Welcome!
to the E&I reading group

Mailing list:  
https://mailman.stanford.edu/mailman/listinfo/inclusivephysicsreadinggroup

This is the first meeting! We'd like your feedback on  
- format  
- goals  
- code of conduct/ground rules

Feedback form (we'll send this out later):  
https://goo.gl/forms/okolyghDDFMNAf4B2

Further reading:  
- Moss-Racusin’s Stanford WISE Lecture in 2014:  
  https://www.youtube.com/watch?v=PLz2d1CnWuY  
- Iris Bohnet, *What Works: Gender Equality by Design* (via Carl Wieman)
Despite efforts to recruit and retain more women, a stark gender disparity persists within academic science. Abundant research has demonstrated gender bias in many demographic groups, but has yet to experimentally investigate whether science faculty exhibit a bias against female students that could contribute to the gender disparity in academic science. In a randomized double-blind study (n = 127), science faculty from research-intensive universities rated the application materials of a student—who was randomly assigned either a male or female name—for a laboratory manager position. Faculty participants rated the male applicant as significantly more competent and hireable than the (identical) female applicant. These participants also selected a higher starting salary and offered more career mentoring to the male applicant. The gender of the faculty participants did not affect responses, such that female and male faculty were equally likely to exhibit bias against the female student. Mediation analyses indicated that the female student was less likely to be hired because she was viewed as less competent. We also assessed faculty participants’ preexisting subtle bias against women using a standard instrument and found that preexisting subtle bias against women played a moderating role, such that subtle bias against women was associated with less support for the female student, but was unrelated to reactions to the male student. These results suggest that interventions addressing faculty gender bias might advance the goal of increasing the participation of women in science.

gender disparity in science (9–11), and that it “is not caused by discrimination in these domains” (10). This assertion has received substantial attention and generated significant debate among the scientific community, leading some to conclude that gender discrimination indeed does not exist nor contribute to the gender disparity within academic science (e.g., refs. 12 and 13).

Despite this controversy, experimental research testing for the presence and magnitude of gender discrimination in the biological and physical sciences has yet to be conducted. Although acknowledging that various lifestyle choices likely contribute to the gender imbalance in science (9–11), the present research is unique in investigating whether faculty gender bias exists within academic biological and physical sciences, and whether it might exert an independent effect on the gender disparity as students progress through the pipeline to careers in science. Specifically, the present experiment examined whether, given an equally qualified male and female student, science faculty members would show preferential evaluation and treatment of the male student to work in their laboratory. Although the correlational and related laboratory studies discussed below suggest that such bias is likely (contrary to previous arguments) (9–11), we know of no previous experiments that have tested for faculty bias against female students within academic science.

If faculty express gender biases, we are not suggesting that these biases are intentional or stem from a conscious desire to
investigating faculty bias
and mechanisms contributing to this bias

Hypotheses (verbatim from paper):

A  Science faculty's perception and treatment of students would reveal a gender bias favoring male students in perceptions of competence and hireability, salary conferral, and willingness to mentor

B  Faculty gender would not influence this gender bias

C  Hiring discrimination against the female student would be mediated (i.e., explained) by faculty perceptions that a female student is less competent than an identical male student

D  Participants' preexisting subtle bias against women would moderate (i.e., impact) results, such that subtle bias against women would be negatively related to evaluations of the female student, but unrelated to evaluations of the male student
the cover story

In the current phase of the study, we are interested in how undergraduate students’ are selected for competitive lab manager positions following their graduation and before they apply to doctoral programs. Lab managers are an important part of the scientific enterprise, but very little is know about how people weigh various factors and make the complicated decision to hire one lab manager from a pool of applicants.

To study this question, we have compiled and summarized information from actual applications of students who have recently applied to be lab managers at universities across the country. These students have volunteered to share their information in exchange for mentoring opportunities as part of their participation in the study. We have summarized their information by creating profiles for each applicant using a standardized form, in order to adjust for individual differences in application procedures and enable consistent evaluations across applicants.

Today, we will be assigning you to read the applicant profile of one randomly-selected student from the nationwide database. Please imagine that you are actually evaluating this student’s application to work in your own lab. After reading the applicant profile, you will be asked to provide your opinions of the student, and offer them feedback as they make decisions about moving forward with their career. These students come from fields where lab managers are typically students with research-focused career ambitions who work in these types of positions for several years before going on to graduate school. Even if your particular sub-field does not have such practices regarding lab managers, please evaluate the student within this context.

Remember, the national database we have created contains information both from very qualified students, as well as students who are less competitive. Thus, we ask that you be prepared to offer honest feedback to the student you are selected to read about, regardless of how qualified they are. Please do not hold back, and don’t be afraid to be truthful—the success of the current project depends upon your ability to provide honest, straightforward feedback.
THE COVER STORY

A picture of ‘slightly ambiguous competence’

Fig. S2. Lab manager application materials (female student condition). The only differences in the male student condition were that the name "Jennifer" was replaced with "John," and all female pronouns were replaced with male pronouns.

Moss-Racusin et al. www.pnas.org/cgi/content/short/1211286109

First name, gender, and pronouns change for male student, and nothing else.
the cover story
a picture of ‘slightly ambiguous competence’

STAYMENTS/LETTERS

Excerpt from student statement: “I am a motivated student and would make the most of the opportunity to serve as your lab manager. After spending a semester working in Dr. [redacted]'s lab and another year doing research with Dr. [redacted], I have gained valuable technical skills, co-authored a journal article, and am now committed to an academic research career...as someone focused on improving my standing and enhancing my research experience, this lab manager position would provide the perfect opportunity to hone the necessary skills to make me competitive for graduate school applications...additionally, the fascinating research taking place in your lab is directly in line with my interests and experiences...in short, I am focused, motivated, organized and dedicated to improving my research skills. I am enthusiastic about the opportunity to fill the lab manager position and collaborate with you on future research.”

Excerpt from faculty recommendation letter: “...although Jennifer admittedly took a bit longer than some students to get serious about her studies early in college, she has impressed me by improving over the last two years of her science coursework and has made every effort to make up for lost ground...she has been a strong research assistant in my lab, and I know she is capable of serving as a dedicated lab manager.”
what was requested from faculty?

- competence ratings (1–7, not at all–very much)
- hireability ratings (1–7, not at all likely–very likely)
- If you had to choose one of the following starting salaries for the applicant, what would it be? ($15000 to $50000 in steps of $5000)
- mentoring ratings (1–7, not at all likely–very likely): If you encountered this student at your own institution, how likely would you be to ...
  1. Encourage the applicant to stay in the field if he/she was considering changing majors?
  2. Encourage the applicant to continue to focus on research if he/she was considering switching focus to teaching?
  3. Give the applicant extra help if he/she was having trouble mastering a difficult concept?
- likability ratings (1–7, not at all likely–very likely)
- questionnaire measuring subtle, ‘modern’ sexism
## Modern Sexism Scale
measuring sexist attitudes beyond than outright hostility

### SWIM, AIKIN, HALL, AND HUNTER

#### Appendix B

**Items Developed to Measure Modern and Old-Fashioned Sexism**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Item</th>
</tr>
</thead>
</table>
| Old-Fashioned Sexism                 | 1. Women are generally not as smart as men.*<sup>a</sup>  
2. I would be equally comfortable having a woman as a boss as a man.  
3. It is more important to encourage boys than to encourage girls to participate in athletics.*  
4. Women are just as capable of thinking logically as men.  
5. When both parents are employed and their child gets sick at school, the school should call the mother rather than the father.* |
| Modern Sexism                        | 1. Discrimination against women is no longer a problem in the United States.<sup>b</sup>  
2. Women often miss out on good jobs due to sexual discrimination.  
3. It is rare to see women treated in a sexist manner on television.*  
4. On average, people in our society treat husbands and wives equally.*  
5. Society has reached the point where women and men have equal opportunities for achievement.*  
6. It is easy to understand the anger of women’s groups in America.*  
7. It is easy to understand why women’s groups are still concerned about societal limitations of women’s opportunities.  
8. Over the past few years, the government and news media have been showing more concern about the treatment of women than is warranted by women’s actual experiences.*<sup>c</sup> |

**Denial of continuing discrimination**

**Antagonism toward women’s demands**

**Resentment about special favors for women**

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**Note.** Items with an asterisk required reverse scoring.  
* Item was adapted from McConahay’s (1986) Modern Racism Scale.
results
relevant to hypothesis A

Fig. 1. Competence, hireability, and mentoring by student gender condition (collapsed across faculty gender). All student gender differences are significant ($P < 0.001$). Scales range from 1 to 7, with higher numbers reflecting a greater extent of each variable. Error bars represent SEs. $n_{\text{male student condition}} = 63$, $n_{\text{female student condition}} = 64$. 
results
relevant to hypothesis A

Fig. 2. Salary conferral by student gender condition (collapsed across faculty gender). The student gender difference is significant ($P < 0.01$). The scale ranges from $15,000$ to $50,000$. Error bars represent SEs. $n_{\text{male student condition}} = 63$, $n_{\text{female student condition}} = 64$. 
Table 1. Means for student competence, hireability, mentoring and salary conferral by student gender condition and faculty gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male target student</th>
<th>Female target student</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male faculty</td>
<td>Female faculty</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Competence</td>
<td>4.01_a</td>
<td>(0.92)</td>
</tr>
<tr>
<td>Hireability</td>
<td>3.74_a</td>
<td>(1.24)</td>
</tr>
<tr>
<td>Mentoring</td>
<td>4.74_a</td>
<td>(1.11)</td>
</tr>
<tr>
<td>Salary</td>
<td>30,520.83_a</td>
<td>(5,764.86)</td>
</tr>
</tbody>
</table>

Scales for competence, hireability, and mentoring range from 1 to 7, with higher numbers reflecting a greater extent of each variable. The scale for salary conferral ranges from $15,000 to $50,000. Means with different subscripts within each row differ significantly ($P < 0.05$). Effect sizes (Cohen’s $d$) represent target student gender differences (no faculty gender differences were significant, all $P > 0.14$). Positive effect sizes favor male students. Conventional small, medium, and large effect sizes for $d$ are 0.20, 0.50, and 0.80, respectively (51). $n_{\text{male student condition}} = 63$, $n_{\text{female student condition}} = 64$. ***$P < 0.001$. 

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**Results**

relevant to hypotheses A and B
Finally, using a previously validated scale, we also measured how much faculty participants liked the student (see SI Materials and Methods). Student gender difference hiring mediation. Values are standardized regression coefficients. The value in parentheses reflects a bivariate analysis. The dashed line represents the mediated path. The composite student competence variable consists of the averaged standardized salary variable and the competence scale items. Student gender is coded such that male = 0, female = 1. \( n_{\text{male student condition}} = 63, n_{\text{female student condition}} = 64. \)

***\( p < 0.001. \)

**Fig. 3.** Student gender difference hiring mediation. Values are standardized regression coefficients. The value in parentheses reflects a bivariate analysis. The dashed line represents the mediated path. The composite student competence variable consists of the averaged standardized salary variable and the competence scale items. Student gender is coded such that male = 0, female = 1. \( n_{\text{male student condition}} = 63, n_{\text{female student condition}} = 64. \)

***\( p < 0.001. \)
Results

Results of multiple regression analyses indicated that participants’ preexisting subtle bias against women significantly interacted with student gender to predict perceptions of student composite competence ($\beta = -0.39, P < 0.01$), hireability ($\beta = -0.31, P < 0.05$), and mentoring ($\beta = -0.55, P < 0.001$). To interpret these significant interactions, we examined the simple effects separately by student gender. Results revealed that the more preexisting subtle bias participants exhibited against women, the less composite competence ($\beta = -0.36, P < 0.01$) and hireability ($\beta = -0.39, P < 0.01$) they perceived in the female student, and the less mentoring ($\beta = -0.53, P < 0.001$) they were willing to offer her. In contrast, faculty participants’ levels of preexisting subtle bias against women were unrelated to the perceptions of the male student’s composite competence ($\beta = 0.16, P = 0.22$) and hireability ($\beta = 0.07, P = 0.59$), and the amount of mentoring ($\beta = 0.22, P = 0.09$) they were willing to offer him. [Although this effect is marginally significant, its direction suggests that faculty participants’ preexisting subtle bias against women may actually have made them more inclined to mentor the male student relative to the female student (although this effect should be interpreted with caution because of its marginal significance).] Thus, it appears that faculty partic-
discussion

The results presented here reinforce those of Stenpries, Anders, and Ritzke (40), the only other experiment we know of that recruited faculty participants. Because this previous experiment also indicated bias within academic science, its results raised serious concerns about the potential for faculty bias within the biological and physical sciences, casting further doubt on assertions (based on correlational data) that such biases do not exist (9–11). In the Steinpreis et al. experiment, psychologists were more likely to hire a psychology faculty job applicant when the applicant’s curriculum vitae was assigned a male (rather than female) name (40). This previous work invited a study that would extend the finding to faculty in the biological and physical sciences and to reactions to undergraduates, whose competence was not already fairly established by accomplishments associated with the advanced career status of the faculty target group of the previous study. By providing this unique investigation of faculty bias against female students in biological and physical sciences, the present study extends past work to a critical early career stage, and to fields where women’s underrepresentation remains stark (2–4).

Indeed, our findings raise concerns about the extent to which negative predoctoral experiences may shape women’s subsequent decisions about persistence and career specialization.
If women’s decisions to leave science fields when or before they reach the faculty level are influenced by unequal treatment by undergraduate advisors, then existing efforts to create more flexible work settings (42) or increase women’s identification with science (27) may not fully alleviate a critical underlying problem. Our results suggest that academic policies and mentoring interventions targeting undergraduate advisors could contribute to reducing the gender disparity. Future research should evaluate the efficacy of educating faculty and students about the existence and impact of bias within academia, an approach that has reduced racial bias among students (43). Educational efforts might address research on factors that attenuate gender bias in real-world settings, such as increasing women’s self-monitoring (44). Our results also point to the importance of establishing objective, transparent student evaluation and admissions criteria to guard against observers’ tendency to unintentionally use different standards when assessing women relative to men (45, 46). Without such actions, faculty bias against
discussion

some follow-up questions

- any particularly surprising results?
- do people identify with these results from personal experience?
- any hypotheses as to why women were likelier to be judged both as less competent and as less mentorable?
- how to fill in the gaps between this study and Steinpreis et al?
  - other evaluations in pre-doctoral years—graduate admissions? awards/fellowships?
  - what about post-doctoral years—postdoc hiring? effects beyond academia?
- thoughts on suggestions in paper?
  - what specific actions targeting undergraduate advisors would help?
  - how to attenuate gender bias when evaluation is remote?