



## **Implicit Bias in the Earth and Space Sciences—The Effect and Importance of Networks**

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Implicit gender bias has been demonstrated to be widespread in academic advancement and awards, scholarly publishing, and meetings—from selection and for awards, to participation as reviewers, to selection as invited speakers, to differences in acceptance rates in some fields. This is part of a larger culture of bias and harassment in science. Societies and publishers are starting to address these issues in a variety of ways, including by expanding training and participation of women (and minorities) in selection committees and editorial teams. To understand the origins of these challenges better, and to explore possible structural solutions, we have analyzed authorship networks in the Earth and space sciences and their association with acceptance rates using data from AGU meetings and publications during the past several years. Merging these data with AGU member data where gender and age are self-declared allow accurate assessment of differences by gender and how these vary over time. The meetings data from 2014-2018 provide more than 1,000,000 unique co-author interactions. The data show that women co-author with the expected age-gender distribution of the AGU membership. In contrast, men regardless of age, co-author with other men. The difference is about 5% across age-cohorts. Thus a likely reason for including women in leadership positions is that it expands networks. A concern is that this bias is still prevalent in younger co-author networks and thus is still not being addressed. Publications data show that acceptance rates are higher when author groups are larger, more international, and also more gender diverse. Thus there is a structural incentive to diversify networks.