

Deep Biases Prevent Diverse Talent from Advancing

A new study indicates that underrepresented students in science-related fields are innovating at high rates—but not reaping commensurate rewards.



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By [Korena Di Roma Howley](#) © 3 June 2020

Does groundbreaking scientific work lead to a successful academic career? According to a recent study, it may depend on your race or gender.

If diversity in science leads to innovation and innovation leads to career success, then it should follow that

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students from diverse backgrounds will have successful careers. A new study, however, finds the opposite is true. In fact, it shows that although underrepresented scholars in science-related fields are more likely to innovate, they're also less likely than their majority-group peers to earn influential academic positions—what the authors call a diversity-innovation paradox.

How to explain it? The study, published in the *Proceedings of the National Academy of Sciences of the United States of America*

(<https://www.pnas.org/content/117/17/9284>), posits that the work of students from traditionally underrepresented groups is discounted and devalued, preventing their contributions, however potentially impactful, from finding traction in the scientific community.

“What we find that partially explains the devaluation is that underrepresented groups introduce ideas that... perhaps bring concepts together that are more distal from one another,” said study colead [Bas Hofstra](https://www.bashofstra.com/) (a postdoctoral research fellow at the Stanford University [Graduate School of Education](https://ed.stanford.edu/)). “That’s somewhat suggestive that these ideas are difficult to parse and difficult to place, and maybe the majority has a disproportionate say in which ideas are useful.”

A Striking Result

To reach their conclusions, Hofstra and his coauthors looked at a near-complete record of Ph.D. theses published in the United States between 1977 and 2015. Analyzing data such as names, institutions, thesis titles, and abstracts, they determined whether students belonged to an underrepresented group and whether they introduced novel concepts in their fields. Researchers then looked at the theses authors’ career trajectories, searching specifically for continued careers in academic research.

What researchers found was that the less likely a student’s gender and racial groups were to be represented in their field, the more likely they were to introduce novel conceptual linkages in their work.

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What researchers found was that the less likely a student's racial and gender groups were to be represented in their field—for instance, a woman in a predominantly male field or an African American in a predominantly white field—the more likely they were to introduce novel conceptual linkages, defined by the authors as having first linked meaningful concepts in a thesis. According to the study, this higher rate of innovation is a result of the unique perspectives and experiences brought by these individuals, who “often draw relations between ideas and concepts that have been traditionally missed or ignored.”

However, these students were also less likely to have their novel concepts adopted by their peers, with analysis suggesting that overall, nonwhite men and women and white women innovate at higher rates than white men, but the innovations of white men go on to have a higher impact.

Lisa White (<https://ucmp.berkeley.edu/people/lisa-white/>), director of education and outreach at the University of California Museum of Paleontology (<https://ucmp.berkeley.edu/>), chair of AGU's Diversity and Inclusion Advisory Committee (<https://www.agu.org/Learn-About-AGU/About-AGU/Governance/Committees/Diversity-Committee>), and the Eos Science Adviser for Diversity and Inclusion (<https://eos.org/science-advisers/lisa-d-white>), called the study “striking” and said the science community should continue to learn from work like this.

“What struck me the most was just how deep the biases continue to run in professional circles... preventing underrepresented students from advancing,” said White, who was not involved in the study. “There really has to be more attention paid to how we're addressing biases in the way we evaluate research quality and potential for career success.”

Evaluating Careers in Science

Hofstra said many institutions are working to increase diversity and equality in science even while the study shows that a significant portion of scientific discovery is guided by biases that align with gender and racial signals. “Being aware and actually pinpointing when and where these biases creep into the evaluation of science is a first step, or at least an additional step, to try and correct [the paradox],” he said.

The study looks specifically at whether scholars have gone on to successful academic careers, for instance, whether they've become a research faculty member or continued to be a research-active scientist. White said that although she acknowledges that individuals in research-intensive positions at labs and universities are pushing the envelope in science, it's worth noting that many Ph.D. students have successful careers outside of research and academia.

“There are plenty of underrepresented individuals who go on to great careers in science,” White said. “They may be at universities or in professional appointments that perhaps don't garner as much high-profile attention....And [the students] don't see that at all as an alternative path or second choice.”

It's Going to Take More

Fewer underrepresented identities in positions of leadership and influence mean fewer role models for underrepresented students.

Although the loss of individual contributions to science and continued research by promising Ph.D. students is a clear outcome of the diversity-innovation paradox, the disparity also has broader implications for the science education community. Fewer underrepresented identities in positions of leadership and influence, for instance, mean fewer role models for underrepresented students, whose numbers in degree programs have been increasing (<https://www.aacu.org/aacu-news/newsletter/2019/march/facts-figures>). According to the American Council on Education (<https://www.higheredtoday.org/2019/01/07/increasing-representation-underrepresented-groups-among-stem-faculty-members/>) (ACE), in fall 2018 women made up 51% of undergraduate science, technology, engineering, and mathematics (STEM) majors but less than a quarter of STEM faculty members.

For underrepresented students, seeing fewer role models in faculty and high-level administration may be among the barriers they face to success in degree programs. ACE cites research showing that women who have role models perform better in math and science

(<https://pdfs.semanticscholar.org/e7c1/ec1f75f97bce1006b71e7d95651261a86809.pdf>), and women science majors who see female STEM professors as role models

(https://www.researchgate.net/publication/258181938_The_Influence_of_Female_Role_Models_on_Women's_Implicit_Science_Cognitions), can better envision themselves in a similar career.

“If you don’t identify with scholars and if their intellectual pursuits aren’t related to yours, then that can be quite a barrier,” said study colead Daniel A. McFarland (<https://www.gsb.stanford.edu/faculty-research/faculty/daniel-mcfarland>), a professor of education at Stanford’s Graduate School of Education.

“If [underrepresented students] are not able to find support,” Hofstra added, and “if they’re not able to find a mentorship, then that entry point from doctorate to faculty or research position becomes particularly hard.”

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McFarland said that although the scientific enterprise is greatly strengthened by consensus and established standards, those same aspects can hide biases. “Societies and communities have biases, and certain groups are more represented in their opinions than others,” he said. “Science is no different, and we have to be vigilant there. I think science’s great advantage is that it continually questions and interrogates things, and this same interrogation can be applied to the scientific enterprise itself. By

recognizing bias and constantly trying to rectify it, science will only improve. We just want to speed up and assist in that process.”

Although certain positive steps are being taken to diversify faculty—such as training hiring committees on implicit bias and requiring diversity and inclusion statements on applications—White said it’s not enough and that administrators at leading universities need to continue to put pressure on hiring committees.

“It’s going to take much more,” White said. “A university may make a great hire or couple of hires...and then they may pause because they think they’ve achieved some progress, [but] we can’t relax on this at all. When people in leadership positions continue to misjudge and undervalue how innovative people of color can be in science, there are consequential outcomes.”

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