



Inclusive STEM

Recognizing intersectionality,
capitalizing on difference,
and helping build better
learning environments for all
women

Who gets bachelors degrees in physics?

	US population age 18-24, 2012	All bachelors degrees 2002-12	Physics bachelors degrees 2002-12
All women	548.77	57.68	20.36
White women	27.46	38.66	15.01
Latinas	9.75	5.26	1.03
Black women	7.37	6.13	1.07
Asian women	2.45	3.6	1.52
American Indian women	0.43	0.42	0.13

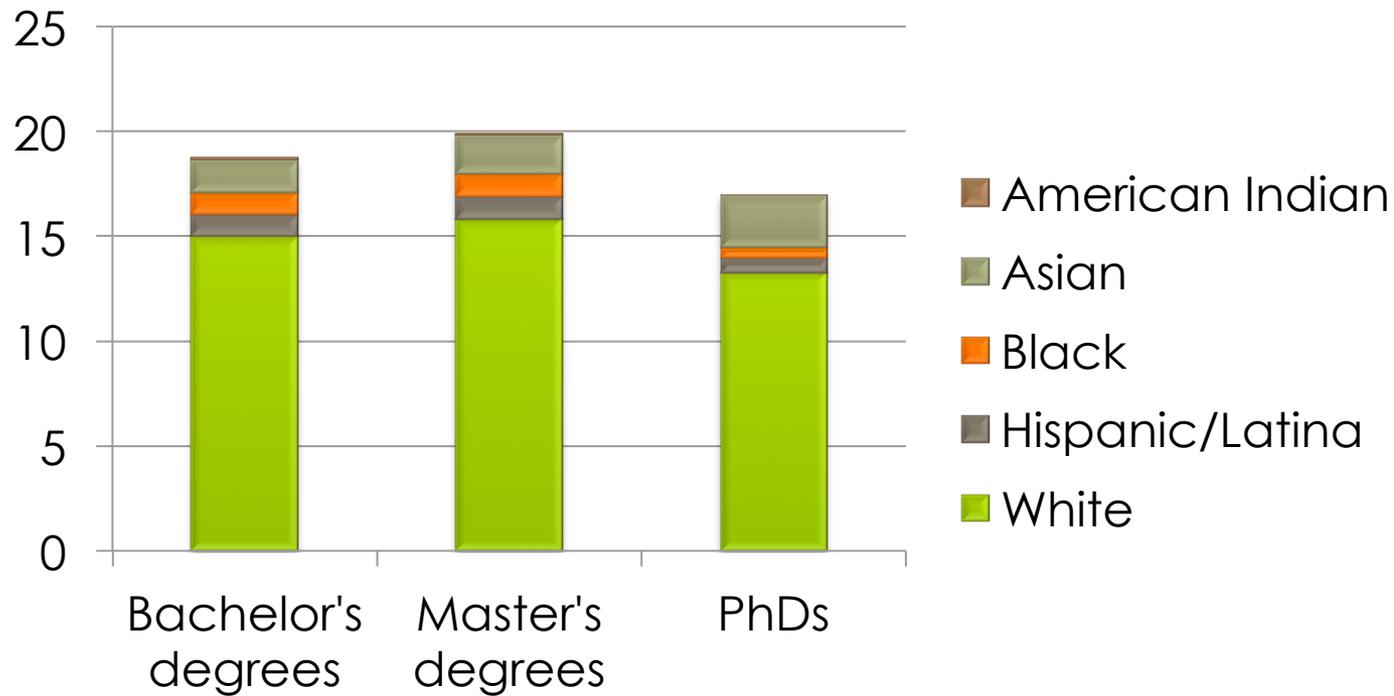
Who gets masters degrees in physics?

	US population age 18-24, 2012	All masters degrees 2002-12	Physics masters degrees 2002-12
All women	548.77	62.35	21.98
White women	27.46	40.64	15.84
Latinas	9.75	4.31	1.05
Black women	7.37	7.29	1.08
Asian women	2.45	3.18	1.86
American Indian women	0.43	.37	.10

Who majors in physics?

	US population age 18-24, 2012	All PhDs 2002-12	Physics PhDs 2002-12
All women	548.77	51.32	17.79
White women	27.46	37.67	13.27
Latinas	9.75	3.09	.71
Black women	7.37	4.13	.48
Asian women	2.45	4.36	2.47
American Indian women	0.43	.25	.04

All degrees



The benefits of diversity: Familiar arguments

- The right thing to do
- Increases the size of the STEM talent pool
- Improves the quality of the STEM talent pool

The benefits of diversity: Emerging findings

- Diverse organizations are more effective
- Diverse groups process information better
- People communicate better in diverse settings

Phillips, 2014

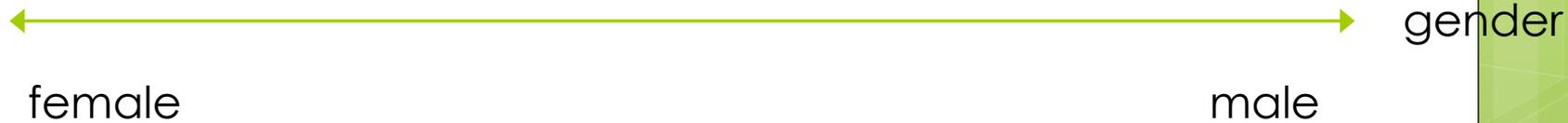
Levine & Stark, 2015

Intersectionality

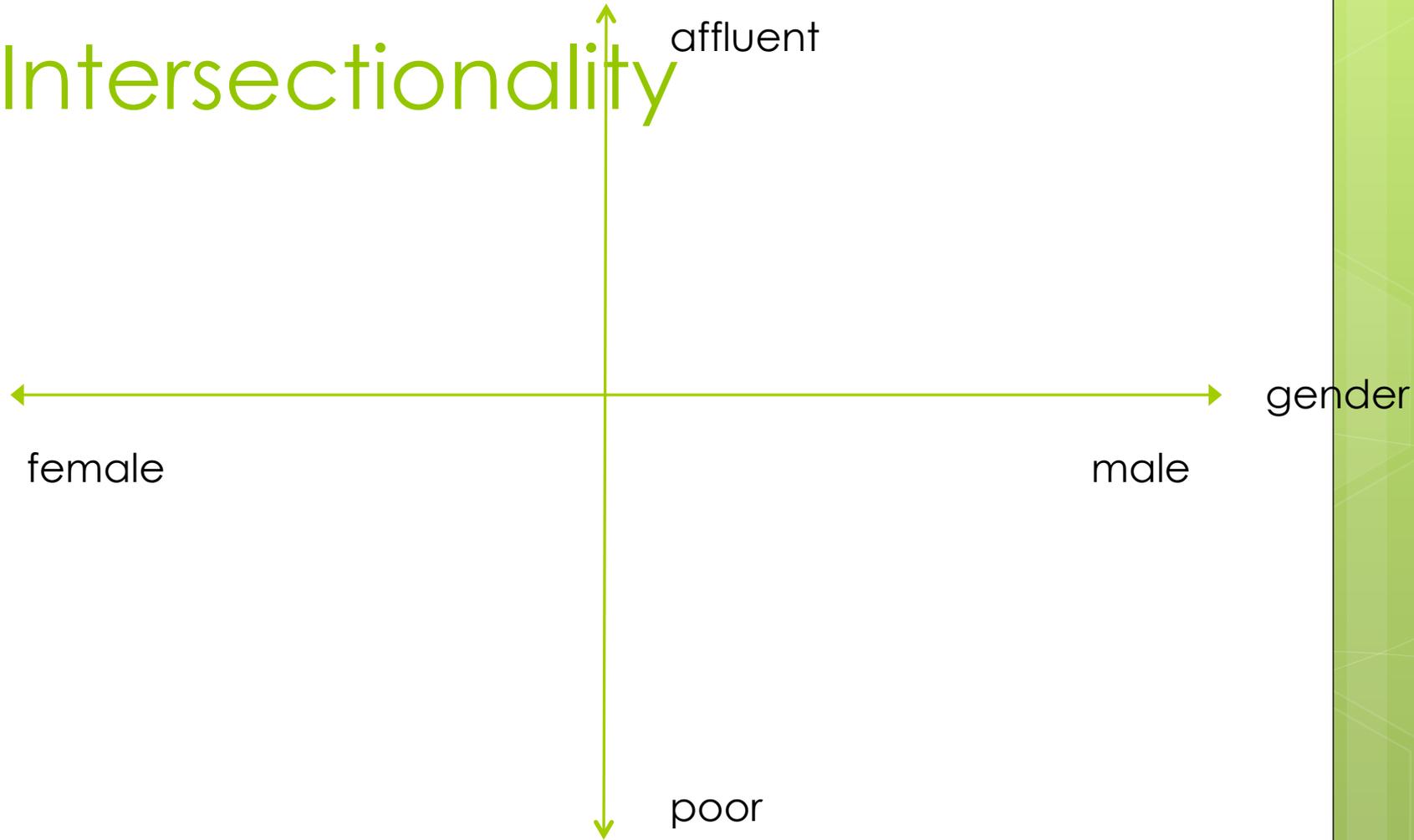
- “Intersectionality refers to particular forms of intersecting oppressions, for example, intersections of race and gender, or of sexuality and nation. Intersectional paradigms remind us that oppression cannot be reduced to one fundamental type, and that oppressions work together in producing injustice” (p. 18).

Collins, 2000

Intersectionality

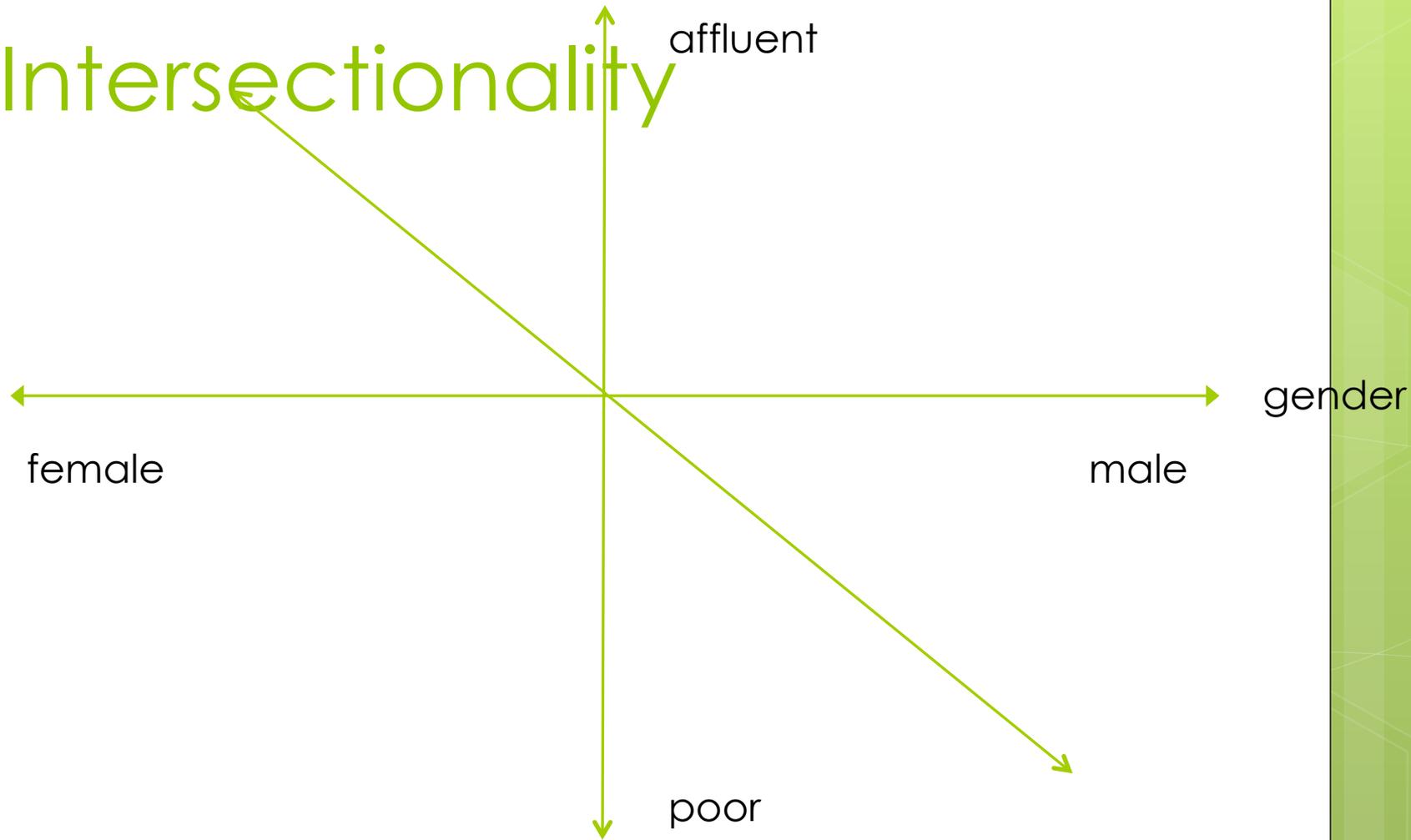


Intersectionality



Social class

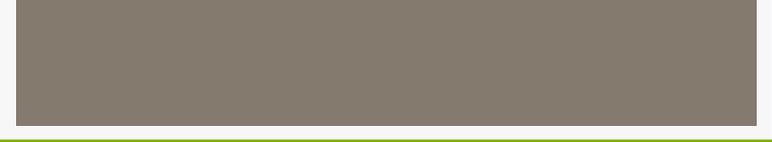
Intersectionality



Social class

Intersectionality

- Our experiences result from our particular combination of age, race, gender, ethnicity, ability, sexuality—any dimensions which divide us, socially
- Thus two people can experience the same conditions differently
- And identical conditions can benefit one person and harm another



Stigma and bias

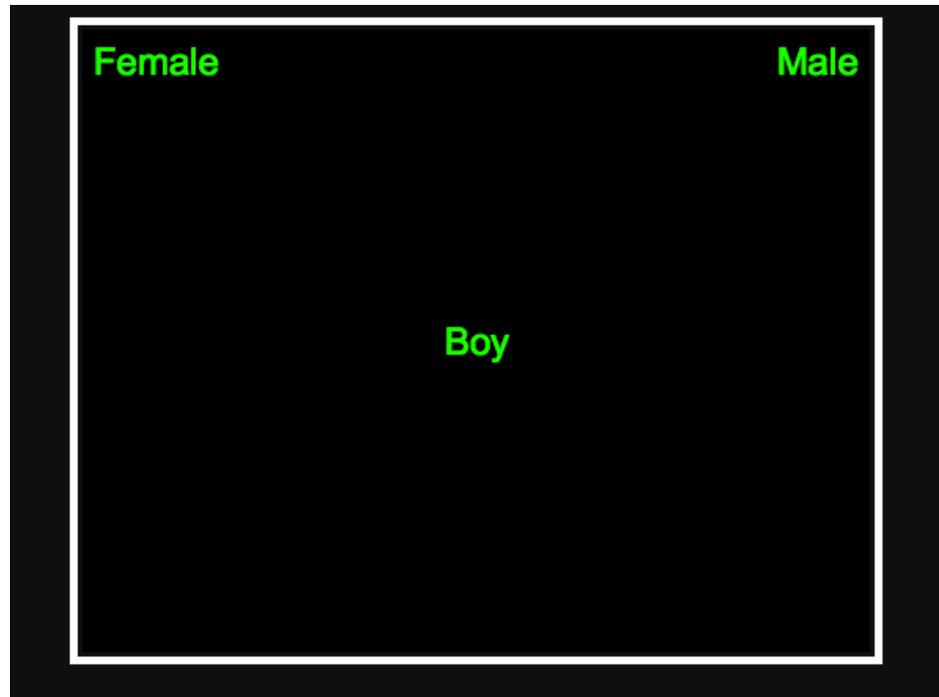
How they affect all of us, and what we can do

Implicit bias

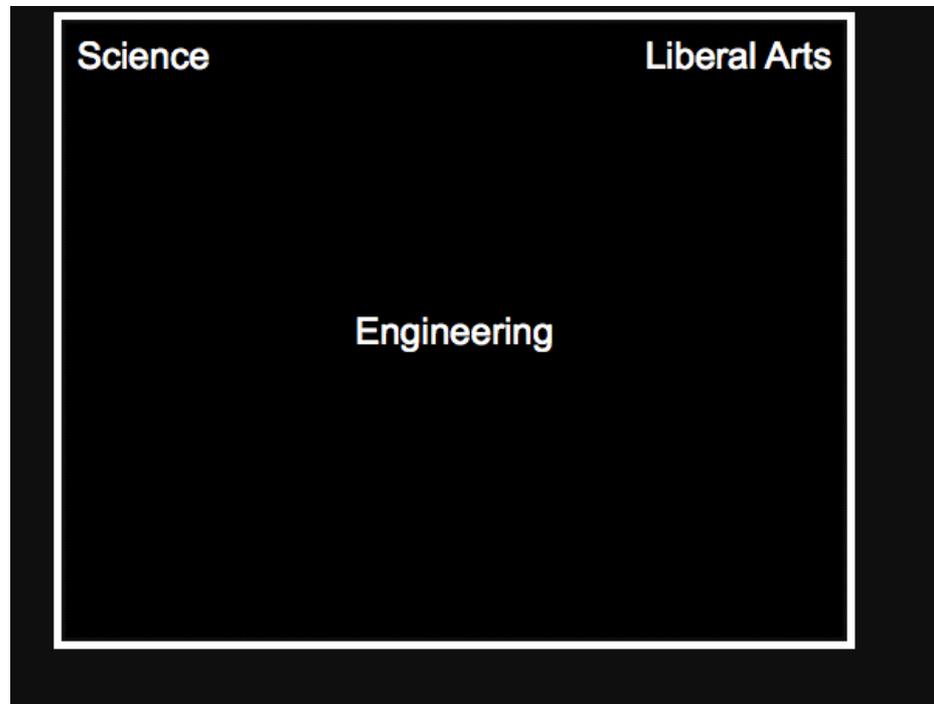
- “*Implicit attitudes* are introspectively unidentified (or inaccurately identified) traces of past experience that mediate favorable or unfavorable feeling, thought, or action toward social objects.”

Greenwald & Banaji, 1995

Implicit association test



Implicit association test



Implicit association test

Female
or
Science

Male
or
Liberal Arts

Wife

Female
or
Science

Male
or
Liberal Arts

Philosophy

Implicit association test

Male
or
Science

Female
or
Liberal Arts

Literature

Male
or
Science

Female
or
Liberal Arts

Grandma

Implicit association test

- Around 70% of respondents take longer when the science terms are associated with female than when science terms are associated with male

Implicit association test

- Similar results when pairing Black and White faces with positive and negative words:

Few Adults Completely Free of Subconscious Racial Bias

% of each group with a ...

Among those who took the white-black IAT	White only	Black only	White-black biracial
Strong white preference	14	5	5
Moderate white preference	22	11	18
Slight white preference	12	13	19
Little/no preference	27	26	23
Slight black preference	15	17	15
Moderate black preference	10	19	13
Strong black preference	1	9	7

Implicit bias

- Résumé study--race:
 - “Black-sounding” vs “White-sounding” names on the résumés sent to jobs advertised in Boston and Chicago newspapers
 - Everything else identical
 - “White-sounding” names received 50% more callbacks

Bertrand & Mullainathan, 2004

Implicit bias

- Résumé study—hiring a lab manager
 - Professors (male and female) in bio, chem and physics at 6 major universities
 - Evaluated an application from a recent graduate; identical except some were from “John” and some from “Jennifer”
 - John was rated a 4 for competence; Jennifer a 3.3
 - John’s starting salary: \$30,328. Jennifer’s: \$26,508.
 - Bias persisted after controlling for professors’ age, sex, teaching field and tenure status

Moss-Racusin et al, 2012

Implicit bias: Teaching across intersections

- 51 White-Black and 54 White-White student pairs
- A White student was the “teacher” and was tested for implicit bias
- The other student was the learner. Pre-and post-test.
- Greater implicit bias in the “teacher” → lower learning in Black students (13% less)
- Mechanism: Anxiety in the high-implicit-bias White “teachers”

Implicit bias: Teaching across intersections

- And—this is the kicker:
- Videos of the lessons in the cross-race pairs were viewed by non-Black students
- Each video viewed by at least 3 students; “learner” edited out; pre-post test
- Viewers of videos where the “teacher” had high implicit bias learned 15% less
- Implication: when teachers have high implicit bias and teach in mixed race classrooms, everyone learns less

Countering implicit bias

- *Stereotype replacement*—Replace a response based on stereotypes with an unbiased response
- *Counter-stereotypic imaging*—Imagining a real or imaginary person who contradicts stereotypes
- *Individuation*—evaluate members of a group based on personal rather than group-based attributes
- *Perspective taking*—taking on the perspective of a group member
- *Increased contact*—seeking out positive interactions with out-group members

Devine et al. 2012

Stereotype threat

- “The existence of a negative stereotype about a group to which one belongs... means that in situations where the stereotype is applicable, one is at risk of confirming it as a self-characterization both to one’s self and to others who know the stereotype. This is what is meant by stereotype threat. And when the stereotype involved demeans something as important as intellectual ability, this threat can be disruptive enough, we hypothesize, to impair intellectual performance”

Steele & Aronson, 1995

Stereotype threat

- The fear of confirming a negative stereotype **that you don't believe** about your group
- [For example: that men are better than women in science]
- Most strongly effects people who most value doing well
- Mechanism: So determined to disprove the stereotype that you induce performance anxiety

Reducing stereotype threat

- Seek out professors and mentors who are on record that they don't believe in racial or gender stereotypes
- Think of success in physics as resulting from hard work and practice, not innate ability
- Seek out cooperative rather than competitive environments
- Invoke protective stereotypes ("college students are good at physics" vs "women are bad at physics")
- Think about what you value about yourself before difficult tasks
- Seek professors who communicate high standards together with the belief that you can meet the standards
- Seek out role models

Aronson 2002; reducingstereotypethreat.org

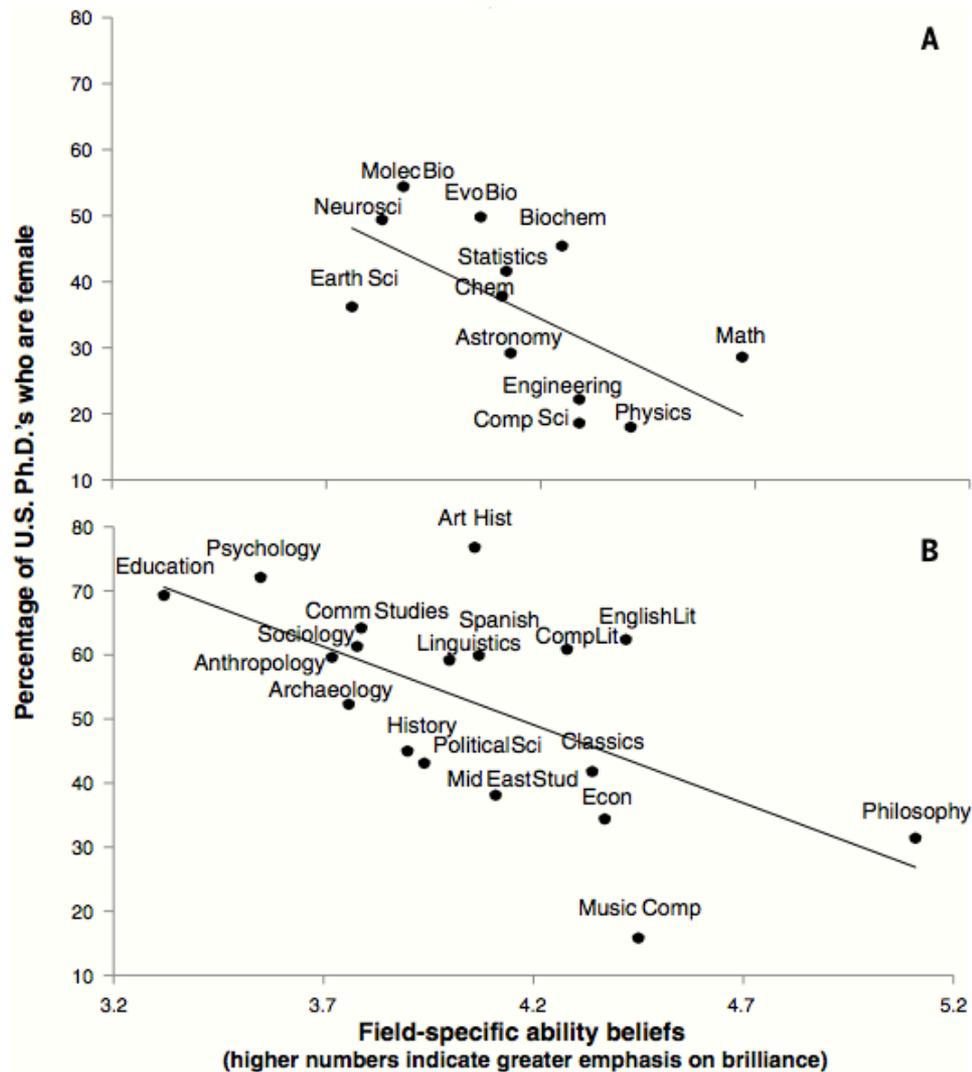
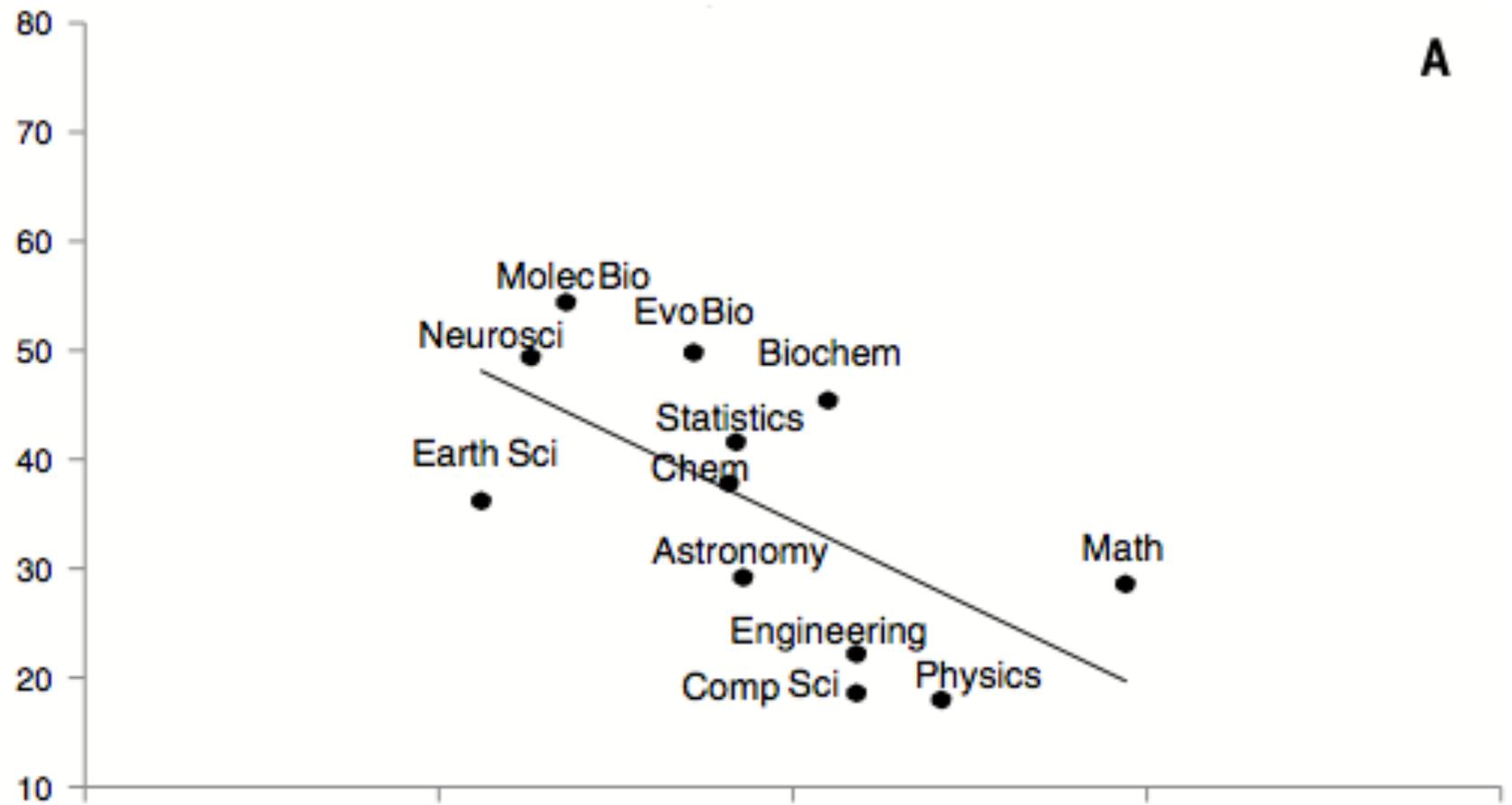
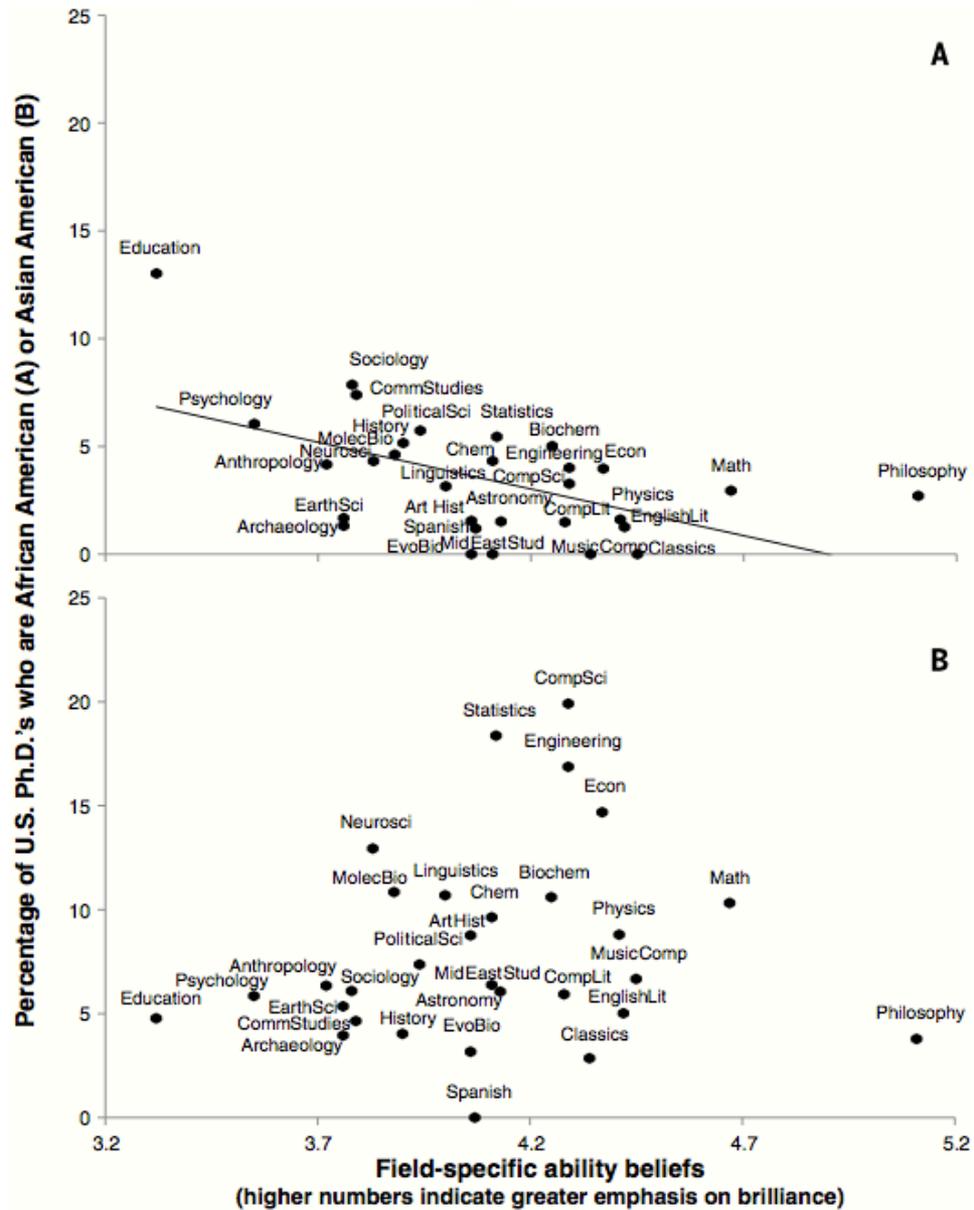


Fig. 1. Field-specific ability beliefs and the percentage of female 2011 U.S. Ph.D.'s in (A) STEM and (B) Social Science and Humanities.





Summary

- Intersectionality: People can experience the same event differently depending on their social location
- Implicit bias: People's subconscious biases can be different from their conscious intent
- Stereotype threat: The effort to disprove negative stereotypes can suppress people's performance

The case studies

The boys club

- [from a Black undergraduate] I was both the only girl and the only undergrad in the entire lab. I didn't actually work with the man who hired me, I worked with a graduate student. I was working with this one volatile chemical to try and density match things, and another person walked into the lab and bumped me while I was pipetting the liquid, and it spilled onto the lab table. I moved one of the hoods over it and someone else walked into the lab, commented on the fact that it smelled, and my mentor laughed and said 'can you guess who spilled it?' and they all looked at me, and they all started laughing, and I was the only girl in the lab at that point, and they all continued to laugh, and I just kind of stood there awkwardly, and the grad student said "how does it feel to have the boys club laughing at you?"

The questions

- Explain the factors at play in the situation and connect them to the theoretical frames provided (intersectionality, implicit bias, stereotype threat)
- What could you do if you were this student?
- What could you do if you were her friend?
- What could you do if you witnessed this situation?

The outcome

- I just packed my things up and left that day. [For the rest of the summer] I didn't speak except when spoken to. I was too afraid to reinforce their idea that I was incapable and didn't belong there. I was afraid of making the necessary mistakes to succeed. I spent basically an entire month being silent in a lab and trying to just work 8 to 6 like I was supposed to, and just leave.

What her advisor did

- He tried to make me feel better about it, chalking it up to [the university where this happened] being a pretentious place. And that is true--all the other students who were there from [that university] were just as pretentious and elitist. That made me feel a little bit better--“it’s not my fault this is happening”--but it made me feel very small, being in the lab, not being treated like everybody else was.

Activity!

- Explain the factors at play in the situation and connect them to the theoretical frames provided (intersectionality, implicit bias, stereotype threat)
- What could you do if you were this student?
- What could you do if you were her friend?
- What could you do if you witnessed this situation?

Unwanted attention

- [from an Asian American graduate student] He [another student] would come up and touch me, and other things, like [be] next to me all the time, so that I didn't really have a chance to interact with the other students, and [he'd] just really get into my personal space... things that really made me feel uneasy. And, when I confronted him about it, he would say, "Oh, well why should I have to tiptoe around you?" ... I didn't make a big deal about it because I realize that astronomy is a very small community. And I don't want to have a reputation as a bitch, because then who will want to collaborate with me?

The outcome

- The woman in this story “went on to reflect that had the harasser been a senior person in the field, she would have felt even more powerless.”

Left out of group work

- A group consists of one woman and two men. The two men do all the interacting, they have all the materials except tape in front of them. The woman has the tape in front of her and is sitting with her hands in her lap; when one of the men wants a piece of tape he just reaches over and gets it. The two men don't look at her at all, and she sits on the edge of the action, observing. One of the men leans onto her piece of paper--her set of instructions--doing his work in her work space. As the activity continues, she moves farther away from the men than she was when the activity began--with a small smile on her face.
- Later, in a discussion of effective scientific cooperation, the men in this group report that the activity was "a team building exercise" and that in order to be a good team member, you should "be inclusive. Not much fun being on a team if you're not going to use the entire team." The woman remains silent.

The outcome

- The next week, the professor put the men in two different lab groups, each with two women and one man. One of men again dominated his group, acting on his ideas without consulting his group members and holding all the equipment (jenga blocks). After 5 minutes the professor stepped in. She told him that “by holding all the blocks, you’re creating a choke point and other people can’t participate. I jumped in several times. I was really aggressive about it, more so than I’m really comfortable with, but I felt like the previous situation was bad enough that I didn’t want the semester to go on that way. It’s supposed to be a nurturing, comforting environment. The way they treated [the woman in the previous story] was incredibly disrespectful.”

The Very Important Researcher

- [from a White undergraduate] God love them, I think [science agency] is a really good environment overall, but I guess they're all White guys. These weren't things like sexual harassment, but they were things that made me feel unwelcome. Mostly this one guy. He's the expert on the detector I use, and so my mentor and I set up a meeting with him for me to tell him about my research, and for him to answer any questions I had about the detector. And all the questions he had, he didn't direct to me, he directed to my mentor. He managed to make me feel I was being pushed out of my own meeting.

The outcome

- What the mentor did:
 - To a degree, he tried to --would direct back to me. But for the most part he kind of just answered [important researcher]'s questions. It was kind of a difficult situation, because even though it's a very small little area of science, everyone has a lot of reverence for [important researcher]. Because he designed this detector in the 1970s. He's the expert in the world on it
- What the student did:
 - "it was annoying but I pushed through it and tried to do my best to explain myself. And the second time I met with him, I was ready! Ready to be like 'you have to pay attention to me.' But I guess because he knew I knew what was up, he started paying attention to me. Because by that time I'd found more of these like interesting signatures in the data that he'd seen before but didn't know what were. 'I'll be polite to you now you seem like you'll be of interest to me.'"

You should just get over it

- [from a Black doctoral student in physics] At an after-work gathering of everyone in her lab group “I communicated that it was a tradition on both sides of my family to honor surviving slavery, and that I thought that was really important for my [future] children – that I wanted them to know that they come from a background of people who have survived very difficult things and that makes them very strong.... And at some point, one of the [White] guys jumps in and says, “You know, you Black people are always complaining about slavery. And you should just get over it. It happened a long time ago and it doesn’t affect you anymore. And you Black people won’t shut up about it.”

Ong, Ko & Hodari 2015

What actually happened....

- “She reported the incident to the group’s leader, their joint advisor, also a White man, only to later learn that he had done nothing about it. Meanwhile, other group members pressured Chloe to apologize to her White peer for being overly sensitive and for creating tension within the otherwise cohesive group.”
- As a result, she left the group. She said, “I just didn’t find that I had enough respect for the research to put myself through being around people who made me incredibly uncomfortable and who upset me deeply.”

Analysis

- From a student, talking about similar situations:
- You're stuck. If you speak up about it, you're seen as being angry, or it's like--you can't be angry as a human being, you have to be angry as a Black woman. It's like stigmatized in a way that is different than any other group of people being angry. You're not taken as seriously and you never know how to react. If you don't react to it, they get away with what they're saying and they don't learn. But if you speak up about it, you're not taken seriously. So you're just stuck between--how do I even react to this situation that just occurred?

Sex talk during class

- [from a White undergraduate in computer science] The other day, some people were making dumb jokes about the type of crypto currency you can use--like bit coin. One of the main industries that develops crypto-currency is adult entertainment, one group in the corner was talking about different names of crypto-currency. One of them was like "tit coin," and they kept saying that and talking about it.

What the professor did

- After it had simmered down, [a male professor] said “and people wonder why women are discouraged in computer science.” That was nice.