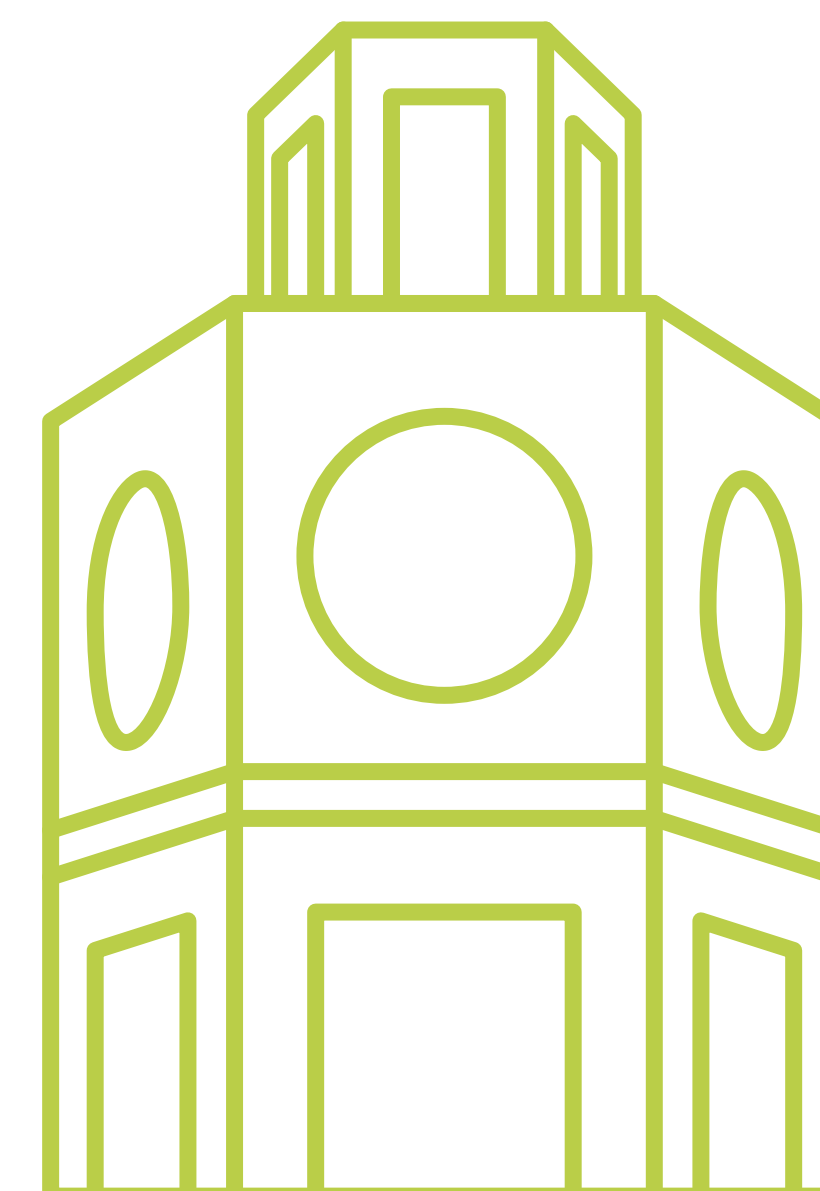


Popular book discussions

a platform for equity in physics

Flip Tanedo



March 26, 2022

KITP Teacher's Conference
Neutrinos and New Physics



UC RIVERSIDE
PHYSICS &
ASTRONOMY



Active Engagement

What should
university physicists
know about **high
school students**?

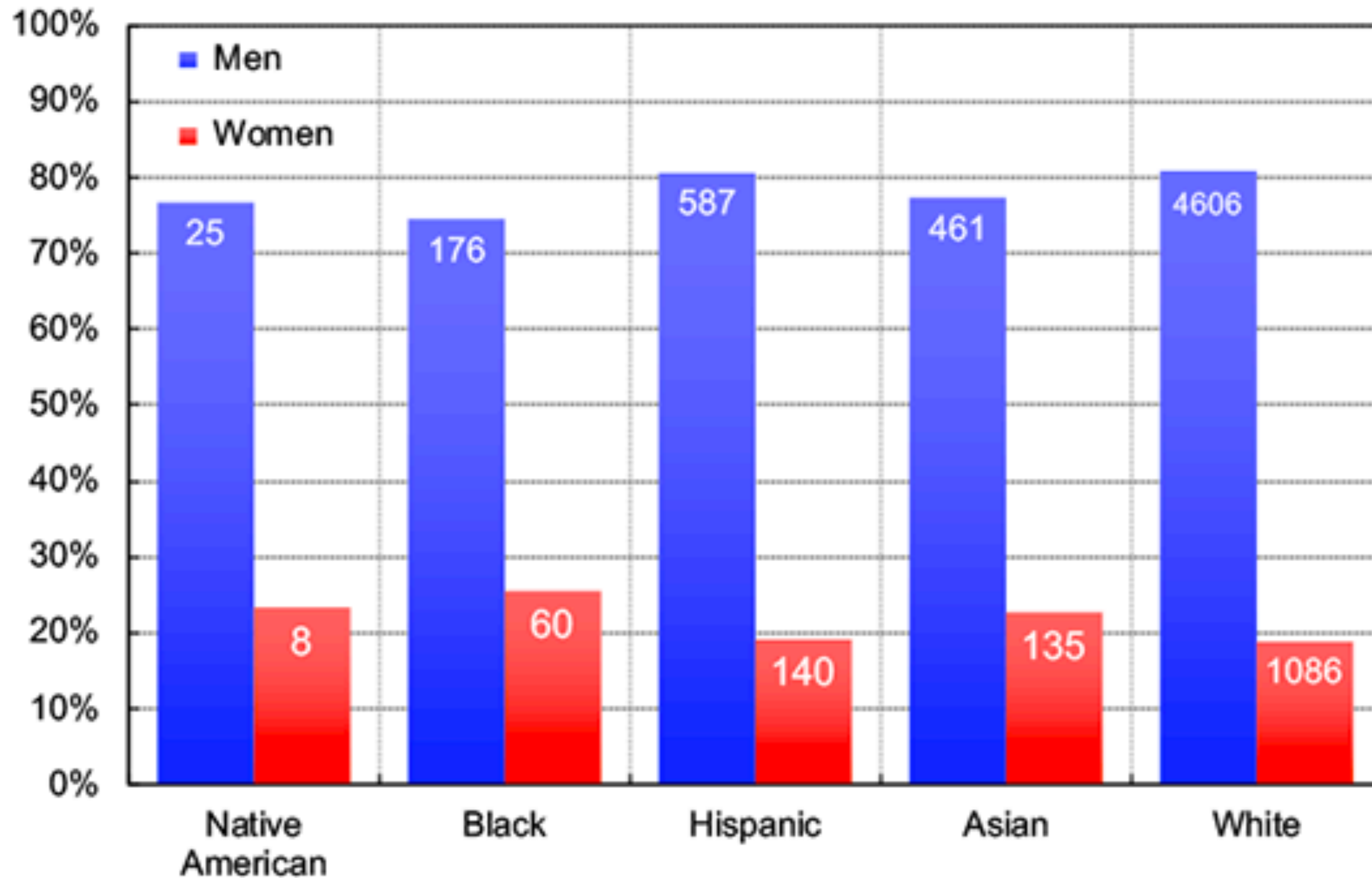
What do **high school
teachers** need to
know about the
**university physics
environment**?

Bottom: Any comments, feedback, contact info that
you would like to share.

Equity in Physics



Women in Physics Bachelor's Degrees (5-yr avg 2014-2018)



Source: IPEDS and APS

Source: APS Committee on Minorities, Committee on the Status of Women in Physics

Intersectionality

Multiple minority identities have a further reduces retention.

- Also applies to less visible identities
- ... LGBT+ identity
- ... political/religious beliefs
- ... socioeconomic upbringing
- ... *Nth generation citizenship*
- ... *Nth generation college student*
- ... *English as 1st, 2nd, 3rd language*
- ... *neurodiversity*
- ... *stability of early home life*

Asking the right questions:
Why versus **what can we do now?**

An Idea: a framework for the *missing* conversations

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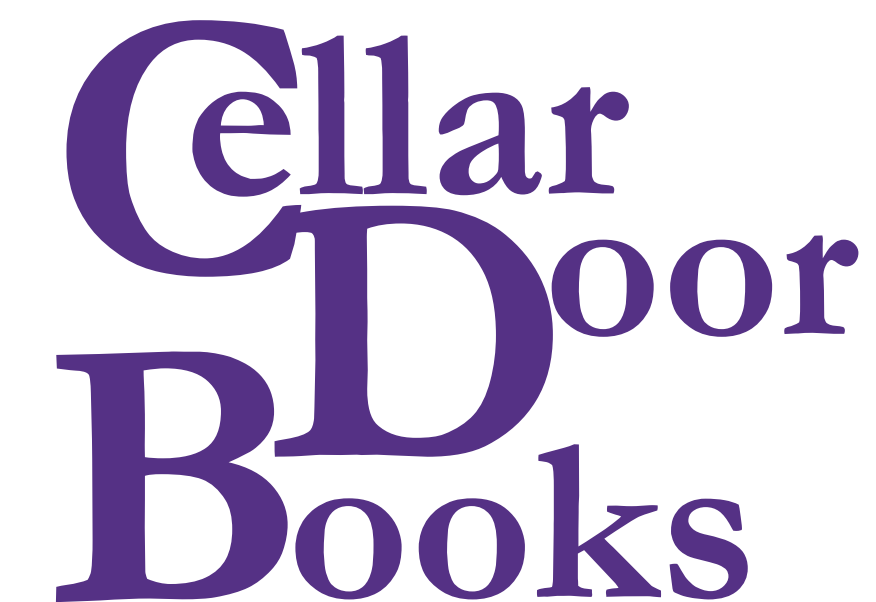
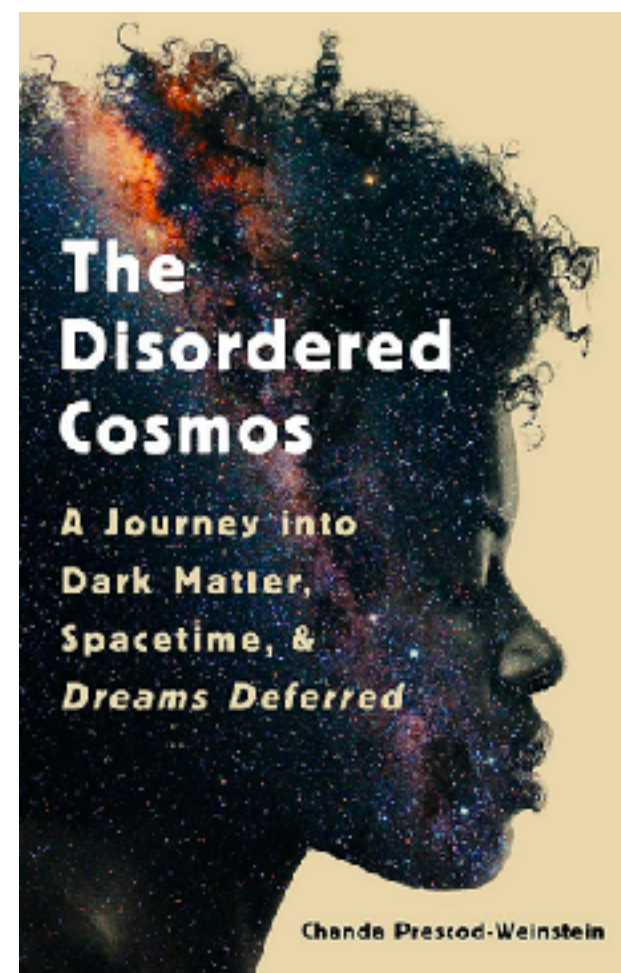
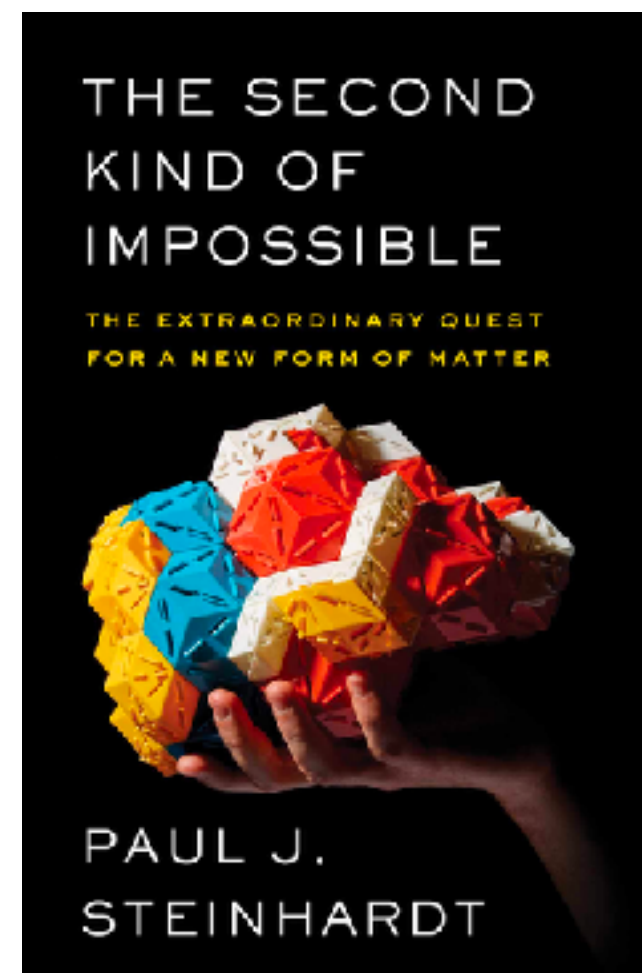
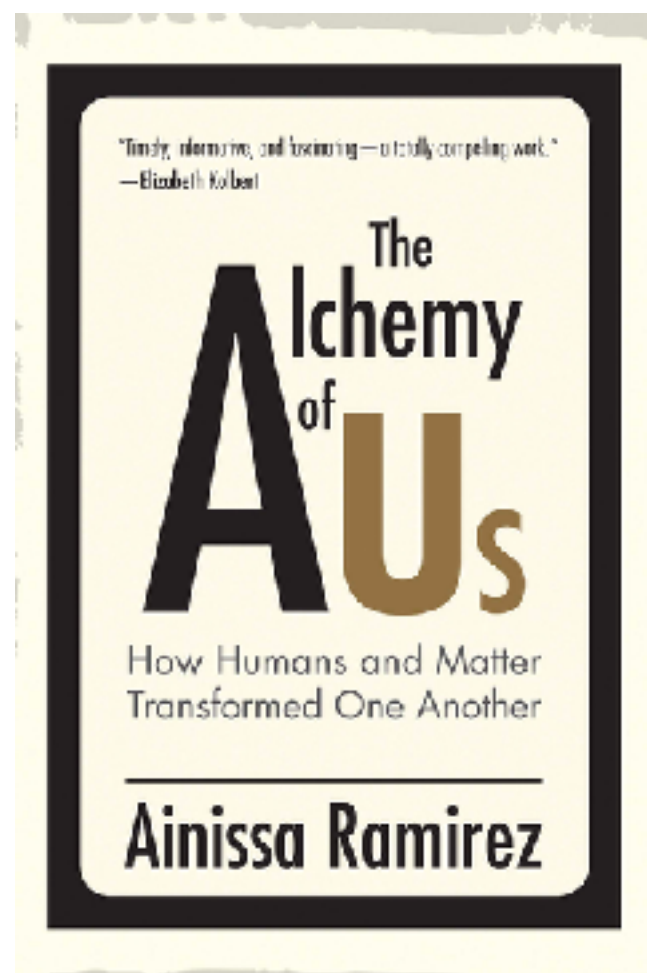
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Goal: inclusive **training** and **preparation** of scientists who come from different backgrounds than most of their university faculty.

An Idea: a framework for the *missing* conversations

Inspired by local book club

- Mix of experts/non-experts discuss popular science books
- Book is common ground across uncommon lived experiences

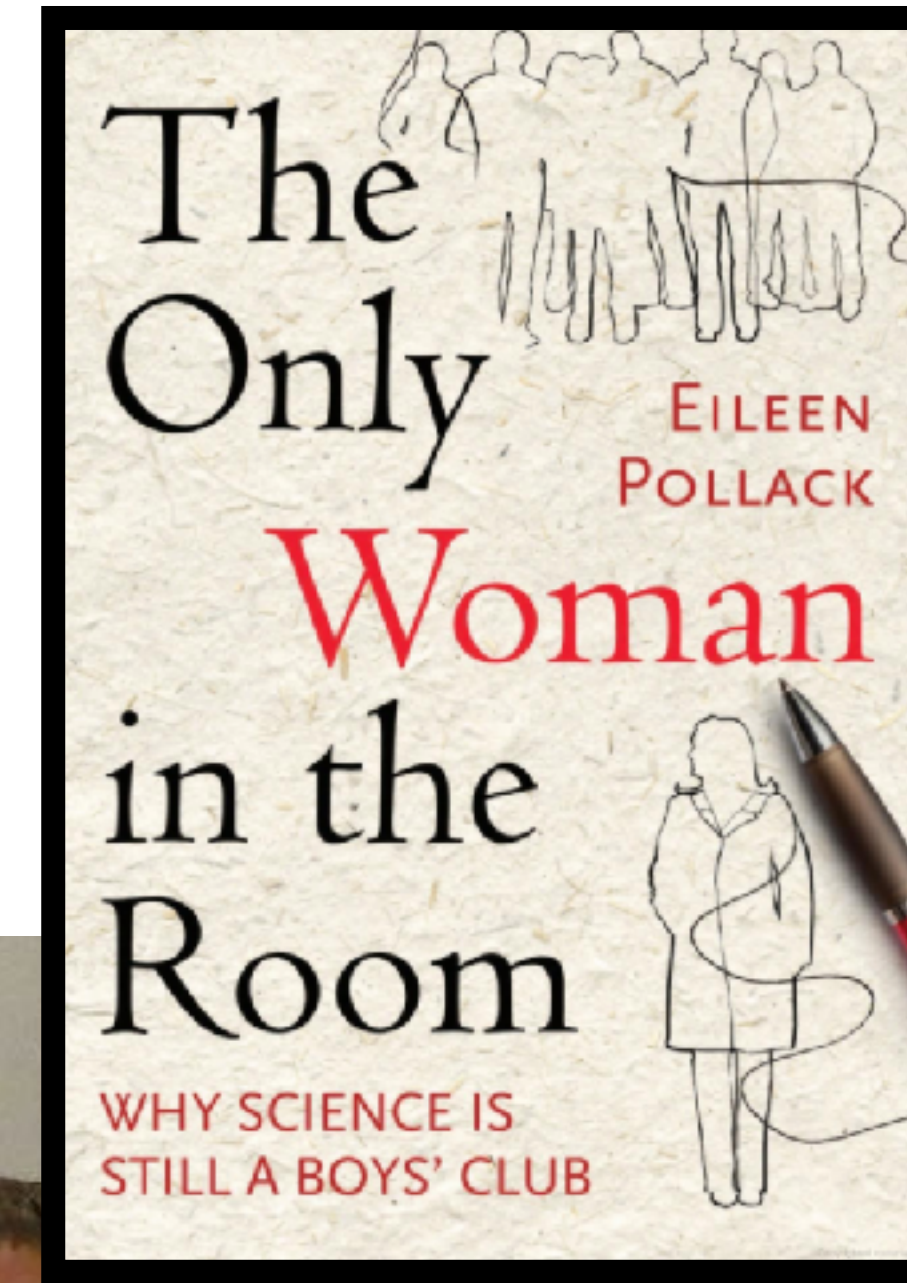


Pilot: UCR Summer Physics Teacher Academy

Women in Physics book club discussion as part of 1 week training program (2019)

Books provided to participants (teachers + grad students + profs.)
Small group discussions + panel of UCR faculty, staff, students

Initial outcomes: “small interactions” can have large impacts, **grad students** were key contributors. Gave a framework for thinking about how to **prepare students** and how to **improve undergrad education**



spta.ucr.edu

Possible Vision: how this scales

Community-based information exchange

- **Equity in Physics “book club in a box”**
Guide for hosting university–high school discussions, suggested discussion topics for each book.
- **Book club network**
Website of shared lessons, insights, innovations. Coordinated book clubs across different districts. Possible author events, connections with APS STEP UP, ...
- **Ecosystem for broader connections**
I suspect that the “handoff” between high school and college is under-studied in the physics education field. A network focused on this may draw collaborations with social scientists and education experts.

Existing Incentive Structures

NSF Broader Impacts



NSF values the advancement of scientific knowledge and activities that contribute to the achievement of societally relevant outcomes. Such outcomes include, but are not limited to: **full participation** of women, persons with disabilities, and underrepresented minorities in STEM; **improved STEM education and educator development at any level**; **increased public scientific literacy and public engagement** with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased **partnerships between academia, industry**, and others; improved national security; increased economic competitiveness of the U.S.; use of science and technology to inform public policy; and **enhanced infrastructure for research and education**.

TL;DR **There is a strong incentive for physicists to dedicate funding towards efforts like this.**

often limited by bandwidth to find/create these opportunities



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Extra Slides



Physics is **hard**.

It is **harder** if you are a woman, if your skin is brown, if you are gay, if you do not identify with the other physicists around you.

Helen Quinn (paraphrased, 2002)



A common response



... but *physics* doesn't care about your race, gender, sexual orientation, socioeconomic status, politics ...



Where do Maxwell's equations depend on the color of your skin?
Why should growing up poor affect your ability to calculate a commutator?

Physics may not care about your identity, but *doing* physics is an interactive and intrinsically social endeavor. Human beings will be your teachers, collaborators, referees, advisors, hiring committee chairs. Your identity intersects with how you interact with the rest of the field to do your science.

A common response



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Where do Maxwell's equations depend on the color of your skin?
Why should growing up poor affect your ability to calculate a commutator?

Sometimes physicists spend too much time arguing whether **social science is science** and not enough time recognizing that **science is social**.

Equality vs. Equity

Some working definitions

- **Equality:** everyone is given the same resources
- **Equity:** resources are customized and tailored in recognition of structural *inequalities* that exist. The goal is to reach a point without these structural inequalities no longer exist so that equity = equality.

privilege. n. Benefit that a select group has that others do not. One can have some privileges and not others. Different from oppressing others. Not something to “apologize” for.

Contrast with: **right.** n. Benefit that we agree everyone should have.

Suggested reading: “Unpacking the Invisible Knapsack,” McIntosh; “Unveiling Privilege to Broaden Participation” *The Physics Teacher* 55, 394 (2017), “The Pencilsword: On a Plate,” Toby Morris, “Privilege 101,” Sian Ferguson *Everyday Feminism*, “What the Origin of ‘Check your Privilege’ Tells us About Today’s Debates,” Arit John *The Atlantic* (2014), “It’s Not Talent, it’s Privilege,” Carl Wieman, *APS News*, Oct 2020.

minority, n.

an identity that is disproportionately not present; underrepresented group

We will use “minority” to include any such identity, **whether visibly apparent or not**. One may have multiple, **intersecting** minority identities.

minoritized (vs. minority): acknowledges systemic effects that cause underrepresentation

Suggested reading: American Physical Society websites on the Committee on the Status of Women in Physics, Committee on Minorities, LGBT Physicists; similar for the American Astronomical Society

Finding the right question

Why are certain groups underrepresented in physics?

Dynamical: something about system is inequitable

Initial conditions: system sensitive to existing inequities

IMPORTANT, BUT CHALLENGING
[“ABOVE MY PAY SCALE”]

What can we do to make physics more equitable?

Given some systems that we cannot change, **where can we make a difference?**

Given a target, **what are our roles?**

How do we incentivize these efforts?

INCOMING 1ST YEAR
PHYSICS MAJORS

BROADER IMPACTS CRITERIA IN NSF RESEARCH GRANTS,
“ADD ON” TO EXISTING EFFORTS, OTHER SOURCES?

PREPARE STUDENTS FOR PHYSICS
“ECOSYSTEM” (NOT JUST PHYSICS);
IMPROVE THAT ECOSYSTEM

UCR Summer Physics Teacher Academy

spta.ucr.edu

1 week physics “training program” for inland empire high school teachers

Talks on research and pedagogy, refresher sessions on physics topics, California science standards, physics demo exchange, networking between local area teachers

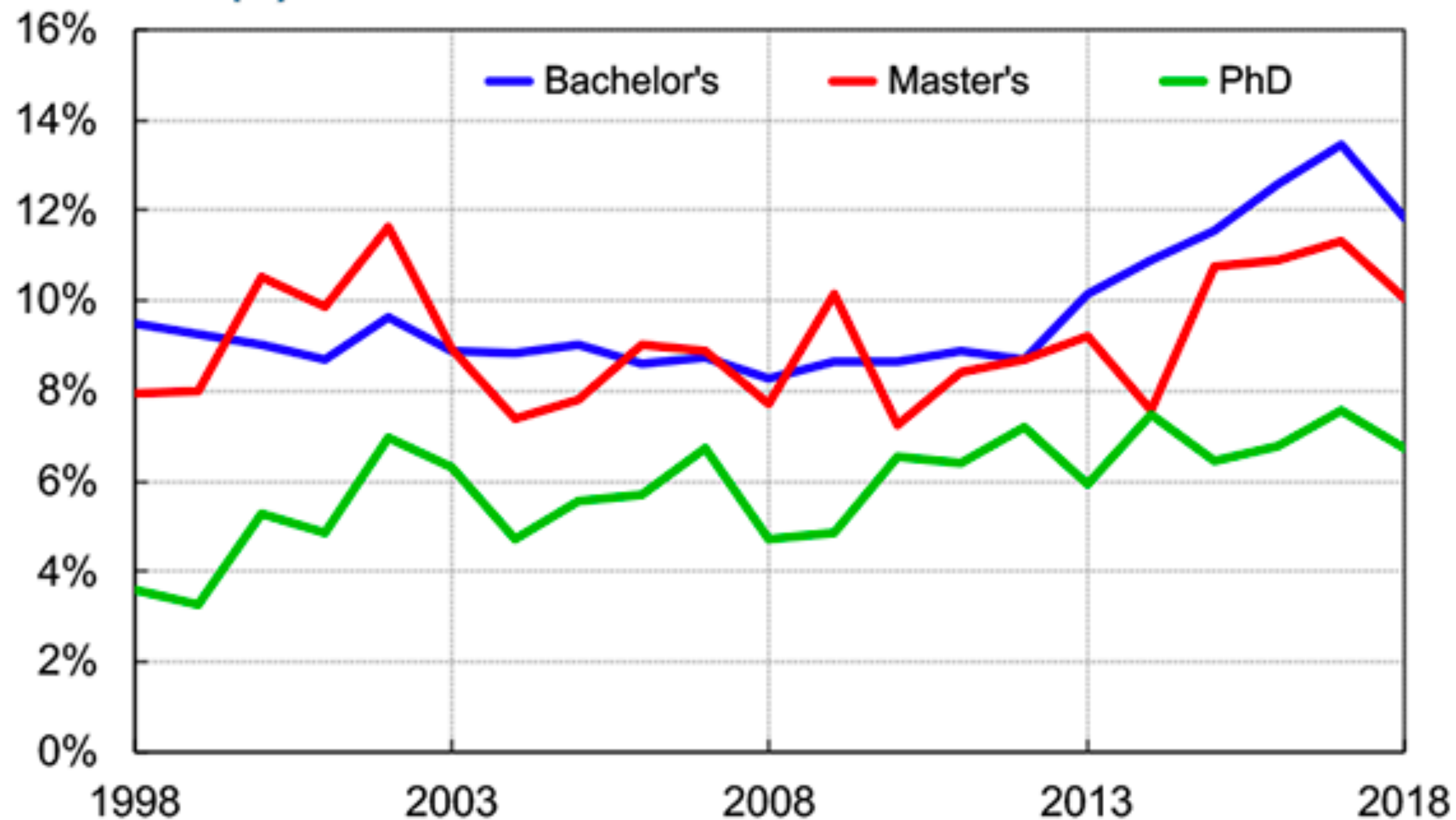
Stipend provided to all teachers

We piloted a Women in Physics book club in 2019 and will do so again in 2022





Underrepresented Minorities in Physics



Source: IPEDS and APS

By some definition of minority
(Here: racial minority)

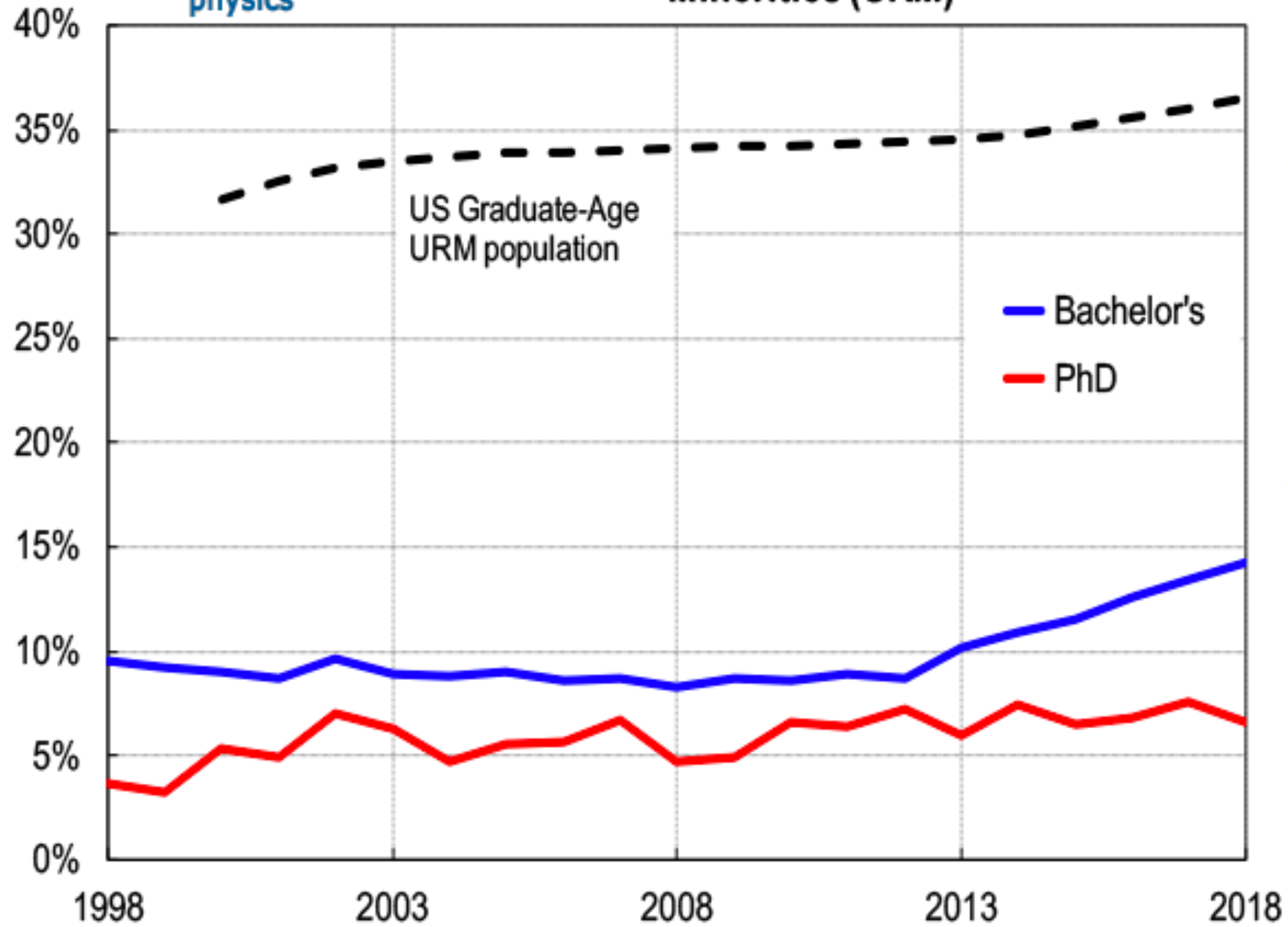
Is this a lot? Is this a little?

After all, aren't "minorities" a smaller portion of the population?

Source: APS Committee on Minorities, Committee on the Status of Women in Physics



Physics Degrees Earned by Underrepresented Minorities (URM)



Source: IPEDS, US Census, and APS



When we say “minority” (underrepresented) in physics, we mean even fewer than expected from the general population.

Source: APS Committee on Minorities, Committee on the Status of Women in Physics