

Looking inward at gender issues

Optimizing participation of different groups in science, technology, engineering, and mathematics (STEM) fields requires a better understanding of how any disparities arise. With regard to gender disparities, several aspects have been analyzed—from looking at degrees awarded in STEM fields to career progression to grant support. Scholarly publishing is not immune to gender imbalance in authorship. We sought to learn how *Science* is doing on this front.

I previously served on the U.S. National Research Council Committee on Women in Science, Engineering, and Medicine (CWSEM), whose mandate is to support the participation of women in these fields. One valuable resource assembled by the CWSEM is a compilation of data sources relevant to women in science and engineering (http://sites.nationalacademies.org/PGA/cwsem/PGA_049131). For example, one can examine statistics from the U.S. National Science Foundation (NSF) and find that the percentage of women employed in all sectors as a “biological or life scientist”

was 41.0% in 2003 and 46.9% in 2011, whereas those employed as “engineer” was 10.4% and 11.7%, respectively.

What does the profile of women authors look like at *Science*? To start, we were interested in the percentages of women among authors of papers published in *Science* compared to papers that were submitted to *Science* but not published. We examined papers published in *Science* in 2015 and a randomly selected set of manuscripts that had been submitted but not accepted for publication. The individuals in the first author and last author positions were analyzed for gender and career stage through Internet searches; gender was inferred from photos, text references, and names. Junior positions were defined as first authors who were graduate students or postdoctoral fellows, whereas senior positions were defined as first or last authors who were in faculty or analogous positions. This evaluation revealed that for published papers, 17% of 862 senior author positions and 25% of 471 junior author

positions were held by women; for the unpublished papers, the numbers were 15% and 30%, respectively. This analysis is described in more detail at *Sciencehound* (<http://blogs.sciencemag.org/sciencehound/2017/01/26/gender-analysis-of-science-authors/>).

To place these values in context, we examined the percentages of women in scientific fields, weighted to match the balance of fields covered by the NSF through the use of NSF data. We estimated that women held 33% of all academic positions regardless of rank in 2010, 27% of senior faculty positions in 2010, and 47% of graduate programs positions in 2011. Comparison of these results with the percentages of women *Science* authors reveals that the percentages of women in both the senior and junior author groups are lower among *Science* authors and submitters by approximately one-third.

The percentages of women authors in published papers are not substantially different from those from the group of papers that were not accepted, with a slightly higher percentage of women in senior positions for published papers

and a somewhat lower percentage of women in junior positions for published papers. These differences are not statistically significant given the sample sizes. This suggests that review processes and editorial decisions are not introducing substantial gender disparities.

Many other dimensions from the *Science* author data, such as trends over time, could be analyzed. However, a major limitation is the availability of data regarding the gender of authors. Within the year, we aim to collect gender and other demographic information from our authors and reviewers for the purpose of facilitating such analyses. Such data will be stored separately from other information and used only for aggregate analyses and not for other processes related to editorial decision-making. I hope that authors and reviewers will share this information with us so that we can understand imbalances and react appropriately to address any issues related to STEM diversity and equity.

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Science

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