Clarity and structure as attenuators of inequities in the context of diversity

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WOMEN IN SCIENCE

Expectations of brilliance underlie gender distributions across academic disciplines

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The gender imbalance in STEM subjects dominates current debates about women's underrepresentation in academia. However, women are well represented at the Ph.D. level in some sciences and poorly represented in some humanities (e.g., in 2011, 54% of U.S. Ph.D.'s in molecular biology were women versus only 31% in philosophy). We hypothesize that, across the academic spectrum, women are underrepresented in fields whose practitioners believe that raw, innate talent is the main requirement for success, because women are stereotyped as not possessing such talent. This hypothesis extends to African Americans' underrepresentation as well, as this group is subject to similar stereotypes. Results from a nationwide survey of academics support our hypothesis (termed the field-specific ability beliefs hypothesis) over three competing hypotheses.

Laboratory, observational, and historical evidence reveals pervasive cultural associations linking men but not women with raw intellectual talent (*1*–*4*). Given these ambient stereotypes, women may be underrepresented in academic disciplines that are thought to require such inherent aptitude. We term this the field-specific ability beliefs hypothesis (fig. S1).

Current discourse about women in academia focuses mainly on women's underrepresentation in (natural) science, technology, engineering, and mathematics (STEM) (*5*). However, STEM disciplines vary in their female representation (fig. S2) (*5*, *6*). Recently, women have earned approximately half of all Ph.D.'s in molecular

Individuals' beliefs about what is required for success in an activity vary in their emphasis on fixed, innate talent (*9*). Similarly, practitioners of different disciplines may vary in the extent to which they believe that success in their discipline requires such talent. Because women are often negatively stereotyped on this dimension (*1*–*4*), they may find the academic fields that emphasize such talent to be inhospitable. There are several mechanisms by which these field-specific ability beliefs might influence women's participation. The practitioners of disciplines that emphasize raw aptitude may doubt that women possess this sort of aptitude and may therefore exhibit biases against them (*10*). The emphasis on raw ap-

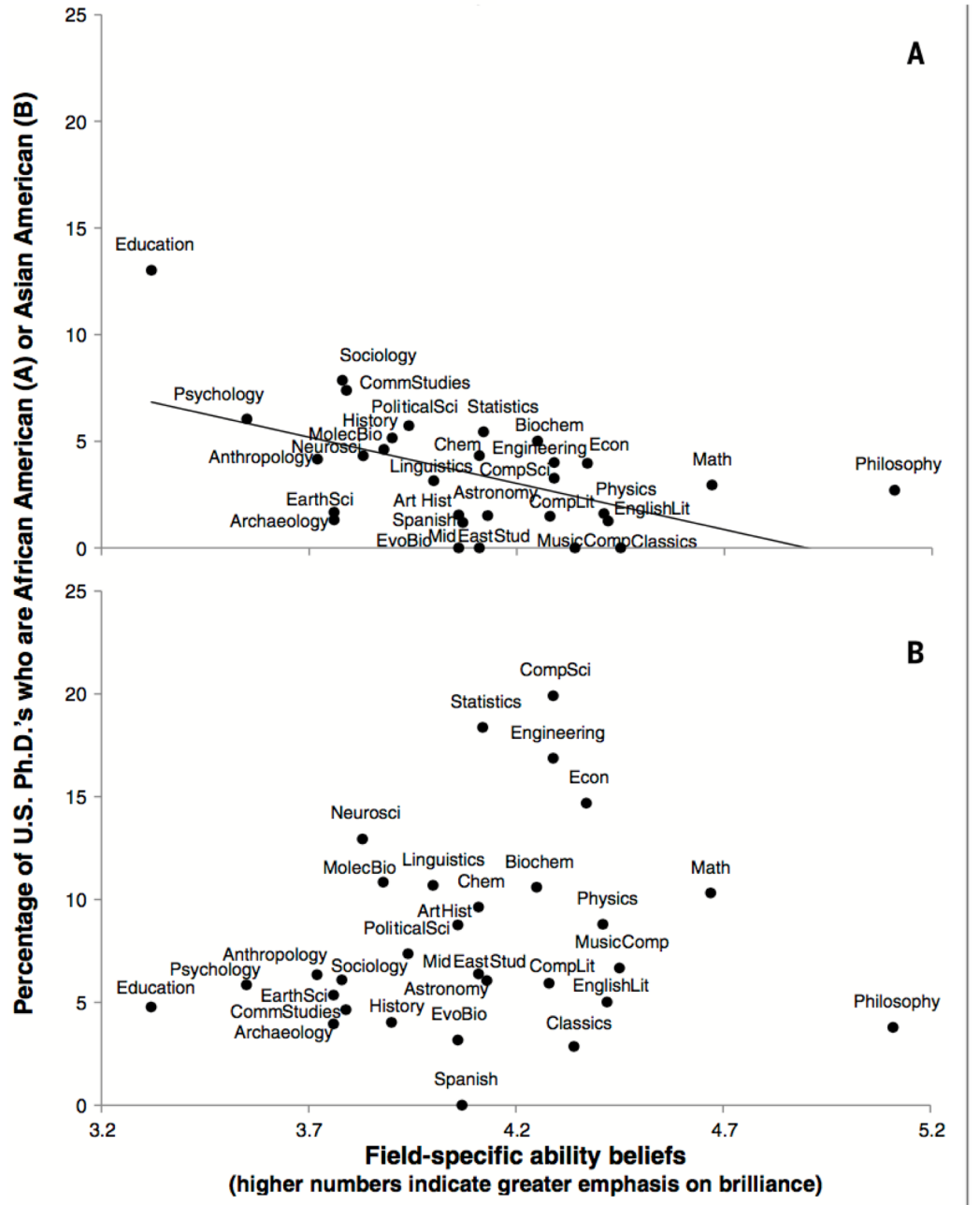
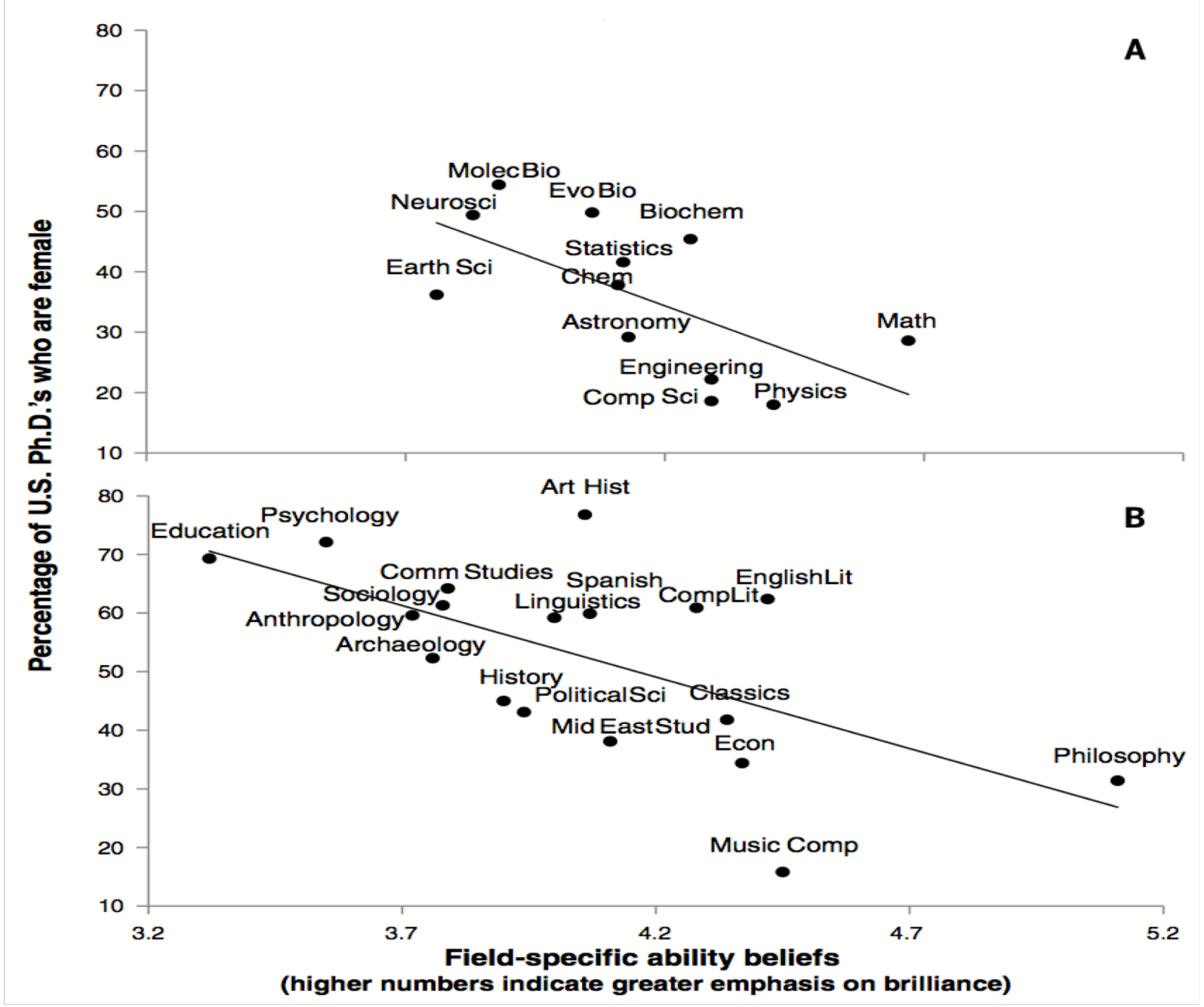
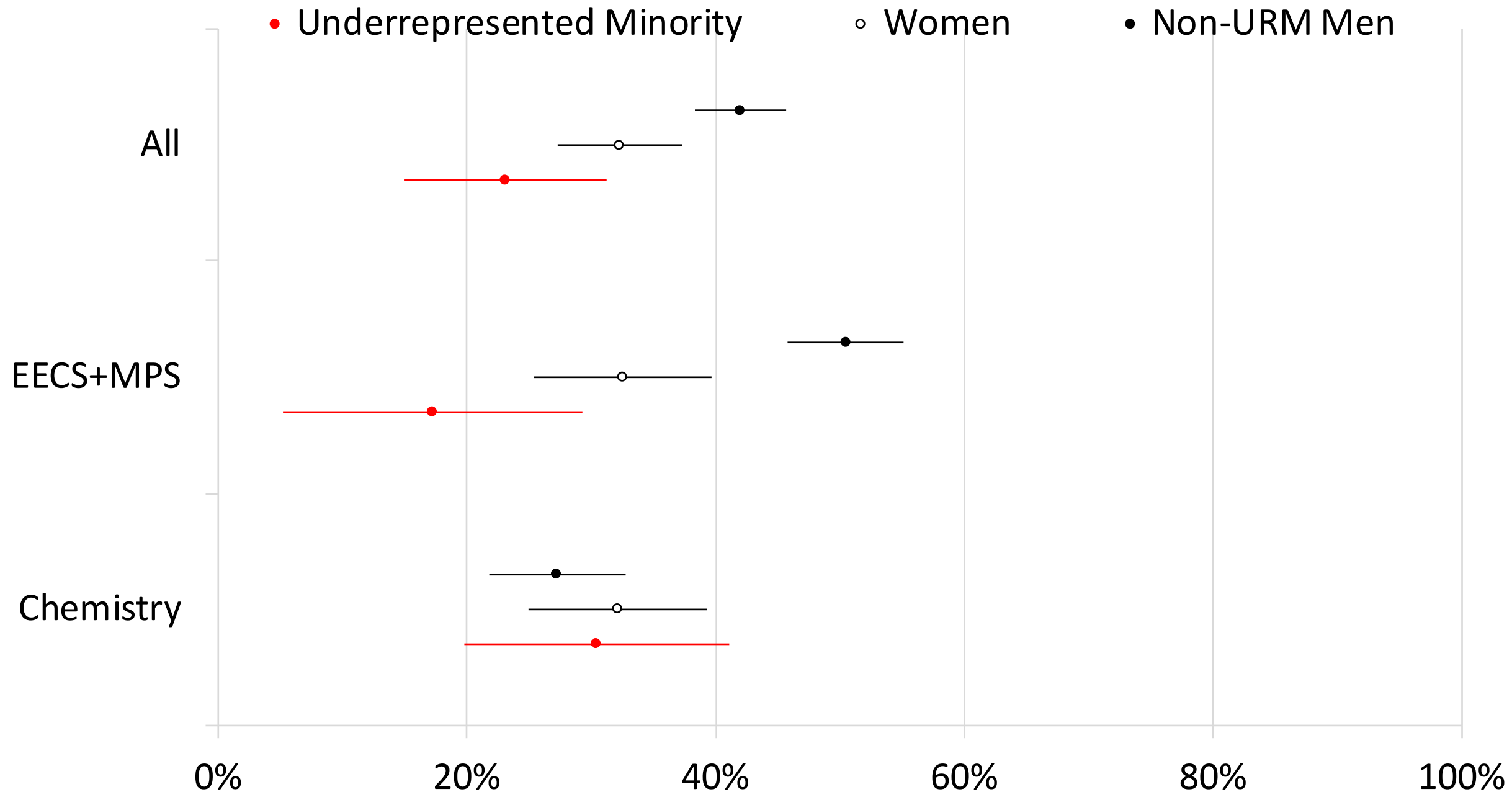


Fig. 2. Field-specific ability beliefs and the percentage of 2011 U.S. Ph.D.'s who are (A) African American and (B) Asian American.



Leslie, Cimpian, Meyer, & Freeland, 2015

Mendoza-Denton, Patt, Fisher, Eppig, Young, Smith, & Richards (2017), *PLoS One*



- Statistical controls:
  - Time in PhD program
  - Research Assistantships
  - Teaching Assistantships
  - Fellowships

- But..
  - Snapshot survey
  - Limited sample

PhD Exit Survey

(1998-2013)

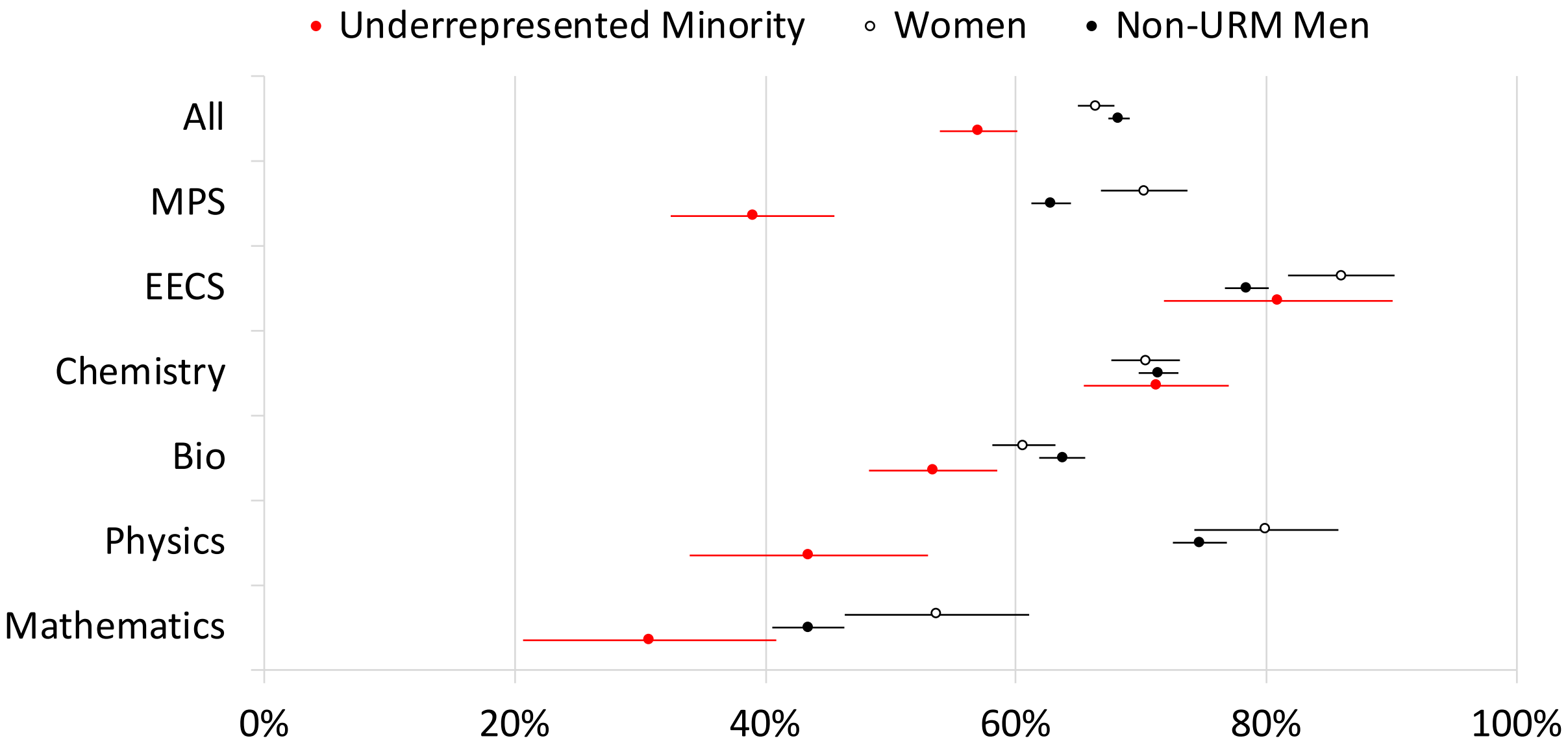
Mendoza-Denton, Patt, Fisher, Eppig, Young, Smith, & Richards (2017), *PLoS One*

Respondent Headcount: PhD Exit Survey

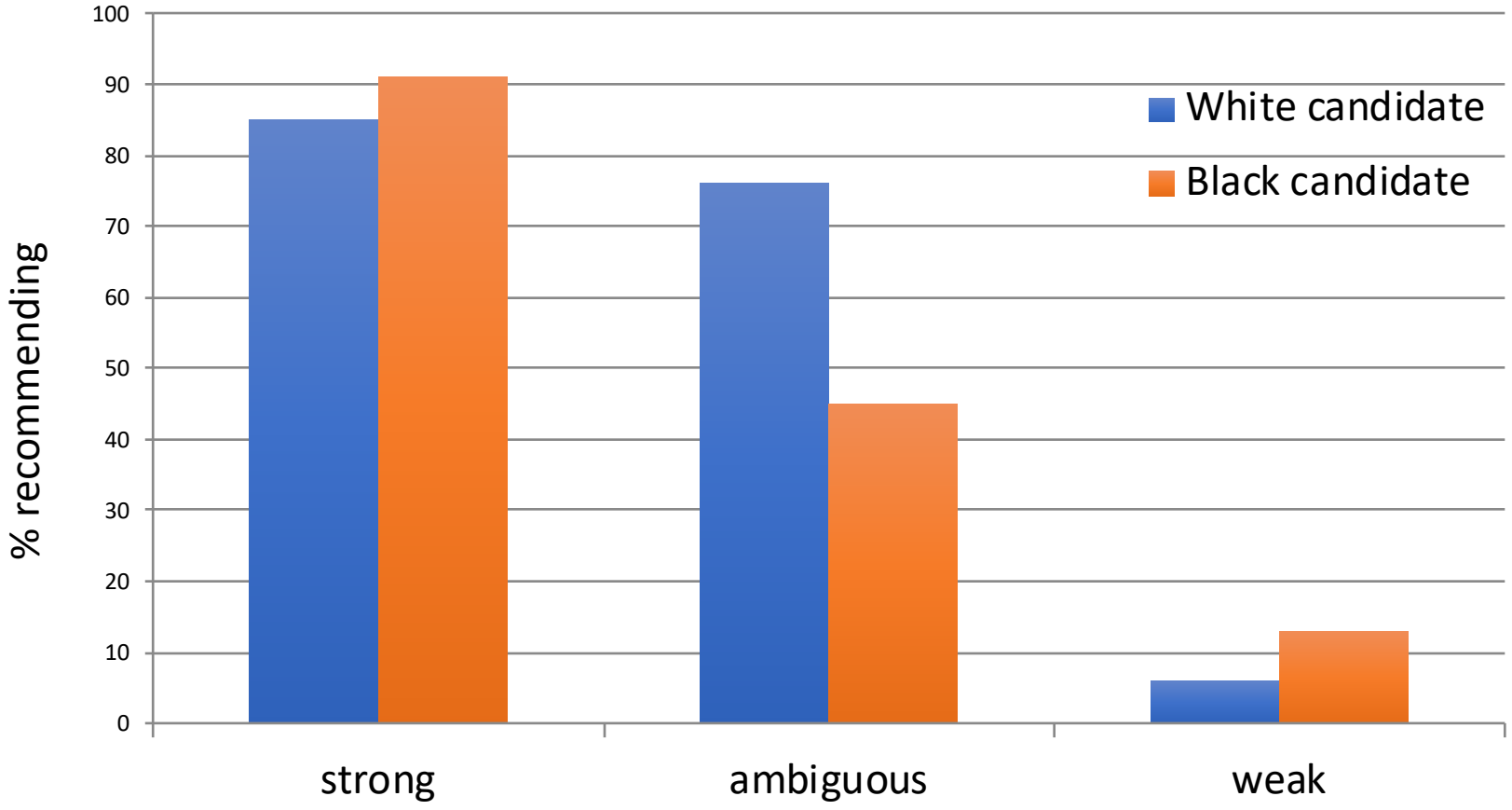
Division	Total	Non-URM Men	Women	URM
Bio	1,563	690	812	103
Chemistry	1,273	814	415	66
EECS	692	559	107	22
MPS	1,242	939	244	59
Mathematics	377	298	55	26
Physics	502	408	65	23
All	4,770	3,002	1,578	250

Mendoza-Denton, Patt, Fisher, Eppig, Young, Smith, & Richards (2017), *PLoS One*

Fig. 2. Papers presented at national scholarly meetings (Ph.D. exit survey). Note: Error bars represent ±1 SE.



Percentage of people recommending a job candidate for hire based on candidate race and strength of resume



Dovidio & Gaertner, 2000

PhD students, postdocs and professors, and looking for patterns, has also proven valuable, as have institution-wide or department-wide surveys about student and staff experiences.

The only validated tool we know of in this area is the Survey of Organizational Research Climate (SOURCE). It assesses seven dimensions, including integrity norms, adviser–advisee relations and departmental expectations. Results correlate with self-reported rates of detrimental research practices: institutions with low scores of integrity norms will also tend to have higher levels of reported fraud and sloppy record keeping[6].

The survey can be done online in 15 minutes, and responses are aggregated to ensure individual confidentiality but still show differences across groups. That can help to identify both pockets of good practice and areas needing improvement. One large institution in the midwestern United States has used results to prompt faculty members within specific departments to talk more with graduate students about authorship, peer review and data management.

As well as being used to compare departments across an institution, the results can be compared against anonymous benchmarking data aggregated by the National Center for Professional and Research Ethics at the University of Illinois at Urbana-Champaign (which C.K.G. runs). Now no one can retort, "well, all departments in our field are that way".

The management literature is clear that one powerful way to bring systemic organizational change is to find 'bright spots' — systems or places in an organization that are working well — study them and seek to spread their successful practices. For that, we need data on where the bright spots are, and the will to act.

The solutions are straightforward, if not necessarily simple. ■

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ILLUSTRATION BY DAVID PARKINS

Go beyond bias training

Ambiguity in expectations and evaluations harms progress, say **Rodolfo Mendoza-Denton** and colleagues.

One morning in February 1934, the police showed up at J. Robert Oppenheimer's home in Berkeley, California, to ask why he had left his date in a car by herself all night. Oppenheimer explained that he had gone for a stroll, got lost in his thoughts and walked home, forgetting his car and companion.

Newspapers reporting this story for Valentine's Day revelled in tales of the absent-minded professor, an archetype that most of us recognize. Brilliant, but short on social graces, such thinkers are assumed to be too busy pondering the deepest questions of the Universe to be ▶