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People still see science as a man's game.

Science still seen as male profession, according to international study of gender bias

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Close your eyes and imagine a scientist: peering into a telescope, flicking a glass vial in a lab, or sitting at a computer typing out a grant proposal. Did you picture a man or a woman? The answer depends on where you live, according to a new study. Researchers have found that people in some countries are much more likely to view science as a male profession, with the Netherlands coming in at the top of the list. Regardless of location, though, the stereotype persists that science is for men.

“Stereotypes associating science with men are found across the world, even in supposedly gender-equal nations,” says the study’s lead author, David Miller, a psychologist at Northwestern University in Evanston, Illinois.

Although all countries exhibited these stereotypes, those with fewer women in science held stronger beliefs that science is for men, the authors found. This trend holds true for both explicit beliefs, as measured by responses to a statement about associating science with men or women, and implicit associations, determined by a computerized test that probes subconscious associations between science and gender. The study, [now available online \(http://d-miller.github.io/assets/MillerEaglyLinn2015.pdf\)](http://d-miller.github.io/assets/MillerEaglyLinn2015.pdf), will be published this fall in the *Journal of Educational Psychology*. If you want to look at the data more closely yourself, you can check out this [interactive table \(http://d-miller.github.io/Stereotypes-Table/\)](http://d-miller.github.io/Stereotypes-Table/) on Miller’s website.

The researchers collected data from about 350,000 self-selecting participants from 66 countries who chose to complete an online, publicly available association test. Volunteers did not need to meet specific criteria, but they provided some demographic information as part of the task. About 60% were women, the average age was 27 years old, and 79% had at least some college experience.

The test measured explicit bias by asking participants to answer “how much you associate science with males or females,” with responses ranging from “strongly male” through “neither male nor female” to “strongly female.” Overall, the responses reflected relatively strong associations of science with men rather than women. Countries where this association was strongest included South Africa and Japan. The United States ranked in the middle, with a score similar to Austria, Mexico, and Brazil. Portugal, Spain, and Canada were among the countries where the explicit bias was weakest.

To measure implicit bias, respondents completed a computerized task called the implicit association test. Here, they were asked to categorize 30 words, such as “mother,” “uncle,” “philosophy,” and “biology” as “male,” “female,” “science,” or “liberal arts” as quickly as they could. In some cases, participants were told to push the same keyboard key for “male” and “science” words, and a second key for “female” and “liberal arts.” In other cases, the pairs were reversed so that one key signified “male” and “liberal arts” and the other “female” and “science.” The relative response times are believed to reflect implicit bias: Participants will complete the task more quickly if the paired items “match” according to

stereotypes. Some critique this method as flawed, but it has been widely used, and many scientists say it provides useful insight into implicit biases that are difficult to measure.

In this study, participants on average completed the task more quickly when “science” was paired with “male” rather than “female,” reflecting the implicit bias that science is for men. Denmark, Switzerland, Belgium, and Sweden were among the countries with the highest implicit bias scores. The United States again came in at the middle of the pack, scoring similarly to Singapore. Portugal, Spain, and Mexico had among the lowest implicit bias scores, though the respondents still associated science more with men than with women.

Both the explicit and implicit biases correlated with the percentage of female undergraduates majoring in science in that person’s country. In the Netherlands, for example, where both bias measures were quite high, only 20.2% of science majors are women, the lowest percentage of all the nations in the study. (Denmark and Switzerland also showed fairly strong implicit and explicit biases against women, and relatively low percentages of female undergraduates majoring in science.) Argentina, where 48% of science majors are women, had among the lowest explicit and implicit bias against women in science—although the bias was still present. In the United States, 43% of science majors are women.

The authors were able to rule out 25 other factors they thought might contribute to differences in the strength of the biases in different countries, including a country’s overall gender equity, the prevalence of science in that country, and the region of the world where it resides. “It is especially useful to see that these relationships are not merely attributable to national variation in gender equality more generally,” writes psychologist Toni Schmader of University of British Columbia, Vancouver, in an e-mail to *Science*.

The huge unanswered question is why? It could be that beliefs about the role of women in science change as more women enter science, that more women enter science when these beliefs change, or a combination. Miller thinks it’s more likely that increased female representation in science influences beliefs rather than the other way around. Schmader, though, thinks the effect likely goes in both directions.

Miller says his results offer a reason for optimism about the possibility of changing

stereotypes about women in science around the world. However, the persistence of the stereotype that science is for men, even in countries like Argentina that have achieved a relatively high representation of women in science, shows that more work needs to be done to change that belief, he says. Apparently, observing female scientists isn't enough to change these persistent stereotypes. To further push against them, Miller proposes integrating discussion of diverse female scientists into science curriculums "so it's not seen as atypical to discuss a woman scientist."

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