Resources for diversifying nuclear physics

Agnieszka Sorensen

December 7th, 2022

Why am I giving this talk???

There are many people in our community, including in this audience, who have *expertise* on this subject.

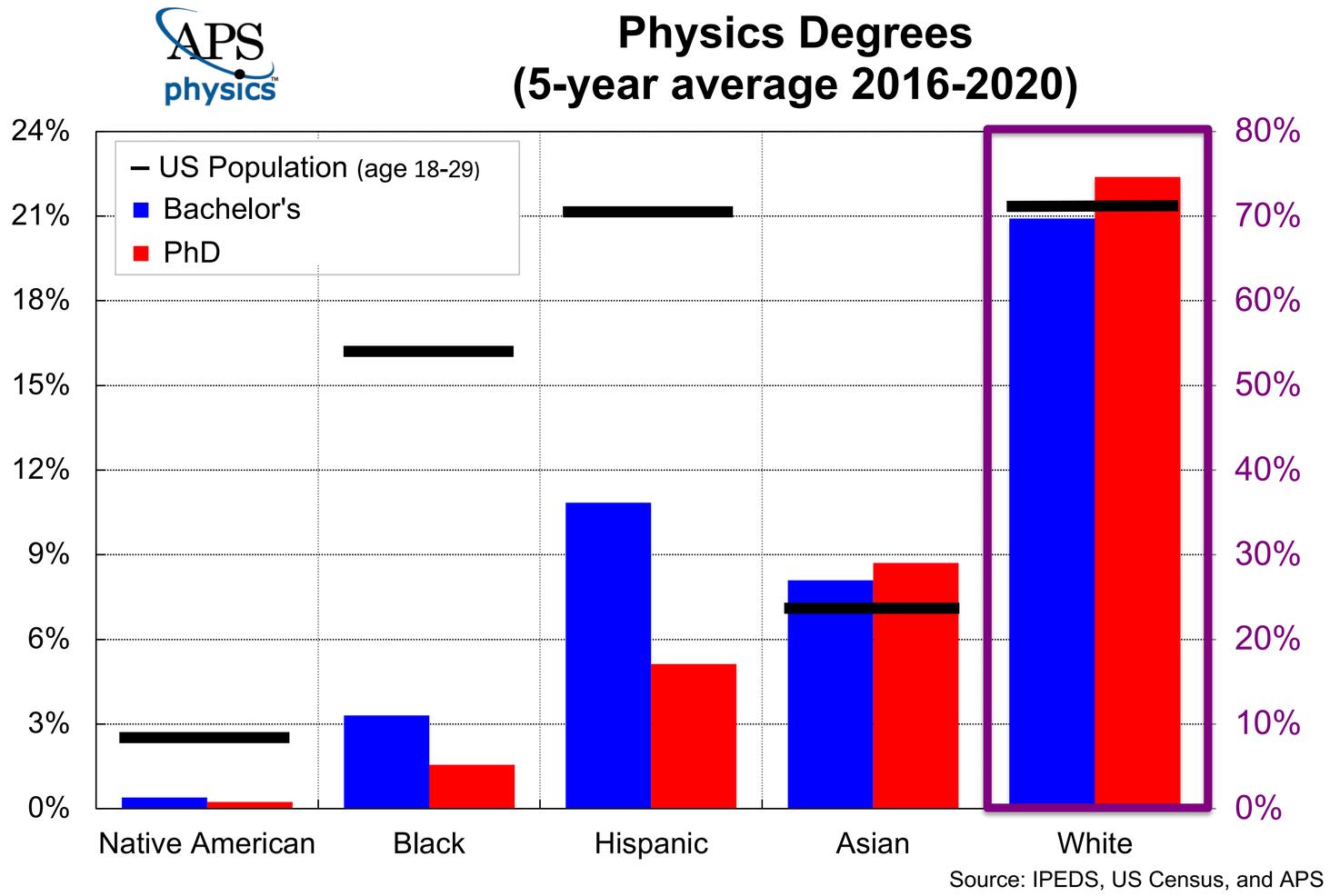
But what percentage of the community are they? 5% ? 10% ? 15% ?

Actions of *lone champions* will not change the majority (~85%) of the community:
the majority of the community must take steps to change itself.

So I take this as an opportunity to learn (a work *very much in progress*), and share what I've learned.

Does nuclear physics need to be diversified? Some data from the APS

Disclaimer: numbers and specific opportunities in this talk will apply to nuclear physics in the US



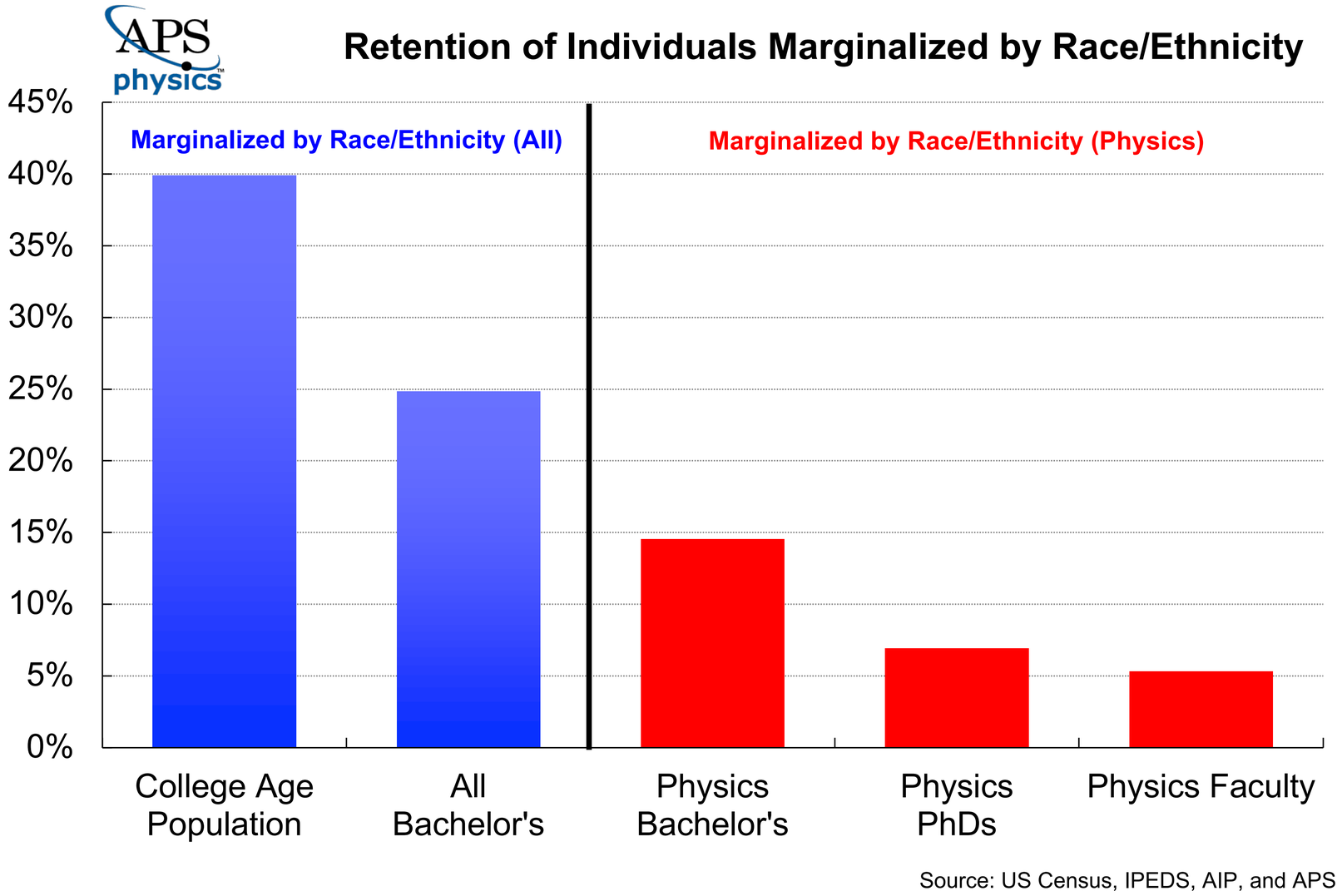
This graph illustrates a five-year average of the percent of physics bachelor's and doctoral degrees awarded to people of various races and ethnicities.

Degrees awarded to temporary residents are not included in the calculations. Data on the college age population are collected from the U.S. Census.

Based on the representation in the US population,

- % of Ph.D. degrees awarded to Hispanic Americans is a factor of ~4 below what it should be
- % of Ph.D. degrees awarded to Black Americans is a factor of ~10 below what it should be
- % of Ph.D. degrees awarded to Native Americans is a factor of ~12 below what it should be

Retention


Retention of Individuals Marginalized by Race/Ethnicity
Marginalized by Race/Ethnicity (All)
Marginalized by Race/Ethnicity (Physics)
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
College Age Population
All Bachelor's
Physics Bachelor's
Physics PhDs
Physics Faculty
Source: US Census, IPEDS, AIP, and APS

Why is this the case?

- Academic resources:
  the “pipeline” begins at the elementary education level;
  schools in minority-majority school districts are severely underfunded
- Insider knowledge: if you are a first generation college student, you might not know that you *don’t have to pay for grad school in physics*
- Financial resources: going into physics, especially Ph.D., is somewhat of a bet;
  would *you* choose this path if
  - you had family members to support?
  - your family couldn’t provide a safety net in case it goes all wrong?
  NOTE: this plays into a large discussion of graduate student and postdoc wages see, e.g., UC strikes
- Climate: if you are in a toxic environment, just *how much* do you have to love physics to endure that — possibly for the rest of your career?

This is just a few of all possible reasons. What is most important?

We don’t have to guess. There is active research on this subject.

The TEAM-UP report (link)

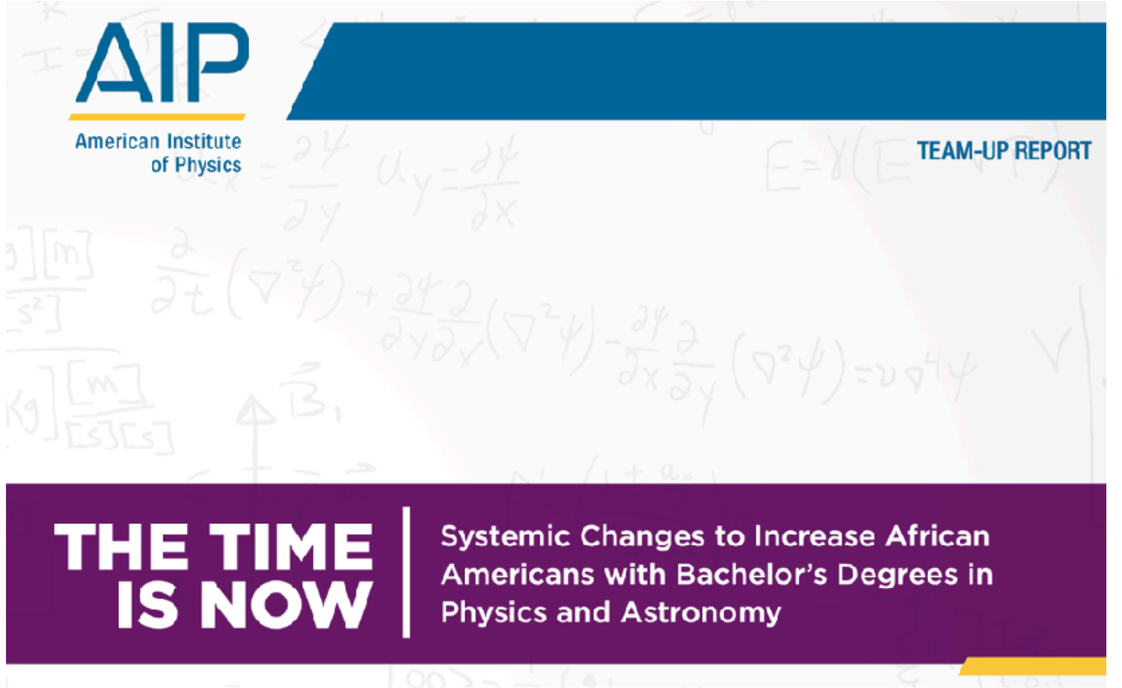
TEAM-UP = AIP National Task Force to Elevate African American Representation in Undergraduate Physics & Astronomy

"The briefest summary of the TEAM-UP report is this:
the persistent underrepresentation of African Americans in physics and astronomy is due to

(1) the lack of a supportive environment for these students in many departments,

(2) the enormous financial challenges facing them and the programs that have consistently demonstrated the best practices in supporting their success.

Solving these problems requires addressing systemic and cultural issues, and creating large-scale change management framework."



The TEAM UP report (link) identifies five factors responsible for the success or failure of African American students in physics and astronomy:
- Belonging
- Physics Identity
- Academic Support
- Personal Support
- Leadership and Structures

The TEAM-UP report success/failure factors: Belonging

Belonging = an individual's feeling of being a welcomed and contributing member of a community

- faculty interactions are critical; sense of belonging increases with the number of faculty who *get to know students as individuals* and *demonstrate* support for their success
- student peers play a big role in mitigating or exacerbating the sense of not belonging; negative factors include microaggressions, the imposter phenomenon, stereotype threat
- peers of the same race/ethnicity/gender provide valuable social and academic supports, often through providing spaces where members of minoritized communities are fully accepted ("counterspaces")

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  spaces where members of minoritized com

Microaggression = commonplace and daily verbal, behavioral or environmental slights, whether intentional or unintentional, that communicate hostile, derogatory, or negative attitudes toward stigmatized or culturally marginalized groups

The imposter phenomenon = a psychological occurrence in which an individual doubts their skills, talents, or accomplishments and has a persistent internalized fear of being exposed as a fraud, despite external evidence of their competence

Stereotype threat = a situational predicament in which people are or feel themselves to be at risk of conforming to stereotypes about their social group

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- Faculty have a pivotal role in fostering the sense of belonging
- Departments can create structures and practices on an institutional level; e.g., creating learning groups should be *intentional*; see →
- Professional societies:
  National Society of Black Physicists (NSBP) link
  Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) link
  American Indian Science and Engineering Society (AISES) link
  National Society of Hispanic Physicists (NSHP) link

A. Johnson, M. Ong, L. T. Ko, J. Smith, A. Hodari

"Common Challenges Faced by Women of Color in Physics, and Actions Faculty Can Take to Minimize Those Challenges",

The Physics Teacher **55**, 356 (2017)

link

The TEAM-UP report success/failure factors: Belonging

"Women of color at this institution reported microaggressions, but also trusted that their professors would cope with those microaggressions so that the students didn't have to."

"Almost all professors in this physics department promote a growth mindset."
growth mindset = intelligence and academic abilities can be developed through hard work and dedication
fixed mindset = you're born with your abilities

"Professors also deliberately create community among students; this gives women of color an opportunity to get to know other students and thus replace their feelings of isolation with a feeling of belonging."

"Professors don't just leave it to chance that underrepresented students will get knit into this community. [E.g., they developed weekly seminar series that provide both learning value and social integration.] By mastering material that is more challenging than what will be required in class, ESP students are protected from stereotype threat; by fostering social integration, they are protected from isolation."

"There are also several public spaces provided for students to work together, near faculty offices; the students know they can ask any faculty member for help on homework, not just the professor who assigned it."

A. Johnson, M. Ong, L. T. Ko, J. Smith, A. Hodari, "Common Challenges Faced by Women of Color in Physics, and Actions Faculty Can Take to Minimize Those Challenges", The Physics Teacher **55**, 356 (2017)
link

The TEAM-UP report success/failure factors: Belonging

Huge importance of professional societies!

NSBP, Inc. Retweeted

Lisa Stewart @Stewart_LisaA · Nov 8

"I feel like a professional researcher now..."

"It jumpstarted our careers as scientists..."

"They did not underestimate us..."

—Panel of Simons-NSBP Scholars #nsbp2022

Simons Foundation and NSBP, Inc.

NSBP, Inc. Retweeted

Mr. F @FaraiMazhandu · Nov 8

If you are a #black #physicist, come to @NSBPInc and feel at home. Personally, I like that the crew goes all out to make sure no one leaves their events without #internship, a #mentor, graduate opportunity, #postdoc, collaboration, or a job #NSBP2022 #2022NSBP #2022NSBPConference

12 27

The TEAM-UP report success/failure factors: Physics identity

Physics identity = perceiving oneself, and being perceived by others, as future physicists and astronomers

- African American students need to overcome stereotypes about who is *interested* or *capable* of becoming a physicist or astronomer

- Faculty encouragement
- Recognition
- Representation (same-race role models) (professional societies again!)
- Inclusion = being routinely invited and *financially supported* to participate in the established activities of the profession
- Being able to connect physics education to activities that benefit the students' communities (e.g., medical physics!)
- *Strategic* approach; use evidence-based strategies: what is your *data* on how successful whatever you're doing is?

The TEAM-UP report success/failure factors: Academic support

Academic support = effective teaching and a strengths-based approach

- Mentoring and student-centered support
- Focus on strengths rather than *presumed* weaknesses
- This helps *all* students, but the lack of effective teaching and mentoring particularly hurts minoritized students who often don't have resources outside of academia (financial, community, etc.) to offset these challenges

- The Effective Practices for Physics Programs (EP3) guides link
- Bridge programs:
  APS bridge program link
  Fisk-Vanderbilt bridge program link
  List of bridge programs from Graduate Resources for Advancing Diversity with Maryland Astronomy and Physics (GRAD-MAP) link
- Research Experience for Undergraduates programs link
- Science Undergraduate Laboratory Internships (SULI) link
- Physicists Inspiring the Next Generation (PING) program link
- Career guides, e.g., by AIP link
- Research exchange for advanced graduate students and postdocs; travel grants between Berkeley, Caltech, Georgia Tech, Harvard, UCLA, U of Michigan, Stanford, U of Texas at Austin, and U of Washington link

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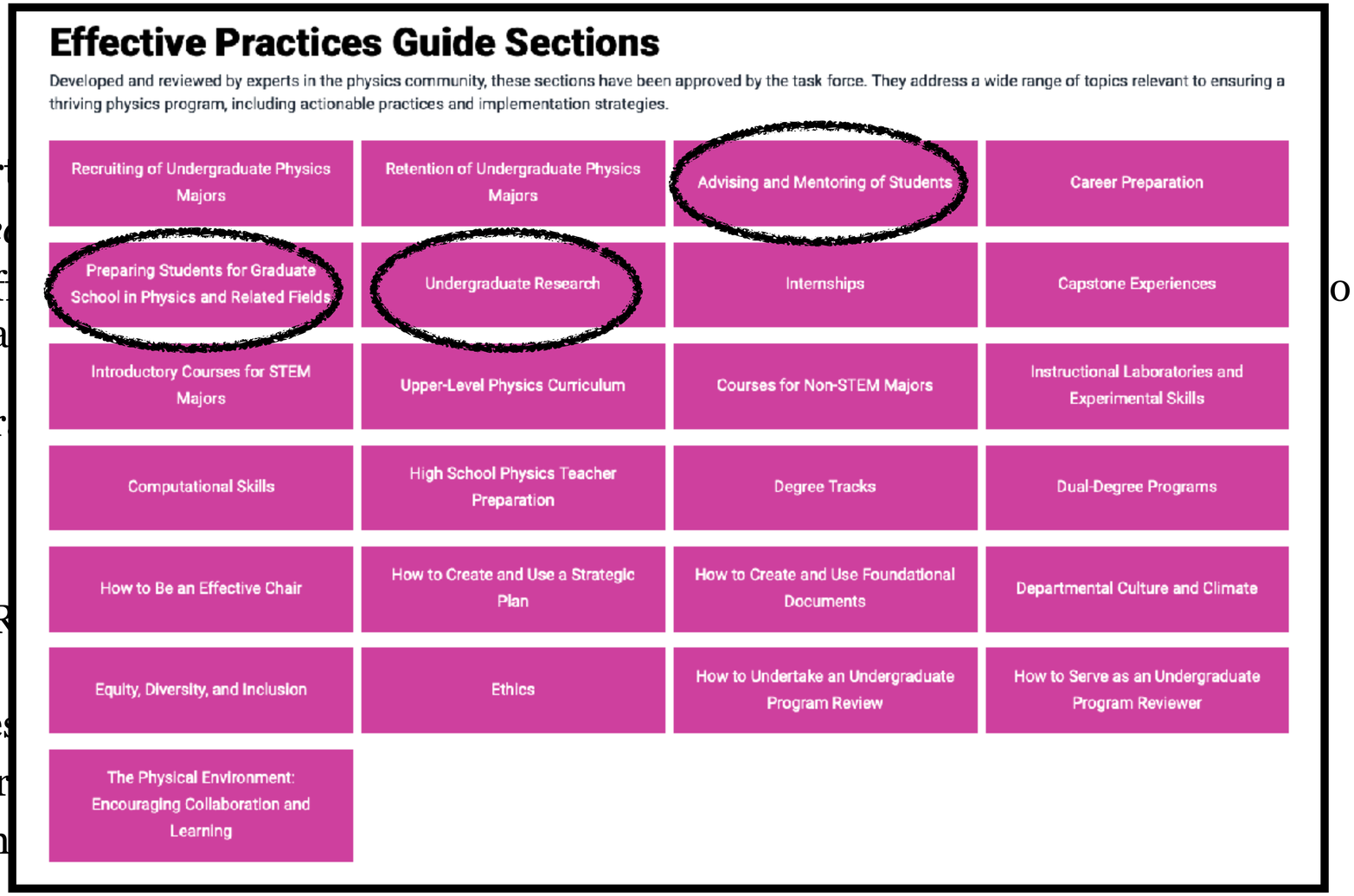


The TEAM-UP report success/failure factors: Personal support

Personal support = support to offset financial burdens and stress

- Financial stress affects everything: grades, mental health, retention rates, …

- Be aware of mental health and wellbeing resources, promote a healthy work(school)-life balance
- Access to jobs related to their major, such as paid internships, Learning Assistants positions, undergraduate research positions
- Be aware of emergency and auxiliary financial help, be prepared to guide students toward these resources
- DOE Reaching a New Energy Sciences Workforce (RENEW program): long-term partnerships between R1 institutions and HBCUs, MSIs; awards on a yearly cycle link
- TEAM-UP Together program (direct funding to African American physics and astronomy undergraduate students attending HBCU's or PBIs) link

The TEAM-UP report success/failure factors: Personal support

DOE RENEW awards in heavy-ions

Award to BNL


Stacyann Nelson (FAMU)


HBCU Collision Collaboration

M. Chiu with the HBCU Collision Collaboration


A. Deshpande (SBU), M. Alfred (Howard), M. Harvey (Texas Southern), R. Palai (U Puerto Rico), W. Rockward (Morgan State), C. Scarlett (FAMU), Noel Blackburn (BNL)

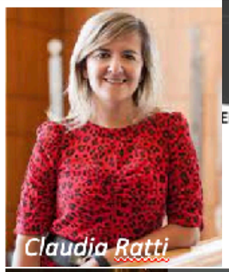
Award to Virginia State University (HBCU)


T. Redpath (VSU)

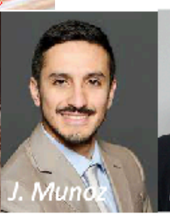

P. Gueye (MSU)


Rare Isotope Beams Cyro-plant. Inset: May student research assistant at FRIB.

Award to University of Houston


Claudia Ratti


P. Sagaati

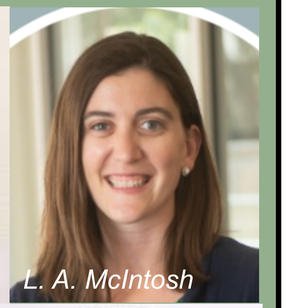

J. Munoz


E. Ferrer

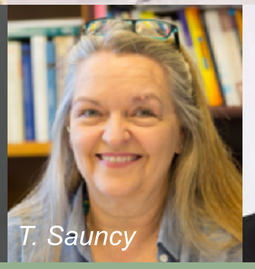

L. Ruan


S. J. Yennello


J. Mabiala


L. A. McIntosh


J. A. Muñoz


T. Sauncy


J. A. Lopez

Award to TAMU

The TEAM-UP report success/failure factors: Personal support

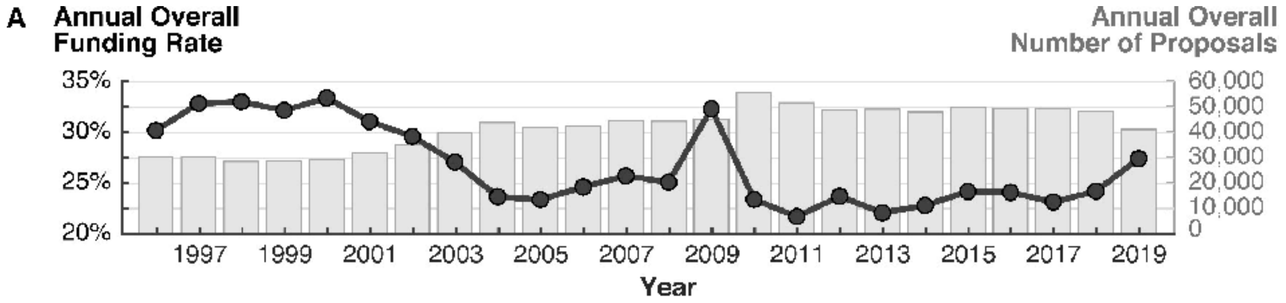
Beyond undergraduate & graduate studies:

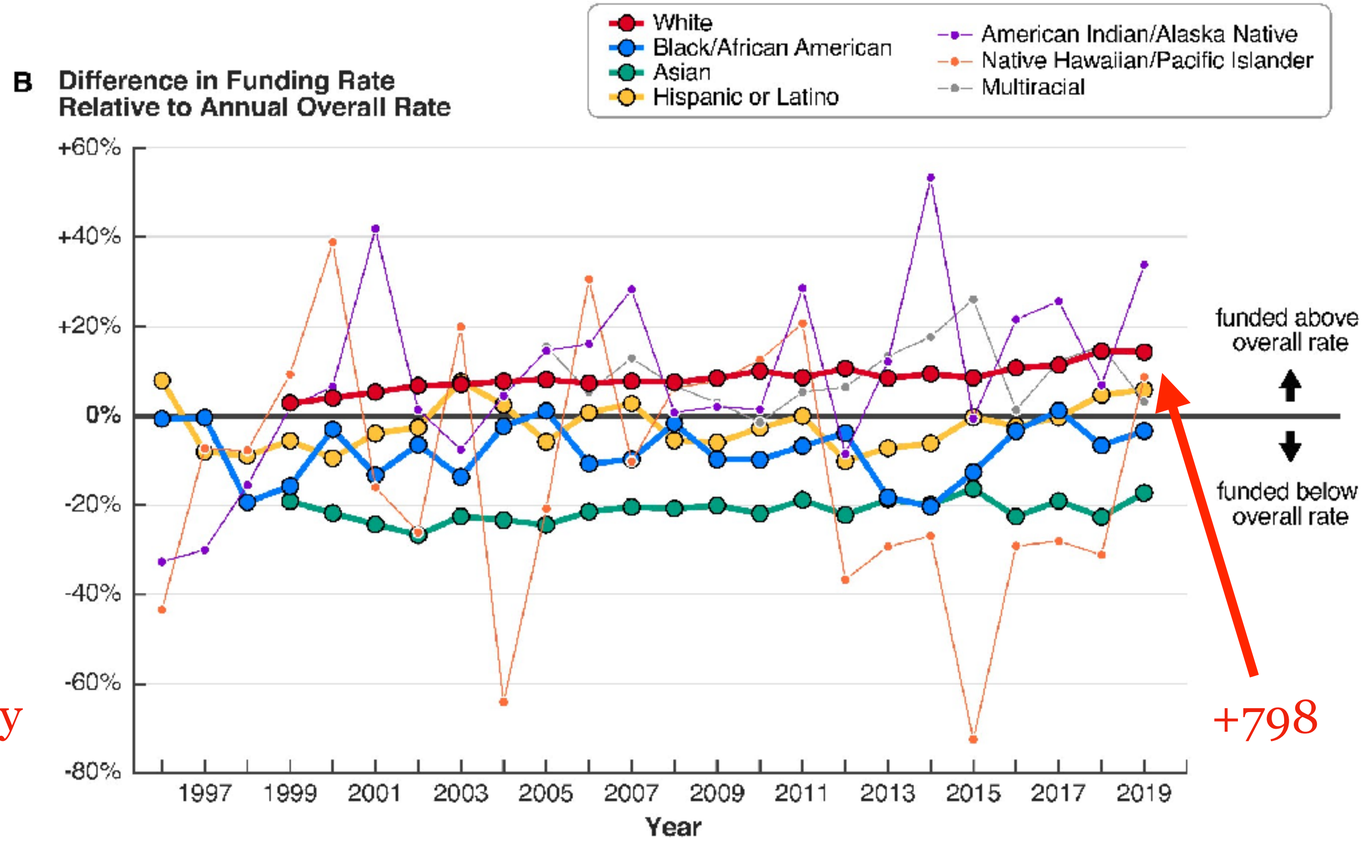
C. Y. Chen, S. S. Kahanamoku, A. Tripati , R. A. Alegado, V. R. Morris, K. Andrade, J. Hosbey,

“Meta-Research: Systemic racial disparities in funding rates at the National Science Foundation”,

eLife **11**:e83071

link





Hundreds of awards away from the overall rate

The TEAM-UP report success/failure factors: Leadership

Leadership = academics must prioritize creating environments, policies, and structures that maximize success

- Adopting policies that lead to a greater retention of minoritized students are functions of leadership
- Utilize committees, internal funding, coalition building to effect change
- A significant fraction of faculty should be involved (a lone champion *will* burn out)

- The Effective Practices for Physics Programs (EP3) guides link
- Incentivize and *reward* faculty members who actively support and create programs for minorities students; e.g., teaching release?
- DOE Promoting Inclusive and Equitable Research (PIER) plan: will require applicants to submit a Promoting Inclusive and Equitable Research (PIER) Plan as an appendix to their proposal narrative link

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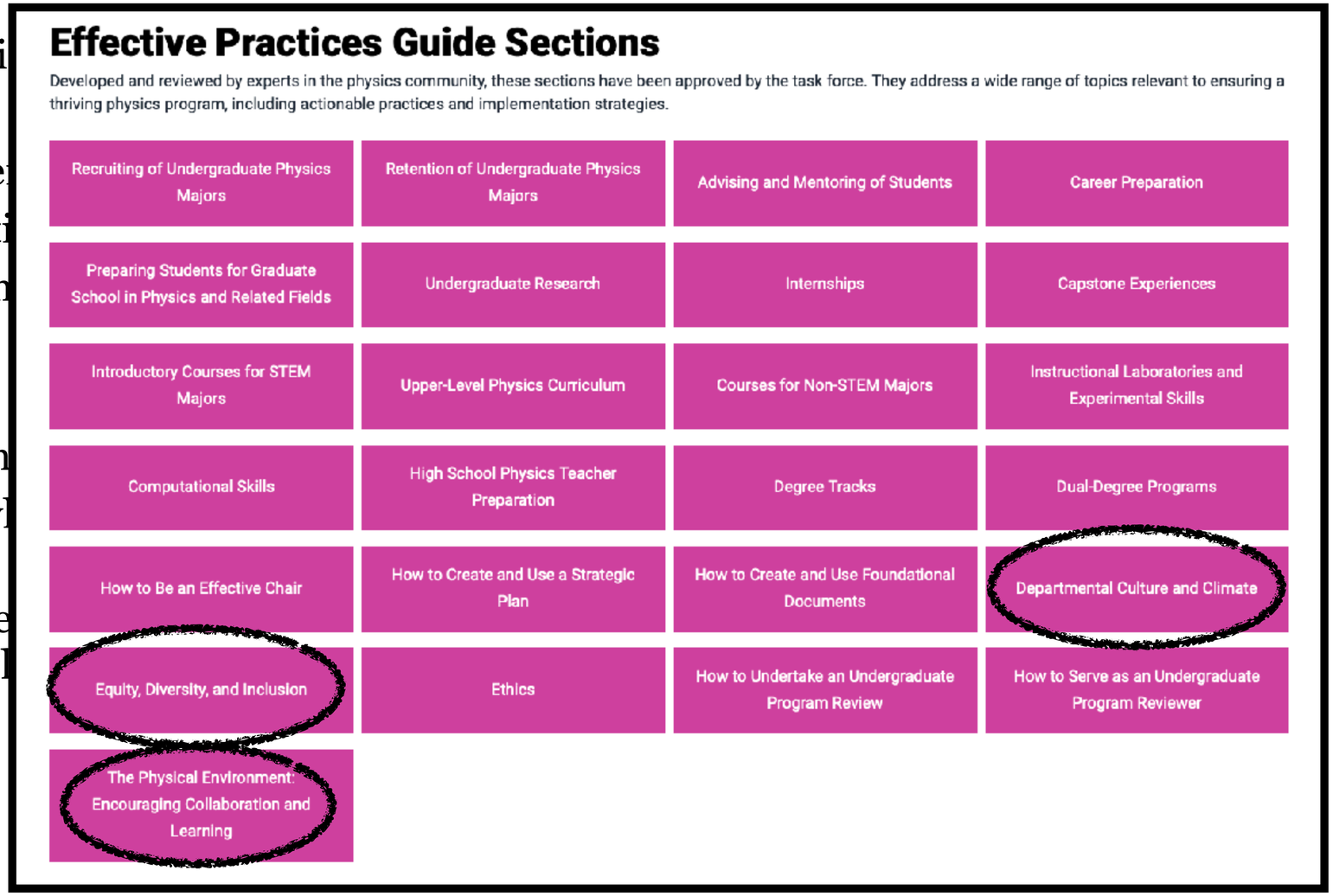


Task forces and committees for Climate & DEI: Where are the men?

TEAM-UP task force: 67% women

Current UEC Members

- **Chairs** (3-year cycle, 1 year in each position)
  - Marzia Rosati (Iowa State Univ)– Chair Elect
  - Zhenyu Ye (Univ of Illinois at Chicago) – Chair
  - Christine Nattrass (Univ of Tennessee) – Past Chair
- **Elected Members** (3-year term - staggered)
  - Megan Connors (Georgia State Univ)
  - Jim Drachenburg (Abilene Christian Univ)
  - Justin Frantz (Ohio Univ)
  - Raghav Kunnawalkam Elayavalli (Yale Univ)
  - Xuan Li (LANL)
  - Christine Markert (Univ of Texas at Austin)
  - Rosi Reed (Lehigh Univ)
  - Hanna Zbroszczyk (Warsaw Univ of Technology)
- **Appointed Members** (2-year term)
  - Ron Belmont (Univ of North Carolina at Greensboro)
  - Carl Gagliardi (Texas A&M Univ.)
  - Yacine Mehtar-Tani (BNL)
- **Elected Student/Postdoc Members** (1-year term)
  - Roli Esha (Stony Brook Univ.)
  - Agnieszka Sorensen (Univ. of Washington)
  - Maria Stefaniak (Warsaw Univ. of Technology)
- **Ex-Officio**
  - Haiyan Gao (BNL)
  - Doon Gibbs (BNL)
  - Hong Ma (BNL)

17 regular members
10 women + 7 men
2 theorists + 15 experimentalists
3 on spin + 14 on heavy ion
2 from lab + 15 from university

RHIC/AGS Users' Executive Committee: 59% women

M. Dancy, A. K. Hodari,

"How well-intentioned white male physicists maintain ignorance of inequity and justify inaction",

arXiv:2210.03522

link

(the title and introduction are somewhat problematic, but it's a very useful read)

2022

Co-Chair: Filomena Nunes, Michigan State University
Co-Chair: Roxanne Springer, Duke University
Members:

- Paul Gueye, Michigan State University
- Elena Long, University of New Hampshire
- Christine Nattrass, University of Tennessee - Knoxville
- Sanjay Reddy, University of Washington
- Warren Rogers, Indiana Wesleyan University
- Loida Rosado del Rio, University of Puerto Rico
- Sherry Yennello, Texas A&M University
- Allison Zec, University of Virginia

APS DNP DEI committee: 70% women

Task forces and committees for Climate & DEI: Where are the men?

“Statistics support the fact that White American males constitute only 33% of the population. Yet, they occupy approximately

80% of tenured positions in higher education
80% of the House of Representatives
80-85% of the U. S. Senate
92% of Forbes 400 executive CEO-level positions
90% pf public school superintendents
99.9% of athletic team owners
97.7% of U. S. presidents

D. W. Sue, “Microaggression: More Than Just Race”
link

The questions we must ask are:
Where are the women?
Where are the people of color?
If these are due to racism and sexism, who are the culprits?
Are these outcomes due to the overt racist or sexist?
Are they due to the hate mongers, the White supremacist, Klan or Skinheads?

I contend that it is not the overt racist or sexist which control the tools that result in such unjust and damaging disparities. It is people we elect to office, teachers who educate our children, business leaders who carry out the policies and practices of their corporations, government leaders, law enforcement officers, physicians, dentists, construction workers, your family, friends, and neighbors. It is well-intentioned people like you and I!“

What is the climate for women? Sexual harassment

Sexual harassment still an issue:

- No effective ways of dealing with it (lack of consistent approaches between universities, Title IX offices, collaborations, etc.).
- Known harassers in the field still invited to meetings (see Quark Matter 2022), retain their titles (e.g., APS Fellow), etc.
- At APS meetings, people (*mostly women*) coordinate to trail several of known offenders

Codes of Conduct / Community Agreements!

E. Barzi, S. Liuti, C. Nattrass, R. Springer, C. H. Bennett,
"How Community Agreements Can Improve Workplace Culture in Physics", arXiv:2209.06755

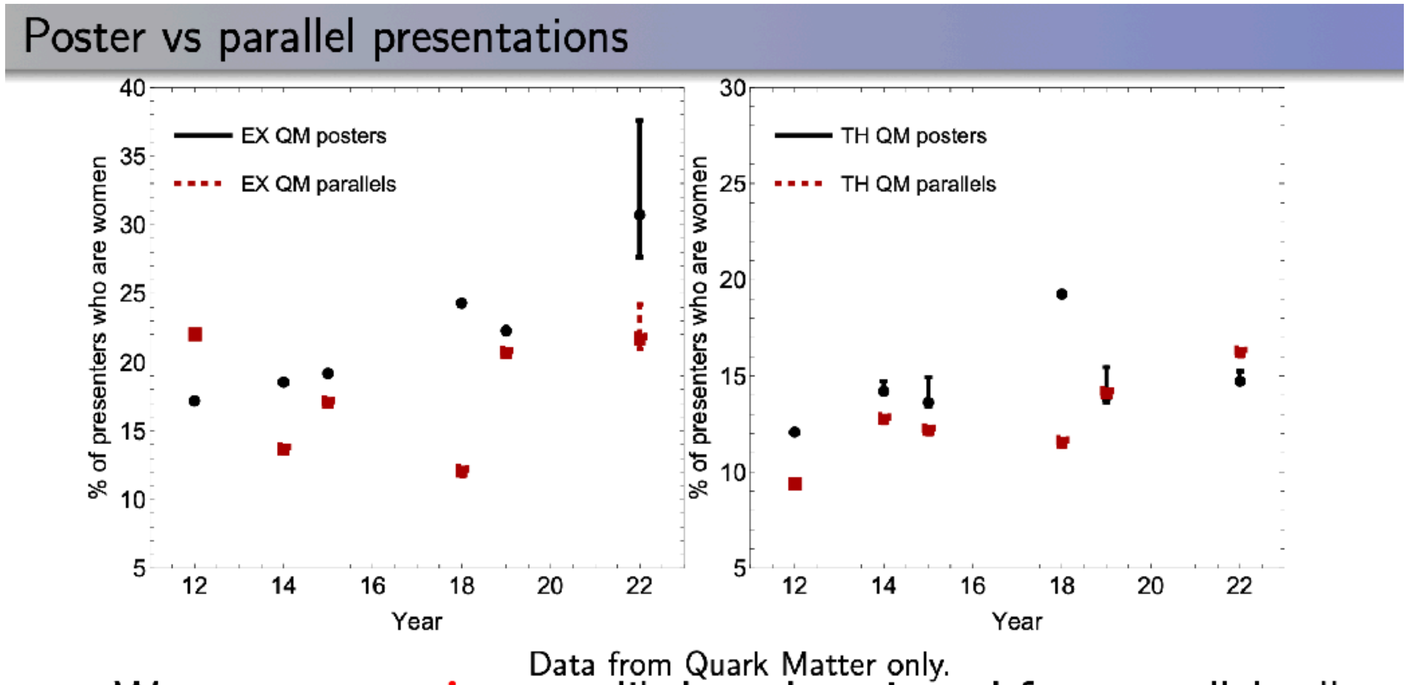
link

What is the climate for women? Disparities in opportunity

Disparities in conference speaker statistics:
see talk by Christine Nattrass at the 2022 RHIC/AGS Annual Users' Meeting link to slides link to video

Zero female plenary theory speakers

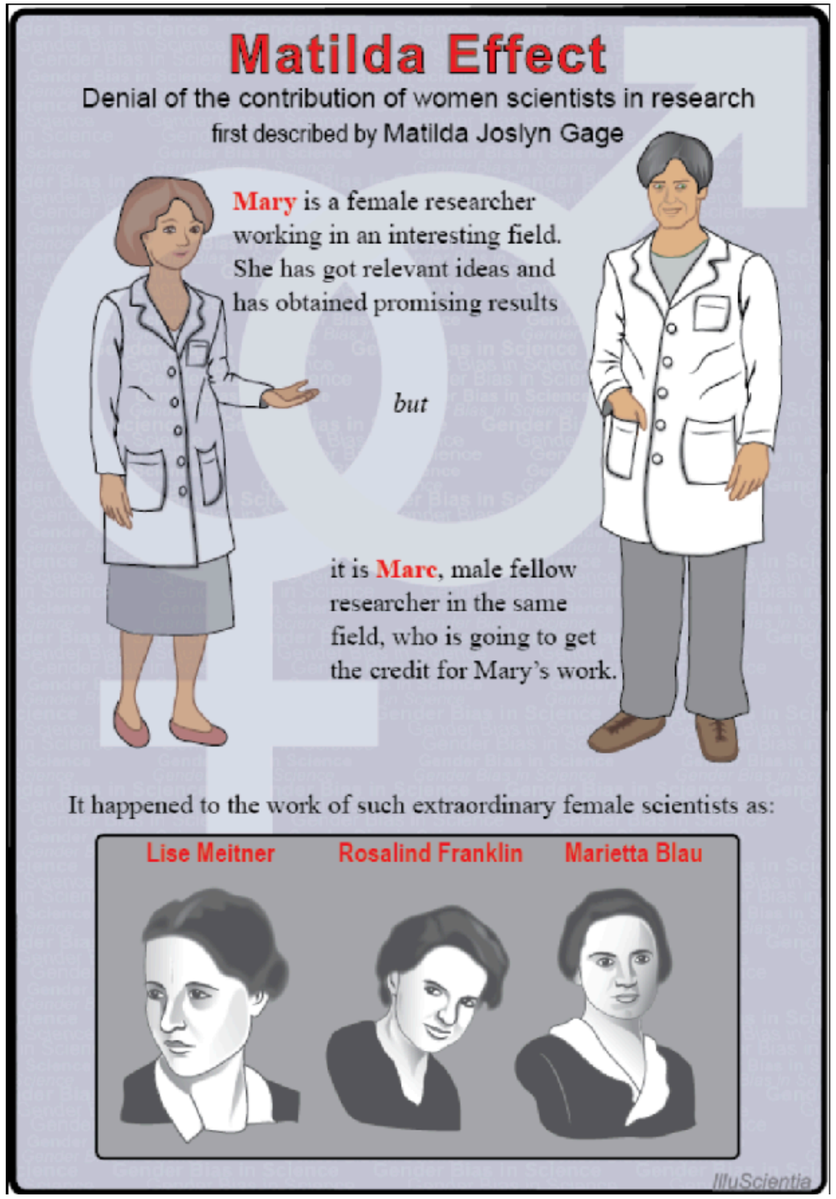
Zero female plenary experimental speakers



Data from Quark Matter only.

Women are **much more** likely to be rejected for a parallel talk, given a poster.

What is the climate for women? The Matilda effect



Dropped out of a write up of a RHIC/AGS UEC Meeting DEI workshop!

Agnieszka Sorensen
@agnieszka_ph

This is a great write up about a workshop organized by Stacyann Nelson and me. Sadly, @BrookhavenLab didn't find space in this long, detailed account to mention two early-career organizers of the workshop, even though we spent *months* choosing speakers and designing the panel.

> **Brookhaven Lab** @BrookhavenLab · Jul 6
> As we transition from #RHIC to the #ElectronIonCollider, we aim to cultivate diverse workforce development. bnl.gov/newsroom/news....

(they corrected it after we pointed it out)

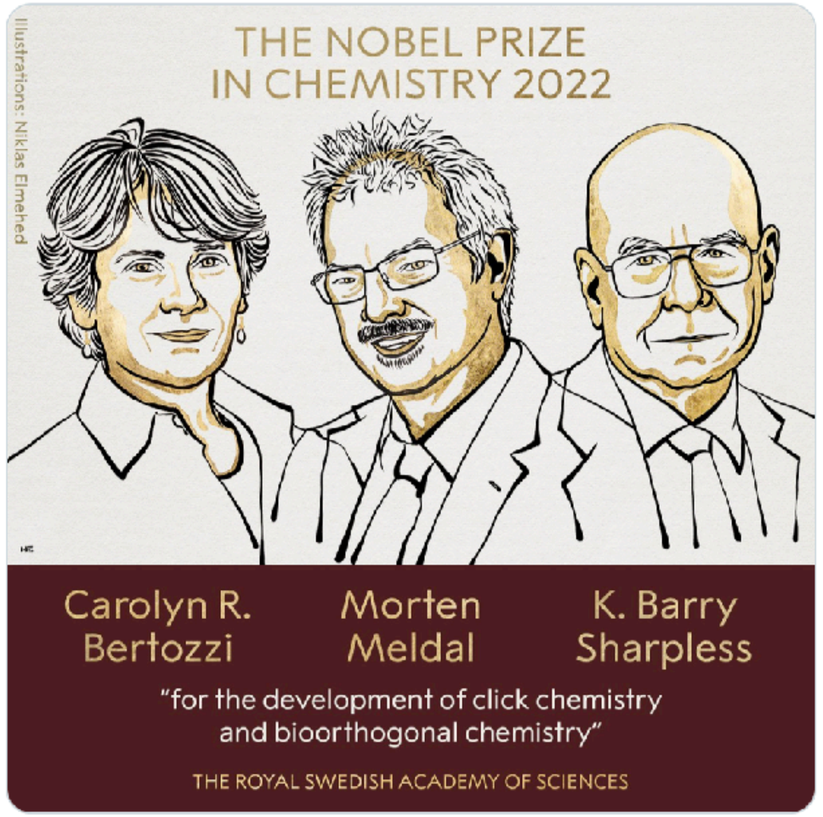
yours truly

Dr. Stacyann Nelson

What is the climate for women? The Matilda effect

The Nobel Prize @NobelPrize · Oct 5

BREAKING NEWS:
The Royal Swedish Academy of Sciences has decided to award the 2022 #NobelPrize in Chemistry to Carolyn R. Bertozzi, Morten Meldal and K. Barry Sharpless "for the development of click chemistry and bioorthogonal chemistry."



380 13.3K 29.3K

Chemical Science
@ChemicalScience

Flagship journal for @RoySocChem, open access with no pu
breadth of the chemical sciences, chemicalscience-rsc@rsc

Cambridge rsc.org/chemicalscience Joined Aug

1,168 Following **66.8K** Followers

Royal Society of Chemistry
@RoySocChem

Here to give every mind in the chemical sciences the support, re
connections they need to shape chemistry's future.

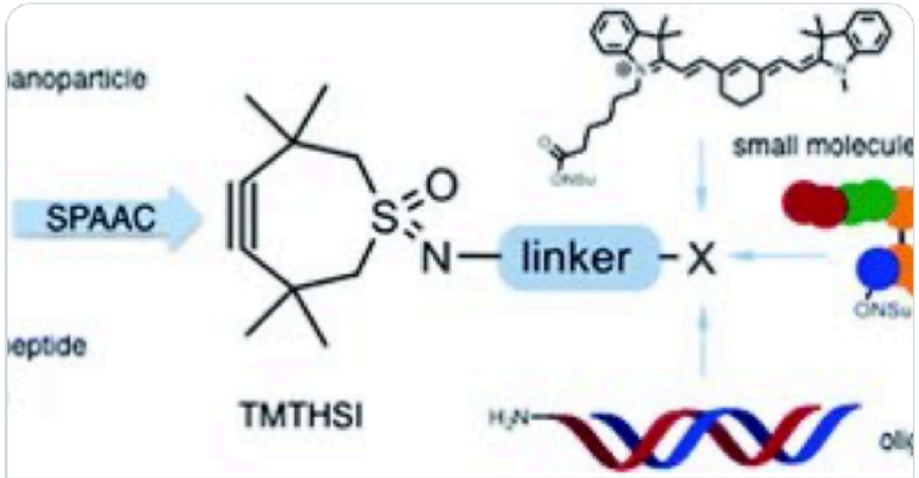
Science & Technology Cambridge, England rsc.
Joined June 2011

1,396 Following **137.1K** Followers

Chemical Science
@ChemicalScience

Strain-promoted azide–alkyne cycloaddition reactions are a cornerstone of click chemistry, which saw Sharpless and Meldal awarded the 2022 #chemnobel.

New reagents for this reaction are being researched and developed, such as TMTHSI.



pubs.rsc.org
TMTHSI, a superior 7-membered ring alkyne containing reagent for strain-pro...
We describe the development of TMTH-Sulfoximine (TMTHSI) as a superior click reagent. This reagent combines a great reactivity, with small size and lo...

10:45 AM · Oct 15, 2022 · TweetDeck

What is the climate for women? The Matilda effect

Robin Ekberg @R00biin · 8h
Replying to @ChemicalScience
The prize was not awarded to two but three people, just a hint! 😯

1 16

Robin Ekberg @R00biin · 8h
Replying to @R00biin and @ChemicalScience
And this type of click chemistry with strained rings was invented by @CarolynBertozzi so why leave her out of the tweet!?!??

14

Thanuka Dananjaya 🎈 @thanukaDD · 10h
Replying to @ChemicalScience
May best it is best to mention Dr. Bertozzi, given she invented the strain promoted click chemistry.

1 72

Carolyn Bertozzi @CarolynBertozzi · 8h
Replying to @thanukaDD and @ChemicalScience
Welcome to 🌎 😉

1 91

M Gallardo-Williams @Teachforaliving · 7h
Replying to @ChemicalScience
Y'all forgot about @CarolynBertozzi? For real? It wasn't even a week ago that they shared the #NobelPrize!

1 4 125

Carolyn Bertozzi @CarolynBertozzi · 7h
Replying to @Teachforaliving and @ChemicalScience
It was fun while it lasted 🎉 🌅

5 6 273

Chemical Science @ChemicalScience

We have deleted our earlier tweet which mistakenly attributed this year's #ChemNobel to only Sharpless and Meldal, and omitted @CarolynBertozzi. We sincerely apologise for this error and will take a close look at how this has happened.

2:31 AM · Oct 16, 2022 · TweetDeck

What is the climate for women? The bias is real

Gendered Language in Teacher Reviews

I've had trouble keeping this site up continuously during COVID. As of March 2021, I'm now trying a new strategy to cache common queries on the server even when the underlying database is down. If you find that many searches don't change the results, that's why.

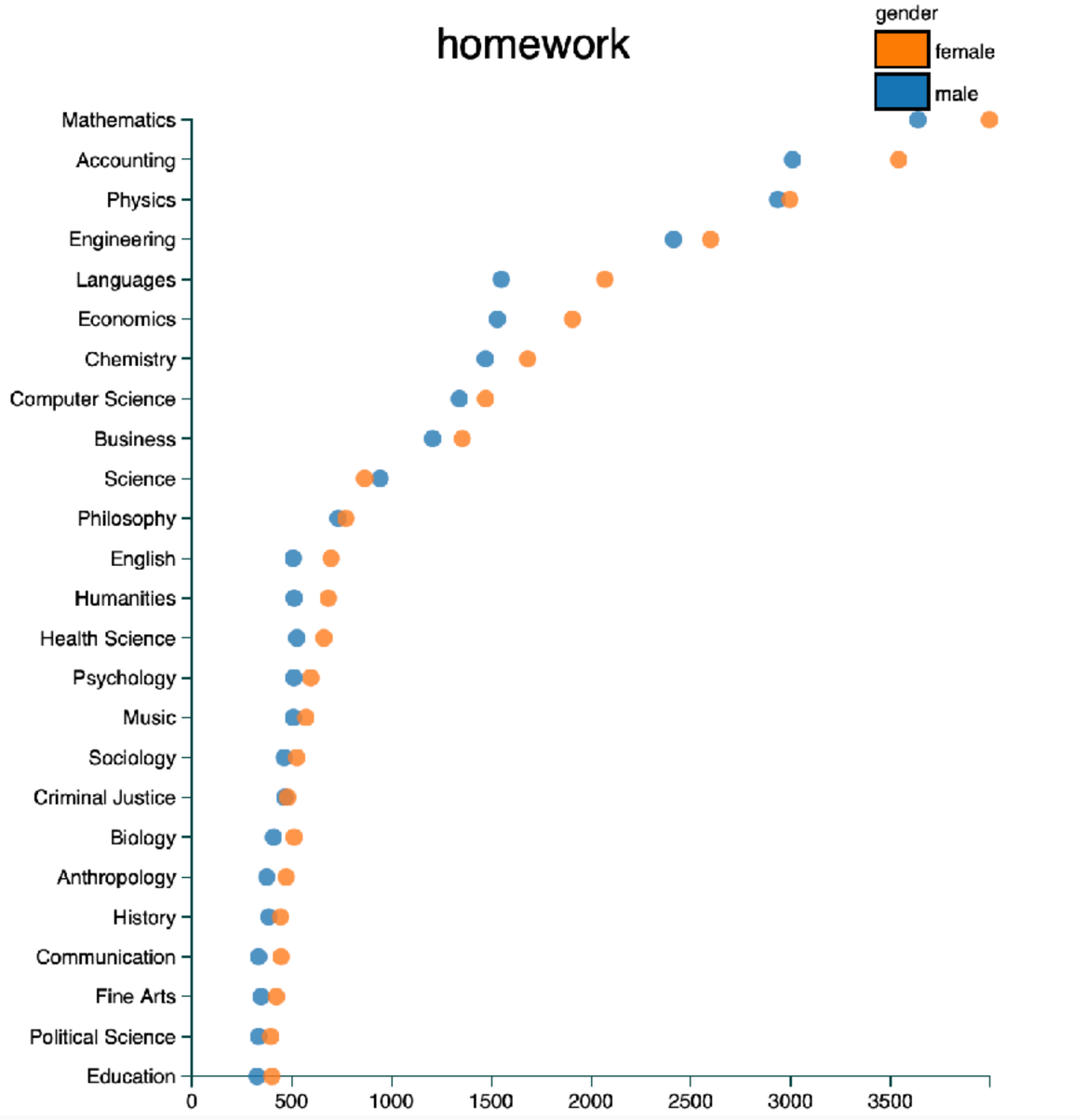
This interactive chart lets you explore the words used to describe male and female teachers in about 14 million reviews from RateMyProfessor.com.

Not all words have gender splits, but a surprising number do. Even things like pronouns are used quite differently by gender.

Search term(s) (case-insensitive):
use commas to aggregate multiple terms

homework

All ratings | Only positive | Only negative



link

You may try these words:

Bad
Good
Bossy
Leader
Funny
Picky
Difficult
Wrong
Genius
Smart
Scientist