Departments That Excel in Diversity, Equity, And Inclusion: Who, What, Why, And How

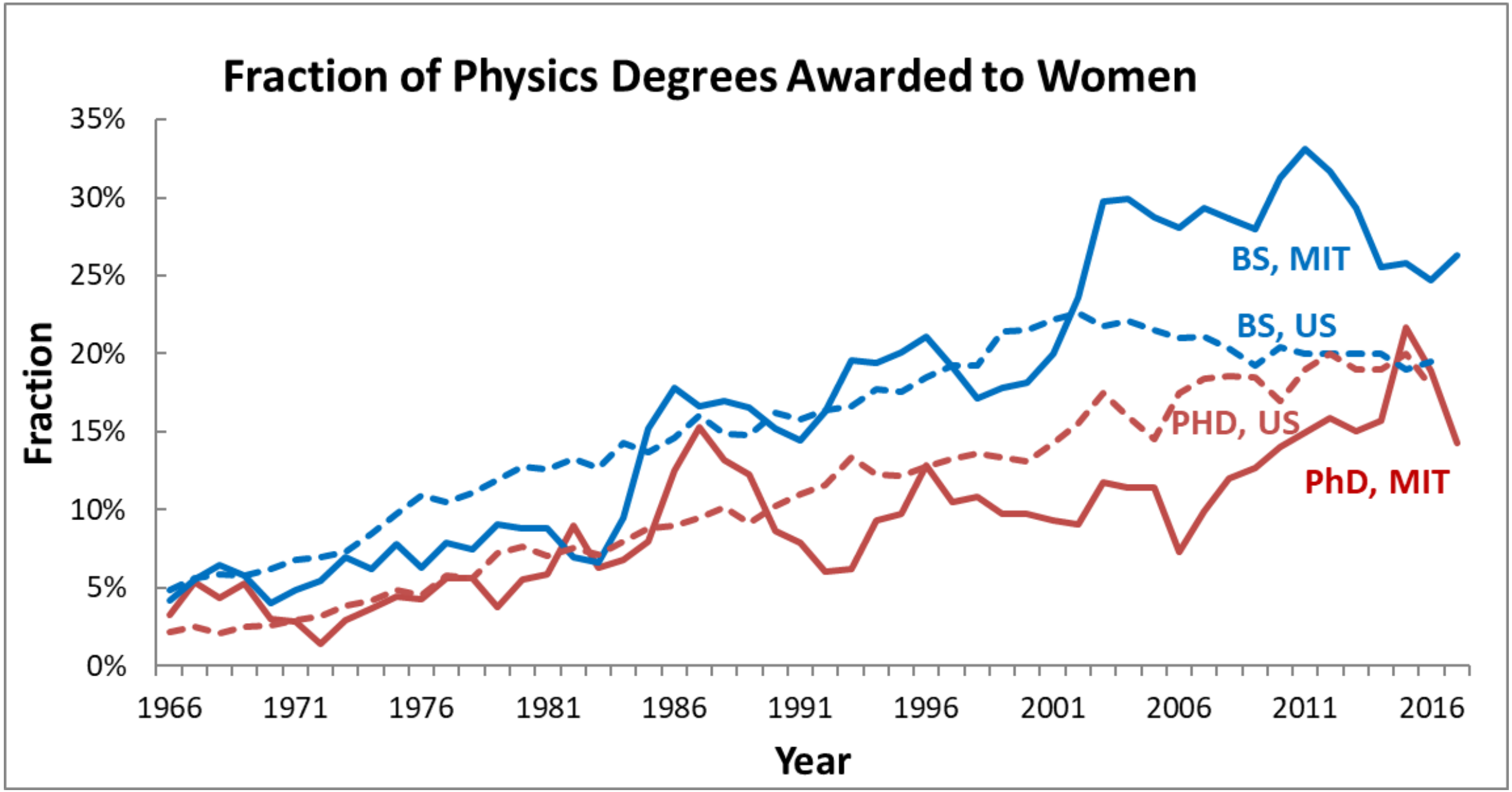
Edmund Bertschinger,

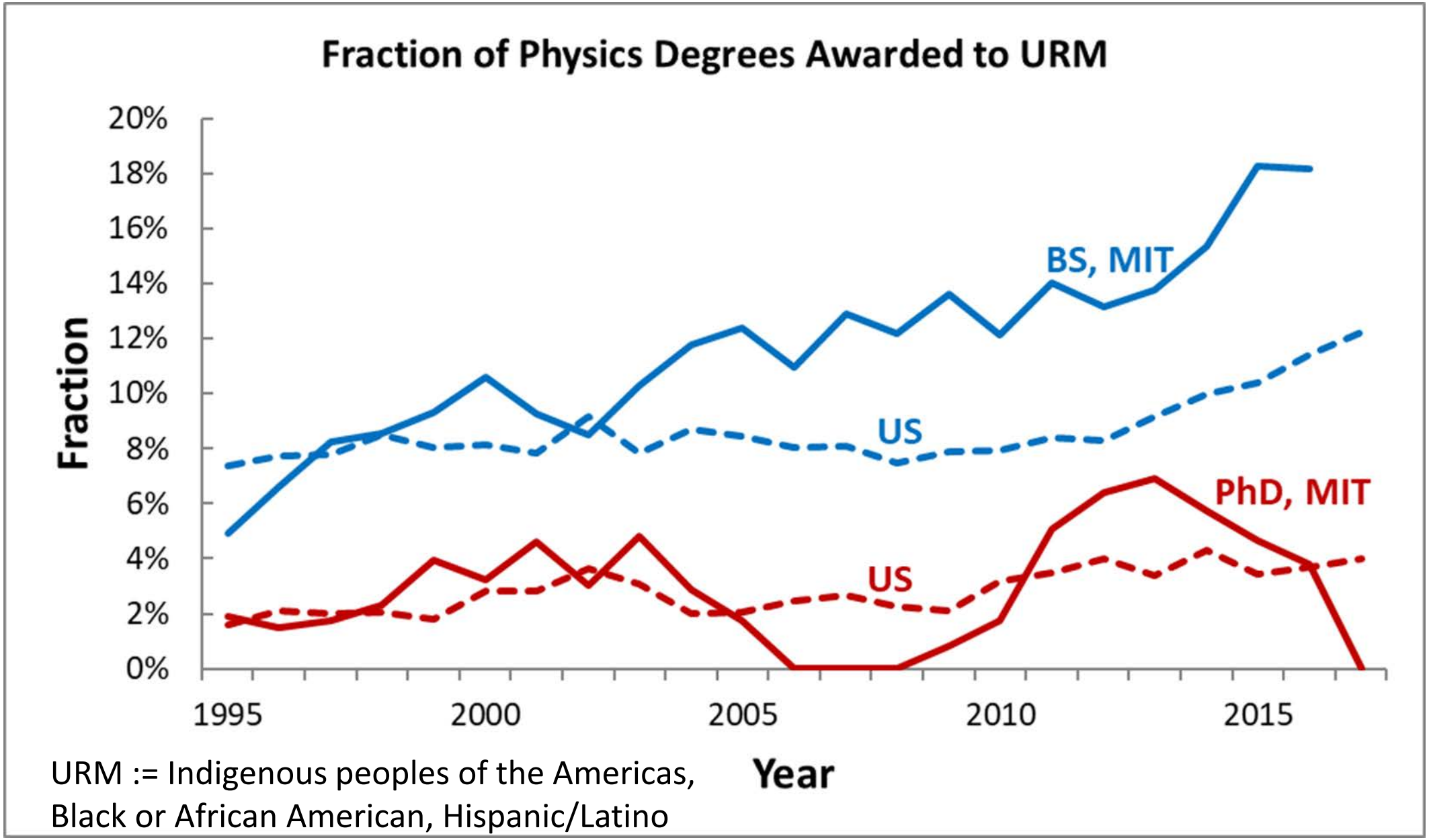
MIT Physics and Program in Women's and Gender Studies

MIT Astrophysics Colloquium

April 9, 2019

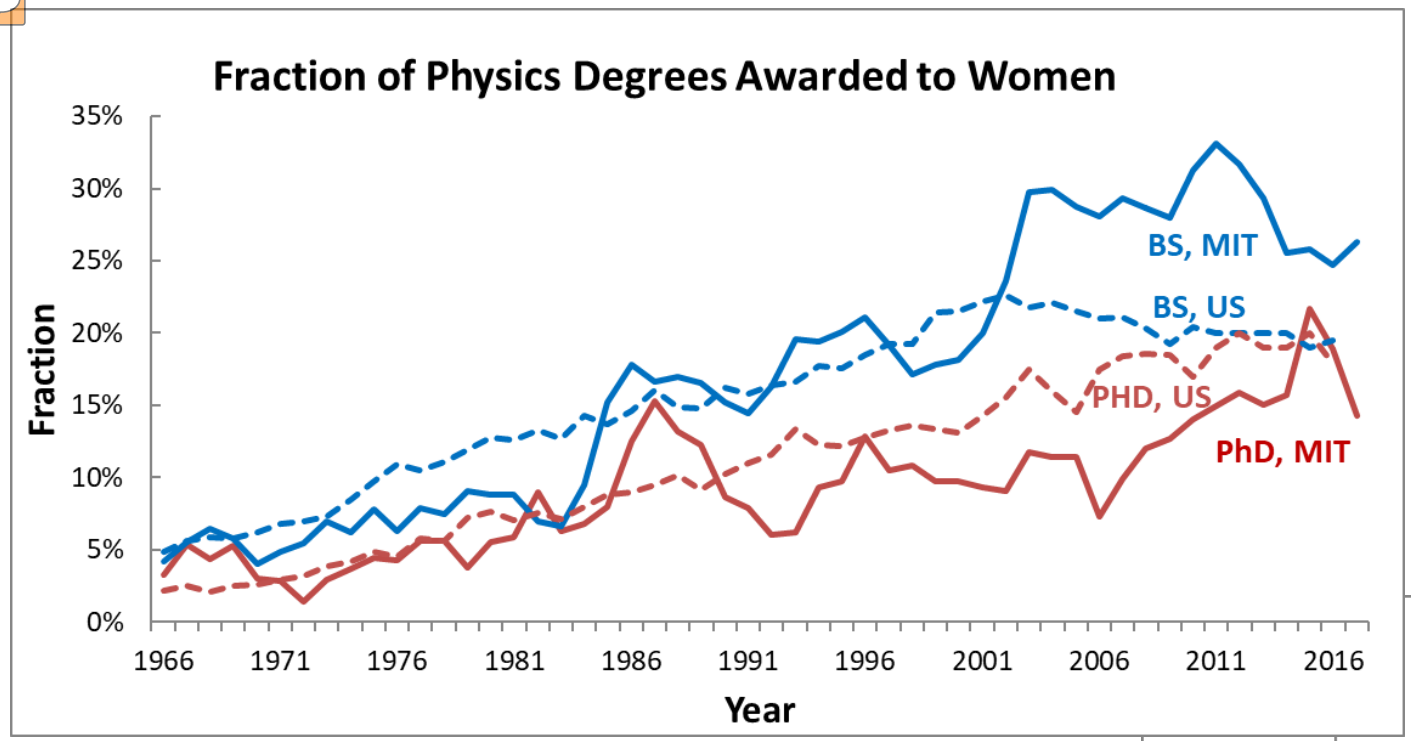
Are universities creating ideal spaces to inspire, support, and educate all students?

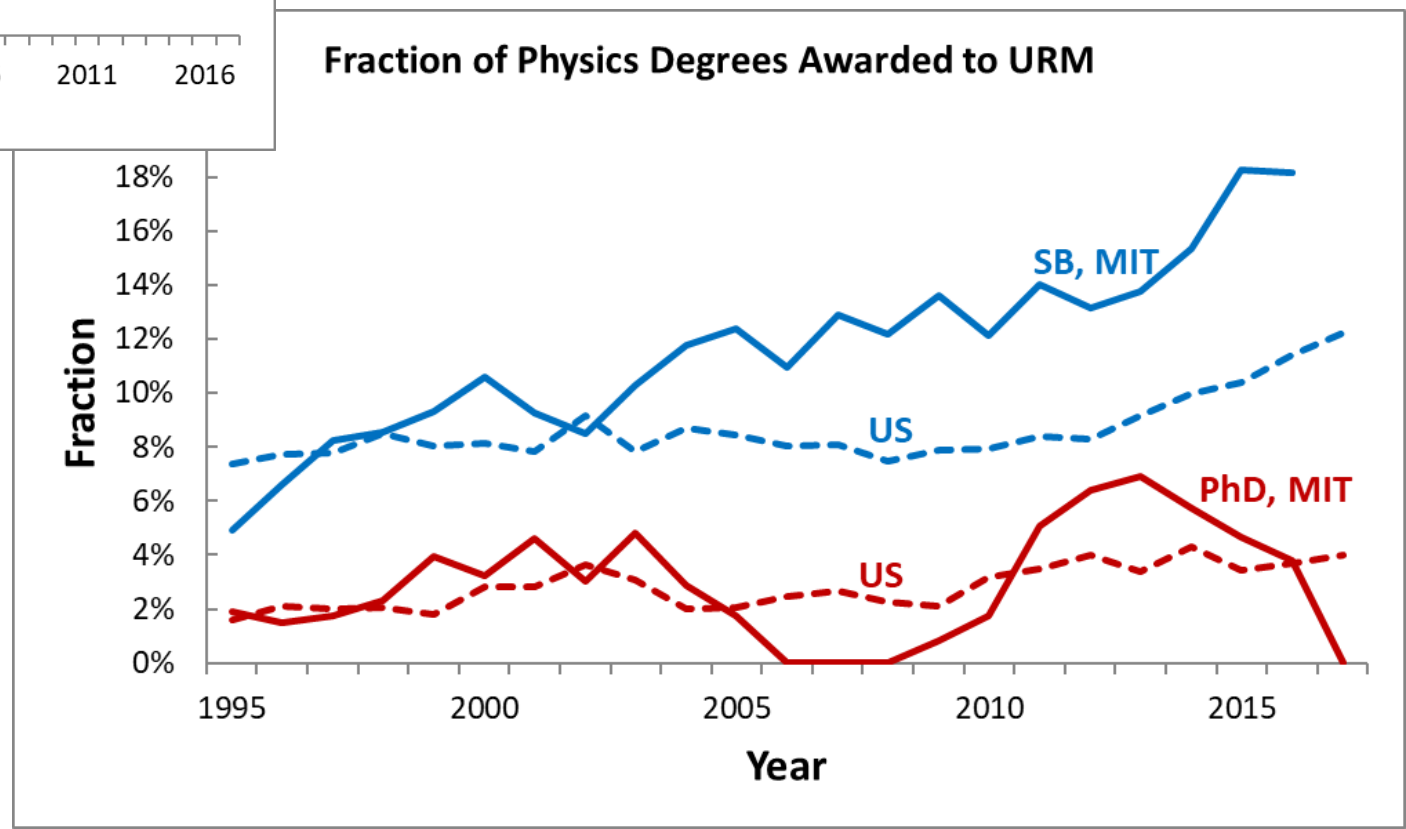

Fraction of Physics Degrees Awarded to Women
35%
30%
25%
20%
15%
10%
5%
0%
Fraction
1966
1971
1976
1981
1986
1991
1996
2001
2006
2011
2016
Year
BS, MIT
BS, US
PHD, US
PhD, MIT


Fraction of Physics Degrees Awarded to URM
Fraction
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
1995
2000
2005
2010
2015
Year
BS, MIT
US
PhD, MIT
US
URM := Indigenous peoples of the Americas,
Black or African American, Hispanic/Latino

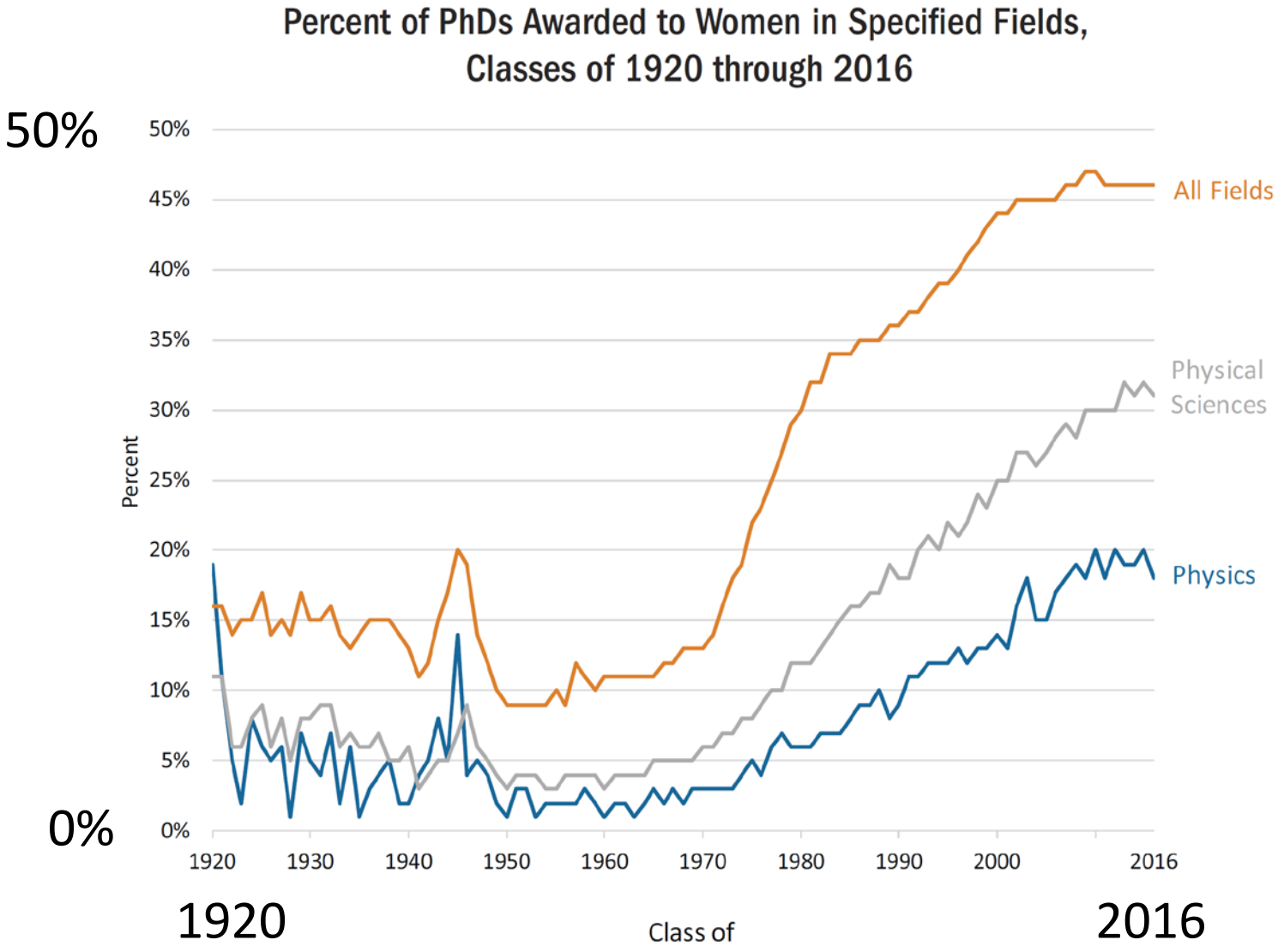
Discuss with a neighbor what you find interesting about these graphs.

What is your interpretation of the trends?


Fraction of Physics Degrees Awarded to Women
35%
30%
25%
20%
15%
10%
5%
0%
Fraction
1966
1971
1976
1981
1986
1991
1996
2001
2006
2011
2016
Year
BS, MIT
BS, US
PHD, US
PhD, MIT


Fraction of Physics Degrees Awarded to URM
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
Fraction
1995
2000
2005
2010
2015
Year
SB, MIT
US
PhD, MIT
US

What is your interpretation of these trends?



Theme for this talk:

Find the stories in the data;
Recognize the data in the stories.

Diversity, Equity, and Inclusion are not synonyms

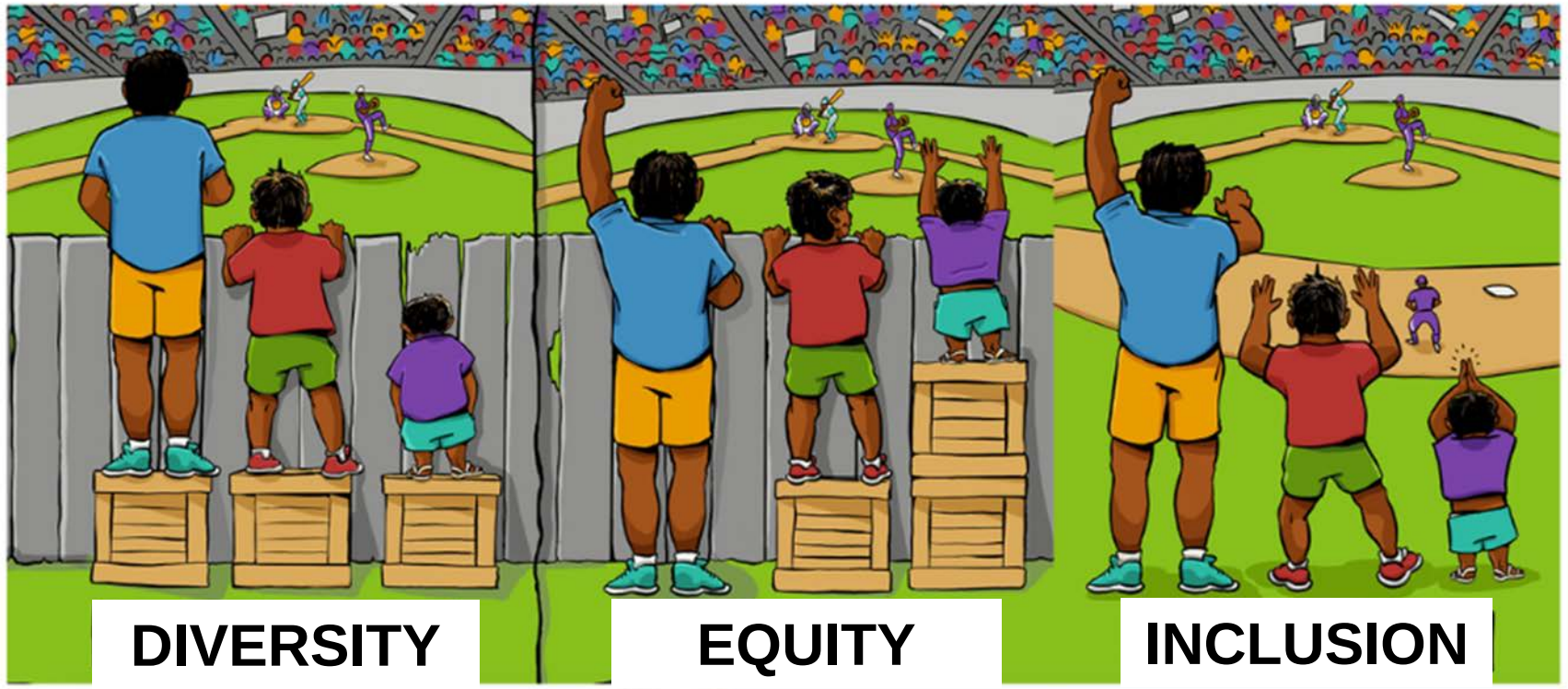


image credit: Angus Maguire/IISC
Labels added by E. Bertschinger

Outline

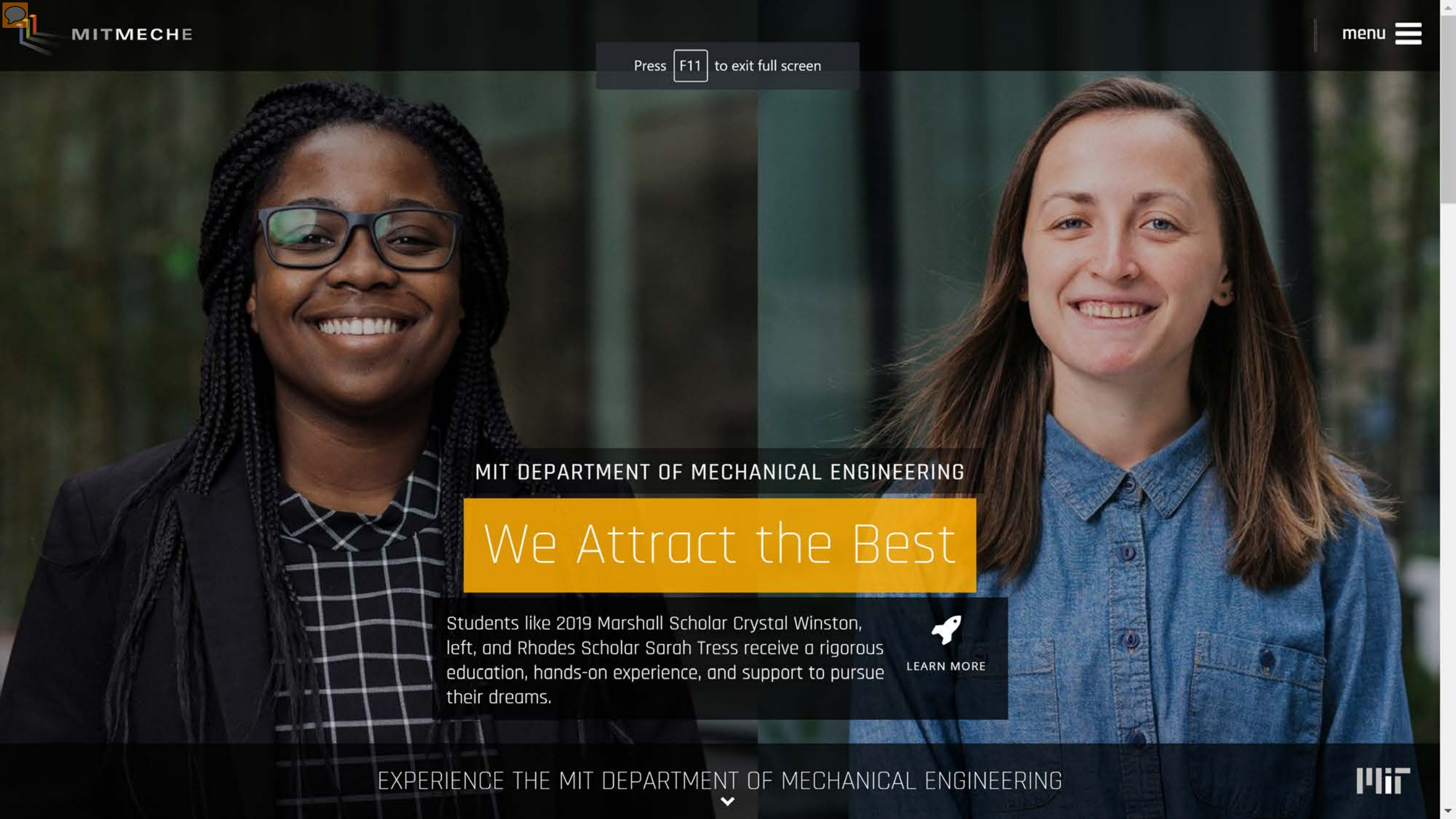
A success story: MIT Mechanical Engineering

A closer examination of MIT Physics diversity

Best in class across physical sciences and engineering

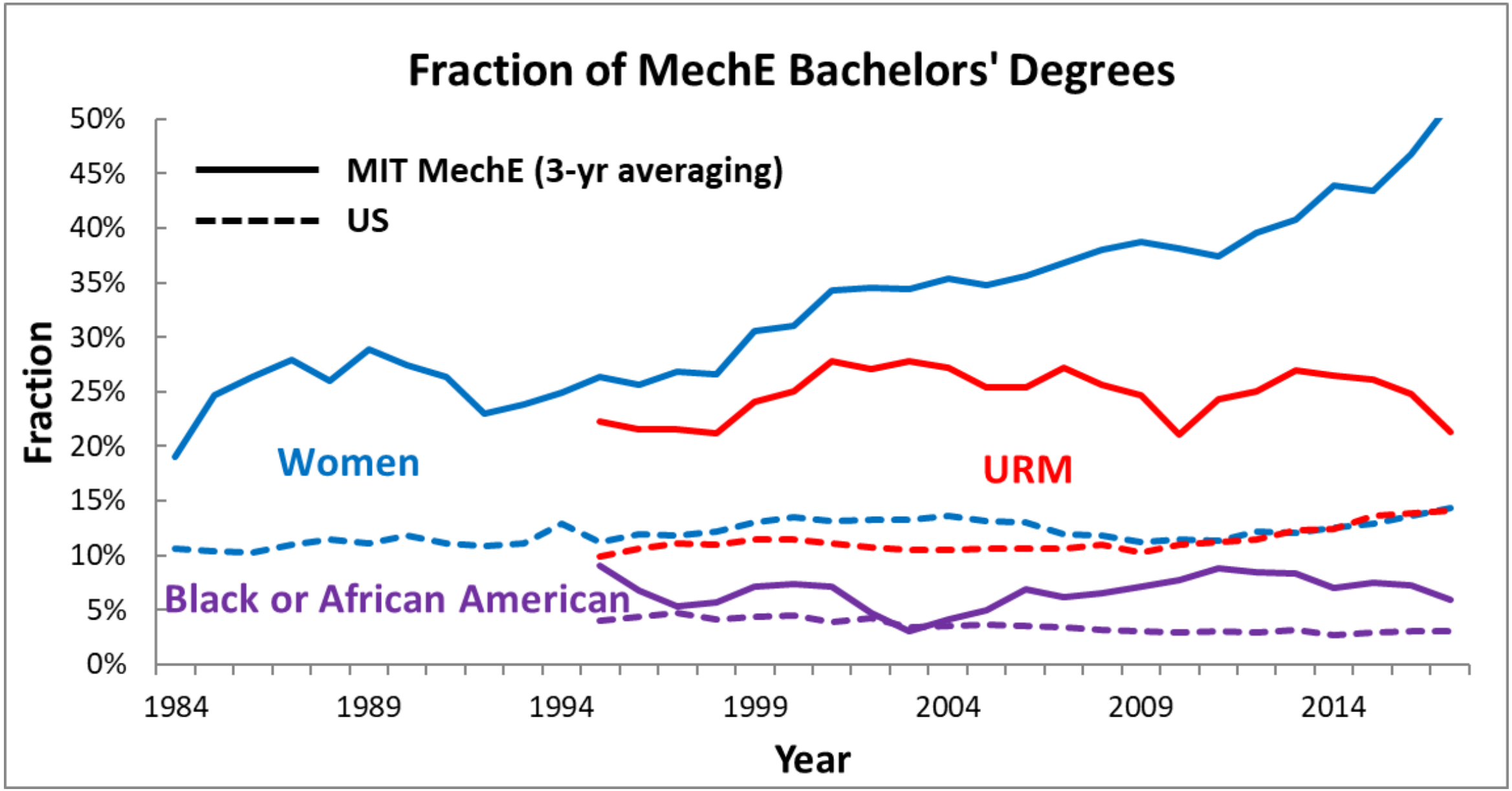
The role of departments and professional societies

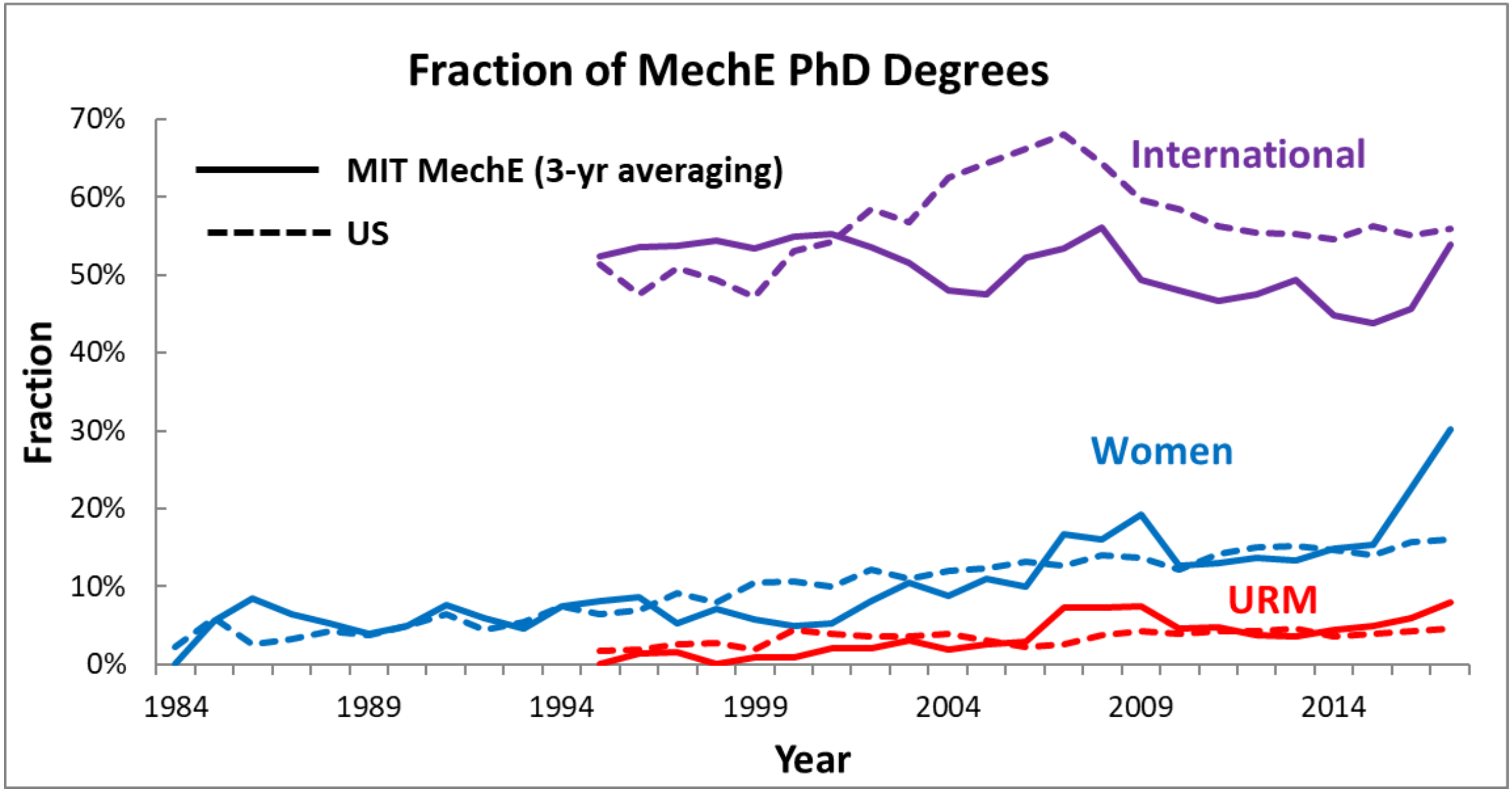

MITMECHE
Home / People
menu
PEOPLE @ MIT MECHE
We're People First
MIT MechE is first and foremost a strong community of faculty, researchers, teachers, post-docs, and staff, dedicated to our students and passionate about our research.
SCROLL TO EXPLORE
Faculty
Staff
Full Directory
More
Search


MITMECHE
menu
Press F11 to exit full screen
MIT DEPARTMENT OF MECHANICAL ENGINEERING
We Attract the Best
Students like 2019 Marshall Scholar Crystal Winston, left, and Rhodes Scholar Sarah Tress receive a rigorous education, hands-on experience, and support to pursue their dreams.
LEARN MORE
EXPERIENCE THE MIT DEPARTMENT OF MECHANICAL ENGINEERING

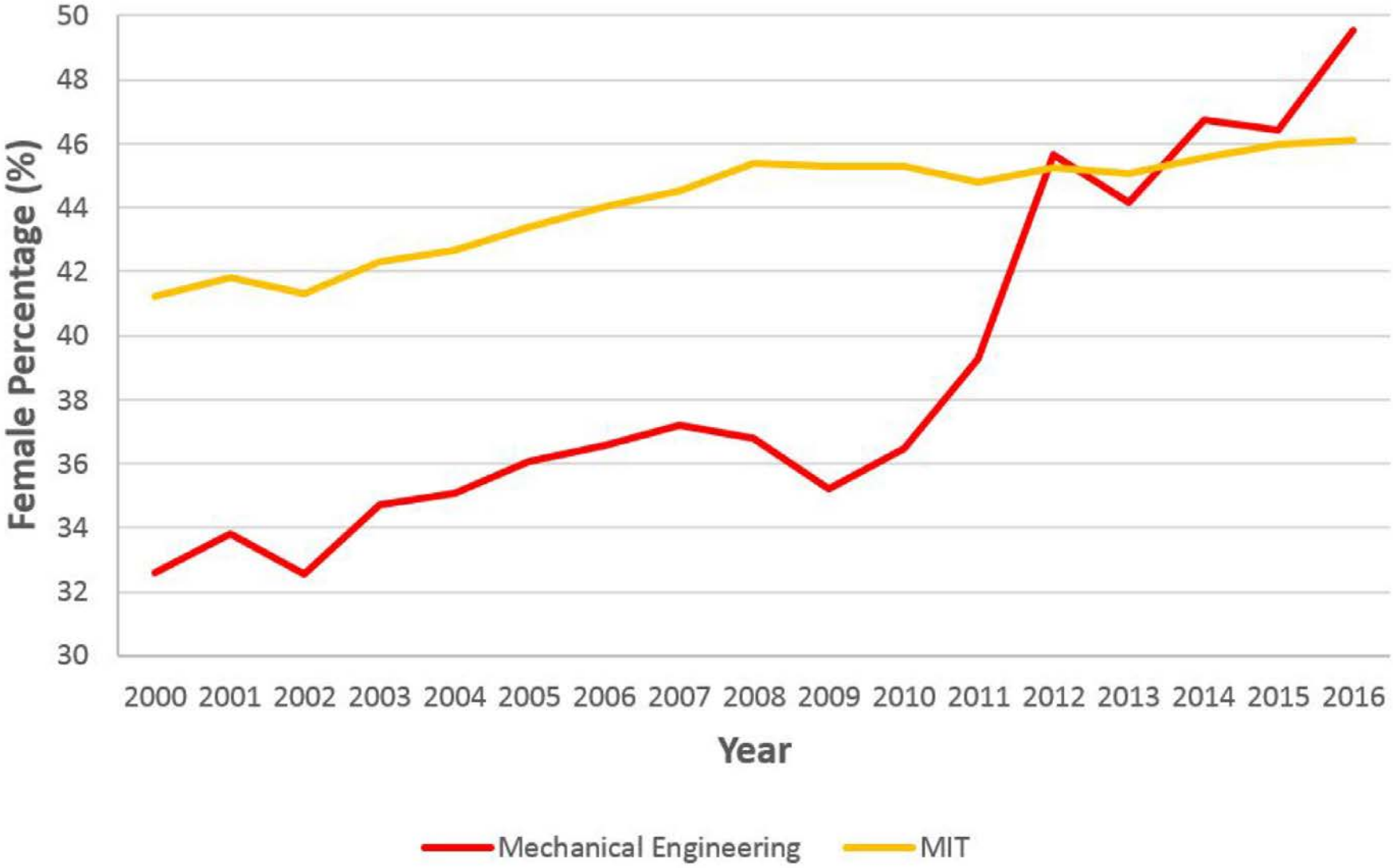
MIT Mechanical Engineering

MIT MechE has reached undergraduate gender parity in a field where only 14% of bachelors degrees go to women. URM students are almost twice the national average percentage.


Fraction of MechE Bachelors' Degrees
MIT MechE (3-yr averaging)
US
Women
URM
Black or African American
Fraction
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
1984
1989
1994
1999
2004
2009
2014
Year


Fraction of MechE PhD Degrees
70%
60%
50%
40%
30%
20%
10%
0%
Fraction
MIT MechE (3-yr averaging)
US
International
Women
URM
1984
1989
1994
1999
2004
2009
2014
Year

Undergraduate admissions helped, but department-level efforts are the most important factor.



How did MechE do it?

Xu, K., Wendell, D., and Walsh, A. S. 2017, “Getting to Gender Parity in a Top-Tier Mechanical Engineering Department: A Case Study,” ASEE Annual Conference paper ID #19081. Based on the senior thesis of Kath Xu.

From the abstract:

“Thematic analysis of interviews reveals that the gender equality so far achieved by the department has been a result of very deliberate, enduring structural changes, (e.g., hiring processes), and a strong representation of proactive department members with high levels of self-efficacy. These members are aware of gender equity issues, believe in their ability to enact change, and are willing to devote the time and energy to do so.”

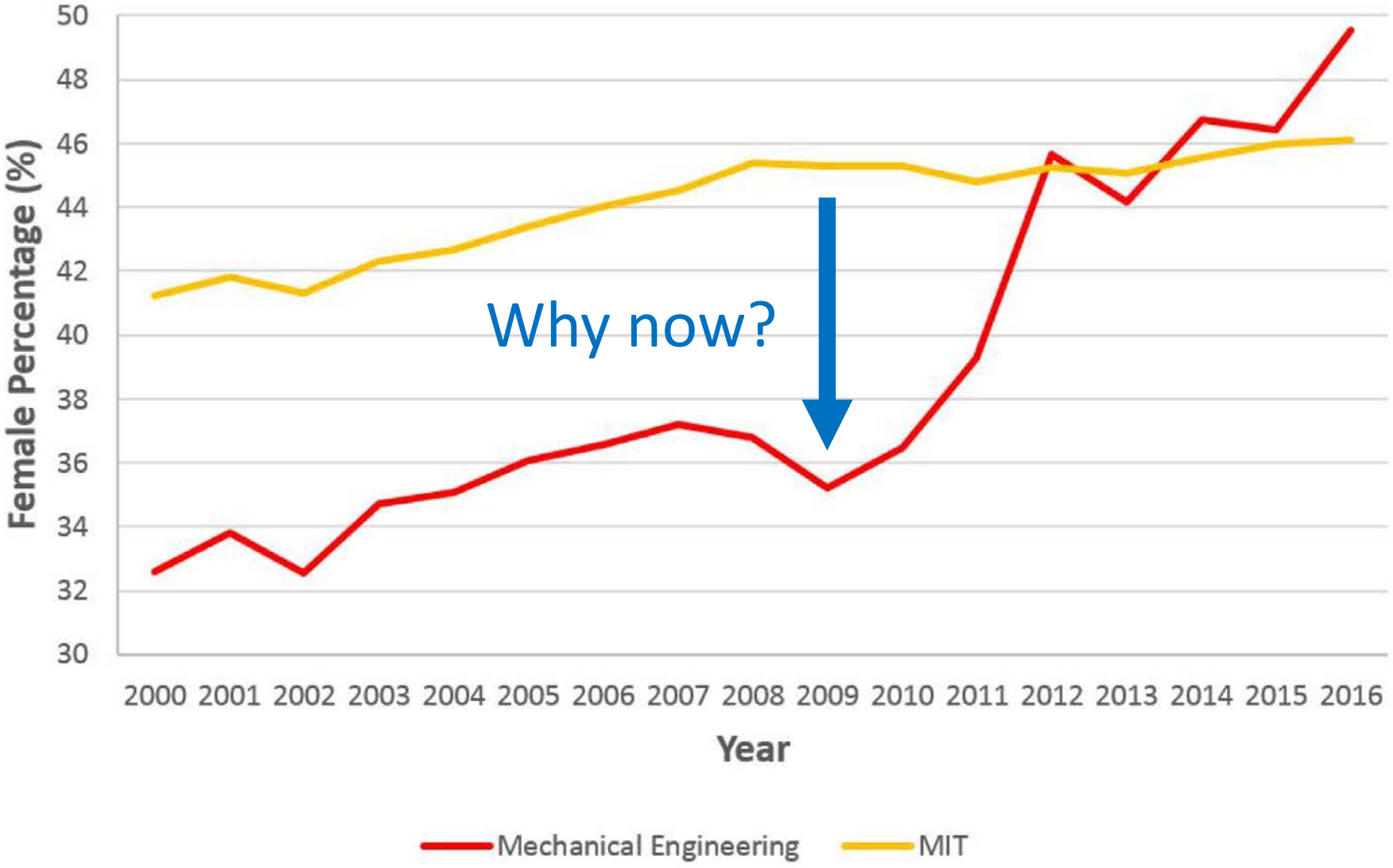
What worked to diversify MechE

- Aggressive recruiting of women faculty: broad searches, proactive calls, cluster hires, male department head and dean committed to increasing the number of women faculty (from 1 of more than 50) – 4 women hired in 2002, 2 more in 2003
- Influential faculty (of all genders) promote gender equity in the department
- A female senior lecturer teaches popular design and manufacturing classes and gives strong encouragement to women and URM.
- Students support and recruit each other. This is especially important for groups that haven't yet reached critical mass (e.g., URM).

Note: Women and URM students still face a more challenging environment than white males, but they have support and encouragement to persist.

At the PhD level, MechE is now almost double the national average for women and URM.

Undergraduate admissions helped, but department-level efforts are the most important factor.



A possible key enabler: faculty diversity

Large increase in women faculty starting 2002: both recruitment and retention succeeded.

MechE Department Head Rohan Abeyaratne and Engineering Dean Tom Magnanti made faculty diversity a priority.

Full impact of faculty diversity took 8 to 10 years to show up.

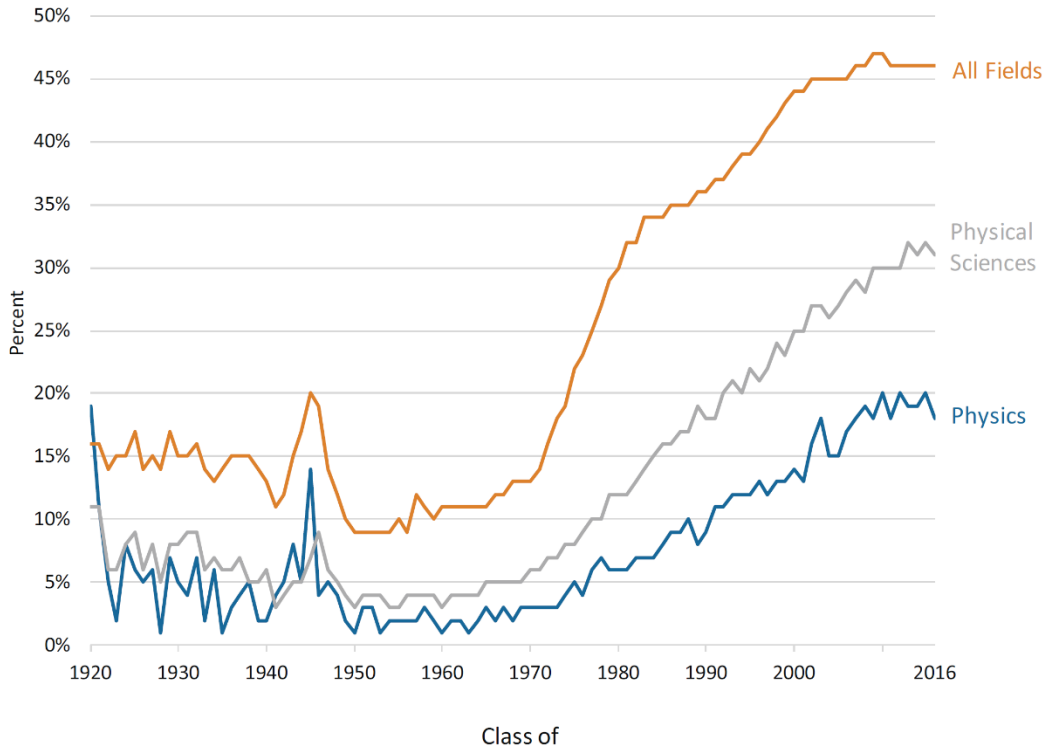
Self-assessments from this time:

http://web.mit.edu/fnl/vol/144/lienhard.htm

http://facultygovernance.mit.edu/sites/default/files/reports/2002-03_Status_of_Women_Faculty-All_Reports.pdf

Aren’t MechE and Physics completely different disciplines?

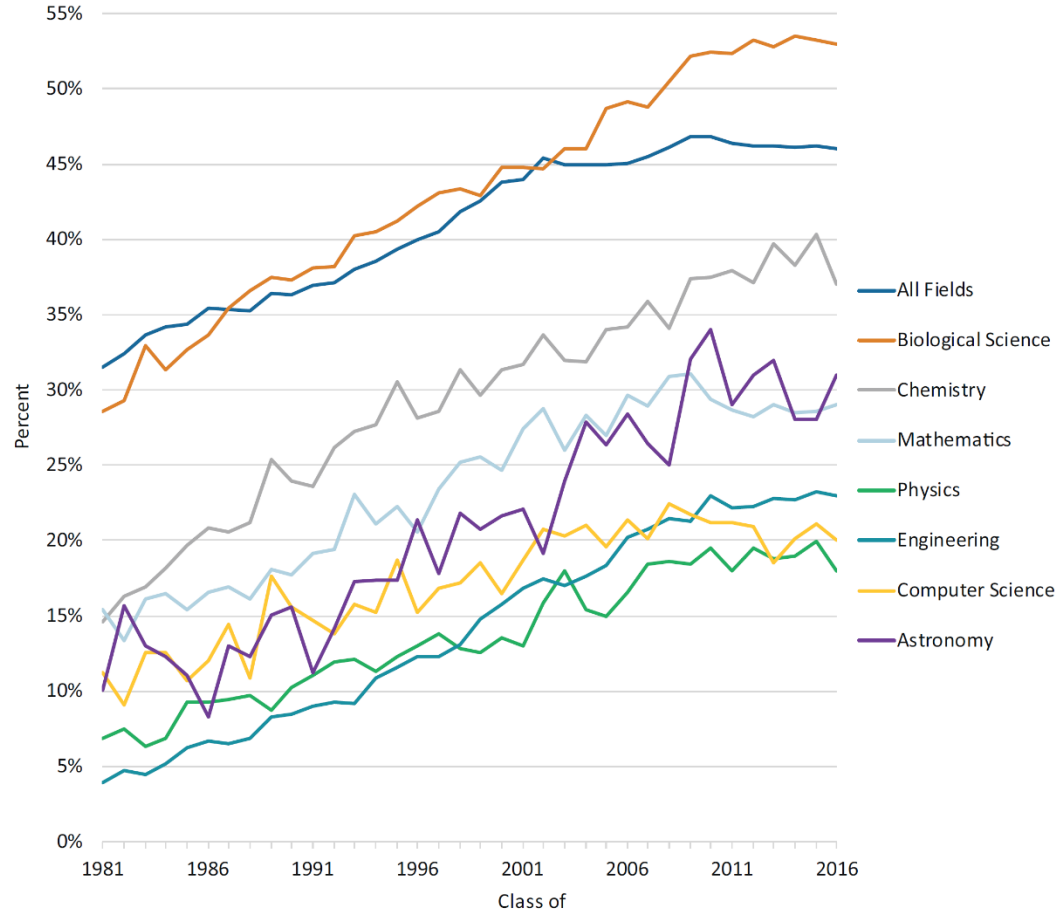
Percent of PhDs Awarded to Women in Specified Fields, Classes of 1920 through 2016



Source: National Science Foundation, National Center for Science and Engineering Statistics.
Data Compiled by AIP Statistical Research Center.

AIP | Statistics aip.org/statistics

Percent of PhDs Earned by Women in Selected Fields, Classes of 1981 through 2016



Source: National Science Foundation, National Center for Science and Engineering Statistics. Data compiled by AIP Statistical Research Center.

AIP | Statistics aip.org/statistics

Find the stories in the data;
Recognize the data in the stories.

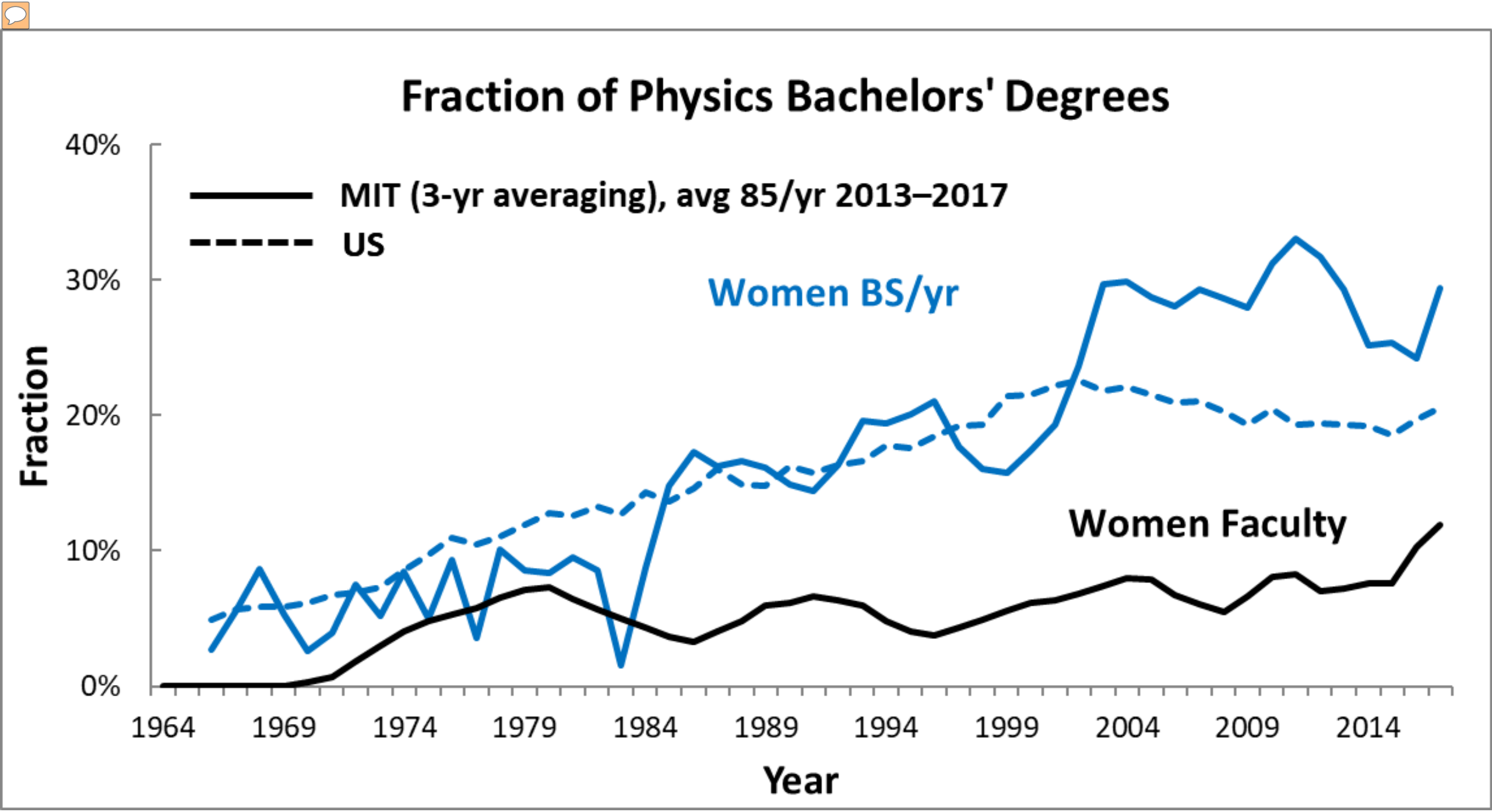
Outline

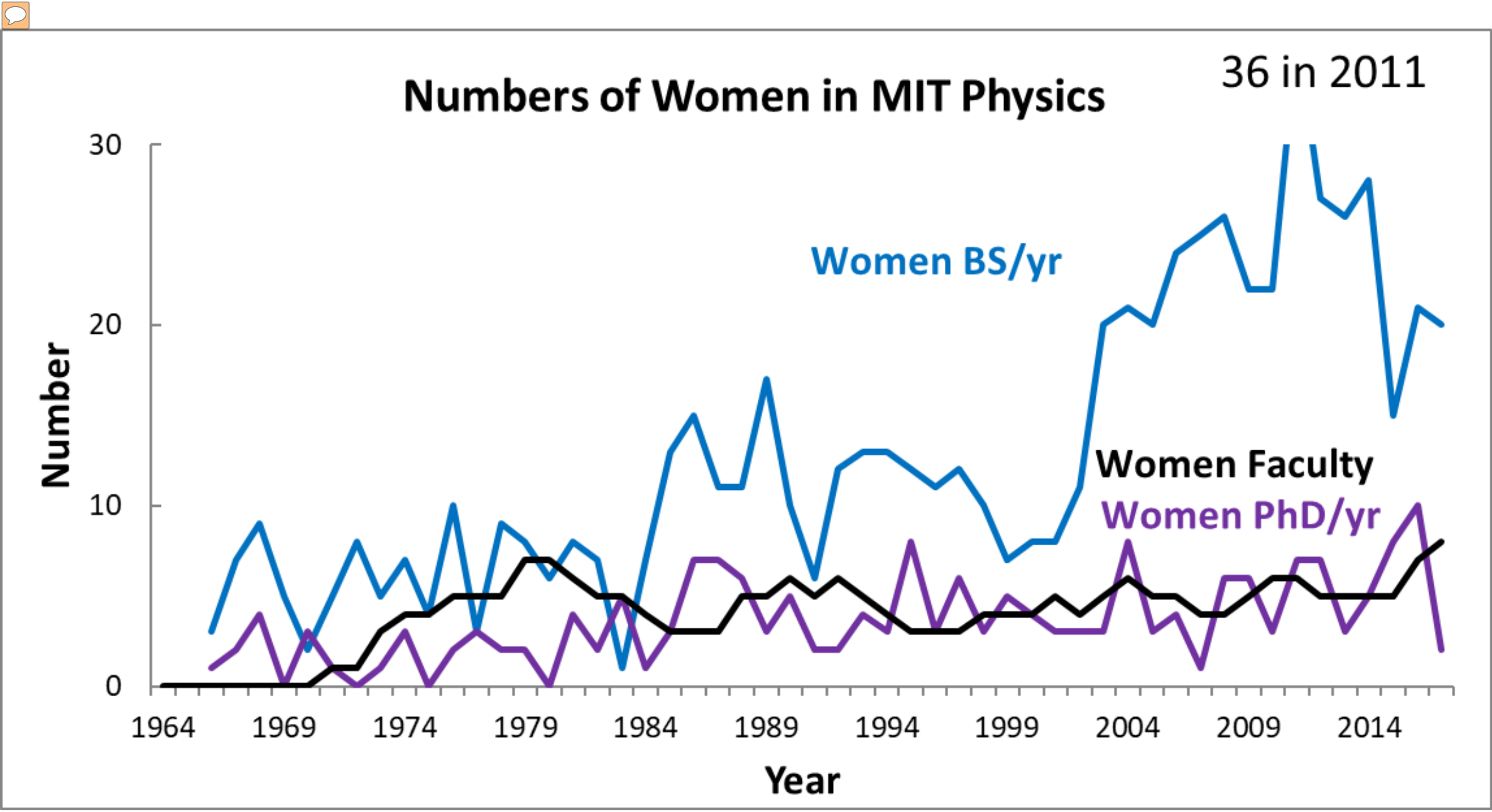
A success story: MIT Mechanical Engineering

A closer examination of MIT Physics diversity

Best in class across physical sciences and engineering

The role of departments and professional societies


Fraction of Physics Bachelors' Degrees
MIT (3-yr averaging), avg 85/yr 2013–2017
US
Women BS/yr
Women Faculty
Fraction
40%
30%
20%
10%
0%
1964
1969
1974
1979
1984
1989
1994
1999
2004
2009
2014
Year

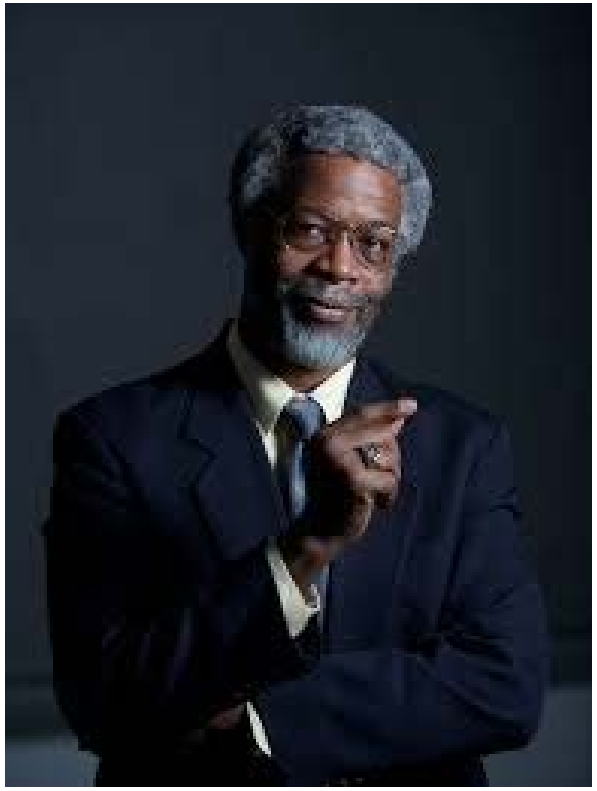

Numbers of Women in MIT Physics
36 in 2011
Women BS/yr
Women Faculty
Women PhD/yr
Number
Year
0
10
20
30
1964
1969
1974
1979
1984
1989
1994
1999
2004
2009
2014

What happened in 1984?

Hypothesis: department leadership and women faculty

- Herman Feshbach (Department Head 1972-83) made diversity a strategic priority
- Margaret MacVicar became Dean for Undergraduate Education 1985 (previously UROP Director and Assistant Professor of Physics starting 1970)
- June Matthews first MIT woman promoted to Full Professor of Physics, in 1982 (started Assistant Professor 1972)
- Vera Kistiakowsky first MIT woman Full Professor of Physics, in 1973. She founded the APS Committee on the Status of Women in Physics in 1971
- Millie Dresselhaus received secondary appointment as Professor of Physics in 1982 (started Full Professor 1968 in EECS)
- 7 women faculty hired in Physics 1970-78

MIT recruited physics faculty and students of color, too

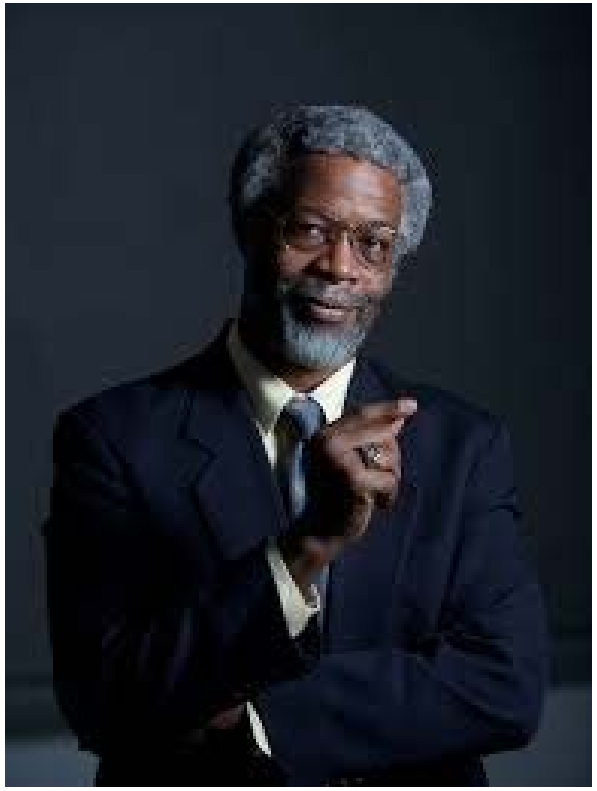


MIT recruited physics faculty and students of color, too

Shirley Jackson
SB 68 PhD 73

James Young
Professor 1970

Ronald McNair
PhD 77



Jim Gates
SB 73 PhD 77
Math Asst. Prof. 1984

Find the stories in the data;
Recognize the data in the stories.

Outline

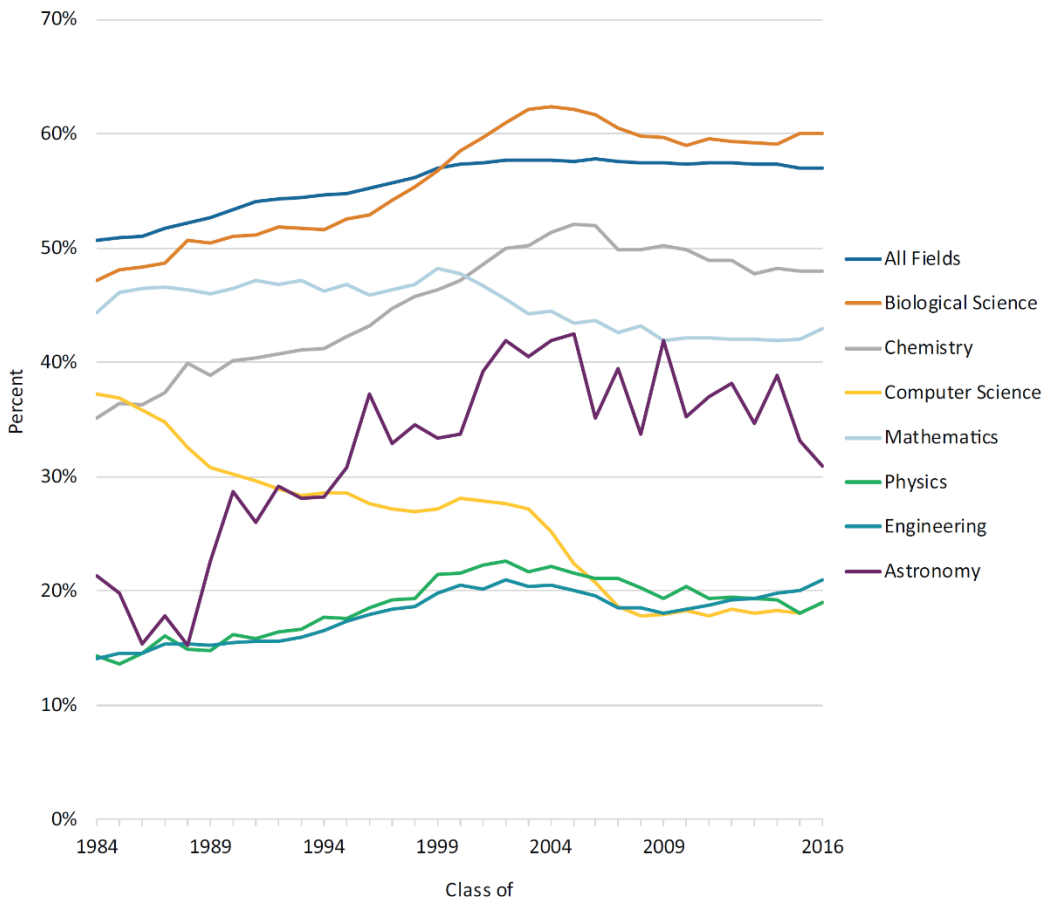
A success story: MIT Mechanical Engineering

A closer examination of MIT Physics diversity

Best in class across physical sciences and engineering

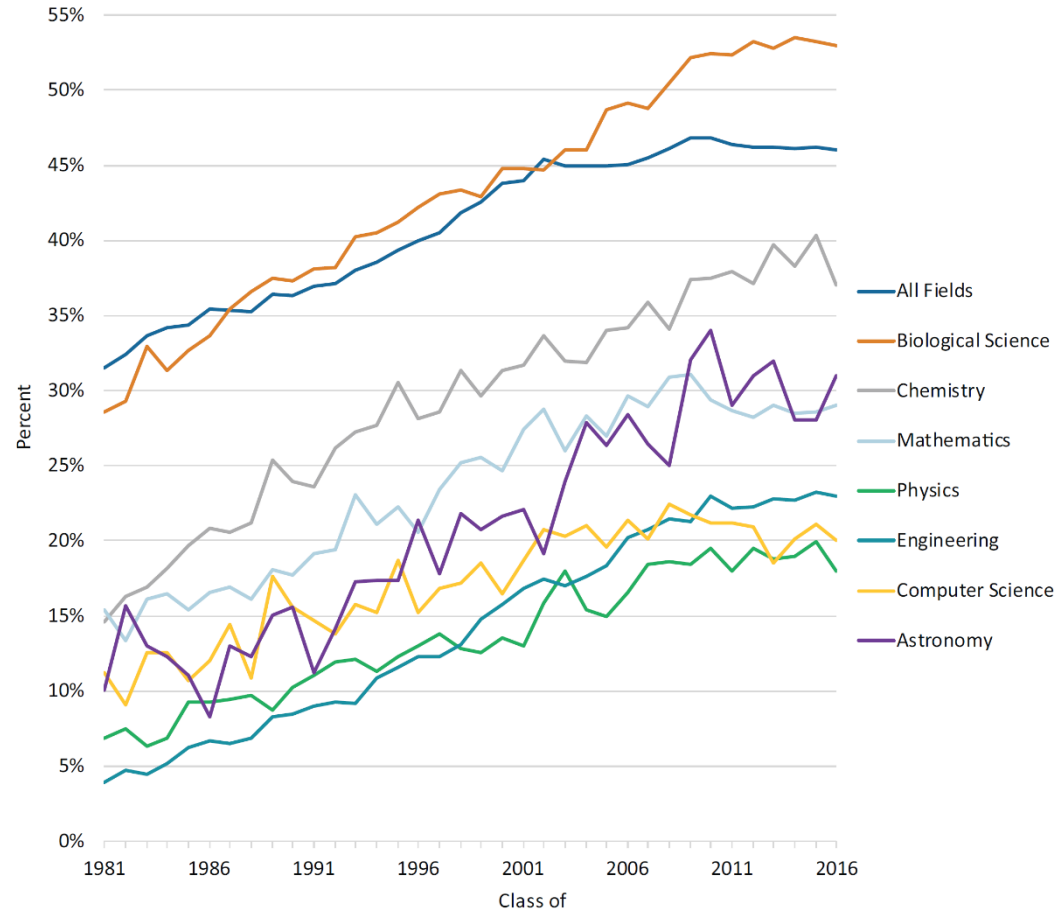
The role of departments and professional societies

Percent of Bachelor's Degrees Earned by Women in Selected Fields, Classes of 1981 through 2016



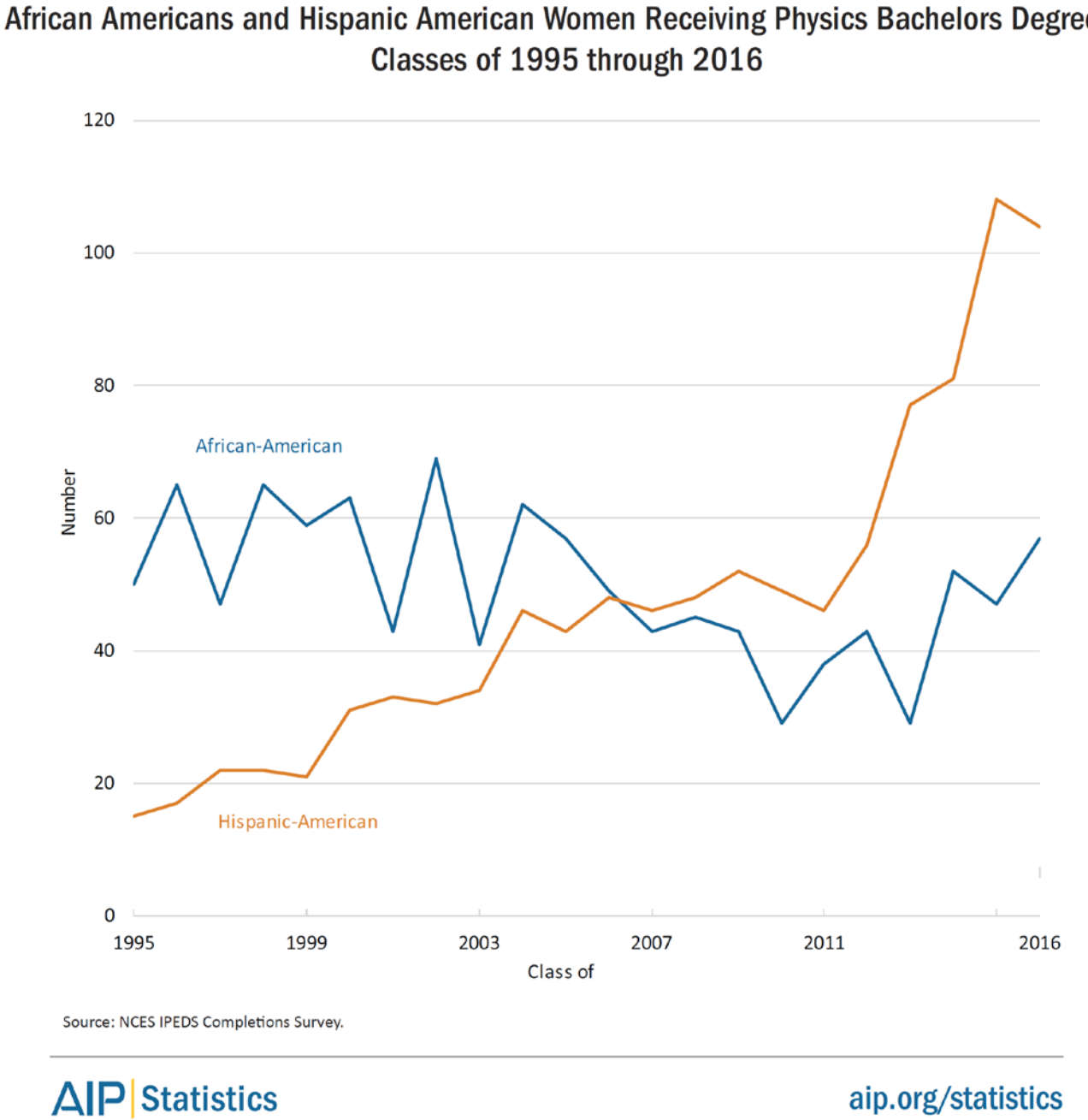
Source: National Center for Education Statistics. Data compiled by AIP Statistical Research Center

Percent of PhDs Earned by Women in Selected Fields, Classes of 1981 through 2016



Source: National Science Foundation, National Center for Science and Engineering Statistics. Data compiled by AIP Statistical Research Center.

Context: national concern with persistent opportunity and achievement gaps in STEM



Diversity Initiatives

AIP and its Member Societies are committed to promoting increased diversity and inclusion in the physical sciences.

Diversity Initiatives

- Overview
- Black History Month
- Pride Month
- Scholarships & Awards
- Services & Programs
- Policies & Best Practices
- Statistics & Reports
- TEAM-UP Task Force
- Women's History Month

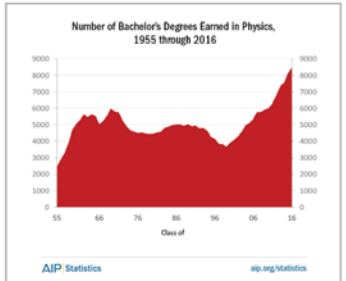
TEAM-UP Task Force

The AIP National Task Force to Elevate African American Representation in Undergraduate Physics & Astronomy (TEAM-UP)

The number of US physics and astronomy bachelor's degrees conferred is at an all-time high. Yet, the proportion of these degrees earned by African Americans remains appallingly low and is even smaller today than it was two decades ago.

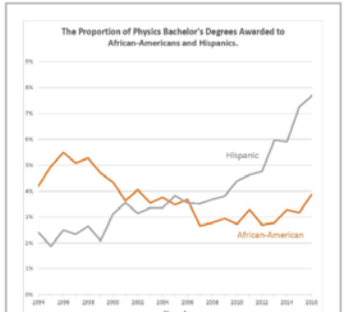
TEAM-UP is investigating why this underrepresentation is persistent and will produce a report of its findings with evidence-based recommendations for increasing African American physics and astronomy bachelor's degree production.

Follow us on Twitter: @AIP_TEAMUP and check out our Twitter Chat series, #TEAMUPTalks in our Twitter Moments.



Number of Bachelor's Degrees Earned in Physics, 1955 - 2016

Click image for larger version.



AIP TEAM-UP in the news

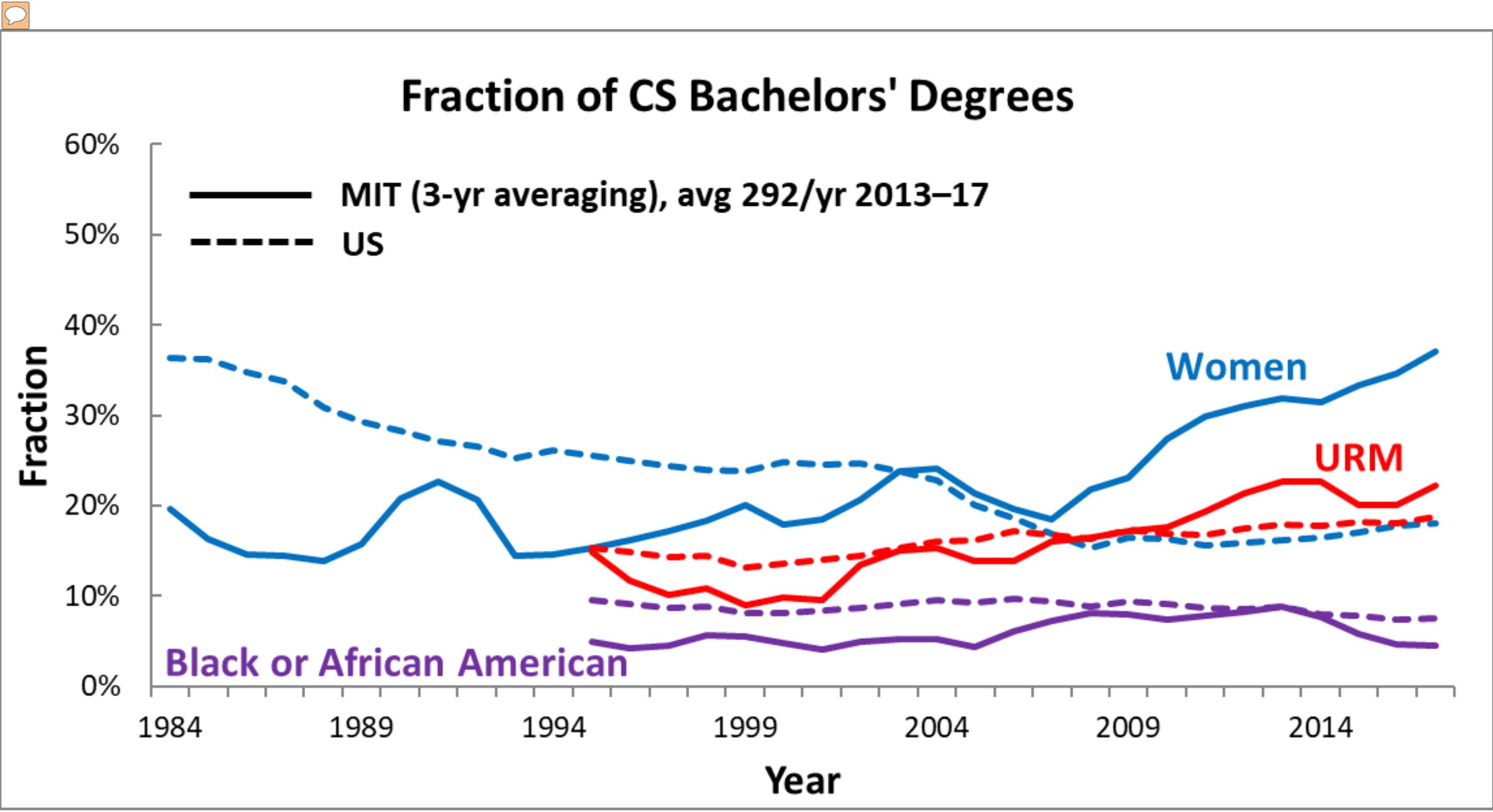
- Boosting the number of students from underrepresented groups in physics, *Nature*, October 2018

Activities and Timeline

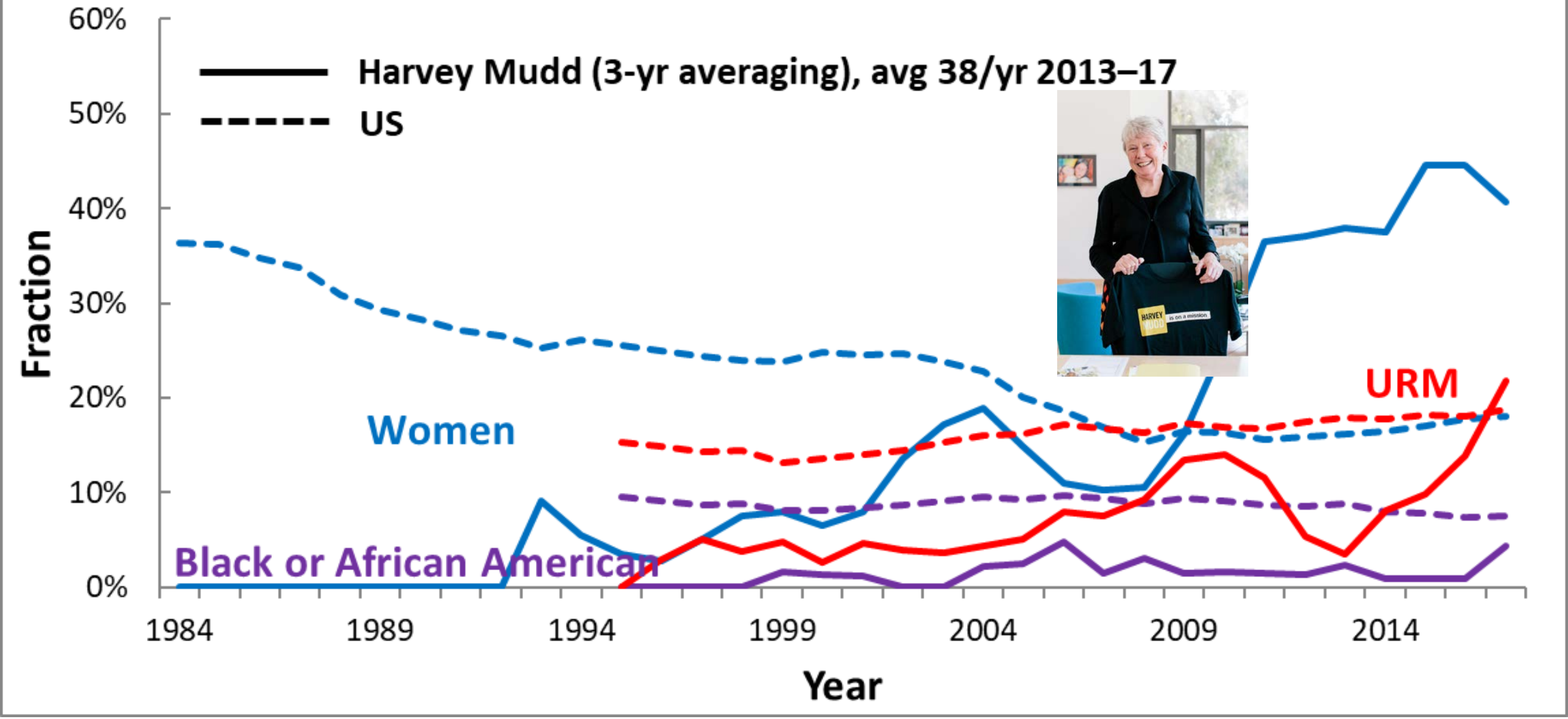
AIP TEAM-UP is using quantitative and qualitative data to identify high-impact practices

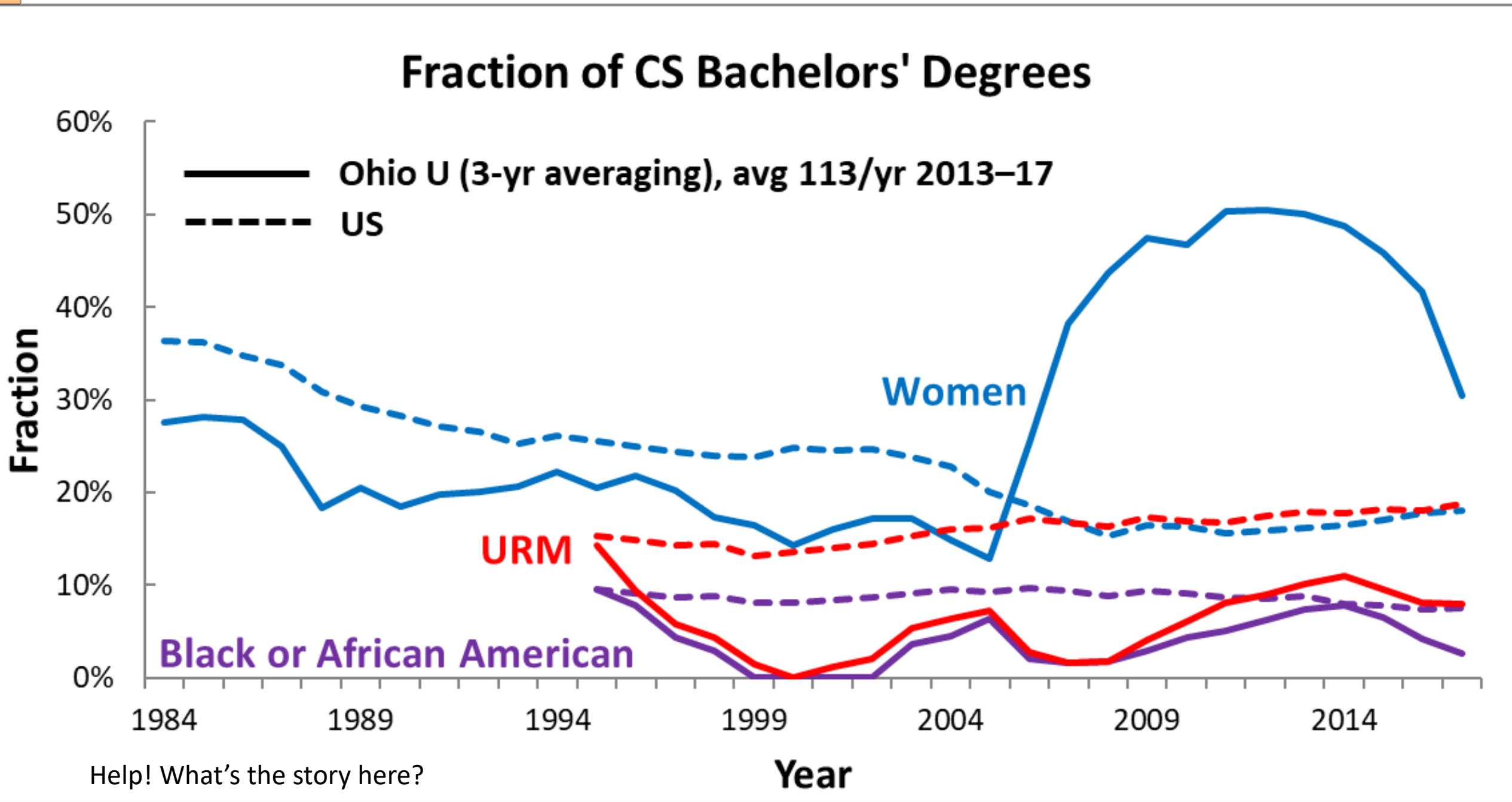
- Degree completions by race/ethnicity/gender for all physics and astronomy departments
- National survey of black physics students, with a control sample of non-black physics students
- Interviews and focus groups with students
- Site visits to top-performing departments (I co-chair this task)

Working with sociologists inspired me to extend the data collection to other STEM fields.

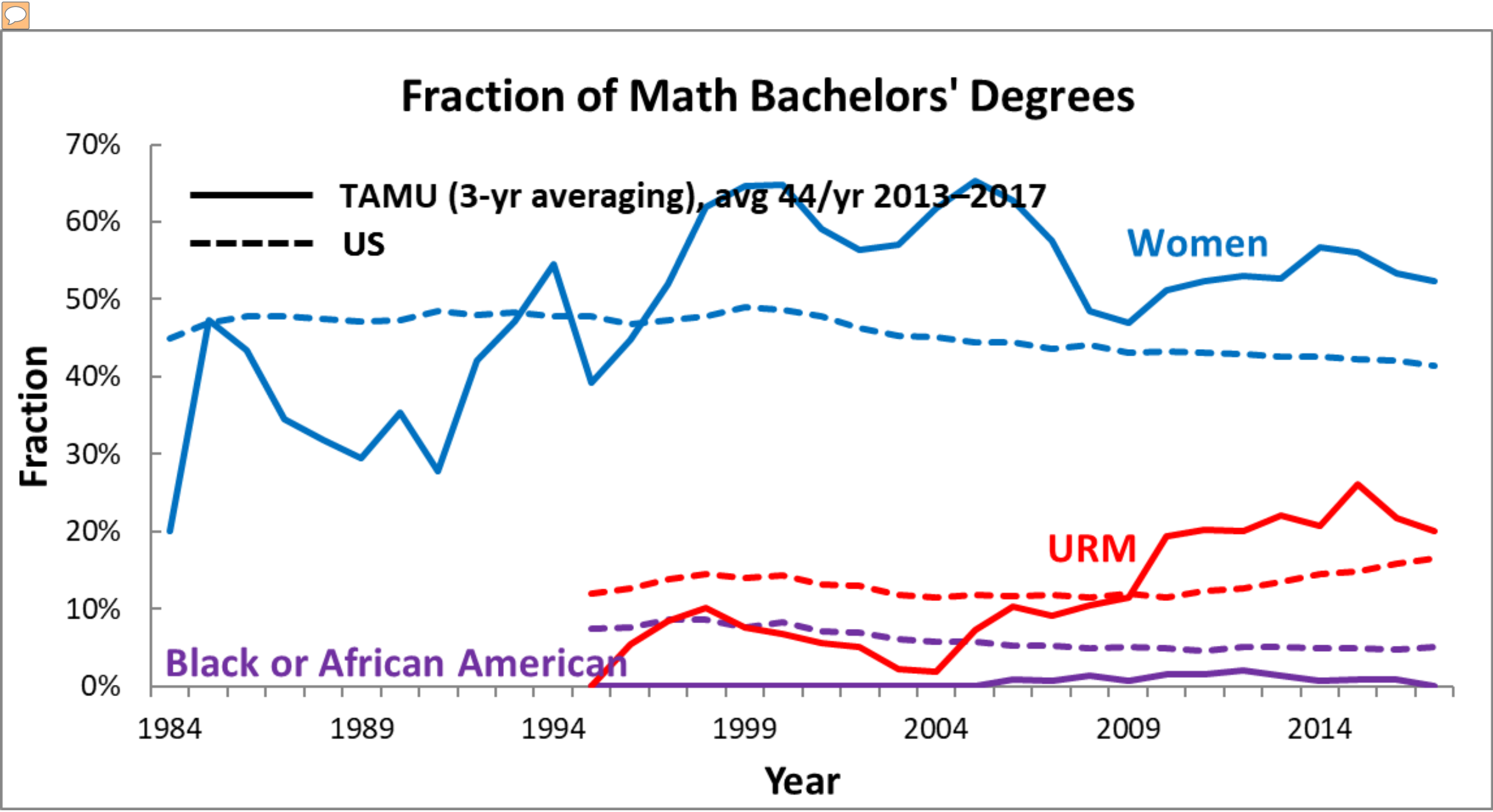

Fraction of CS Bachelors' Degrees
MIT (3-yr averaging), avg 292/yr 2013–17
US
Women
URM
Black or African American
Fraction
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year

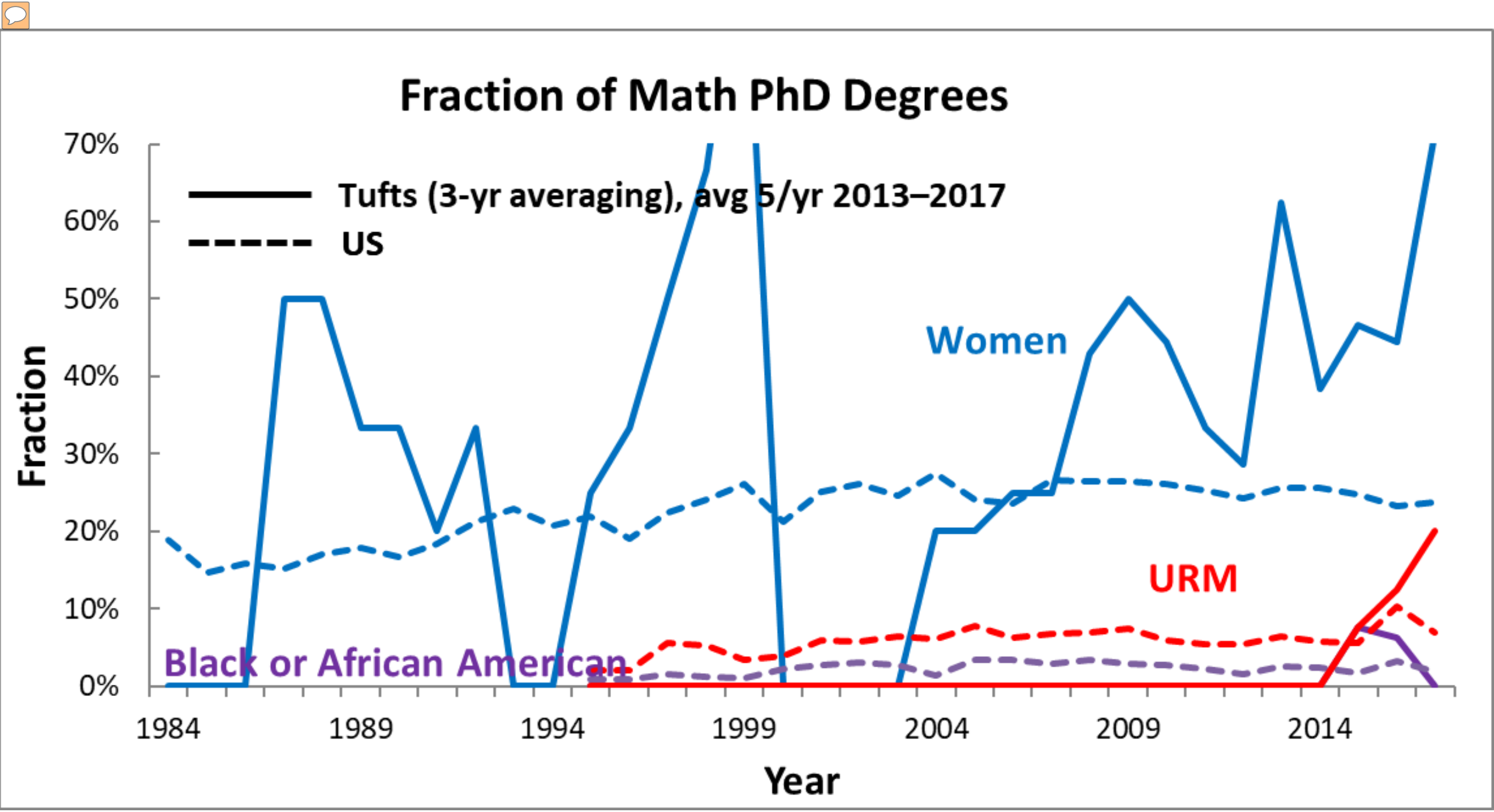
Fraction of CS Bachelors' Degrees

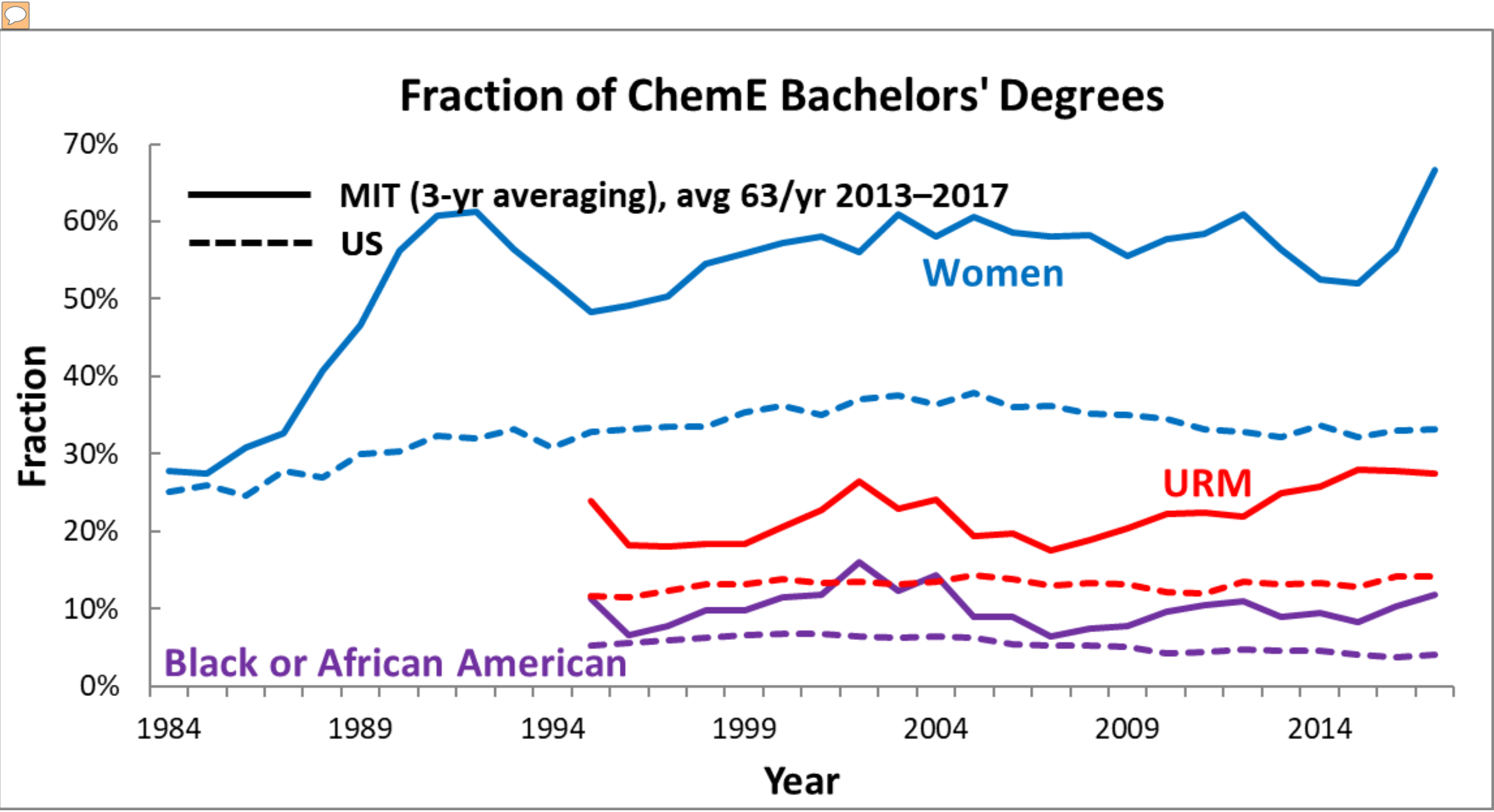


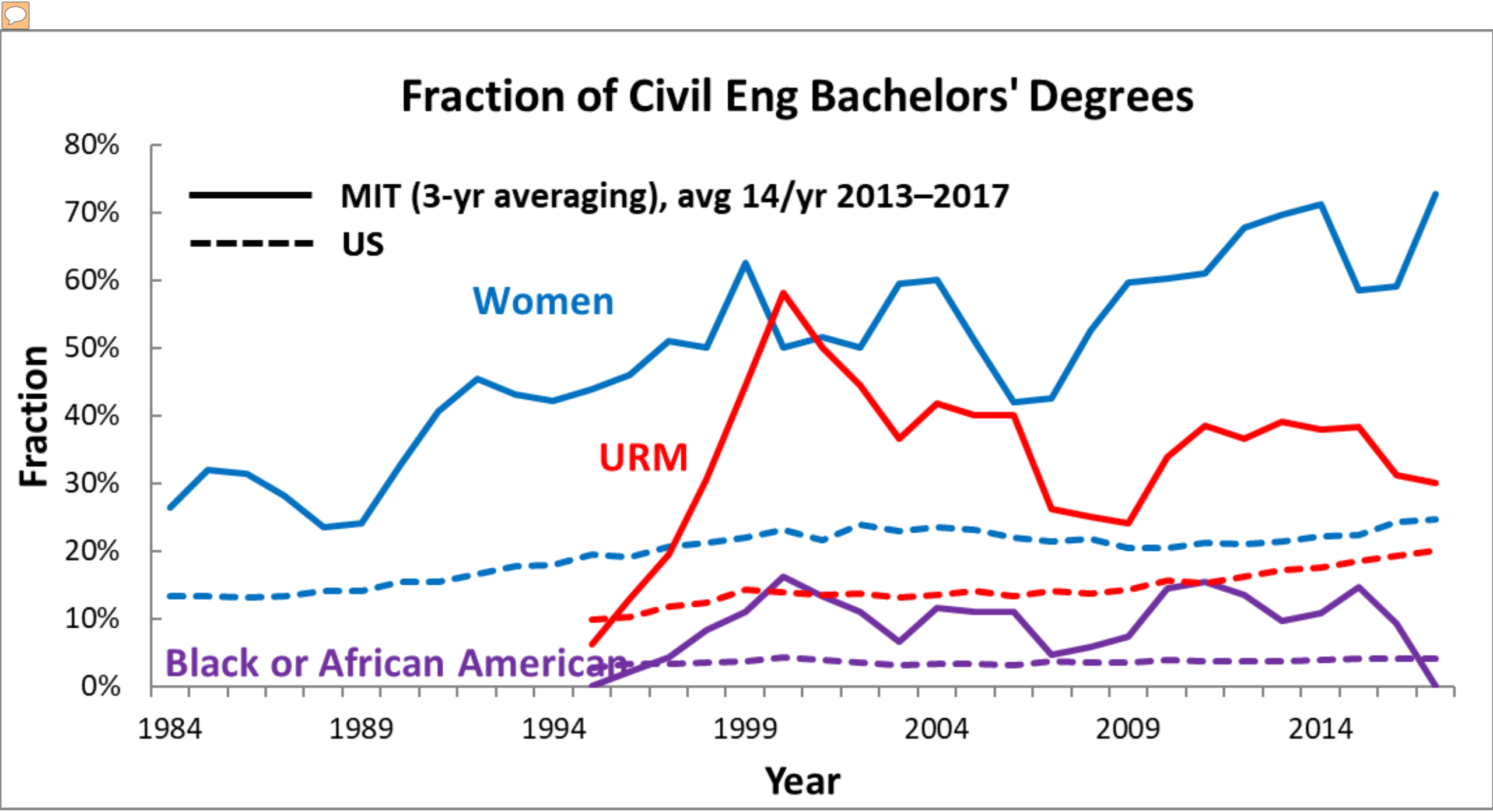


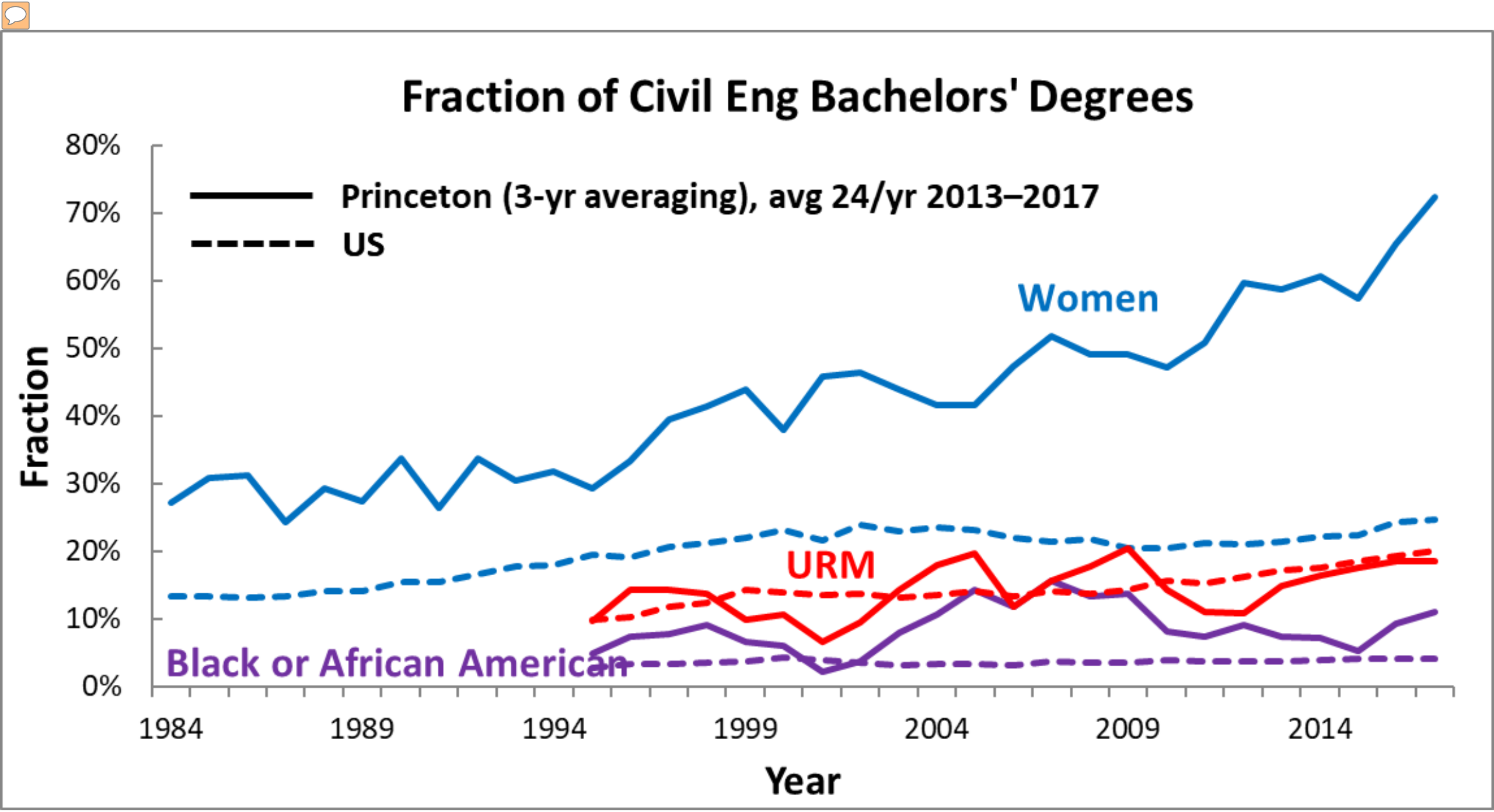
Help! What's the story here?

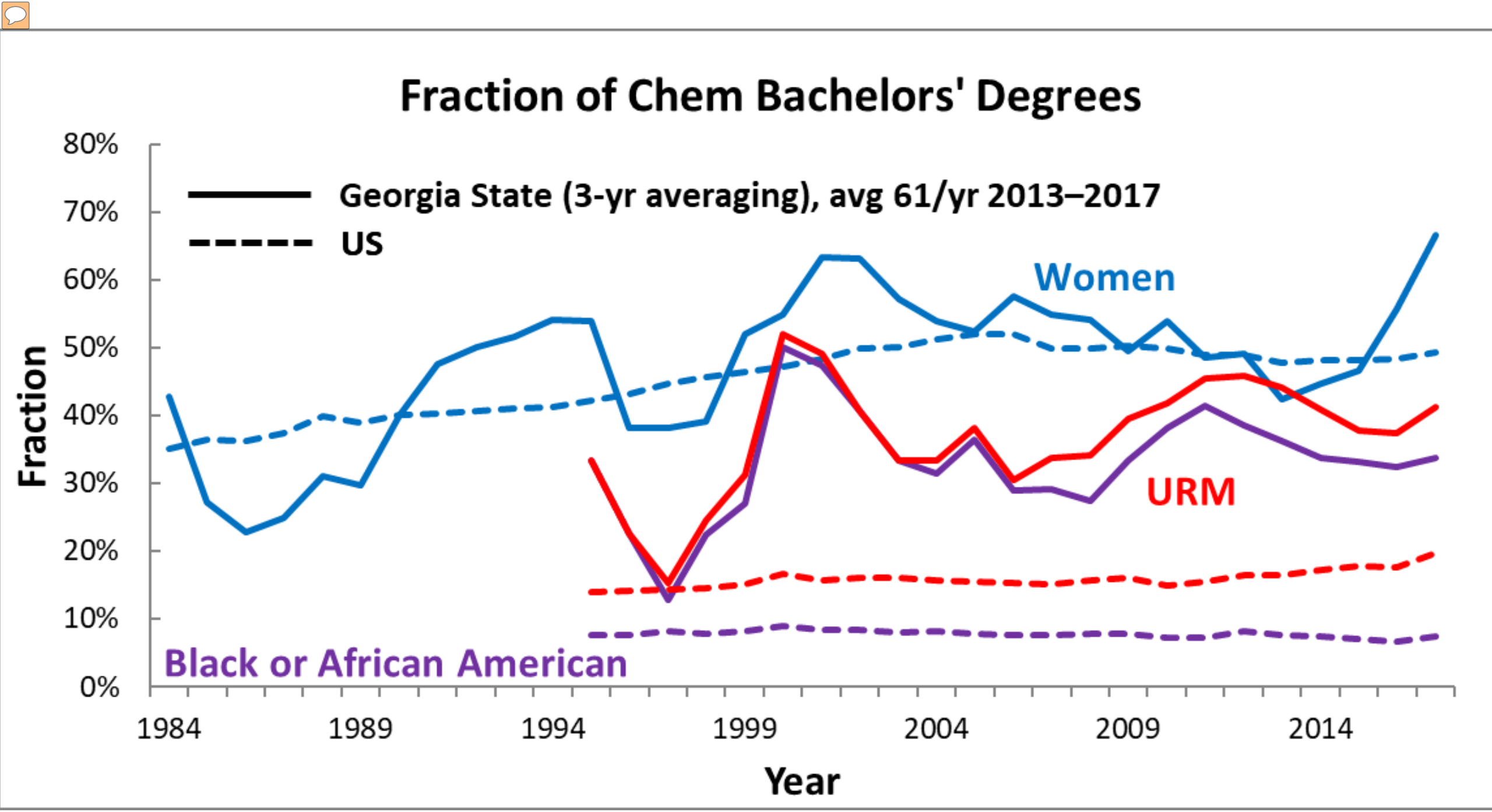

Fraction of Math Bachelors' Degrees
TAMU (3-yr averaging), avg 44/yr 2013–2017
US
Women
URM
Black or African American
Fraction
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year


Fraction of Math PhD Degrees
Tufts (3-yr averaging), avg 5/yr 2013–2017
US
Women
URM
Black or African American
Fraction
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year

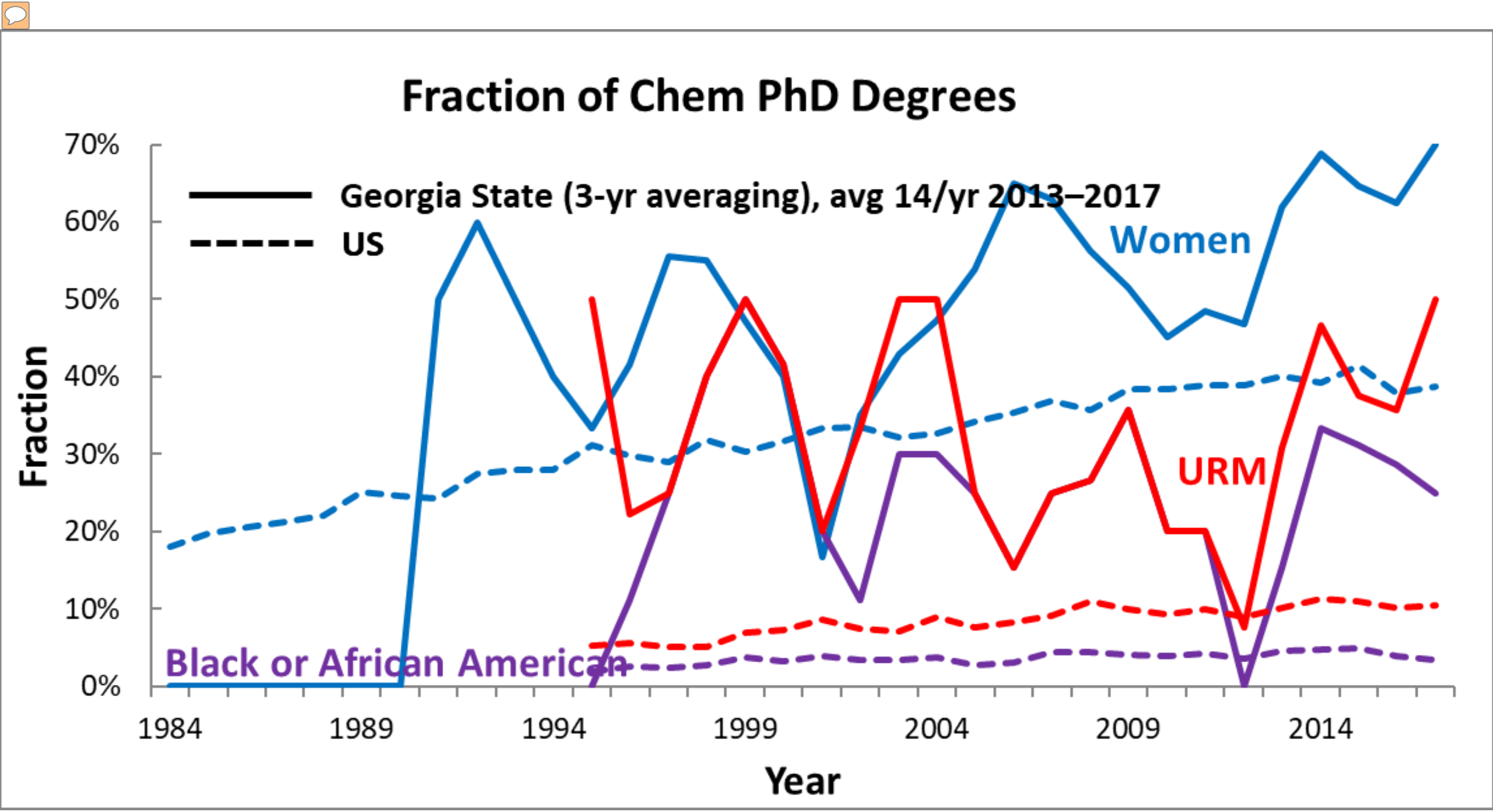

Fraction of ChemE Bachelors' Degrees
70%
60%
50%
40%
30%
20%
10%
0%
Fraction
MIT (3-yr averaging), avg 63/yr 2013–2017
US
Women
URM
Black or African American
1984
1989
1994
1999
2004
2009
2014
Year

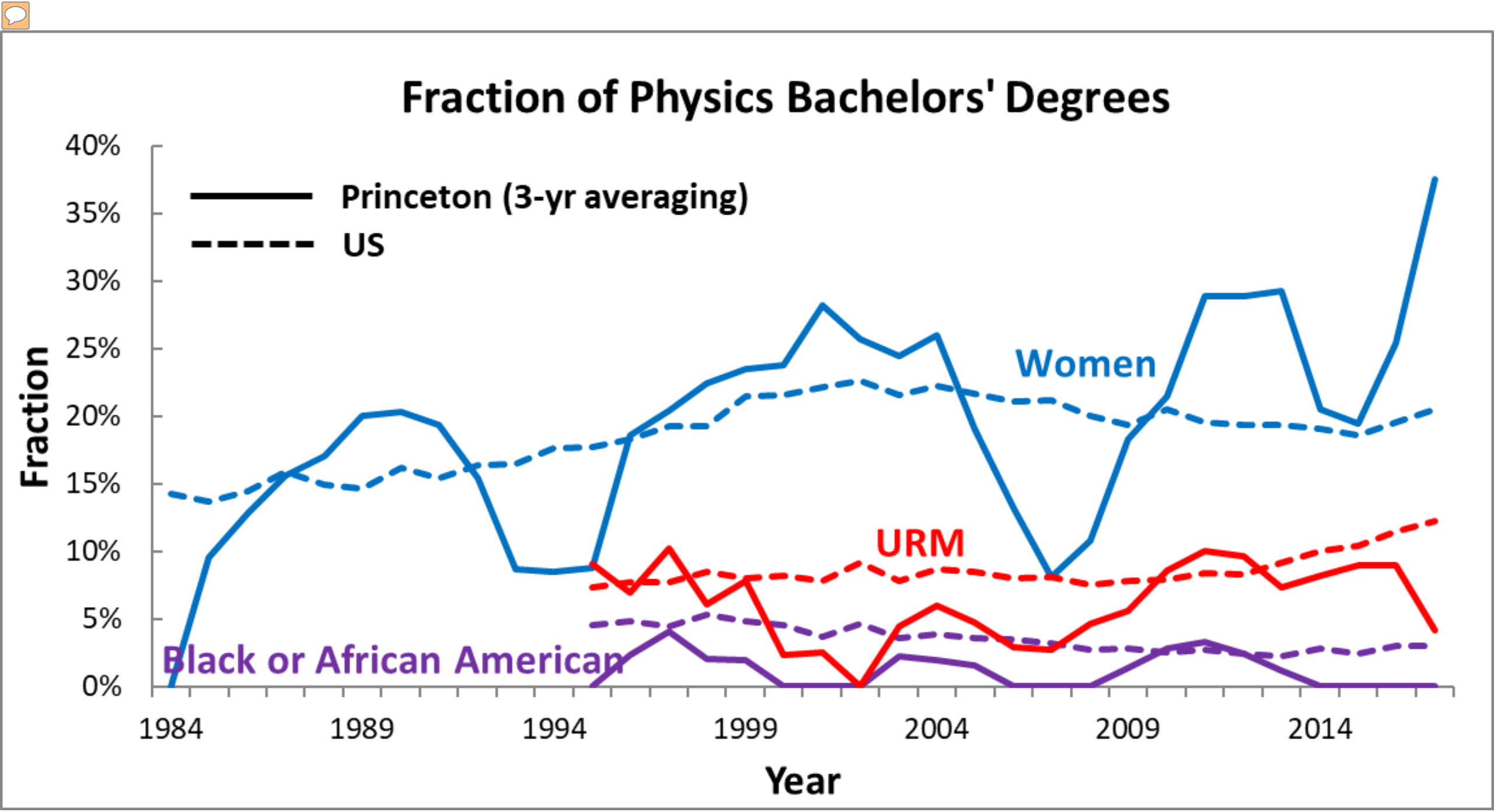

Fraction of Civil Eng Bachelors' Degrees
MIT (3-yr averaging), avg 14/yr 2013–2017
US
Women
URM
Black or African American
Fraction
80%
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year

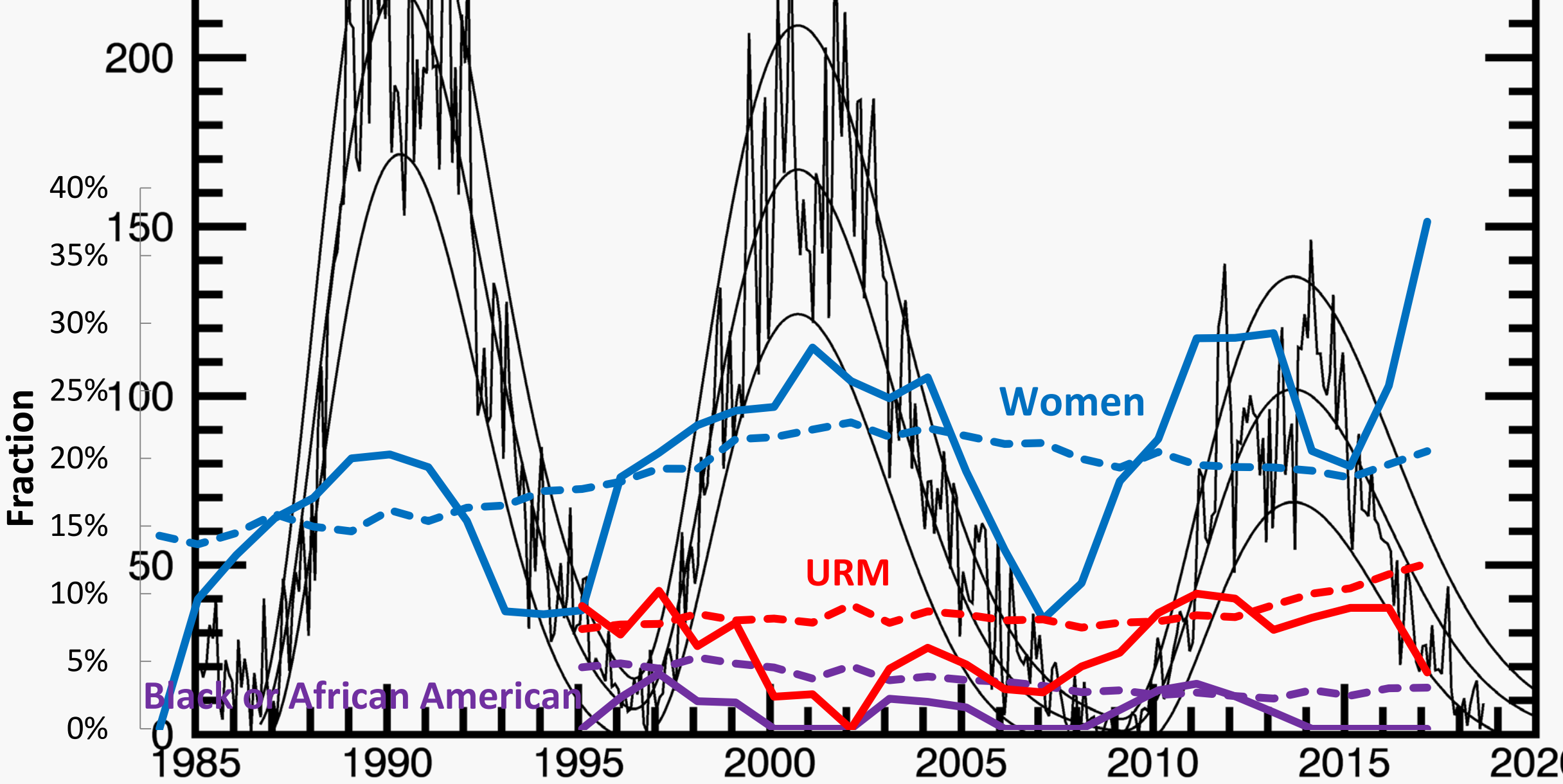

Fraction of Civil Eng Bachelors' Degrees
Princeton (3-yr averaging), avg 24/yr 2013–2017
US
Women
URM
Black or African American
Fraction
80%
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year


Fraction of Chem Bachelors' Degrees
Georgia State (3-yr averaging), avg 61/yr 2013–2017
US
Women
URM
Black or African American
Fraction
80%
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year

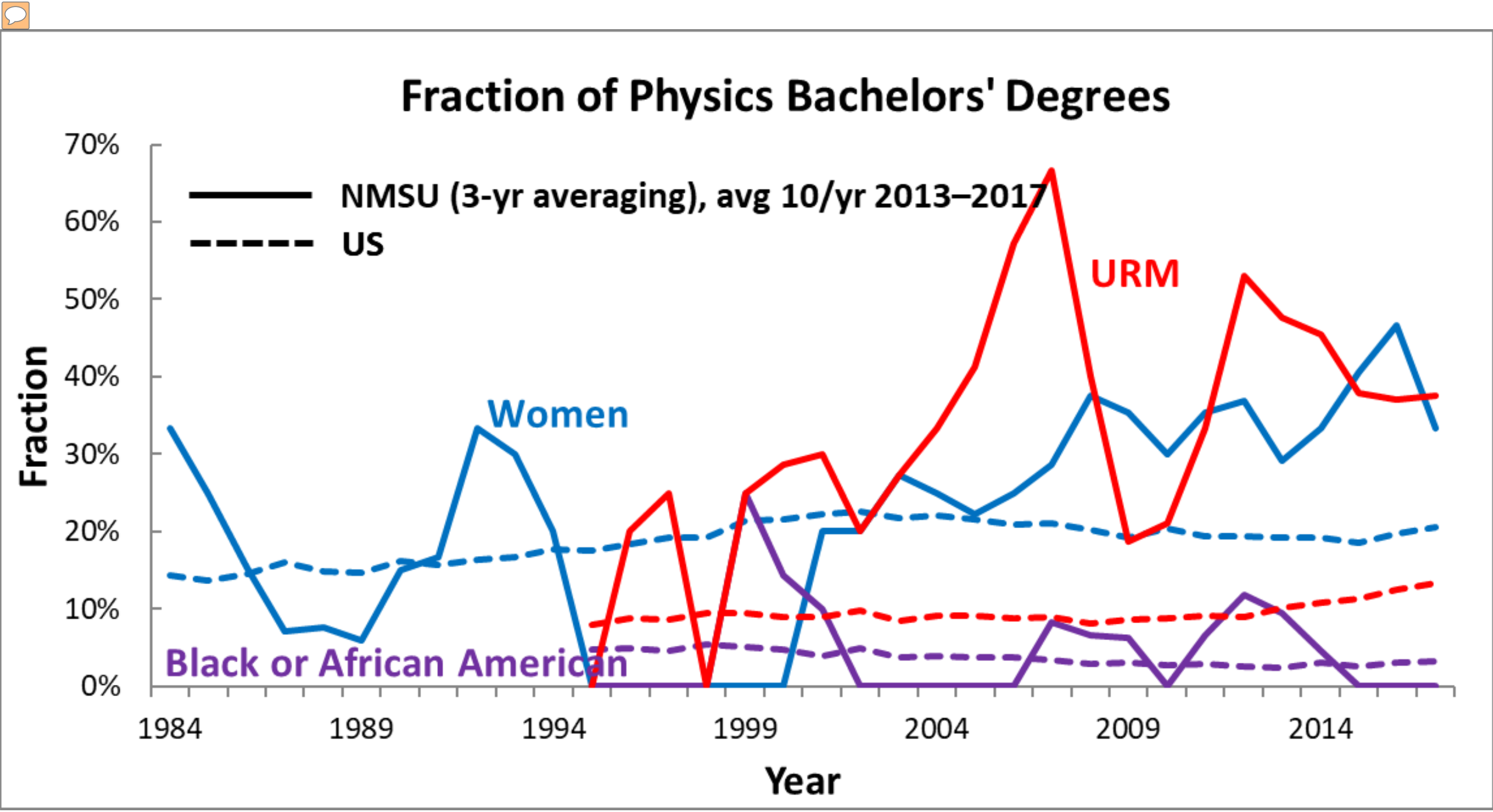

2016
Student Success Programs at Georgia State

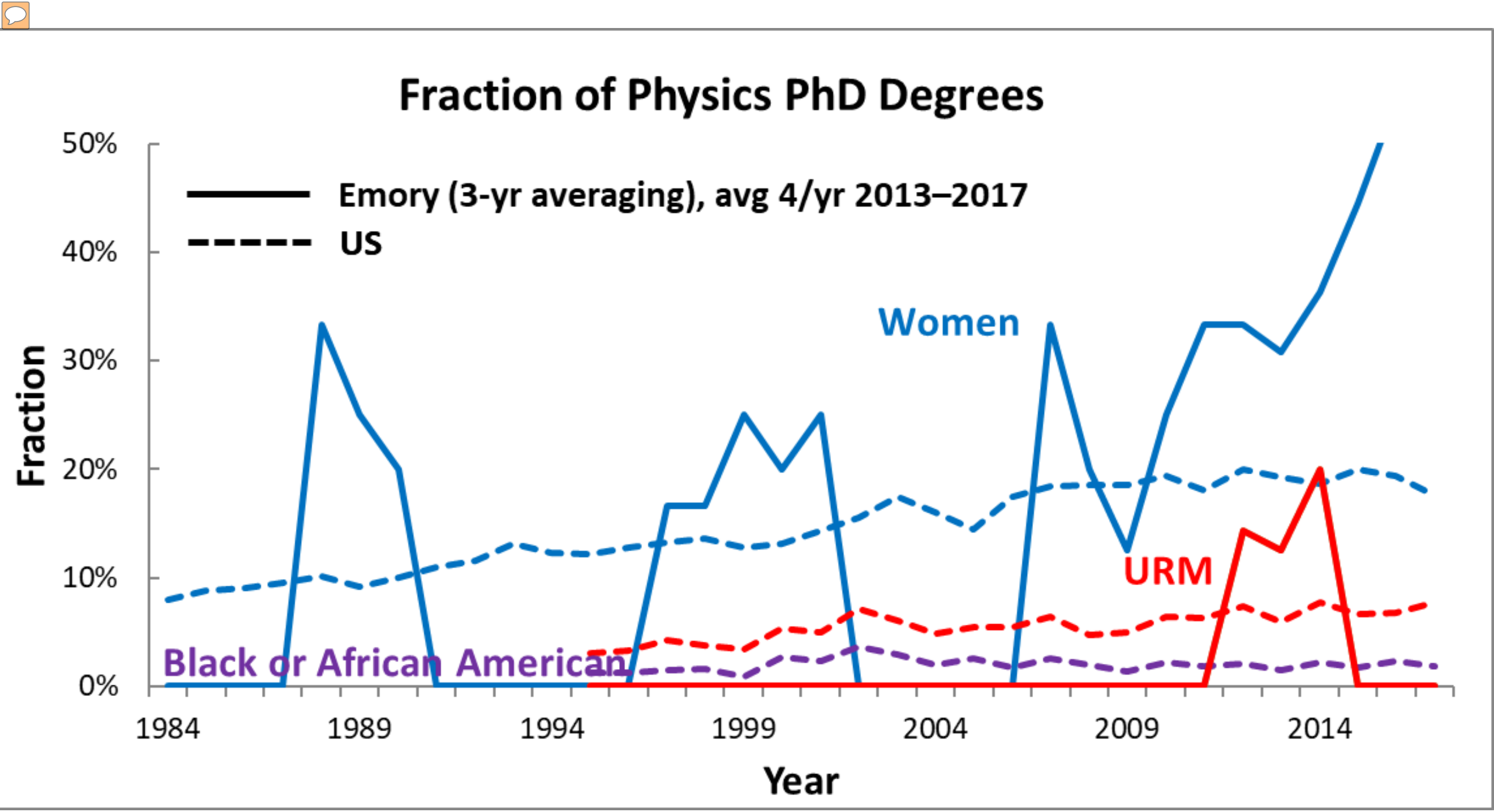

Fraction of Chem PhD Degrees
Georgia State (3-yr averaging), avg 14/yr 2013–2017
US
Women
URM
Black or African American
Fraction
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year

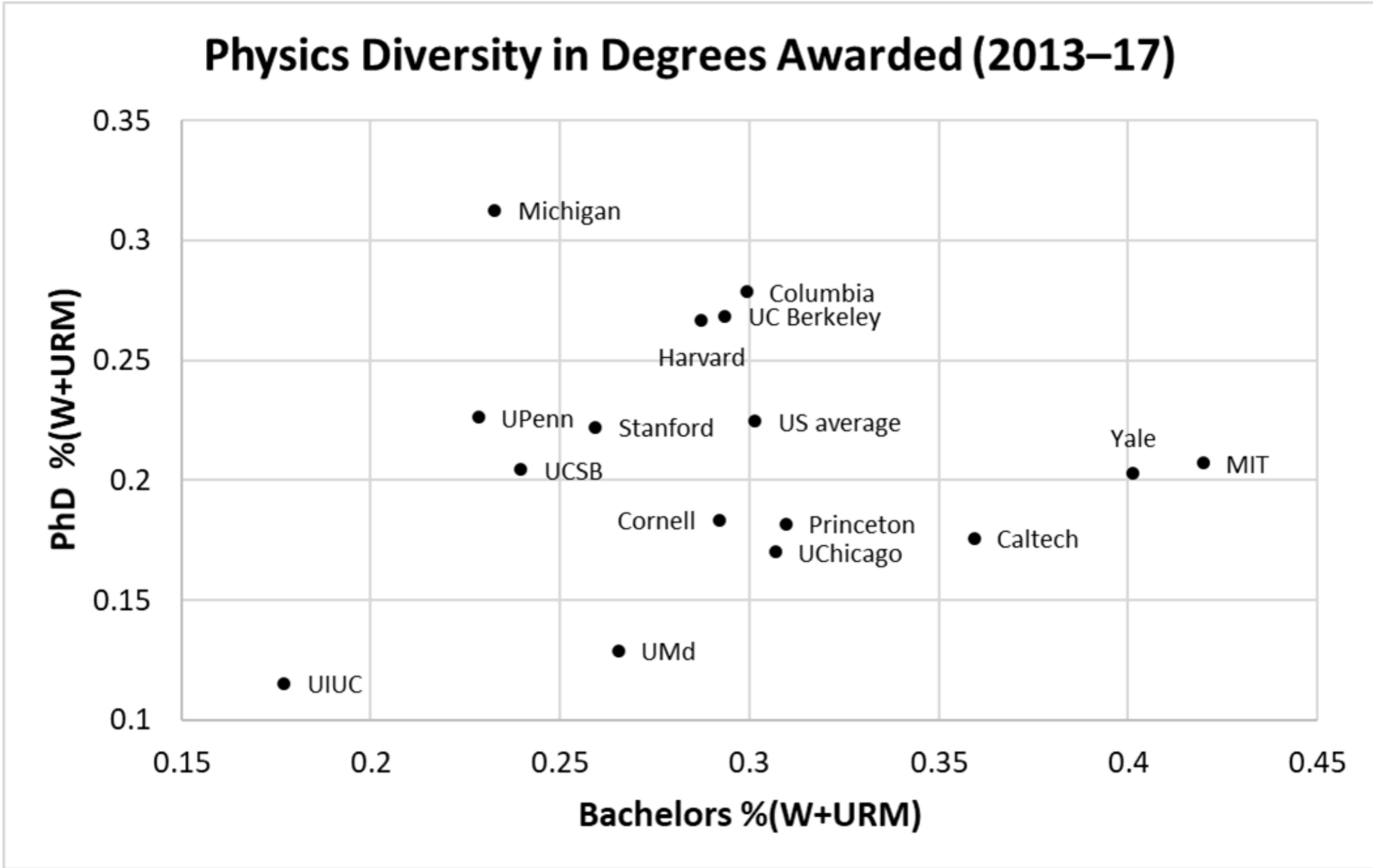

Fraction of Physics Bachelors' Degrees
Princeton (3-yr averaging)
US
Women
URM
Black or African American
Fraction
40%
35%
30%
25%
20%
15%
10%
5%
0%
1984
1989
1994
1999
2004
2009
2014
Year



Could Princeton be influenced by sunspots?


Fraction of Physics Bachelors' Degrees
NMSU (3-yr averaging), avg 10/yr 2013–2017
US
URM
Women
Black or African American
Fraction
70%
60%
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year


Fraction of Physics PhD Degrees
Emory (3-yr averaging), avg 4/yr 2013–2017
US
Women
URM
Black or African American
Fraction
50%
40%
30%
20%
10%
0%
1984
1989
1994
1999
2004
2009
2014
Year


Physics Diversity in Degrees Awarded (2013–17)
PhD %(W+URM)
Bachelors %(W+URM)
0.35
0.3
0.25
0.2
0.15
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Michigan
Columbia
UC Berkeley
Harvard
UPenn
Stanford
US average
Yale
MIT
UCSB
Cornell
Princeton
UChicago
Caltech
UMd
UIUC

Find the stories in the data;
Recognize the data in the stories.

No school is perfect, and we can improve by listening to our students.

From the

Report on the Status of Undergraduate Women at MIT

Environment

"My initial impression [of MIT was] very positive. Over the next years, I became more aware of the struggles of being a female at MIT. What are some of the factors [that influence this] and why don't I see more people like me [in my classes]? My younger sister is 16 and she's starting to look at colleges. I'm trying to put myself in her shoes. What does she see in a science career? What is appealing for her there?"

-Class of 2014, Mechanical Engineering

A positive and equitable school climate is crucial for a satisfied and productive student body. Females are significantly less likely to agree that, "The climate and opportunities for female students at MIT are at least as good as those for male students" (SQL, 2013) (Fig. 2.1). The data suggest that more than half of undergraduate students have at least some reservations about whether MIT has equal opportunities for men and women. This chapter explores aspects of MIT's environment that may contribute to the disparity in climate and opportunities by gender.

Preliminary conclusions (TEAM-UP report out early 2020)

1. Consistently, top performing departments have *multiple* faculty members who are effective mentors and make the students feel they care about them as individuals. These faculty include members of the predominant demographic group (e.g., white men).

2. Leadership by a committed department chair or head is important to hire and give these faculty support and encouragement for their efforts.

3. Institutional systems (e.g., GPS Advising at Georgia State) provide additional crucial support and are important for sustaining efforts through department leadership changes.

4. Students' sense of identity in an academic discipline is strengthened by research.

5. Students' sense of belonging in a department is strengthened by having peers of similar social identity.

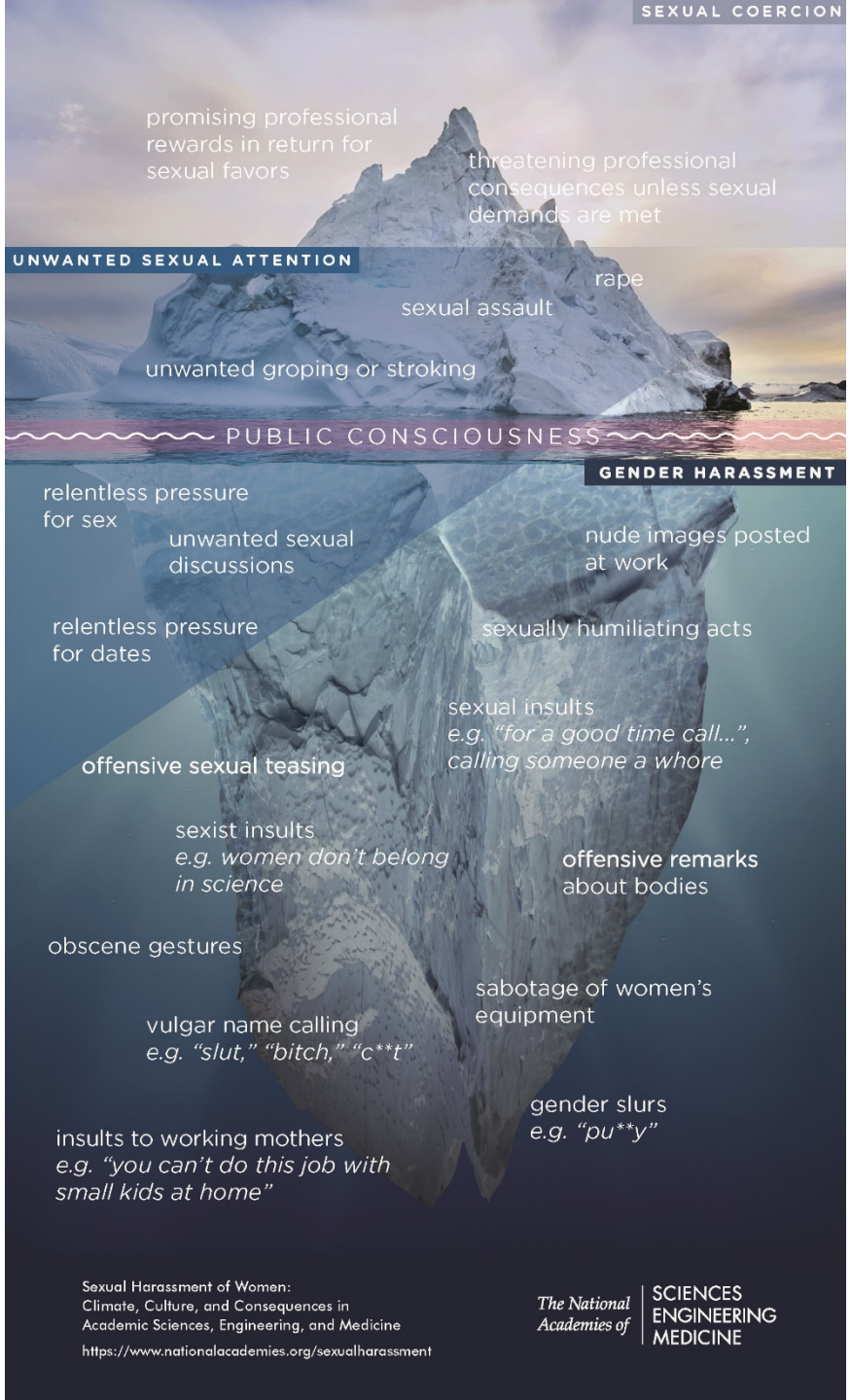
Outline

A success story: MIT Mechanical Engineering

A closer examination of MIT Physics diversity

Best in class across physical sciences and engineering

The role of departments and professional societies



Fix the macho culture of higher education

NASEM Consensus Study Report 2018:

Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine

Three levels of sexual harassment:

1. Gender harassment (verbal and nonverbal behaviors that convey hostility, objectification, exclusion, or second-class status about members of one gender)
2. Unwanted sexual attention
3. Sexual coercion

CAREER NEWS · 21 FEBRUARY 2019

Astronomy society pushes for diversity in US PhD programmes

Task force hopes that a report on boosting participation by under-represented groups will 'pull the alarm cord to say we can't continue doing things the way we have been'.

Kendall Powell

The American Astronomical Society wants to increase diversity among doctoral students in the field. Credit: Getty

The American Astronomical Society (AAS) in Washington DC wants those in charge of doctoral programmes in the field to work harder to recruit and retain students from under-represented groups. It aims to boost participation by women, minority ethnic groups, people of sexual and gender minorities, people with disabilities or who are neuroatypical, and under-represented socioeconomic groups, among others.

RELATED ARTICLES

LGBTQ scientists are still left out

Making physics more inclusive

These labs are remarkably diverse — here's why they're winning at science

SUBJECTS

Careers Education Institutions

Report of the 2018 AAS Task Force on Diversity and Inclusion in Graduate Astronomy Education

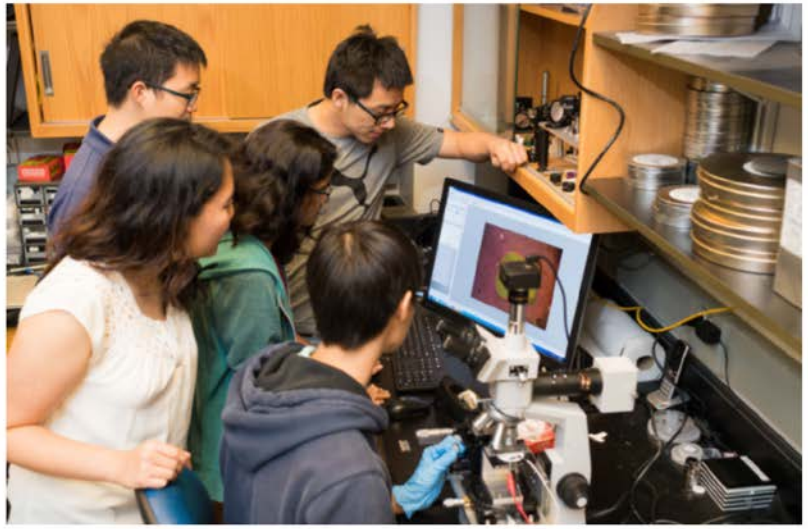
1. Admissions and recruiting
   a. Partner with institutions producing large numbers of underrepresented graduates
   b. Implement evidence-based holistic admissions
   c. Support and amplify university policies and practices for DEI
2. Retention and mentoring
   a. Undertake strategic planning with self-assessment
   b. Provide effective mentoring through evidence-based practices and expanded networking opportunities
3. Data and metrics
   a. Participate in the recommended AAS/AIP national demographic and climate survey
   b. Regularly collect and analyze data relevant to graduate education
   c. Assess the success of steps to improve the educational experience of graduate students using an evidence-based rubric
   d. Report results on progress in implementing the recommendations of this Task Force on the platform provided by the AAS, and on departmental websites

Sample Self-Assessment Rubric

Departmental climate	**Stage 1: Emerging**	**Stage 2: Developing**	**Stage 3: Transforming**
Communications	Department website provides information on policies and procedures and points to university-wide resources. Departmental communications use minimal language around equity and inclusion	Department chair communicates the importance of equity and inclusion in person and in writing shared with all department members. The department website provides details on family-friendly policies, mentorship, inclusive teaching, and responding to harassment and bullying	The department has adopted a values statement and a code of conduct. The department chair advises other departments on how to improve the climate for all people. The department chair periodically hosts colloquia on topics related to diversity, equity, and inclusion in academia
Training	Department members participated in mandatory university trainings on lab safety, Title IX, etc.	New faculty receive training on teaching, mentoring, and on university resources to support the success of all people. Faculty search committee members receive training on implicit bias and best practices for inclusive searches	Department chairs receive training on diversity, equity, and inclusion, and on mediation and conflict management. They receive regular coaching. The department hosts trainings for all members on topics such as "being an ally", responding to microaggressions and harassment, and inclusive teaching practices. The majority of faculty attend these trainings

Example of excellent departmental communication: Michigan DEI Committee pages

You Belong At Michigan.



Our Vision Statement

The field of Physics lacks diversity with respect to gender and underrepresented minorities (**URM**). The situation has not improved significantly with time; in fact, the number of degrees earned by African Americans has decreased in the last decade. Leaders at physics organizations and universities have recognized the demand for improved diversity. This has prompted official statements from the American Physical Society (**APS**) and the American Association of Physics Teachers (**AAPT**). The University of Michigan Physics Department has also acknowledged this and formed a committee on Diversity, Equity, and Inclusion (**DEI**) in order to address these and related issues. The university president's diversity charge states it is central to the mission as an educational institution to ensure that each member of our community has full opportunity to thrive.

The committee aims to improve diversity, equity, and inclusion in the University of Michigan's Physics Department such that the representation of traditionally underrepresented and marginalized groups, within the department, is more reflective of our society, and work towards a sustainable, diverse and thriving physics community. The committee is dedicated to contributing to the department in such a way that the University of Michigan becomes a leading example in diversity initiatives. Lastly, in order to demonstrate that the Physics Department is aligned with the goals outlined in University of Michigan LSA college-wide strategic plan for Diversity, Equity, and Inclusion it is imperative that the

Recommendations to AAS: Recognition of progress

Maintain a platform to let departments share their practices and metrics. Serves as a resource for prospective graduate students looking for the most inclusive departments. Encourage participation in this effort

- Encourages adoption of practices outlined in “Recommendations to Departments”
- Provides public recognition for participating departments
- Provides information about those departments for prospective graduate student
- Over time, provides a measuring tool of national progress for the the field

Recommendations to AAS: Measurement of Practices & Climate

Contract with AIP to create a web-accessible survey for participating departments, centering on a small set (~10) of standardized climate questions

- Key demographic variables would also be surveyed
- Departments will be asked to encourage participation
- Only aggregated results would be made public
- Departments could negotiate to receive more detailed results (with careful protection of privacy at both ends)

The AAAS has a new recognitions program!

What is STEM Equity Achievement Change?

- A national diversity-equity-inclusion rating system for research universities led by the AAAS
- Modeled after the highly successful UK Athena SWAN system
- Similar to a LEED rating for buildings; bronze, silver and gold ratings last for 5 years and can be renewed.
- National Physics and Engineering societies are already planning department-level certifications

seachange.aaas.org

First SEA Change awards announced this year: BU, UC Davis, UMass Lowell

Michael Colella/AAAS

AAAS PRESS RELEASE, EUREKALERT!, FEBRUARY 13, 2019

AAAS recognizes three universities with Bronze Awards for STEM equity achievement change

Boston University, the University of California, Davis and the University of Massachusetts Lowell are being recognized by AAAS for their commitment to diversity, equity and inclusion in STEM and furthering positive change in their institution's relevant policies and practice. The STEM Equity Achievement (SEA) Change initiative at AAAS will present the three universities with a Bronze Award on February 13, 2019 at the AAAS Annual Meeting. [more]

Outline

A success story: MIT Mechanical Engineering

A closer examination of MIT Physics diversity

Best in class across physical sciences and engineering

The role of departments and professional societies

Discuss with a neighbor one thing you learned in this presentation.

For further information:

1. https://www.aip.org/statistics/reports/women-physics-and-astronomy-2019 - the source for some figures in this presentation
2. https://success.students.gsu.edu/ - the Georgia State success story
3. https://www.cimerproject.org/ - learning to become an excellent research mentor
4. https://aas.org/education/aas-task-force-diversity-and-inclusion-graduate-astronomy-education - the Astronomy report
5. https://seachange.aaas.org/ - the SEA Change initiative
6. http://web.mit.edu/fnl/vol/archives/Fnl144.pdf – The Status of Women Faculty at MIT, 2002 (still very relevant today)