

Research reveals a gender gap in the nation's biology labs

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Among the sciences, biology consistently attracts the greatest numbers of women to graduate school and academic careers. About half of all biology graduate students are women, and 40 percent of biology postdocs are female. However, those numbers drop dramatically among faculty members: Nationwide, only 36 percent of assistant professors and 18 percent of full professors are women.

A new study reveals a possible explanation for this discrepancy: In the labs of the highest-achieving male biology professors—winners of the Nobel Prize, the National Medal of Science, and other prestigious awards—women are greatly underrepresented, compared with their overall percentages in the field. Those labs serve as a major pipeline to junior faculty positions at top research institutions, the study found.

"What we found is that these labs really function as a gateway to the professoriate. So we think the fact that they're not hiring very many women is important for understanding why there are still so few female [faculty members](#)," says Jason Sheltzer, a graduate student in biology at MIT and author of the study, which appears this week in the *Proceedings of the National Academy of Sciences*.

Bringing attention to this imbalance offers an opportunity for faculty members and institutions to try to remedy the situation, says Angelika Amon, the Kathleen and Curtis Marble Professor in Cancer Research in MIT's Department of Biology, who is Sheltzer's PhD thesis advisor but was not involved in this study.

"Once you know what the problem is, you can actually do something about it. It's a great opportunity for these highly accomplished scientists to really reach out and make a very conscious effort to do something about the gender landscape of science at high-powered research institutions," Amon says. "A large segment of the population is being excluded from doing high-level research, and that can never be a good thing. We're losing out on bright and intelligent people."

'A very different picture'

Sheltzer and the paper's other author, Joan Smith, a software engineer and 2013 MIT graduate, studied the nation's top 24 biology research institutions, as ranked by U.S. News and World Report. They focused on

programs such as cell biology, molecular biology, genetics, and biochemistry, which typically attract many women. From individual lab web sites or departmental directories, they were able to determine the number of male and female postdocs and [grad students](#) in the labs of 2,062 faculty members.

In labs run by female professors, women made up 53 percent of grad students and 46 percent of postdocs. Labs run by men had 47 percent female grad students and 36 percent female postdocs.

These gender differences became much more striking when the researchers analyzed the numbers from the labs of "elite" faculty members, which included members of the National Academy of Sciences, Howard Hughes Medical Institute (HHMI) investigators, and winners of seven different major research awards, including the Nobel Prize.

In the labs of male Nobel laureates, male grad students outnumbered female grad students by two to one, and male postdocs outnumbered female postdocs by more than three to one. In the labs of male HHMI investigators, only 31 percent of postdocs were female, compared with 38 percent for all other male professors.

"Looking at this small subset of labs, you get a very different picture than you do when you look at the field as a whole," Sheltzer says.

However, Sheltzer and Smith found no such imbalances in labs run by elite female faculty members. Female HHMI investigators ran labs with 48 percent female postdocs, compared with 46 percent in labs run by other female scientists.

The study did not explore the reasons for these discrepancies, but Sheltzer offers some possible explanations. "There is a chance that self-

selection among female students plays a role—maybe there are fewer applications to these labs from women. In addition to that, there could be conscious or unconscious gender bias on the part of male faculty members, which makes them more reluctant to hire women," he says.

The application process for grad students or postdocs to work in a particular lab is informal: Usually an applicant emails the lab's principal investigator to inquire about openings, and there are no official records of how many people apply to work in a particular lab. Analyzing this application process more closely might help institutions figure out whether they should devote more effort to making labs more welcoming to female scientists and recruiting women more actively, the researchers say.

Explaining the leaky pipeline

Between 1969 and 2009, the percentage of doctoral degrees awarded to women in the life sciences grew from 15 percent to 52 percent, but women still lag when it comes to faculty appointments. The MIT team believes the new study helps to explain this attrition, known as the "leaky pipeline" problem.

Labs run by high-achieving professors usually have more funding available, more high-profile publications, and better connections with other top researchers, all of which can help young scientists from those labs when applying for scarce faculty positions. At top research institutions, there are typically dozens or even hundreds of applicants for every tenure-track faculty opening.

In this study, the researchers analyzed the employment history of 311 of the assistant professors working at the top 24 [research institutions](#). Of these, 144 had completed a postdoctoral fellowship in one of the labs the researchers surveyed. The researchers found that the principal

investigators of the "feeder" labs that produced these top job candidates were much more likely to have markers of elite status. For example, while only 13 percent of the total labs were run by National Academy of Science members, 58 percent of feeder labs were run by those individuals. Overall, the feeder labs employed 14 percent fewer female postdocs than nonfeeder labs.

More information: Elite male faculty in the life sciences employ fewer women, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1403334111

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