https://doi.org/10.1038/s41556-023-01302-w

Gender equity: toward redefining values

Chrystal A. Starbird, Zara Y. Weinberg & Mary Munson

Women and gender minorities make defining contributions to science. Despite increased representation of women across the scientific career ladder, institutions routinely fail to support their career advancement or value their input. For an equitable and intersectional future faculty, definitions of excellence must evolve to better value women's contributions.

Women have made critically important advances in science, but for much of scientific history their recognized acceptance in academic spaces was limited, if not banned outright. Despite the inspiring story of Marie Curie, who was the first woman to earn a PhD in physics and to be awarded the Nobel Prize, many more stories exist such as those of Ada Lovelace, Katherine Johnson, Rosalind Franklin and other so-called hidden figures whose contributions to groundbreaking scientific discoveries were initially poorly recognized. Despite policies and cultures that prevented their full participation in scientific research, women were clearly passionate about, and leading, scientific discovery. Yet even today, when the participation of women is allowed and, in many places encouraged, the reward and promotion systems have still not fully adapted to acknowledge and support this participation. Moreover, systems that are incapable of sufficiently supporting women and valuing their contributions are even less well-equipped when it comes to supporting and valuing the work of people whose identities exist across a broader spectrum of gender diversity. Notably, although we discuss these issues in the context of the USA, we anticipate that while the details may be different, the theme of our observations and suggestions will have relevance worldwide.

A lack of support for women in science over time has contributed to a scarcity of women role models to mentor and advocate for the next generations of scientists. Role models, especially those with whom we share identities, are critically important to encourage participation and retention in science[1]. In the past, women who pursued science despite a lack of obvious role models were met with material challenges including being subject to abuse and harassment[2] and faced discrimination in pay[3] and grant funding[4,5], on top of societal-scale issues including insufficient support for birthing parents. One of us (M.M.), upon starting her lab ~20 years ago, was even advised not to hire women of childbearing years as research associates, as they might have babies and not be productive anymore. How has science changed for women and gender-diverse folks since?

Progress for women in science

Today, the contributions of women are increasingly recognized, and the number of women scientists has grown, progress that has often been made through women's own self-advocacy or through the work of women-led organizations and initiatives. As an example, the Women in Cell Biology (WICB) Committee of the American Society for Cell Biology recently celebrated their 50th anniversary. To mark this momentous occasion, they created a 50th anniversary video that shares some of the remarkable stories of their founders and participants throughout the years[6] and it's worth reflecting on this history as we look towards the future. WICB originally started in 1971, through posting flyers in the women's bathroom and through 'whisper' networks. The founders of WICB wanted to avoid backlash in their organizations but felt strongly that building a community would increase mentorship and advancement of women in science. They shared stories of faculty job openings (which were not widely advertised then), funding opportunities and unsupportive places and people to avoid. Even today, similar networks exist, for example, on social media, where people spread the word about social justice movements to promote the advancement of women of colour and gender minorities in science. Thanks to the early work of organizations like WICB, we are no longer posting notes in the bathroom, but the need for these organizations to advance issues important to their participants is still immense and necessary.

While the number of women leading research labs and at higher career levels has increased, the work to achieve parity with their male counterparts is far from over. In the USA, women at the assistant professor level had increased to ~39% as of 2015, but the numbers of women at the levels of associate (~34%) and full professor (~19%) have seen more modest increases. Crucially, this progress has not been equal amongst all women, as white women have seen the greatest advancement while, for example, Black women (2% of assistant professors and less at the associate and full professor level) continue to be the most underrepresented group at the faculty level when compared with their representation in the population of the USA. Furthermore, faculty surveys often do not adequately account for women with disabilities, non-binary people or other gender minorities and as such, we are unsure of the representation of these groups across career stages. Surveys should be more inclusive to increase the visibility of people with these under-recognized identities.

A fundamental question that we must consider more fully is whether our academic spaces have adapted in ways that truly promote the retention of all women and gender minorities in science.

While the number of women in science has grown, women are navigating spaces that they, as a whole, did not design and that were not

designed with their needs and their specific talents in mind. Not only is there still poor access to important resources for women such as childcare, leave and reproductive healthcare, but these areas of consideration and research continue to receive less interest and funding overall. For example, one of us (C.A.S.) notes that upon winning a prestigious fellowship from the National Institutes of Health (NIH) in the USA, she lost health insurance coverage for her family because the systems in place were not designed to support postdoctoral fellows who also needed to support a family. These types of structural issues highlight that while the priorities of those in research are changing, the systems and cultures have been much slower to adapt. Women are more likely to take on additional service responsibilities, including mentoring roles, participation in university committees and outreach — these continue to be aspects of the professoriate that are less rewarded in promotion and tenure considerations. Moreover, the coronavirus disease 2019 (COVID-19) pandemic had a tremendously disproportionate effect on women/caretakers, which has not been resolved for most scientists[7].

The experiences of trans scientists who have transitioned during their scientific careers provide a unique and sobering lens for viewing the realities of this differential treatment. Ben Barres famously quipped that after transitioning, one of the most striking differences he noted in how his colleagues treated him was that "I can even complete a whole sentence without being interrupted by a man."[8] Likewise, in recounting the struggle of being taken less seriously as a woman, Joni Wallis said that "frankly, the hard part of being a trans woman in science has more to do with being a woman than with being trans."[9] One of us (Z.Y.W.) experienced this first hand, finding that her male colleagues began doubting her expertise and work in ways they had not before her transition mid-PhD. These, and countless other unmentioned stories, lead us to ask: what progress have we really made if simply existing as a woman in science is enough to get your expertise and ideas devalued by colleagues?

What should the future of women in science look like?

As scientists, we thrive on obtaining and analyzing data and experimenting to test our hypotheses. Successfully identifying and making changes to our academic systems, processes and academic cultures with the goal of increasing diversity, equity and inclusion follows a similar research path, and there are many studies to suggest strategies that can help increase the recruitment, retention and promotion of all women and gender minorities in science[10–12] (additional resources here). Indeed, many of the strategies we describe here are likely to be effective at reducing marginalization across many axes simultaneously. In implementing these strategies, it is essential that their efficacy not only be judged by its effects on women in science, but also through an intersectional lens that ensures we are actively increasing equity and inclusion for all scientists.

At the recruitment level, previous work suggests that setting clear targets for equity during hiring, redefining merit in terms of the types of work that is valued during hiring evaluation, diversifying hiring committees[13], and clearly laying out a rubric for evaluating applications can all contribute to increased equity during hiring[14]. For retention and promotion, universities need to have better support systems, for instance, accessible childcare, mentoring, advocacy and so on, and to acknowledge and value the contributions of women more fully. In addition, increasing awareness and community best practices through culturally aware mentorship and career development workshops can help foster an inclusive and welcoming community in ways that recognize intersectionality.

Once recruited, institutions must implement strategies to support and retain women faculty. These strategies are myriad, and they are well-documented[15] — institutions must regularly assess their climates, set clear goals around diversity, salary equity and behaviour, and act to achieve these goals with interventions at the individual faculty level as well as at the departmental and institutional level. These interventions include iteratively developed faculty development programming, alongside regular modification of policies to support diverse faculty members.

Existing metrics for assessing excellence often fundamentally fail women and marginalized scientists. Women are over-represented in service positions and dedicate a large amount of their time to mentorship activities that further the development of their trainees, mentees and peers[16]. This service is invaluable to universities and helps to create the environments that contribute to their funding levels and prestige. Importantly, these efforts are not inherently feminine, anyone can engage in these activities, but institutional culture regularly expects these activities more from their female and diverse members. This workload should be better distributed across all faculty, and these activities should be valued comparably with scientific output. Hiring, tenure and promotion evaluation must treat this work as essential. Funding agencies should also incorporate assessments of this essential labour activity into grant evaluations. In the USA, the NIH has made promising steps in this direction with the goals of the MOSAIC K99/R00 program, the ReWARD R01 and DEIA Administrative Supplements.

Together, these studies provide the toolkits and ideas to drive changes in our academic systems. The future depends on empowering the faculty and university leadership to roll up our sleeves and do the work to make science more inclusive — because we need all types of women and people of all gender identities in science.

Chrystal A. Starbird [1], Zara Y. Weinberg [2] & Mary Munson [3]
[1]Department of Biochemistry and Biophysics, University of North Carolina School of Medicine, Chapel Hill, NC, USA. [2]Department of Biochemistry and Biophysics, University of California San Francisco, San Francisco, CA, USA. [3]Department of Biochemistry and Molecular Biotechnology, University of Massachusetts Chan Medical School, Worcester, MA, USA.
e-mail: mary.munson@umassmed.edu

Published online: 16 January 2024

References

1. Gladstone, J. R. & Cimpian, A. *Int. J. STEM Educ.* **8**, 59 (2021).
2. Johnson, P. A. et al (eds) *Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine* (National Academies Press, 2018).
3. Samaniego, C. et al. *Scientometrics* **128**, 1395–1407 (2023).
4. Safdar, B. et al. *Cureus* **13**, e14644.
5. Ginther, D. K., Kahn, S. & Schaffer, W. T. *Acad. Med.* **91**, 1098–1107 (2016).
6. Masur, S. K. et al. *Mol. Biol. Cell* **32**, pe2 (2021).
7. Davis, P. B. et al. *Nat. Med.* **28**, 436–438 (2022).
8. Barres, B. A. *Nature* **442**, 133–136 (2006).
9. Wallis, J. *Neuron* **109**, 3184–3186 (2021).
10. Mays, A. et al. *Cell* **186**, 2510–2517 (2023).
11. DeAro, J., Bird, S. & Mitchell Ryan, S. *Equal. Divers. Incl.* **38**, 131–139 (2019).
12. Smith, K. A., Arlotta, P., Watt, F. M., Initiative on Women in Science and Engineering Working Group & Solomon, S. L. *Cell Stem Cell* **16**, 221–224 (2015).
13. Sensoy, Ö. & DiAngelo, R. *Harv. Educ. Rev.* **87**, 557–580 (2017).
14. Bhalla, N. *Mol. Biol. Cell* **30**, 2744–2749 (2019).
15. Wingard, D., Trejo, J., Gudea, M., Goodman, S. & Reznik, V. *J. Natl Med. Assoc.* **111**, 46–53 (2019).
16. Guarino, C. M. & Borden, V. M. H. *Res. High. Educ.* **58**, 672–694 (2017).

Competing interests

The authors declare no competing interest.