

Curiosity and the end of discrimination

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Systemic discrimination on the basis of gender and race, among other ascribed identities, harms minoritized people. This is a structural problem in society, and astronomy is not immune to it. Although we talk about the challenges faced by 'women and minorities', it is all too rare to acknowledge intersecting realities: some of us are minority women and our experiences are different from both white women and minority men, with sexism and racism compounding in nonlinear ways. Confronting the challenges associated with invoking an intersectional analysis can be daunting if the mainstream community continues to ignore helpful work from the social sciences, which can teach us new ways of understanding how we produce scientific knowledge. Rather than failing to question how science is done, we should let curiosity be our guide.

I wanted to start this Perspective by saying that the astronomy community by and large accepts that women and gender minorities face challenges that cis (gender conforming/non-transgender) men do not. But as I started to type the sentence, I realized I could think of so many counterexamples to the statement that it might not serve women or gender minorities well to open with it. The counterexamples include several sexist and racist arguments in the Facebook Astronomers group, which has similar membership requirements to the American Astronomical Society (AAS) and at over 8,000 has more members than AAS. While it's easy to write the Facebook group off as unrepresentative rather than a relevant data point, in my experience and that of others, the views expressed reflect those we've heard in person, from both lay AAS members and also some society leaders and prominent members of the field. Moreover, gender minorities (transgender, non-binary and genderqueer people) hardly factor in these conversations at all, to the point where not even the American Astronomical Society Committee on the Status of Women in Astronomy has made a clear statement about the inclusion of transmen and non-binary people under their purview.

Then of course there are the questions about 'which women': women at intersections of minoritized identities like those of us who are racial minorities, sexual orientation minorities, and/or transgender minorities have to accept that when conversations do centre on women, they will primarily only touch on issues that affect straight, white cis women, never the problems that are specific to our double or triple binds¹. While there is much discussion about microaggressions against women these days — daily and casual incidents of discrimination² — not nearly enough attention has been paid to the way ignoring the needs of women at intersections constitutes a constant microaggression.

There are unspeakable things too that are not daily or casual. These are the conversations that won't come up in Facebook discussions because our names are attached to them, and outing your PhD advisor — or pretty much anyone — as a racist or sexist harasser is like getting in an express shuttle to career death. Instead we whisper in huddles at bars during conferences, by text message and via Facebook messenger, about harassment large and small: the sexual assaults, the racist comments, the nasty e-mails. The e-mails in particular are curious. A number of men are ready and willing to send a woman a nasty e-mail defending another woman from critique. To the recipient and many outsiders, it looks like men enacting the patriarchal narrative of the gallant man, ready to save the little



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science lady who can't defend herself! The irony is almost funny except that the impact is seriously harmful both to recipients and in my opinion, the woman whose honour is being defended.

Datasets such as those presented in the *Nature Astronomy* Letter by Neven Caplar and colleagues³ should be read in this context. Although Caplar *et al.* make a strong effort by using a native-speaker database of baby names (the problematically named python module SexMachine), and names often correlate with gender and sex identity, they aren't perfect correlates, especially if the designers of the study aren't aware of the fluidity of certain names.

Furthermore, someone with a name that is typically gendered one way or the other may or may not actually be the gender with which their name is usually associated. Non-binary people who in recent years have made themselves known in the astronomy community are erased entirely. Moreover, trans people who may not have been able to change their publishing name may be miscategorized, even if they are part of the traditional gender binary. One might argue that this is a possibly small group of people, the size of a reasonable error bar. Yet the very size of the group and the possibility that it is under-represented makes it even more important that they are included in discussions about discrimination, harassment and marginalization. As the 2016 LGBT+ climate in physics survey showed, trans and non-binary people in physics (including astronomy) experience some of the highest rates of harassment⁴.

But ultimately in a world where people who are professional data gatherers and interpreters seem to reject an overwhelming amount of evidence that women (and others) experience systemic and individualized gender discrimination¹⁵, there is a lot of value in a study that asks the simple question: how do the citation numbers of women-lead papers in astronomy compare with those of men-lead papers? The question is not insignificant, given the way that citation number is used in hiring. The next question is: does this represent a systemic bias against women? If the answer is yes, then it becomes clear that while the non-human objects that we study in astrophysics may be doing their operational calculations objectively, we scientists have some way to go before human structures do the same.

Indeed, Caplar *et al.* find that papers written by women receive about 10% fewer citations than comparable papers by men. The metaphorical playing field, as we call it in American English, is not level. Since citation numbers are used for hiring, fellowships and granting, this means that the average woman publishing in astronomy may be starting out with a 10% deficit compared to male applicants for the same programmes and jobs. This puts in stark relief the debates about affirmative action — or the rather loaded term positive discrimination as they call it in the UK — and whether women should be given extra consideration simply because of their gender. If white men start with a systemic 10% leg up, isn't it negative discrimination not to affirmatively promote people who are not white men?

Of course, for those of us who work in women's studies and the interdisciplinary field of science, technology, and society studies (STSS), the result is not surprising. Although one might hardly know it from the increasingly popular 'diversity and inclusion' discourse in physics and astronomy, STSS has produced intellectual work for decades that tackles the ways in which gender and sex hierarchies and discrimination are deeply embedded in the human production of scientific knowledge. In such works, it is standard to begin with an intersectional analysis⁶. As defined in Vivian May's excellent 2015 book, intersectionality "approaches lived identities as interlaced and systems of oppression as enmeshed and mutually reinforcing: one aspect of identity and/or form of inequality is not treated as separable or subordinate"⁷. Intersectionality articulates a critical framework for data analysis: the way sexism and racism (among other forms of discrimination) can combine in the life of a woman of colour cannot be disaggregated separately into 'the sexist stuff' and 'the racist stuff', and the power associated with one's social positioning with respect to systemic discrimination matters.

This work complements the fundamental view that science and society co-construct^{8,9}, and not just in discussions of gender. This is, in academic parlance, a matter for 'Science Studies 101'; but is absent in mainstream discussions by scientists about science and society¹⁰. In other words, it is no surprise to those of us in STSS that as we excavate data that reflects women's experiences in astronomy — and science in general — we are finding that scientific communities mirror the sexism and racism of the broader society in which they exist. Noting that astronomers like Cassini and Huygens played a role in deploying research programs that helped improve the efficiency of shipping enslaved Africans to the Caribbean and their low-cost work product to Europe, it is evident from this and many other examples that science can be a tool of the oppressor by aiding those who are engaging in oppressive practices such as slavery¹¹. By the same token, the invention of pasteurization revolutionized public health and changed lives for the better. Science and society are processes working in tandem with each other, unified not (yet) by a grand unified theory of the Universe but rather by humans.

It's important to be clear that in my experience, women are sometimes just as surprised by this as men¹². My first year as the lone Black student and one of the only women students in my PhD program, I had a memorable conversation with a brand new woman postdoc who felt that sexism was no longer really a problem in academia. She later had such devastating experiences with

gender-based discrimination that it ended her career in the field, a point that will forever be a sore spot with me.

That same year, 2006, I had an argument with social scientists who were working on a survey of women in astronomy. They did not intend to ask about race on their survey, and as an active member of the National Society of Black Physicists, I was aghast at this failure to use an intersectional analysis. Anyone who had ever bothered to look at the numbers available from the National Science Foundation and American Institute of Physics knew that African Americans of any gender were highly underrepresented in physics, even more so than white women. On a conference call about whether to include race as a question, a white woman asked microaggressively, "Well why does my race matter?"

Just over ten years later, in the era of a highly visible global Black Lives Matter movement and vocal discussion about discrimination against non-white immigrants, I hope such a question is evidently foolish, as much as the question of whether the Universe is static or expanding is to anyone with an astronomy degree. But I know after a decade of being enmeshed in conversations about discrimination in science that I hope in vain. For example, a cursory search for the words 'race' and 'racism' in the paper by Caplar *et al.* turns up nothing. It is hardly surprising that a study looking at names only through the lens of gender would yield little data about race or racism. But I would expect that a comprehensive discussion of what the study does and does not tell us would mention a phenomenon that is well-studied in the social sciences: discrimination against job applicants because of the racialization associated with their names¹³. Specifically, applications with names that sound more traditionally African American attached to them receive lower ratings and fewer call-backs than identical applications with names that American readers might guess were white people's, or 'raceless'. The curious normalization of 'white' as raceless is already a phenomenon worth discussing, and in the fields of Black studies and ethnic studies, it is being discussed very much¹⁴.

The running theme here is that work to investigate the experiences of women in astronomy and science in general is harmed by minimal engagement with work in other fields that could be informative. In the decade since I first became involved in what some might call diversity activism, my understanding of the goals and what is required has changed a lot. As a high-school student from a working class background, I was aware that being a Black woman meant I'd probably break a few barriers. A product of the 80s, my perspective on this was primarily shaped by a multicultural lens: barrier breaking was mostly a thing you did on paper, the days of people saying ugly things to Black people at school were over. I should have known better since, as early as age eight, I had dealt with memorable anti-Black racism in the classroom.

Yet I was completely unprepared for the multitude of ways barrier breaking is not fun: being the only Black student in the classroom, not being able to find a hair stylist who can give you a simple hair cut, having people mock you for being concerned about this, listening to men make breast jokes that make you uncomfortable, having male graduate students invite you to coffee for mentoring and then spending the entire time trying to convince you to have sex with them. Barrier breaking isn't fun; it's horrible, and it tarnishes the magic of physics¹⁵.

By the time I earned my master's degree, I was a sexual assault and domestic violence survivor. I never felt I could tell my degree advisor or any of the faculty in my program that I was recovering from an assault involving a member of our professional community. This meant no time off — I had to pass qualifying exams on the same schedule as everyone else. (I did.) Thus, when I arrived at Perimeter Institute for Theoretical Physics as a PhD student in 2006, I didn't need to see numbers to know that astronomy and physics had a profound problem with racial and gender discrimination. In the coming years as an out queer person, I would learn about the homophobia too.

These stories are important because as numbers-oriented people, astronomers and physicists tend to valorize datasets that are large enough to do statistics. We know well that any given data point can be an outlier. It can be easy to brush stories like mine aside as anecdotes, even as over the last year the media has exploded with stories of sexual abuse in astronomy. But it was obvious to me as a PhD student that my anecdotes were evidence of a systemic failing. Live as a woman (or disabled person or any other minority for that matter) for 24 years and you start to notice some patterns in your life. Of course, my proclivities as a budding theoretical physicist manifested in a desire to formalize what I was seeing. So I armed myself with statistics, naively believing that if I just shared the numbers with my fellow scientists, they'd see the problems right there in front of their faces.

In fact, going through a box recently, I found the first notes I took about the earnings of African Americans with physics PhDs. My notes indicate that although there are about 2,000 physics PhDs awarded annually, and Black Americans make up about 13% of the US population, between 1996 and 2003 only 108 (under 1%) of physics PhDs went to African Americans¹⁶. These are the same numbers I had pulled out for that conference call where I subsequently was asked whether race mattered.

Over time, it became evident to me that data isn't enough. For the moment, there are men (and women) who persistently want to explore the possibility that rather than sexism explaining the underrepresentation of women in astronomy, it's simply that women biologically prefer to be stay-at-home mothers or to work in fields that are 'softer' and have more human contact, never mind that what we know about biology increasingly suggests that the idea of a two-sex binary is out of sync with science¹⁷. Similarly, even though Black women show different degree earning trends than white women, many white women still refuse to take race into account when talking about the experiences of women in science.

Increasingly it has been an urgent matter for me to situate this dynamic between data and the refusal to take it at face value in a larger context, and as a result, I have moved from working solely in theoretical cosmology and particle physics to also doing research on how we constitute observers in science¹⁸. In particular, I am interested in the philosophical but essential question of what it means for the astrophysical research that we do when we erase people and data from our narratives about how science is done, for example by refusing to take intersectionality into account.

Is it the fault of scientists that we seem so caught up in these mistaken approaches to diversity and inclusion? Yes and no. It took me 15 or 16 years to articulate why I struggled so much as a barrier breaker, that in some sense the way the status quo in physics operates 'unconstructs' me as a competent observer. For every incident of discrimination I experienced, no matter what patterns I was familiar with, there was someone in a position of social and/or intellectual authority (usually a white man but also sometimes a white woman or a non-white man) there to question whether I really understood — even if they were complete neophytes on the topic. If it's that hard for me to articulate (I understand it's a challenge for others since our training fails to prepare us for these conversations) then it's a problem universities should fix. Interestingly, one might even say that a barrier women and gender minorities face is that we are more likely to need to spend time figuring out how to articulate these matters — work that the community proclaims when men are doing it, but is undervalued and rarely compensated, even sometimes labelled as a negative point in hiring. "She's thinking about sexism instead of physics!" never seems to be paired with "We should make room so she feels free to focus on physics."

Simultaneously, recent discourse about the March for Science represents a useful example of wilful ignorance¹⁹. Many of us have noticed resistance from Washington DC and satellite march

organizers to truly interrogate what they even mean by the word nonpartisan. Organizers cling to this word in order to promote the presence and comfort of political conservatives at the expense of the comfort and presence of people who are most likely to be targeted by the current Republican administration. That they themselves define the word to be fundamentally inclusive does not actually make it so. Yet there has been much redefinition (some might say 'appropriation') in the organizing process. In a recent example, an article arguing in favour of the march's rhetoric borrows from Black American intellectual and literary history while simultaneously failing to engage directly and substantively with the critiques made by Black American (women) scientists and valorizing the oft-repeated, deeply historically inaccurate rallying cry that "science is a great equalizer"¹⁰.

If the citations of women in astronomy are any indicator, this is clearly not the case. Will 'science' fix the citation numbers? What does that question even mean? I hope that we are curious enough to find out, especially when so many resources are at our disposal^{1,20}.

Received 8 April 2017; accepted 26 April 2017;
published 2 June 2017

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How to cite this article: Prescod-Weinstein, C. Curiosity and the end of discrimination. *Nat. Astron.* **1**, 0145 (2017).

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Competing interests

The author declares no competing financial interests.