

Just citations



A new study that reveals under-citation of women physicists invites individual and journal-level action to tackle discrimination.

It is well-known that women are underrepresented in physics and can face bias and discrimination. Studies are increasingly reporting on the many ways in which this discrimination occurs. Although diversity considerations are becoming more common – for example, through mandates requiring gender-balanced conference speaker lists – there are many subtler manifestations of gender disparities in science. One symptom of gender bias is the under-citation of papers authored by women, which is demonstrated in a [Perspective](#) in this issue of *Nature Physics* through an extensive analysis of over one million physics papers.

Erin Teich and colleagues analysed papers published between 1995 and 2020 in 35 physics journals. The author gender was inferred from the author forename. Although this method is not always accurate and does not take into account non-binary gender identities, Teich and colleagues argued that those who cite a particular work also infer the gender from the forename and are influenced by the perceived gender of the author. The team found that papers with first and last authors who are men were cited more often than expected and those with either first and/or last authors who are women were cited less often than expected. The citation imbalance was highest for papers authored by men, for general physics papers and in the case of citations of works on topics with which the citing authors likely had less familiarity.

One might think that gender imbalance in citations is a relatively small issue when considered against the backdrop of many seemingly more serious forms of gender-based discrimination, but multiple negative effects can reinforce each other. A recent study found that women are less likely to be credited for their work in a scientific publication than men¹, and we know that citation numbers are routinely used by academic hiring committees

and funding bodies to measure the impact of a particular physicist. Therefore, it becomes clear that the combination of different expressions of discrimination can snowball into something large and difficult to tackle.

Those who perform detailed analyses of the effects of discrimination hope to provide the much-needed evidence to convince those who don't believe it happens. However, non-believers might not be the only problem. A recent survey exploring the experiences and beliefs around gender and race of 27 graduate students and faculty members in physics who are self-identified progressive white men showed that even well-intentioned researchers tended to believe that finding solutions to tackle sexism and racism was not their responsibility and that the issue was too big for them to address (<https://doi.org/10.48550/arXiv.2210.03522>).

It is essential, therefore, to acknowledge not only the large-scale inequities but also one's own personal privilege and biases. That science is not a meritocracy has been made abundantly clear and we all have conscious and unconscious biases that we should confront. To acknowledge one's own role in perpetuating disparities is also to realize one's power to effect positive change.

Although there are now quite a few studies providing evidence of gender imbalance in physics, clear guidelines on how to improve the situation are scarce. Although inaction cannot be justified, the feeling of the problem being too vast and complex for one person to make any meaningful difference, is likely felt by many. Helpfully, Teich and colleagues also offer concrete suggestions for immediate actions to overcome this imbalance.

At the individual level, authors should take care when choosing which works to cite, especially for papers that are outside of their immediate expertise, as the over-citation of man-authored papers was shown to occur more frequently for papers beyond the author's domain. Teich and colleagues suggest the inclusion of a Citation Diversity Statement and point out tools that can help authors assess the citation diversity statistics of their

papers (see, for example, <https://github.com/dalejn/cleanBib#instructions>).

On a journal level, Teich and colleagues found that journals publishing more woman-authored papers tend to show less under-citation of women. Although this observation is non-causal it suggests that increasing the number of papers by women in a journal may lead to more equitable reference lists in that journal.

Here at *Nature Physics*, we acknowledge the citation imbalance in favour of papers authored by men that occurs on our pages. Our editorial team will continue to strive for gender balance among the authors of our commissioned content in the hope that, among other things, this will lead to a reduction in the under-citation of women in the articles we publish.

Teich and colleagues emphasized that their study focused on citation imbalance along the gender binary and that future work should investigate citation practices along other dimensions of difference such as race, ethnicity, social class, disability and sexual orientation, and the intersections between them. The need for this type of investigation is made clear by the recent analysis of patterns of disadvantage along a spectrum of 32 intersecting demographic groups². The study showed that although heterosexual white men without disabilities enjoy more unearned privileges than any other group, the level of (dis)advantage encountered in science, technology, engineering, and maths (STEM) varied greatly among the other 31 groups.

The pervasive discrimination of women and other marginalized groups in physics emerges from a collection of individual actions. Although overturning personal implicit biases requires effort, it is essential that each member of the physics community takes that action. The result will be a fairer and richer research environment.

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References

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