

## Gender Bias in the Sciences

In many disciplines, the representation of women as faculty lags behind degrees awarded. These resources explore the research on the reasons women are underrepresented across many fields. Committees are encouraged to consider, discuss and apply the implications from this research to address relevant barriers to equitable hiring, retention and advancement processes.

### Overall research on gender

This annotated list of references collates diverse studies on **gender bias in the academy**:

<https://www.hastac.org/blogs/superadmin/2015/01/26/gender-bias-academe-annotated-bibliography-important-recent-studies>

It has 2 major sections:

- Part I: Studies that Find Gender Bias in Academe
- Part II: Studies That Find Lack of Bias or Bias in Favor of Women in STEM Fields

Atir, S., & Ferguson, M.J. (2018). How gender determines the way we speak about professionals. *PNAS* 115(28), pp. 7278-7283. <https://doi.org/10.1073/pnas.1805284115>

### Research on specific topics

- **Beneficial effects of women in leadership** roles:
  - Cauterucci, C. (2015). Companies with Women on Their Boards Do Better—And Not Just Because They Know Shampoo. *Slate.com*, December 8, 2015. <https://slate.com/human-interest/2015/12/companies-with-women-on-their-boards-do-better-and-not-just-because-they-know-shampoo.html>
  - Chapman, B. (2017). Workplace gender quotas weed out incompetent men and make businesses more efficient, study finds. *Independent.co.uk*, June 19, 2017. <https://www.independent.co.uk/news/business/news/workplace-gender-quotas-incompetence-efficiency-business-organisations-london-school-economics-lse-a7797061.html>
- **Beneficial effects of diversity**:
  - Phillips, K.W. (2014). How Diversity Makes Us Smarter. *Scientific American*, October 1, 2014. <https://www.scientificamerican.com/article/how-diversity-makes-us-smarter/>
  - Powell, K. (2018). These labs are remarkably diverse — here’s why they’re winning at science. *Nature*, June 6, 2018. <https://www.nature.com/articles/d41586-018-05316-5>
- **Sexual harassment** has **negatively impacted women's careers in sciences and engineering**. There are approaches that institutions can take to reduce sexual harassment and address its impacts, including through addressing organizational climate—which links to willingness to use preferential and limited

hiring, and supporting women in leadership positions:  
<http://sites.nationalacademies.org/SHStudy/index.htm>

This report includes the following paragraph on pp.3-4 highlighting why increasing the representation of women in leadership positions influences work culture:

*Environments where men outnumber women, leadership is male dominated, and/or jobs or occupations are considered atypical for women have more frequent incidents of sexual harassment for women (USMSPB 1995; Fitzgerald et al. 1997; Berdahl 2007a; Willness, Steel, and Lee 2007; Schneider, Pryor, and Fitzgerald 2011). On many campuses, these programs and departments persist as male-dominated work settings. More often than not, men are in positions of authority—as deans, department chairs, principal investigators, and dissertation advisors—and women are in subordinate positions as early-career faculty, graduate students, and postdocs.*

- **Women are underrepresented** or have limited access to **elite labs and programs** while male students are given more opportunities
  - Milkman, K. L., Akinola, M., & Chugh, D. (2015). What happens before? A field experiment exploring how pay and representation differentially shape bias on the pathway into organizations. *Journal of Applied Psychology*, 100(6), 1678-1712.  
<http://dx.doi.org/10.1037/apl0000022>; <http://psycnet.apa.org/record/2015-15680-001?doi=1>
  - Moss-Racusin, C.A., et al. (2012). Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences of the United States of America*, 109(41), pp. 16474-16479. Stable URL: <http://www.jstor.org/stable/41763373>
  - Sheltzer, J.M. & Smith, J.C. (2014). Elite male faculty in the life sciences employ fewer women. *Proceedings of the National Academy of Sciences of the United States of America*, 111(28), pp. 10107-10112. <https://doi.org/10.1073/pnas.1403334111>
  
- **Women are underrepresented in academic positions**
  - Association of American Medical Colleges (2009). Unconscious bias in faculty and leadership recruitment. <https://www.aamc.org/download/102364/data/aibvol9no2.pdf>
  - Canadian Association of University Teachers (2018). *Underrepresented & Underpaid: Diversity and Equity Among Canada's Post-Secondary Education Teachers*. Discusses underrepresentation of women as faculty, particularly in science and engineering.  
[https://www.caut.ca/sites/default/files/caut\\_equity\\_report\\_2018-04final.pdf](https://www.caut.ca/sites/default/files/caut_equity_report_2018-04final.pdf)
  - CBC Radio. (2019). Glass obstacle course: Why so few women hold top STEM spots.  
<https://www.cbc.ca/radio/quirks/sep-21-2019-women-in-science-special-how-science-has-done-women-wrong-1.5291077/glass-obstacle-course-why-so-few-women-hold-top-stem-spots-1.5291082>
  
- **Women experience disadvantages in funding**
  - Bol, T., de Vaan, M., & van de Rijt, A. (2018). The Matthew effect in science funding. *PNAS* 115(19) 4887-4890. <https://doi.org/10.1073/pnas.1719557115>

- Witteman, H.O., et al. (2019). Are gender gaps due to evaluations of the applicant or the science? A natural experiment at a national funding agency. *The Lancet*, 393(10171), P531-540  
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)32611-4/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)32611-4/fulltext);  
[https://doi.org/10.1016/S0140-6736\(18\)32611-4](https://doi.org/10.1016/S0140-6736(18)32611-4)
- **Women experience disadvantages in peer review, publication access and authorship credit**
  - Brock, J. (2018). Women edged out of last-named authorships in top journals. *Nature Index*.  
<https://www.natureindex.com/news-blog/women-edged-out-of-last-named-authorships-in-top-journals>
  - Canadian Association of University Professors (2019). The Matilda Effect. *CAUT Bulletin*.  
<https://www.caut.ca/bulletin/2019/02/matilda-effect>
  - Fine, I. & Shen, A. (2018). Perish not publish? New study quantifies the lack of female authors in scientific journals. *The Conversation*. <http://theconversation.com/perish-not-publish-new-study-quantifies-the-lack-of-female-authors-in-scientific-journals-92999>
  - Fox, C.W. & Paine, C.E.T. (2019). Gender differences in peer review outcomes and manuscript impact at six journals of ecology and evolution. *Ecology and Evolution*, 9(6), Pages 3599-3619.  
<https://doi.org/10.1002/ece3.4993>
  - Lundine, J., Bourgeault, I.L., Glonti, K., Hutchinson, E., & Balabanova, D. (2019). "I don't see gender": Conceptualizing a gendered system of academic publishing. *Social Science & Medicine*, 235, 112388. <https://doi.org/10.1016/j.socscimed.2019.112388>
  - Overbaugh, J. (2018). Defining the Barriers to Women Publishing in High-Impact Journals. *Journal of Virology* 92(7) e02127-17; DOI:10.1128/JVI.02127-17;  
<https://jvi.asm.org/content/92/7/e02127-17>
  - Wenneras, C. & Wold, A. (1997). Nepotism and sexism in peer-review. *Nature*, 387, pp. 341-343. Retrieved from <https://www.nature.com/articles/387341a0>
- **Qualified female candidates and faculty are not always evaluated fairly:** undervalued, underrated, evaluated with different standards
  - Foschi, M. (1996). Double standards in the evaluation of men and women. *Social Psychology Quarterly*, 59(3), 237-254. <http://www.jstor.org/stable/2787021>
  - Good, J.J. & Rudman, L.A. (2010). When Female Applicants Meet Sexist Interviewers: The Costs of Being a Target of Benevolent Sexism. *Sex Roles*, 62(7/8), 481-493.  
<https://doi.org/10.1007/s11199-009-9685-6>
  - Isaac, C., Lee, B. & Carnes, M. (2009). Interventions That Affect Gender Bias in Hiring: A Systematic Review. *Academic Medicine*, 84(10), 1440-1446.  
<https://www.ncbi.nlm.nih.gov/pubmed/19881440>; doi:10.1097/ACM.0b013e3181b6ba00
  - Sinclair, L. & Kunda, Z. (2000). Motivated stereotyping of women: She's fine if she praised me but incompetent if she criticized me. *Personality & Social Psychology Bulletin*, 26(11), p. 1329-1342. <https://journals.sagepub.com/doi/abs/10.1177/0146167200263002>;  
<https://doi.org/10.1177/0146167200263002>

- Regner, I. et al. (2019). Committees with implicit biases promote fewer women when they do not believe gender bias exists. *Nature Human Behaviour* 3, 1171–1179. <https://doi.org/10.1038/s41562-019-0686-3>
- Steinpreis, R.E., Anders, K.A., & Ritzke, D. (1999). The Impact of Gender on the Review of the Curricula Vitae of Job Applicants and Tenure Candidates: A National Empirical Study. *Sex Roles*, 41(7/8), pp. 509-528. <https://search.proquest.com/docview/1308098969?pq-origsite=summon>
- **Gender bias in letters of reference disadvantage women**
  - Commission on the Status of Women, University of Arizona. (n.d.) Avoiding gender bias in reference writing. [https://csw.arizona.edu/sites/default/files/avoiding\\_gender\\_bias\\_in\\_letter\\_of\\_reference\\_writing.pdf](https://csw.arizona.edu/sites/default/files/avoiding_gender_bias_in_letter_of_reference_writing.pdf)
  - Flaherty, C. (2018). Help That Hurts Women. *Inside Higher Ed*. <https://www.insidehighered.com/news/2018/06/19/study-finds-recommendation-letters-inadvertently-signal-doubt-about-female>
  - Trix, F. & Psenka, C. (2003). Exploring the Color of Glass: Letters of Recommendation for Female and Male Medical Faculty. *Discourse & Society*, 14(2), 191–220. <https://doi.org/10.1177/0957926503014002277>

## Ways to apply these research findings

Implications from this research may be applied in varying ways:

- Discuss gender and equity regularly as a department, bringing in relevant research articles for discussion
- Respond to any concerns that arise about hostile work environments or sexual harassment
- Address gender dynamics in the composition and discussion processes of committees
- Ask committee members to take an implicit bias test before they develop criteria and use this information to inform their discussions
- Establish strong criteria that create an inclusive definition of excellence and address gendered discrepancies in access to elite institutions, funding, publication, and more
- Discuss how to use consistent language across genders to discuss to applicants and colleagues
- Review data on gender representation in the department (ask EQHR for this data) and discipline
- Identify unintended barriers to full participation and advancement of women
- Integrate support for gender equity into the requirements for a position
- Acknowledge the potential impact of leaves and cumulative and systemic barriers on productivity and professional timelines
- Integrate gender considerations into reviewing materials, including letters of reference
- Use a gender lens to review the work of the department, including guest speakers, awards granted, workloads (formal and informal), and more