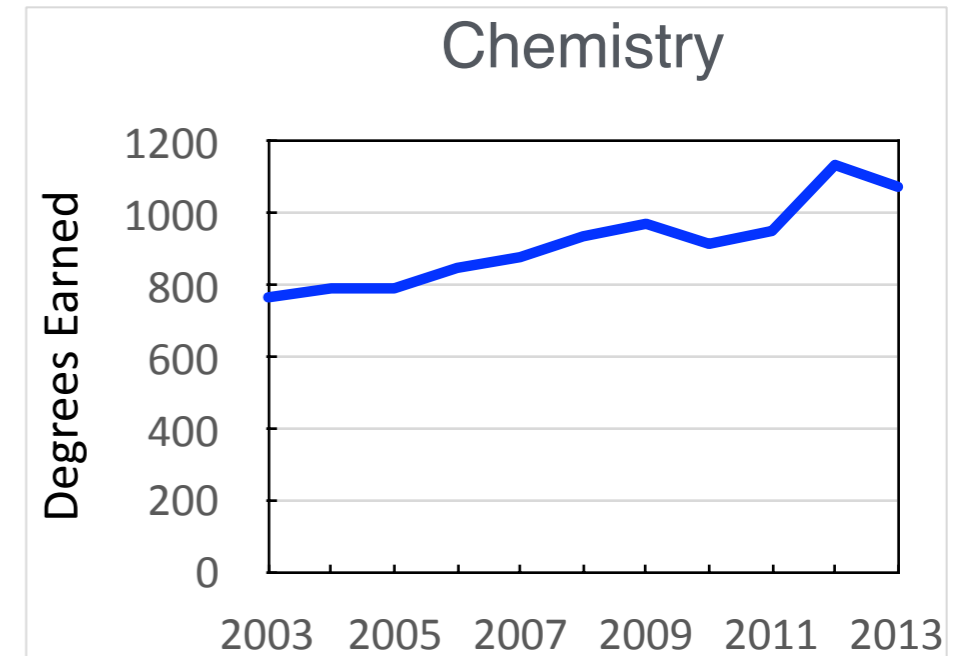
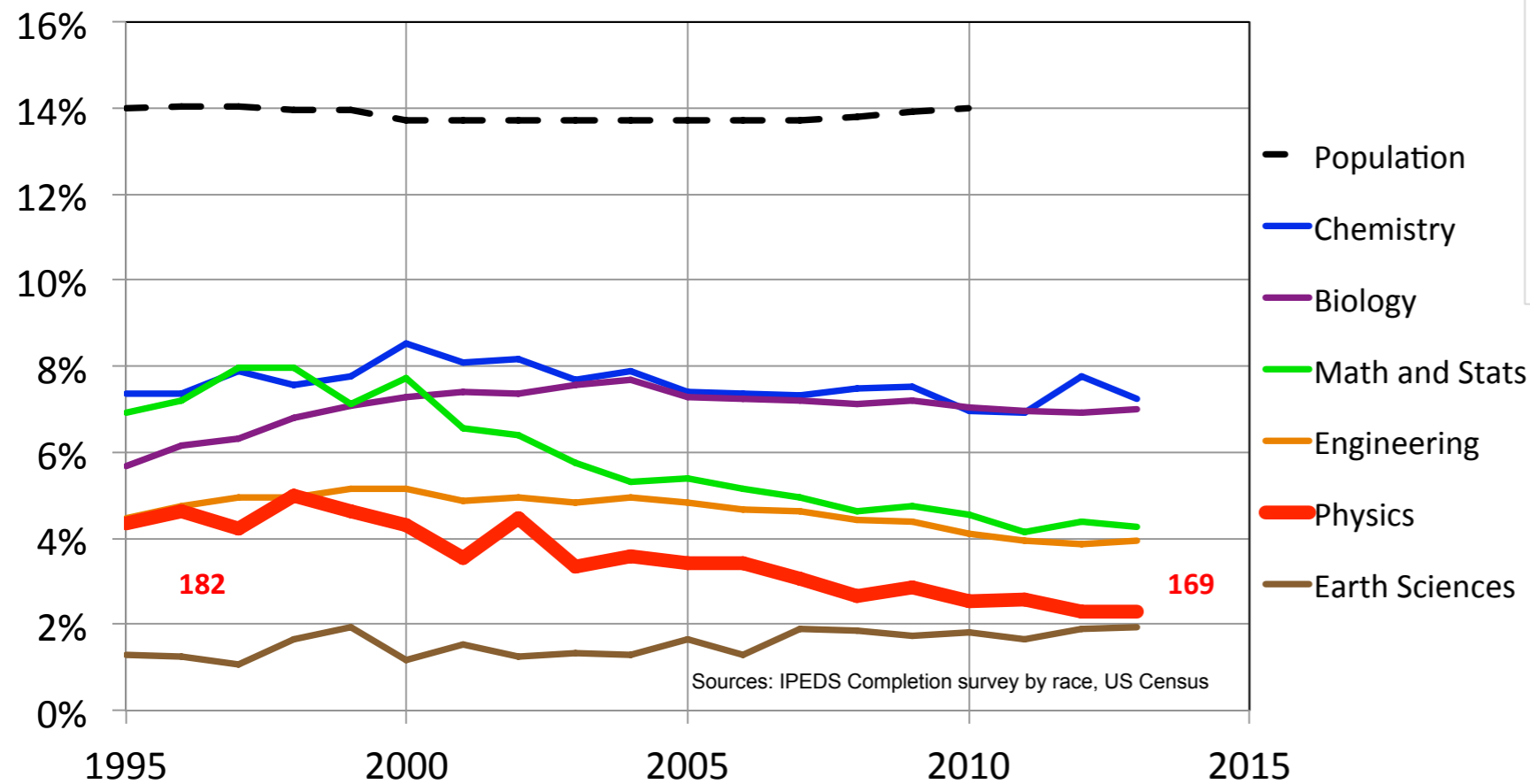
Outcomes

Conclusion/Outlook

Bachelor's Degrees Earned by African Americans in Physical Science Fields

African American Physics BS accounts for 2-3% of earned degrees

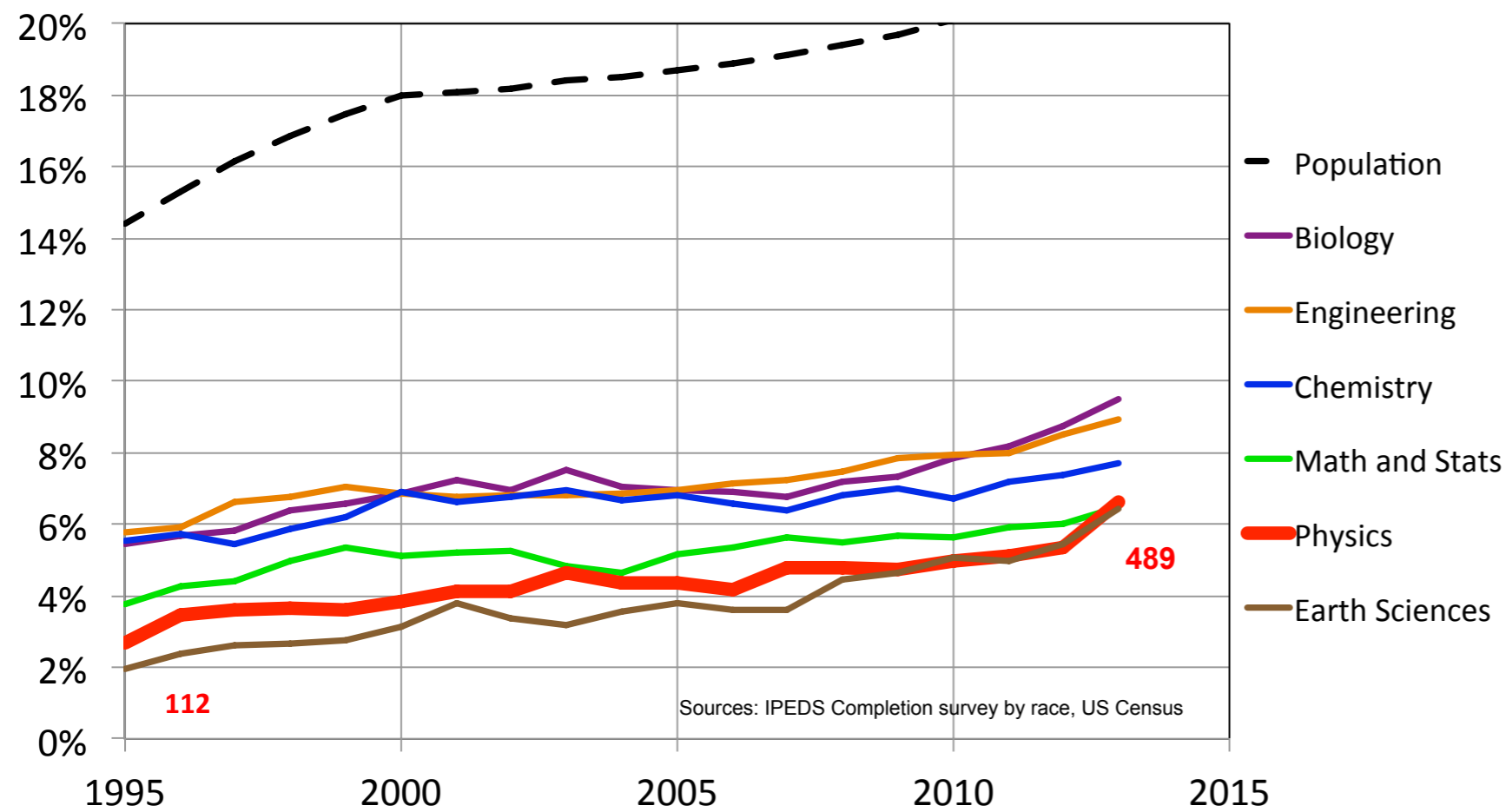
Percentage of BS degrees earned by African Americans by Major



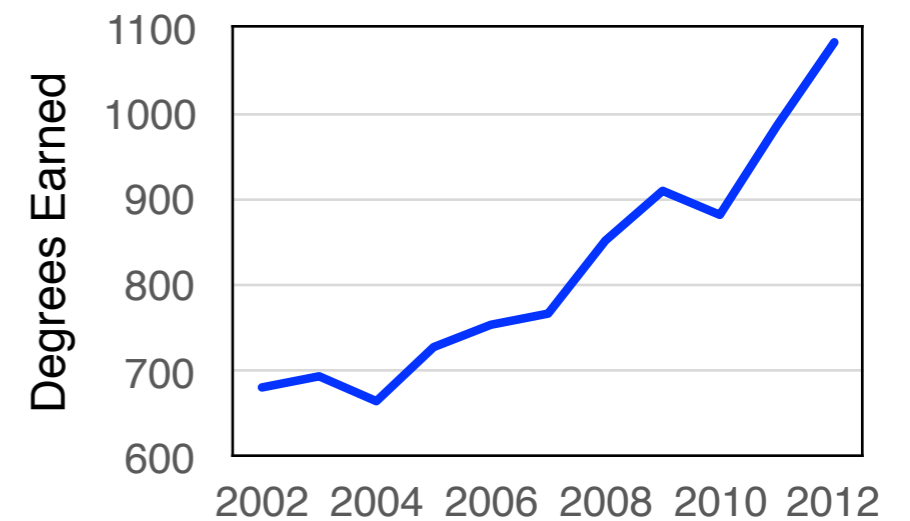
Bachelor's Degrees Earned by Hispanic Americans in Physical Science Fields

Hispanic Americans Physics BS accounts for 6-7% of earned degrees

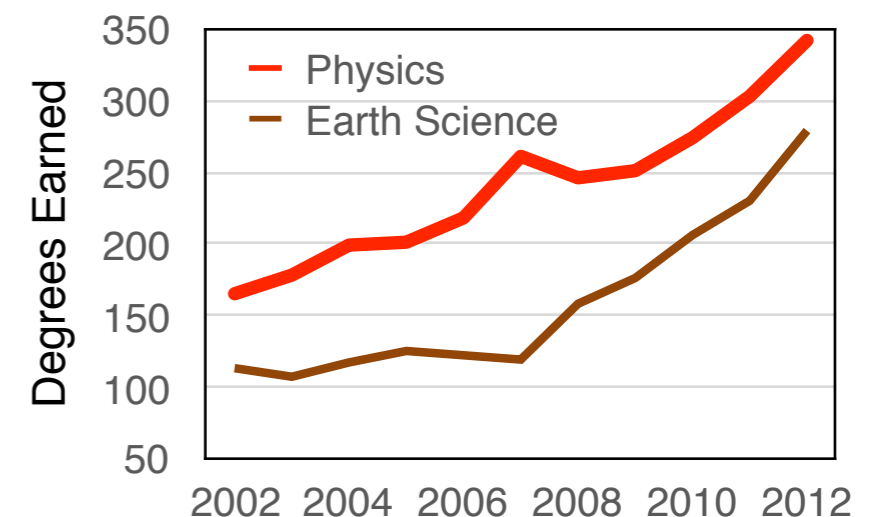
Percentage of BS degrees earned by Hispanic Americans by Major



Chemistry

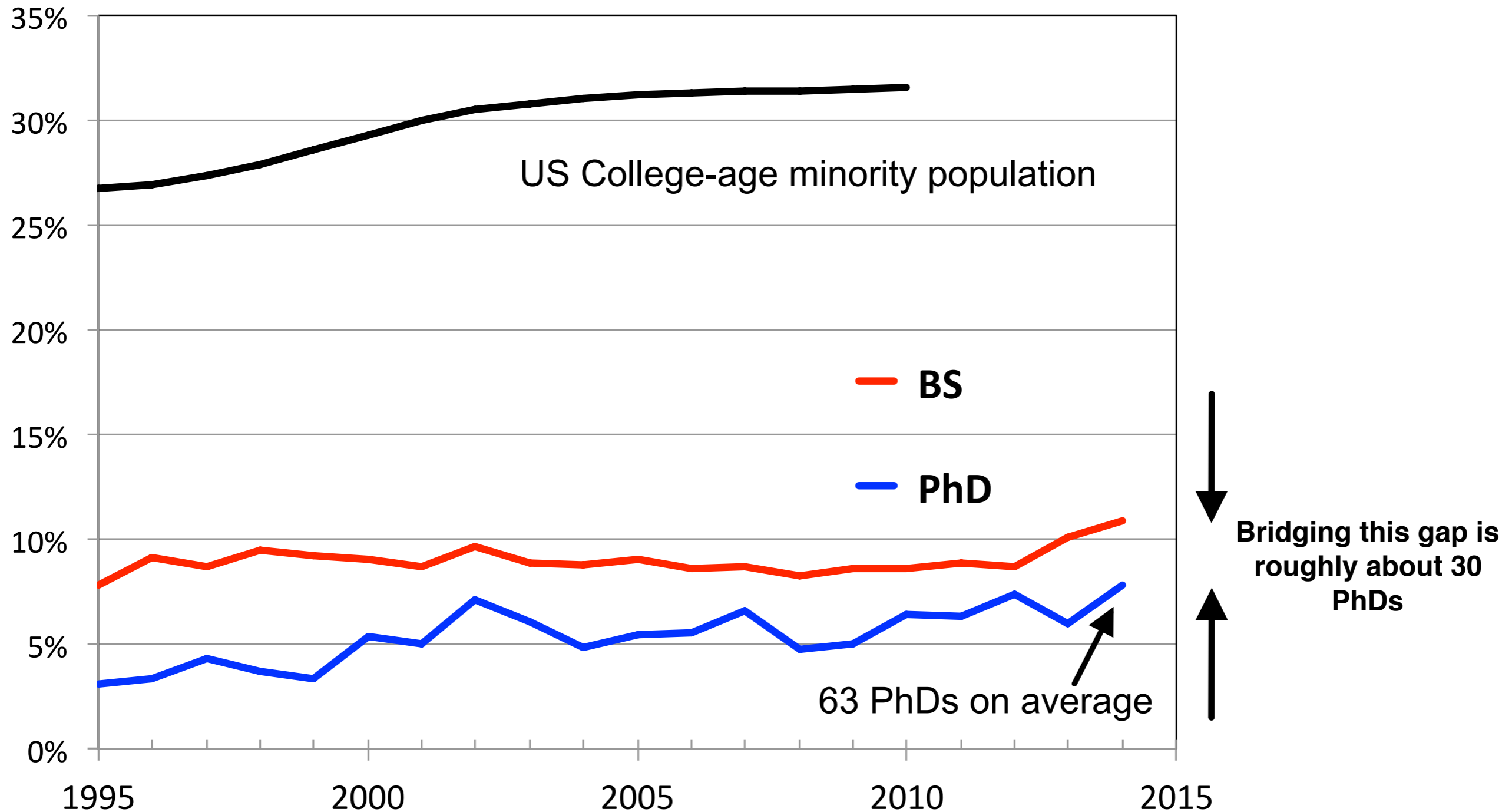


Physics and Earth Sciences



URM Trends in Physics

Percentage of degrees earned by URM in Physics

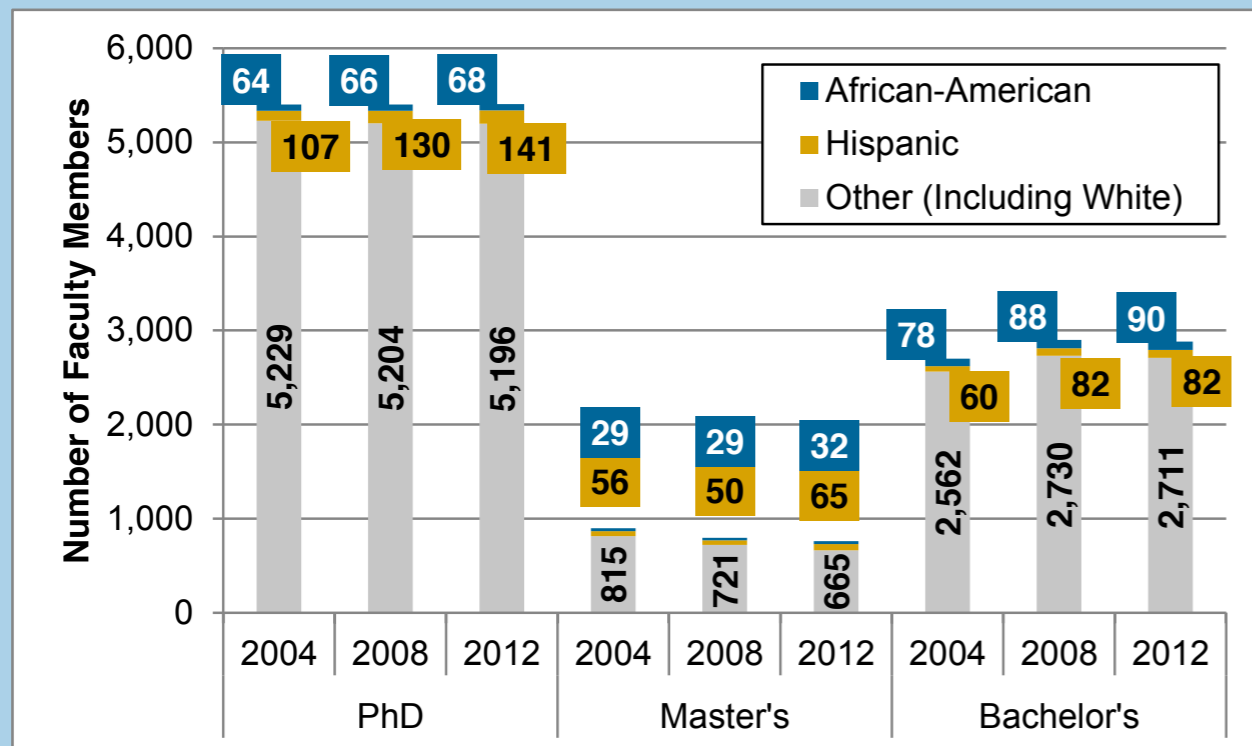


Diversity in Physics Faculty

Where do most URM have positions?

- 50% of African American faculty are employed at HBCUs
- HBCUs account for roughly 4% of physics departments
 - ▶ most physics students have never had/seen black faculty on their academic path

Number of African-American and Hispanic Physics Faculty by Highest Degree Awarded by Department, 2012



www.aip.org/statistics

Race and Ethnicity of Physics Faculty

	Physics			All Disciplines*
	2004 (%)	2008 (%)	2012 (%)	2009 (%)
African-American	2.0	2.2	2.1	6.6
Asian	10.6	13.2	14.3	6.0
Hispanic	2.7	3.1	3.2	4.0
White	82.2	80.0	79.2	74.9
Other	2.2	1.5	1.2	0.5

* Data for all disciplines (which includes non-science disciplines) found at <http://nces.ed.gov/fastfacts/display.asp?id=61>

www.aip.org/statistics

Bridge Programs in Physics

Bridge Program -

- An approach to addressing the underrepresentation of some groups in physics
- Aim to provide opportunities for students to be successful that may not have had such chances by traditional means

APS Bridge Program - National effort to increase the number of PhD earned by underrepresented students in physics.

APS Funded Sites:

- Florida State University
- Indiana University
- Ohio State University
- University of Central Florida
- University of South Florida
- Cal. State Long Beach

Other Programs:

- University of Michigan
- Columbia University
- Fisk/ Vanderbilt University
- MIT
- Princeton University
- University of Chicago
- Others under development

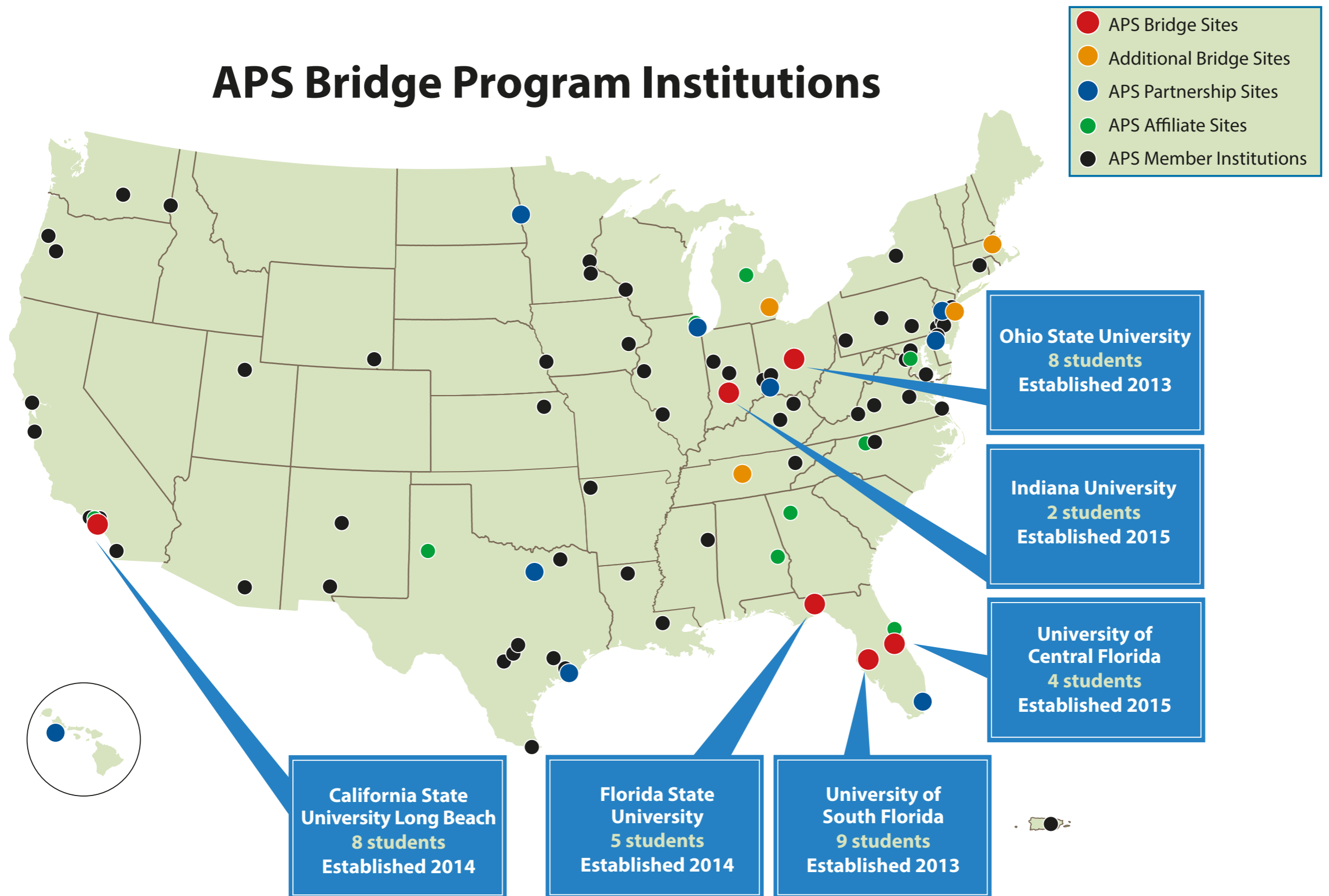
Goal of APS Bridge Program

APS Bridge Program

- Increase the fraction of physics PhDs Awarded to underrepresented minority students to match the fraction of physics bachelors awarded
- Develop, evaluate, and document sustainable bridging experiences that improve the access to the culture of graduate education for all students, with emphasis on underrepresented groups in doctoral physics programs
- Promote and disseminate successful program components to the physics community

Bridge Programs in Physics

APS Bridge Program Institutions



Best Practices

Faculty Involvement

- 10-15% tenure faculty involved is needed for sustainability

Admissions decisions

- Decide what are you selecting for? (“Holistic review”)

Financial support

- Secure funding for at least one year for Bridge experience (timing)

Mentoring

- Mentor-mentee contracts outlining expectations, and multiple mentors (including peer mentoring)

Coursework

- Flexibility in courses and usage of cross listed courses (Induction advising and alternate plan)

Progress monitoring and inductions

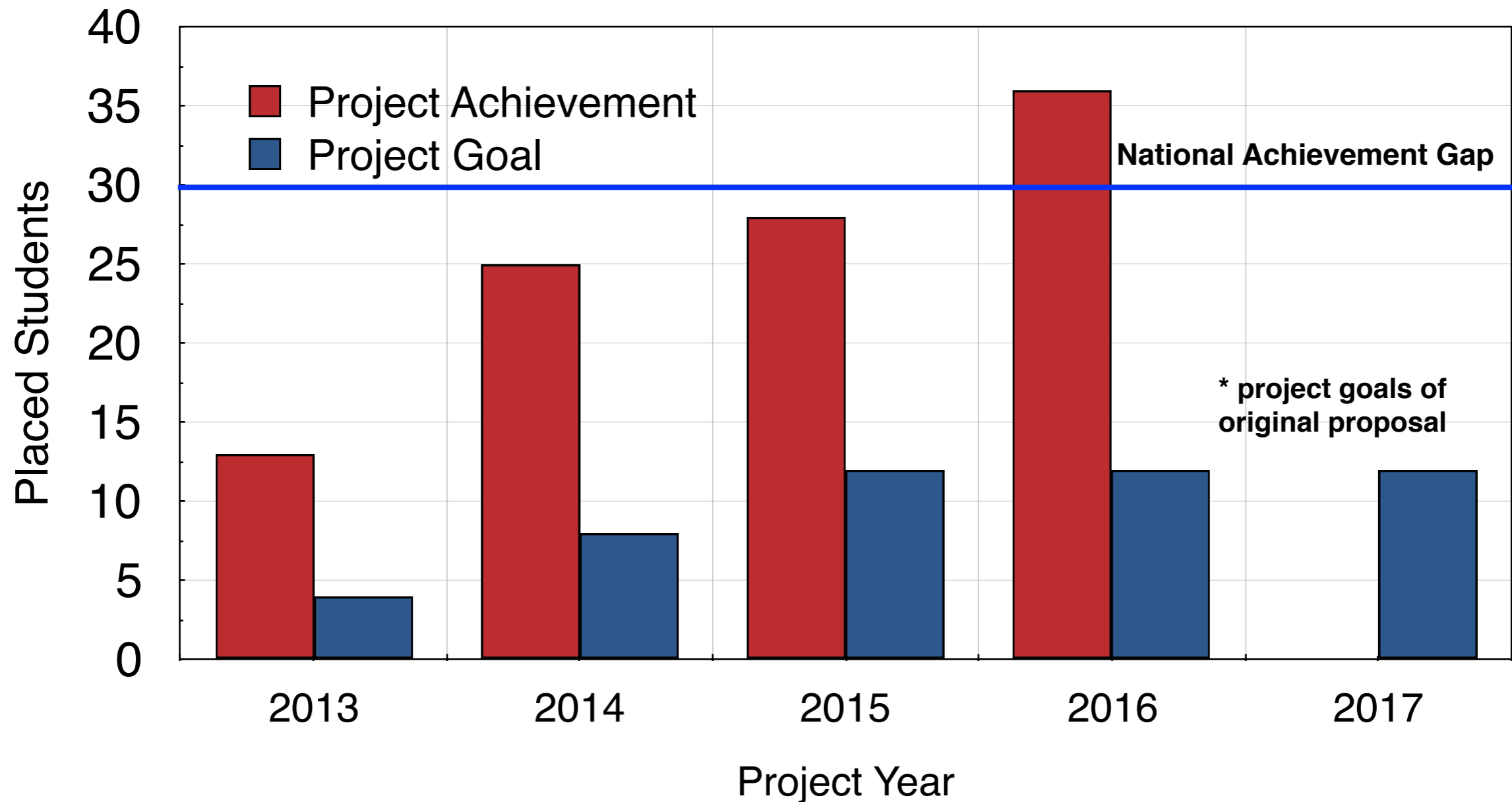
- Introduction into graduate life and new culture
- Weekly progress meetings (timing, intervention)

Research

- Appropriate match

APS Outcomes

Over 100 students have been placed into Bridge or Graduate programs in physics.



None of these students would have entered graduate school !

Major Achievements

Placement

- APS ~ 66 students entered grad programs
- 36 scheduled for fall 2016

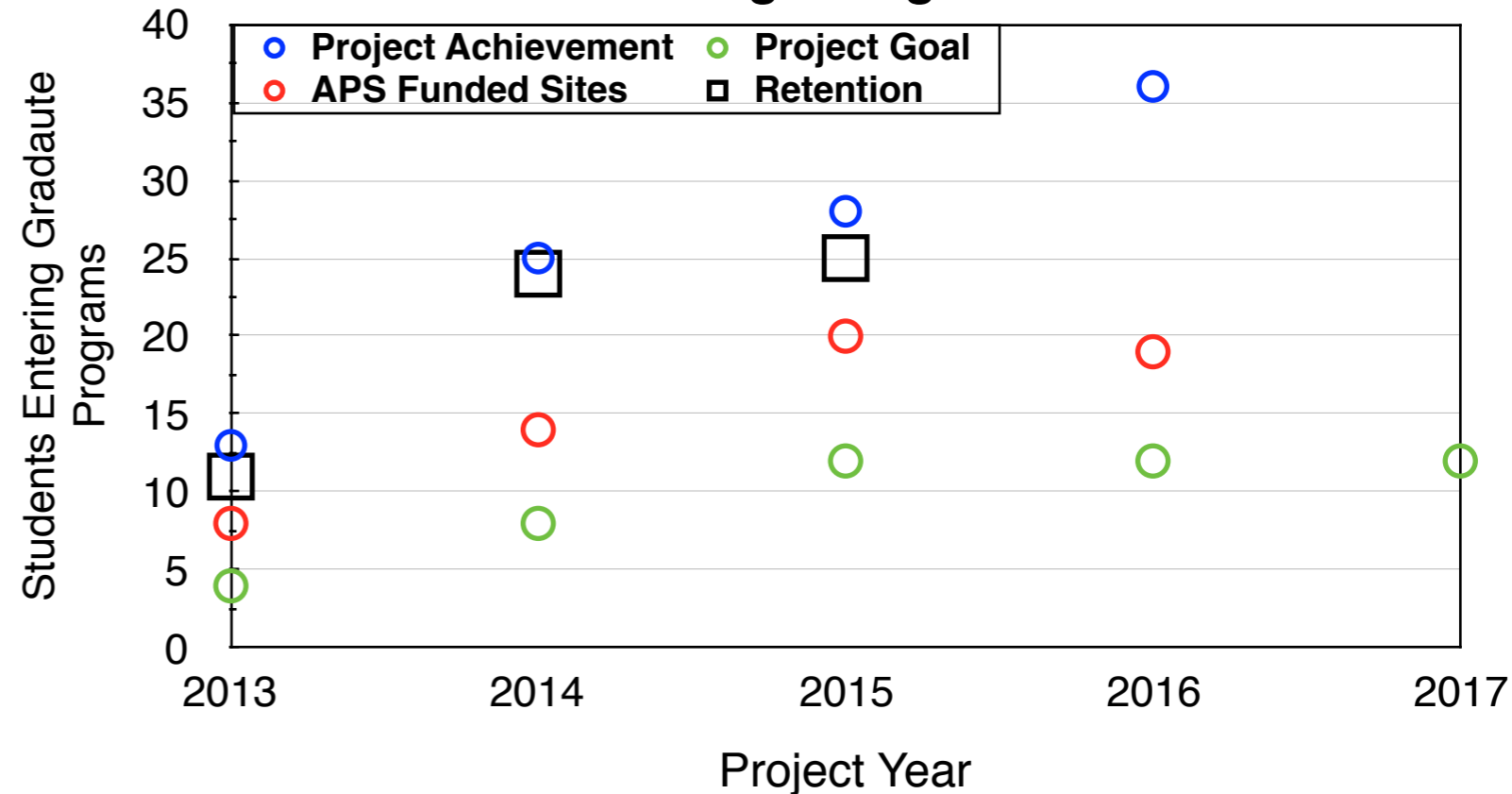
Retention rates

- APS ~**88%**
- Fisk Vanderbilt ~**80%**
- *University of Michigan* ~**90%**
- National average ~**60%**

U of Michigan Bridge to Doctorate Program (interdisciplinary)

- 97% of students completed the Bridge Masters (61/63)
- 70% of those that completed matriculated into a PhD program (43/61)
- 24 students entered UM PhD program (56% of those entering PhD programs)

APS Bridge Program



2013	2014	2015	Actions
28	38	53	Eligible applications
8	18	22	Bridge students selected
23	69	45	Departments expressing an interest in recruiting these students
12	20	29	Remaining applications circulated
5	7	6	Additional students recruited by "Affiliated" sites
13	25	28	Total number of students entering grad studies
11	24	28	Retained in physics graduate programs

Conclusion/Outlook

If we care about science, then we must also care about scientists

Bridge Programs can be implemented to increase diversity in student enrollment and retention, and ultimately the physics community

Implementing best practices benefit all students

Bridge Programs provide an opportunity and access for students to be successful !!

Diversity and inclusiveness initiatives must acknowledge intersectionality (Gender and Sexual Minorities (GSM) and members of the LGBTQ+ community)

Resources

AIP Statistical Research Center: aip.org/statistics

APS Bridge Program : www.apsbridgeprogram.org

Fisk-Vanderbilt Bridge Program: fisk-vanderbilt-bridge.org

University of Michigan Bridge Program: [Michigan Imes-Moore Fellows program](#)

**Stereotype Threat:
www.reducingstereotypethreat.org**

Additional

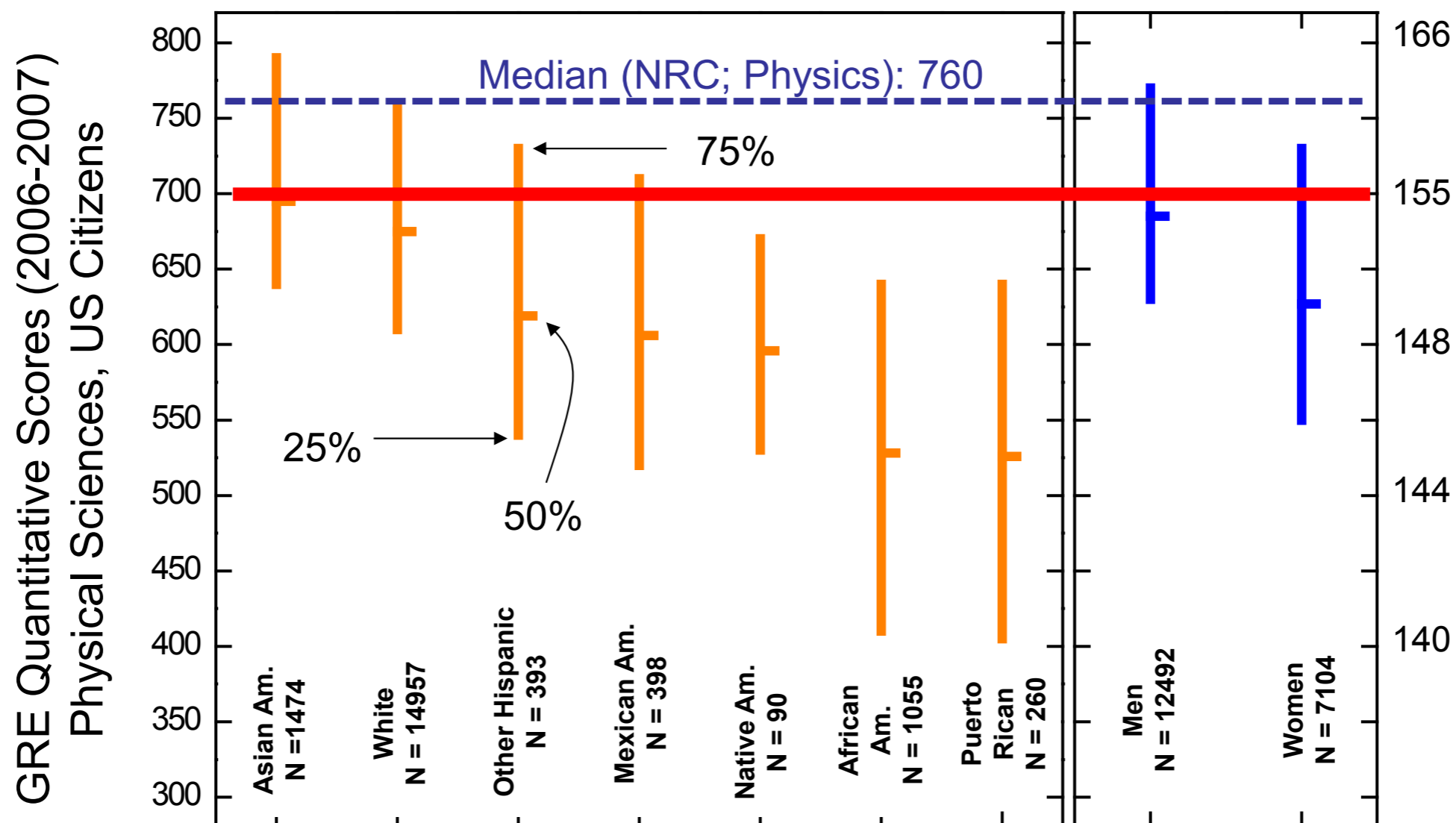
ETS Guidelines

ETS guide on use of scores

- ◉ What are the impacts cut off scores?
 - ▶ A score should not be the sole criteria of denial of admission
 - ▶ Any department considering using a cut-off score should have a rationale justifying the use of the score in regards to the following
 - evidence that the proposed score usefully distinguishes between individuals that are likely to be success in graduate school and those that are not
 - the impact of the proposed score on the institution's goals related to diversity

Physics GRE: Impact of Cutoff Scores

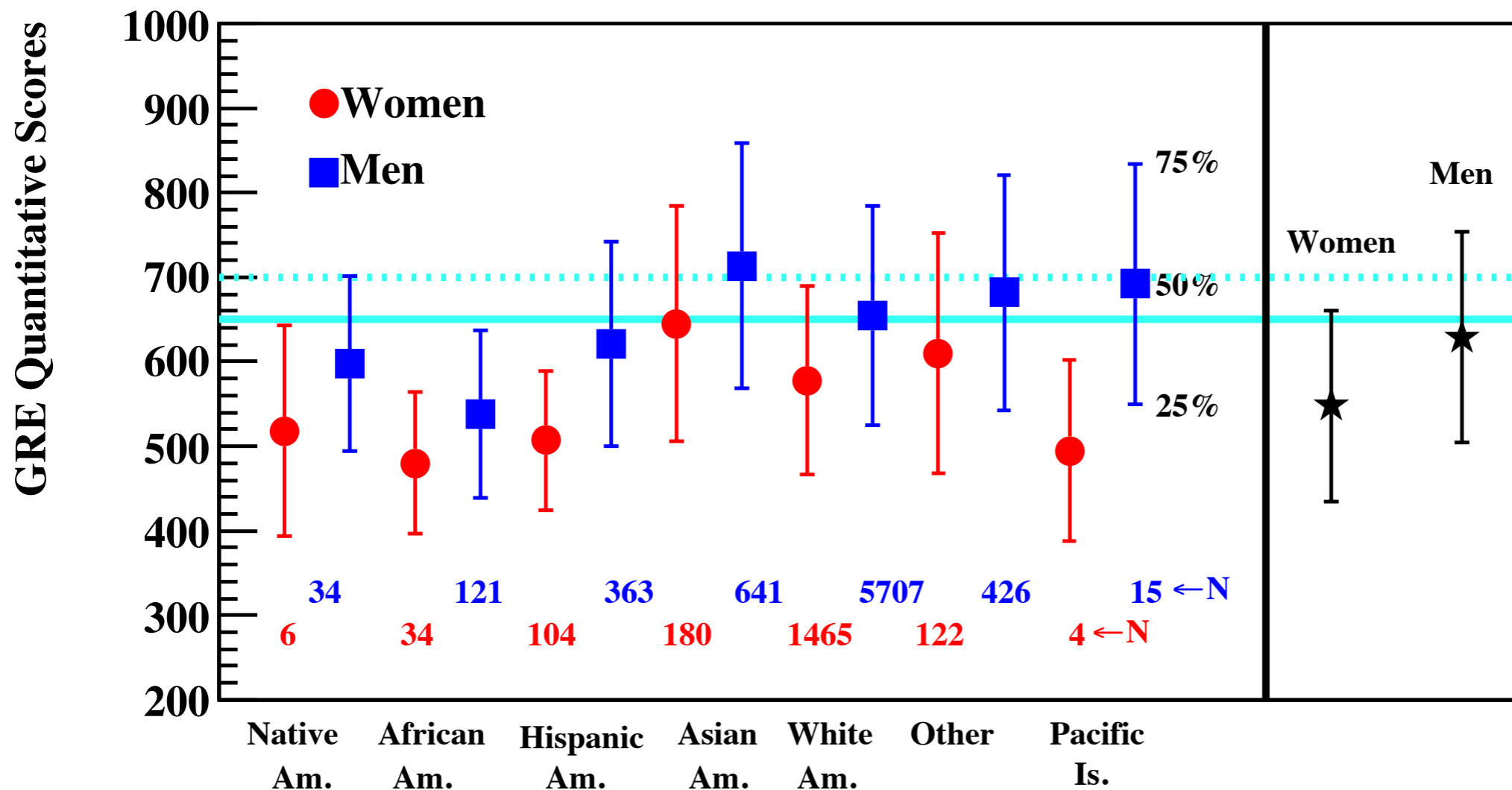
Use of minimum acceptable GRE score negatively impacts diversity in stem



Physics GRE: Impact of Cutoff Scores

Use of minimum acceptable GRE score negatively impacts diversity in stem

2009 - 2012 GRE Quantitative Scores Physical Sciences, US Citizens



US PhD Physics Programs

There are around 180 graduate programs listed in the AIP graduate bok

- 96% require the general GRE with 1/4 stating a minimum score for admission (700)
- 46% require Physics GRE with 1/2 stating a minimum score for admission (600)

Other Reasons Students are Not Admitted

Admissions Committee:

- ◉ Members overwhelmed
- ◉ Not up to date on recent findings on admission research
- ◉ Not trained in selection

Students:

- ◉ Low GRE scores
- ◉ Applied to few schools (financial challenge)
- ◉ Application materials do not convey a predictive story
- ◉ Inadequate preparation
- ◉ “Feeling unprepared”

Current Admissions Practice

Present admission practices

- Traditional filters- GPA, GRE scores, and undergrad institution
- Qualitative - letters, statements, past research experience

Holistic Admissions

Best Practices

- Holistic admission practices
 - ▶ Interview candidates (takes time and effort)
 - ▶ Look at the whole story to discern research and leadership potential, enthusiasm, grit, and passion
 - ▶ Clearly decide the goals of admissions
 - Smart students, passing course, match for your research program with potential for great research?

Lowered Quality

Diversity does mean that standards of quality are lowered.

- Diversity does not have to come at the expense of quality.
- Lowering the bar only perpetuates stereotypes by definition
- It also perpetuates feelings associated with imposter syndrome
- And bar for what?

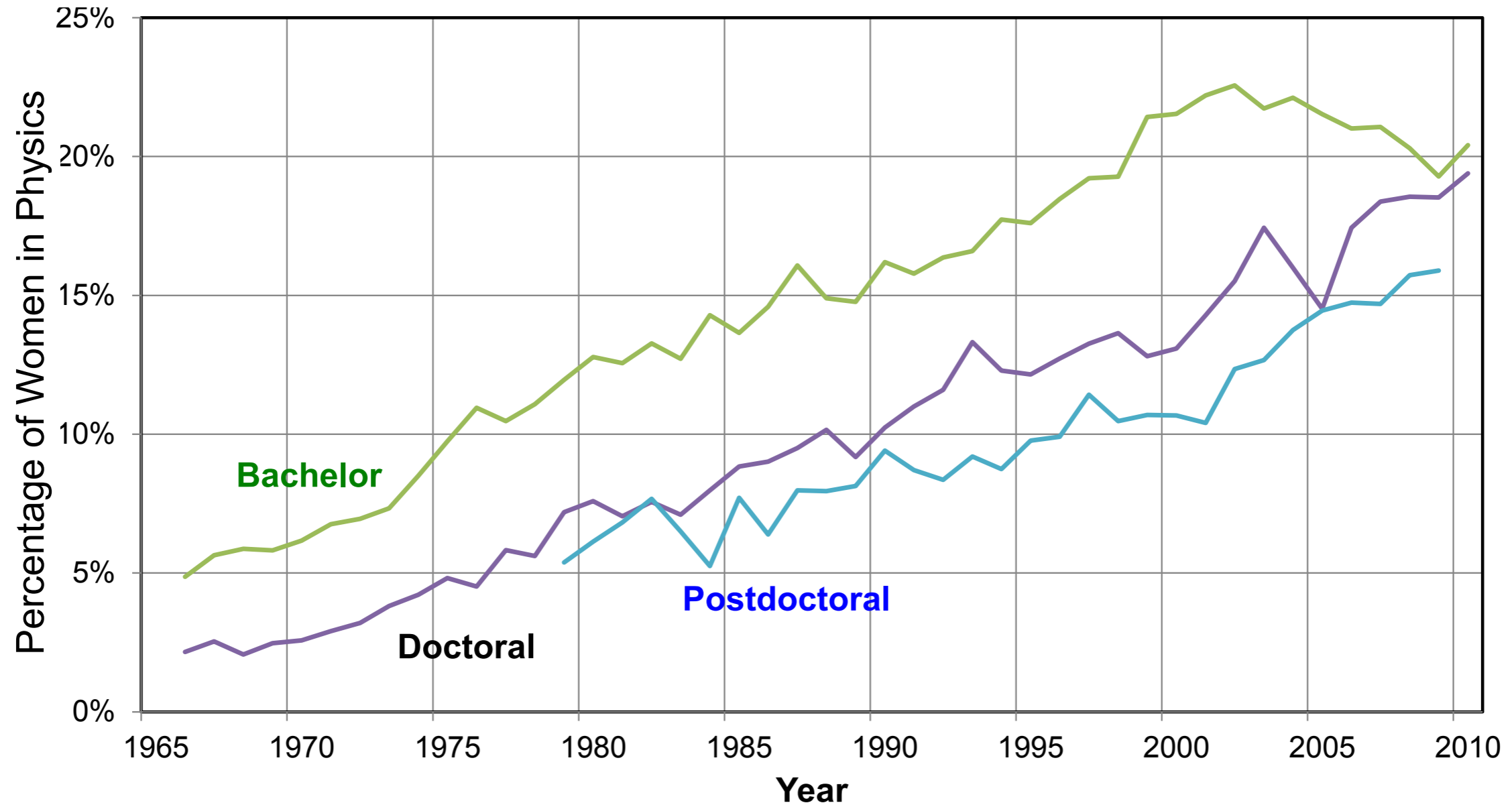
Other Factors

Be aware of climate effects

- Stereotype threat
- Imposter syndrome
- Implicit bias

Least Diverse

Physics is the least diverse of the sciences



Credit: APS/Source: IPEDS Completion Survey & NSF-NIH Survey of Graduate Students & Postdoctorates in Science and Engineering

Top Producers (BS)

URM Undergraduate Physics Degrees: Bachelor's Degree Institutions 2011-2013

Institution	Average Degrees/Year
Morehouse College	9
University of Puerto Rico Humacao	5
California State Polytechnic University Pomona	4
St Mary's University	4
Angelo State University	4
United States Naval Academy	4
Benedict College	4
California State University Stanislaus	4
University of Texas Pan American	4
Xavier University of Louisiana	3
Dillard University	3
South Carolina State University	3

URM Undergraduate Physics Degrees: Master's Degree Institutions 2011-2013

Institution	Average Degrees/Year
University of Puerto Rico Mayaguez	9
University of Texas at Brownsville	9
University of Puerto Rico Rio Piedras	4
University of Texas at El Paso	4
California State University Fullerton	3
CUNY City College	3
Embry Riddle Aeronautical University Daytona Beach	3
Delaware State University	3
Northern Arizona University	3
San Francisco State University	3

URM Undergraduate Physics Degrees: PhD Degree Institutions 2011-2013

Institution	Average Degrees/Year
Massachusetts Institute of Technology	12
Florida International University	11
University of California Berkeley	9
University of Texas at Austin	8
University of California Los Angeles	7
University of Arizona	7
University of California Santa Barbara	7
Cornell University	6
University of California Santa Cruz	6
University of Washington Seattle Campus	5
Arizona State University Tempe	5

Top Producers (MS & PhD)

URM Master's Physics Degrees: Master's Degree Institutions 2011-2013

Institution	Average Degrees/Year
Fisk University	5
California State University Los Angeles	3
North Carolina A & T State University	2
North Carolina Central University	2
University of Puerto Rico Mayaguez	2
California State University Northridge	1
Christopher Newport University	1
University of Houston Clear Lake	1

URM PhD Physics Degrees: PhD Degree Institutions 2011-2013

Institution	Average Degrees/Year
Stanford University	4
University of Michigan Ann Arbor	3
Massachusetts Institute of Technology	2
University of California Berkeley	2
California Institute of Technology	2
New Mexico State University Main Campus	2
Rice University	2
Texas A & M University College Station	2