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Editorial

Women Advancing Science

In his much-acclaimed best seller "The World is Flat," Thomas L. Friedman warned that America is slipping further behind China and India in producing scientists and engineers at the peril of the innovation and productivity of our nation. A recent report from the National Academies, *Beyond Bias and Barriers*, provides a very direct solution to this conundrum. American science needs more talent and that talent is readily available in a legion of well-trained but greatly underutilized scientists and engineers who happen to be women. The good news is that a few significant changes in the academic system could stem the loss of these women, thereby fortifying our scientific leadership.

The lack of women among the ranks of the country's university science professors is not due to biological differences between the sexes. There are many genetically determined differences between men and women, but differences in innate ability cannot explain women's low representation in the leadership of science. Women faculty continue to be outnumbered by men even in scientific disciplines in which women have received as many doctoral degrees as men for many years. In some other scientific disciplines, women's representation on the faculty has increased 30-fold in the last 25 years, a rate too rapid to be explained by changes in genetics of the population, illustrating that women have the ability to perform and the capacity to endure the rigors of academic science as opportunities open to them. Collectively, the report's findings provide indisputable evidence that social factors, not aptitude or interest, are powerful drivers of the gender composition of the scientific leadership of the academy.

Why are there so many women who excel in science and choose to invest years of their lives in hard, frequently unrewarding work to attain advanced education in science, but so few in academic positions? The Academy committee concludes in *Beyond Bias and Barriers* that a combination of unconscious biases held by both men and women as well as archaic university structures limits the participation of women in academic science.

Unconscious, inadvertent bias often clouds people's perceptions and judgment. Randomized, controlled studies show that when both male and female evaluators are asked to evaluate job applications, they will give the applicant a lower rating and be less likely to hire the person if they are told that the applicant is a woman than if they are told the applicant is a man. Similar outcomes are evident when evaluators are asked to review candidates for raises, promotions, or leadership positions. The biases are most evident when the job under consideration is in a male-dominated field, which may explain the slower advancement of women in science than in other academic fields. Studies show the same type of prejudice toward members of certain racial minority groups, which likely contributes to the bleak picture for minority women. For example, in 2002 there were no African American, Hispanic or Native American women in faculty positions in the nation's top 50 computer science departments. Both unconscious and deliberate prejudice also contribute to a chilly climate in many science departments. Women, more often than men, feel excluded from decision-making in their departments and from scientific discourse with colleagues. The cumulative effect of repeated exclusion can reduce productivity and cause women to leave academic positions.

Institutional barriers such as the tenure system further augment the difference in men's and women's access to faculty positions. Candidates must establish well-funded, innovative research programs, demonstrate their teaching abilities, and contribute to their universities through service, all within seven years. This is a tall order for all scientists, but it is a Promethean task for those who have young children or care of other family members during this same period of life. Since women continue to shoulder a disproportionate share of family responsibilities, the collision between the tenure system and family life affects women far more than men.

The recommendations of the Academy's report are simple. Educating the academic community about the insidious role of unconscious bias in decision-making could substantially reduce the application of that bias. Department chairs can be trained to improve the climate for women faculty, which may require simply using inclusive practices for decision-making and communicating. Lengthening the time to tenure, ensuring that research funding does not lapse because of child bearing, and making lactation rooms, child care, and flexible work schedules readily available will ensure that both men and women can meld careers with family life.

The report makes the straightforward but nevertheless bold assertion that the government should enforce equal protection laws such as Title IX as vigorously for science

as it does for intercollegiate athletics. This is not a recommendation about special opportunities or treatment; it is an effort to level the playing field and give women the same access to positions in academic science that men have always enjoyed.

The simplicity of the message in the Academy report is both reassuring and inspiring. American science needs more brainpower and now we just have to make sure that we access that talent. Otherwise, Tom Friedman's ominous warning may well come true.

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