Why Are We Still Worried about Women in Science?

We still haven’t solved the problems that kept women out of science decades ago
By Sue V. Rosser and Mark Zachary Taylor

Related Tables

Percentage of Degrees Received by Women in 2004 by Major Discipline and Group

Percentage of Women Doctoral Scientists and Engineers in Academic Institutions by Field and Rank in 2003

On January 14, 2005, Sue Rosser, one of this article’s co-authors, was an invited speaker at a conference of the National Bureau of Economic Research at Harvard University. The same day, economist Lawrence Summers, who was then Harvard’s president, delivered his now-infamous speech to the conference about why elite institutions have so few tenured women scientists and engineers on their faculties. His remarks fueled a national debate about women and science.

Summers drew on anecdotes and popular but outdated science or pseudo-science to make three points about the paucity of women scientists and engineers: (1) women are unwilling or unable to work the eighty-hour weeks required for success in science at top-flight academic institutions; (2) innate or biological factors, not socialization, probably account for sex differences in mathematical aptitude and also for adult choices of fields of academic study and occupation; and (3) discrimination, which he defined as a “taste” for hiring people like oneself, does not exist in academia, because market forces eliminate it when less elite institutions hire highly qualified women and minorities, thereby gaining a competitive advantage.

Today, four years after Summers’s remarks and three years after he was forced to resign from the Harvard presidency, interest in the question of women in science remains. (Summers is now chief economic adviser to the Obama administration.) On July 15, 2008, journalist John Tierney intensified the debate in a New York Times article attacking Congress, some federal agencies, and women’s groups. “Members of Congress and women’s groups . . . say there is evidence that women face discrimination in certain sciences, but the quality of the evidence is disputed,” he wrote. “Critics say there is far better research showing that on average, women’s interest in some fields isn’t the same as men’s.” In a similar vein, a December 3, 2008, column in the Washington Post by Ruth Marcus carried the title, “Was Summers Right?”

Why has the women-in-science question not been resolved after years of debate and the investment of millions of federal and foundation dollars in programs encouraging women to enter science and engineering? What is the evidence for discrimination in academia, when many more women now earn degrees in science and engineering compared with thirty years ago?

Hidden Trends

Over the past three decades, the overall percentage of women receiving degrees in science, technology, engineering, and mathematics—known collectively as the STEM disciplines—has increased dramatically. This growth tends to mask at least three other aspects of the demographics of the science and technology workforce.

To start, it masks a decrease over recent decades in white U.S. men, the traditional group from which this country has drawn its STEM workforce. In the United States, women now earn more bachelor’s and master’s degrees than men (see table 1). The National Science Foundation (NSF) reported in 2007 in Women, Minorities, and Persons with Disabilities in Science in Engineering that in 2004, women earned 57.6 percent of the bachelor’s degrees in all fields and 59.1 percent of all master’s degrees. Beginning in 2000, women also earned more of the bachelor’s degrees in science and engineering, although they earned only 43.6 percent of the master’s degrees in those fields. In 2004, women earned 60 percent of the PhDs in fields other than science and engineering, but only 44 percent of the PhDs in science and engineering received by U.S. citizens and permanent residents.
The aggregated data also hide the wide variance in women’s participation in STEM fields. The NSF reports that, overall, women earn most of the bachelor’s degrees in fields other than science and engineering, such as humanities, education, and fine arts, and in the science and engineering fields of psychology, social sciences, and biological sciences. Men earn most of the degrees in computer sciences; earth, atmospheric, and ocean sciences; mathematics and statistics; physical sciences; and engineering.

At the master’s level, women earned the majority of degrees in 2004 in fields including the biological sciences, psychology, and the social sciences. Women earned fewer than half of the master’s degrees in computer sciences; earth, atmospheric, and ocean sciences; mathematics and statistics; physical sciences; and engineering.

At the doctoral level, women earned fewer than half of the science and engineering degrees in 2004 in all fields except psychology and a few social sciences, such as anthropology, history of science, and sociology. Women earned 46.3 percent of the PhDs in the biological sciences. Unfortunately, the number of tenure-track positions available in the social and life sciences is constant or decreasing, and federal funding is relatively tight, leading to intense competition. According to the NSF’s 2007 report, women earned fewer than a third of the PhDs in computer sciences; earth, atmospheric, and ocean sciences; mathematics and statistics; physical sciences; and engineering.

In short, in many of the social and the life sciences, women have reached parity in the percentages of degrees received. In other areas, such as the geosciences, mathematics, and physical sciences, the percentages of women continue to increase but have not approached parity. In engineering and computer sciences—the fastest-growing STEM fields with the greatest workforce demand—the percentages of women have reached a plateau or dropped over the past decade.

Unfortunately, aggregated data mask the attrition at women at every phase of the educational and career STEM pipeline. Despite grades and other academic attainments equal to or surpassing those of the men who remain in STEM fields, more women than men leave science and engineering. As a result, few women are in senior or leadership positions in the STEM workforce (see table 2). In “Women Faculty Gain Little Ground,” published in 2006 in *Chemical and Engineering News*, senior journal editor Corinne A. Marasco reports that women made up 41.0 percent of assistant professors of science and engineering at four-year colleges and universities in 2004, 31.1 percent of associate professors, and 17.6 percent of full professors. At the top fifty PhD-granting institutions, women accounted for 21 percent of assistant professors, 22 percent of associate professors, and only 10 percent of full professors in chemistry.

Is it simply a matter of time until the increased numbers of women earning degrees in science and engineering translate into more women professors at elite universities? Or will the percentage of women among full professors in science and engineering at elite research institutions remain constant at 10 percent, as it has for the past five decades? What difference does it make if women continue to be less attracted to some areas of science and technology initially, drop out of the science workforce, or never attain senior and leadership positions at elite academic institutions?

**Barriers**

Many of the women who earn PhDs in science and engineering and enter the workforce leave soon after they begin academic employment. They do so because certain obstacles prevent them from remaining in the field or from reaching their full potential as professionals in academia. Some of these barriers are new, but interviews Rosser conducted with women scientists in 2004 document that issues from thirty years ago remain, appearing today in somewhat different language, behaviors, and structures.

Why do women exit the STEM workforce? The answer is not genetic disposition or lack of interest. If this were the case, then female STEM students would underperform their male counterparts in college and graduate school. The data show the contrary: women outperform men academically, receive more awards, and have higher graduation rates and better attitudes toward education. Interviews, case studies, and statistical research consistently suggest that two primary factors stand out among the multiple forces pushing women to leave the STEM workforce: the need to balance career and family and a lack of professional networks.

For both male and female scientists, marriage and family create demands that can cut short a thriving STEM career. In his 2001 book *From Scarcity to Visibility: Gender Differences in the Careers of Doctoral Scientists and Engineers*, sociologist and statistician J. Scott Long reported that single men and single women participate about equally in the STEM workforce. In contrast, a married female PhD is 13 percent less likely to be employed than a married male PhD. If the woman is married with young children, she is 30 percent less likely than a single man to be employed.

Women’s biological clocks often mean that decisions about marriage and children cannot be delayed until after their careers have been well established. Dozens of studies document the struggle to balance career and family. A survey Rosser conducted in 2004, for example, found that among 450 female scientists and engineers employed at research universities, more than 70 percent cited the need to balance career and family as the most significant challenge facing their professional advancement.

Compared with their colleagues in other countries, scientists in the United States have few federal or institutional supports for childbearing and rearing, such as paid leave for both mothers and fathers, on-site day care, and the mandatory holding of academic positions while faculty take leave. Instead, children are an individual responsibility.

Using seventeen nationally representative data sets drawn from different stages of the life course, sociologists Yu Xie and Kimberlee Shauman found that balancing career and family responsibilities slows career advancement of academic women scientists, but not men scientists, with preschool children. They write about their findings in their 2005 book, *Women in Science: Career Processes and Outcomes*. 
In the November–December 2004 issue of *Academe*, University of California, Berkeley, research scholars Mary Ann Mason and Marc Goulden reported on a study using data from the 1979–95 *National Science Foundation Surveys on Doctoral Recipients*. They found that male faculty members who start families within five years of receiving their PhDs are 38 percent more likely to earn tenure than women who do the same. For every three women who take a fast-track (elite or research) university job before having a child, only one ever becomes a mother. In contrast, the group they define as “second-tier” women PhDs—those who are not working or who are adjunct, part-time, or “gypsy” scholars and teachers—have children and experience marital stability much like men who become professors.

Another aspect of balancing career and family affects dual-career couples. Several studies have explored the problems they face in academia, which include obtaining tenure-track positions at the same institution, particularly if they are in the same field. The dual-career issue is especially salient for women scientists, because 83 percent of women scientists have academic partners who are scientists compared with 54 percent of their male peers, as scholars Londa Schiebinger, Andrea Davies Henderson, and Shannon Gilmartin note in their 2008 book, *Dual-Career Academic Couples: What Universities Need to Know*.

Yet another major source of leakage in the pipeline results from lack of networking and mentoring. Studies by Fiona Murray and Leigh Graham of the Massachusetts Institute of Technology have found that women scientists may have fewer graduate and postdoctoral students to support their work than men and less diverse networks. In addition, women faculty report fewer referrals from collegial networks to participate in the commercial marketplace by being asked to consult, serve on science advisory boards, and interact with industry.

**Toward a Solution**

Many institutions of higher education are reviewing and reforming their policies and practices in response to the national focus on women’s participation in science and shortages in the science and technology workforce resulting from national security measures introduced after September 11, 2001, which have made it difficult for highly skilled non-U.S. workers to get U.S. visas. Attracting women to science and high-tech entrepreneurship and then retaining them will require changing the culture of science to make it more family-friendly and inviting.

First, both men and women must recognize that women who want families do not have the luxury of waiting to have children until they have established their careers. Grant-making organizations should allow all applicants to allocate grant money toward family care, including child and elder care. Clare Booth Luce Professorships, funded by the Henry Luce Foundation and designed to advance the careers of women in science, engineering, and mathematics, provide a model for doing so.

Second, STEM departments at U.S. universities should incorporate marketing, finance, management, and other business training into graduate education. Interview research reveals that high-tech employers seek STEM workers who understand project management, leadership, and business skills, such as the ability to read financial statements and write proposals. Women often do not receive this mentoring in graduate school, just as in the 1970s they often were not mentored in grant writing.

A third solution, uncontroversial and low cost, would be for the government simply to enforce existing antidiscrimination laws, such as the sixth, seventh, and ninth titles of the Civil Rights Act. Men are no longer banning women from their academic laboratories (as was done to Madame Curie until she won her second Nobel Prize) or withholding research funding to support their employment (as was done by the federal funders of the Stanford Linear Accelerator Center during the 1960s). But cultural and institutional biases do creep in to chill the climate for women scientists. For example, *A Study on the Status of Women Faculty in Science at MIT*, published in 1999, found an unequal distribution of resources between men and women faculty in terms of laboratory space, salary supplements, start-up packages, university funding, and even prize nominations.

Fourth, the NSF’s ADVANCE program should be expanded and redirected. Initiated in 2001 to increase the representation of women in academic science and engineering careers, this modest program has achieved fantastic results at almost thirty U.S. universities. This successful model should be expanded to include other federal agencies such as the National Institutes of Health, the Defense Advanced Research Projects Agency, and the Department of Energy.

Fifth, more aggressively promoting qualified women to science advisory boards, science journal editorial boards, and science policy positions would make them more visible. Mentors need to encourage their women graduate students to assert themselves and to sell their ideas, and they should help introduce them into men-only networks.

Finally, the country as a whole must reject the portrayal of women scientists as a special interest group. Women constitute half of the U.S. population and now earn more than half of the undergraduate degrees in science. Because of the income advantage that STEM skills bring, losing STEM-trained women from the workforce as a result of poor mentoring or a failure to institute family-friendly policies risks resegregating women economically. Moreover, 2006 research by the nonprofit group Engineers Dedicated to a Better Tomorrow documents that women are attracted to science and technology when they see its “specific and tangible contributions to society and in bettering local communities, our nation, and the world.” These sound like exactly the characteristics we need in scientists and engineers to help create a better society. If we fail to rid ourselves of anachronistic cultural biases and outdated policies, we will lose out to countries that are able to do so. But if we succeed in attracting more women to science and technology, we will benefit both women and science.

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Comments:
Why are we so concerned about women in STEM where they receive 44% of the PhD’s, but completely unconcerned about men in the other disciplines where men receive only 40% of the PhD’s? At a more basic level, why aren’t we concerned that men receive only 40% of Bachelor Degrees?

Not only is it time for women to give up their privileged position in education (special access, special programs, special funding and the feminist notion that it’s ok for women to only look out for women), it is time to undertake programs specifically designed to recruit and retain male students and adapt programs to men’s needs.

K. D.

Look at any newspaper in the country. Count the faces. How many are men versus women? It gets even worse if you look at the sports or financial/money sections. Go into any city fire department or police department. If they are 25% women it is unusual. More like 10%, at best. Find me an electrician, plumber or air conditioning/heating technician that is a woman. All very decent paying jobs with low education requirements but great old boy networks for working your way into these jobs. Why would a man go into the lower paying jobs that require college degrees? There’s your answer.

K.D.

Comments
ann (not verified)
Tue, 01/15/2013 - 8:55pm
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Females will take over higher positions in time

I see socialization and its effects from differential treatment by gender as hurting Male development from an early age, while this differential treatment is enabling Females more wonderful tools to develop over time. I see while there are currently more Male in higher positions of science and engineering, the differential treatment, increase in instability of the world, and increased stereotyping and yes, more aggressive treatment of Males will increase the drop in Male participation in higher academics including science and engineering. Even if the increase in Female participation remains slight, this will be enough over time to have superior numbers in those positions. You see, the Male participation will remain stagnant or drop and older Males in those positions will eventually retire. I feel in time, this will lead to three or four very qualified Females for Male participants in all fields, including higher science and engineering fields.

I feel in time, as technology and information age skills increase, there will be many more Females applying for and taking over many jobs from Males, including those in generally considered working class fields.

reply
Agreed, but then what?

When we coalesce the data into a 'big picture' it is difficult to not see that the feminist interest with encouraging more women into STEM fields is a practice of numbers and percentages above quality of satisfaction. To put it a bit differently, the movement puts more emphasis towards getting numbers of women to enter STEM fields (assuming that there are that many women naturally interested in these fields) than establish provisions and protections for women in those fields even if they only comprise a minority due to lack of interest.

The success of such a driving movement becomes most evident in the momentum it generates. Here we are seeing the growth in numbers of women accomplishing all the highlights and hot points for entry and success in the STEM fields. It also creates another type of mask like the one mentioned in the article. In this case what we don’t see is how many women enter these areas of study on the premises they encountered in their primary schooling only to discover their interest had waned by the time they achieved their goal of bachelors, masters or even doctorate degrees.

The question, though, is what measures are in place by the drivers of this change to keep that momentum from swinging the pendulum to an opposite extreme. If equality equals 50/50, then how do we address the females who populate the above 50% mark? How do we reignite the statistics of men which constitute the below 50%?

Do we have a follow-up plan in place to keep the balance of equality once it’s achieved, or are we choosing to not worry about that until after women are the majority of employed personnel?
The social engineering agenda

OK, it's time to address the real agenda here. Women are being promoted over more qualified men constantly now in the sciences in an effort to carry out a social engineering agenda to make society more controllable, divided and easily manipulated.

The reason that the globalist elite have been pushing feminism is because men are the biggest threat to their control of the populations. In every takeover or suppression of an enemy throughout history the men were taken out first. Men are more likely to view totalitarian authority as an alpha male threat whereas women are more likely to view it as a protector (related to women liking the 'bad boys'). Men are thus more likely to challenge authority and are physically more dangerous.

It's also about divide and conquer. They need to destroy the social fabric to make it harder for familial relationships to form particularly between men and women as families provide cohesion and resistance against tyranny. So pushing women to abandon traditional nurturing female traits and to pursue male qualities creates friction as men have evolved to protect and compliment women not compete with them. Relationships have become harder to form between men and women, divorce is at an all time high, marriage at an all time low as women abandon their biological natures in favour of pursuing masculine traits, ending up with internal conflict and they are often unhappy.

At the heart of feminism lies deception. Feminism was created by the power elite as a communist tool (modelled off Stalinesque Russian female empowerment techniques) to make society more divided, more matriarchal and thus more controllable.

The fact is that the top minds/IQs are men, this is a biological fact, yet women are getting promoted to top positions despite the top scientists still being male.

The IQ distributions in all major IQ tests are markedly different between men and women, on average men and women are roughly equal but women's IQs are more grouped around the middle whereas men's are more spread across the spectrum, meaning there are more stupid men than women but a lot more highly intelligent men than women. This is because the bigger the difference between men the easier it is for women to select the smarted mates and the best selected from an evenly spread group is going to be much more intelligent than the best selected from an average group thus humanity's intellectual evolution advances more rapidly via natural selection.
RE: Social Engineering Agenda

Women have had fewer opportunities than men. Famous intellects have had support from other people whether they want to admit it or not. Also there is nothing wrong with intelligent women raising to the top alongside men. That is how the United States will make the world a better place for the poorer nations. Why is the United States so fortunate? What do we do with this fortune? Well we must help others advance as well. Women can contribute just as much as men if they so choose. I am a women and am making the decision to contribute to the advancement of Biostatistics, Mathematics, Statistics, and other fields of science. I have a husband and I also think I can nurture relationships in my life while still contributing to science at a large scale, for I have been gifted with a beautiful mind. You cannot claim that a correlation is a causation. Someone's gender or race is independent of their ability to learn and be smart. However someone's race or gender may restrict opportunities. The country or town someone grows up in may restrict opportunities. It should be our responsibility to help those people!

reply

RE: The social engineering agenda

Since the beginning of time men have marginalized, controlled, and limit women. Look at every major religion - they all "protect" women by limiting them to the kitchen and the bedroom. Divorce is at an all time high because women have realized they don't need a man to make them happy, particularly backwards men like you seem to be. About the IQ - the highest IQ ever recorded was a woman.

reply
The intrinsic sexual differences

The books by Dr. Anne Moir on the subject of intrinsic sexual differences more than suggest there is a difference. She reviews the science from the last century in "Brain Sex" and this one in "Why Men Don't Iron". He fellow scientists warned her not to publish her books for fear of the Gay and Feminist outcry and then getting less research funding. Her first doctorate was in genetics. She worked for the BBC making science shows and now teaches at Oxford.

Given her career, she could be the poster child for the Feminism notion; Yet she believes science has shown that notion to be a fantasy. In any case, "Brain Sex" is a fascinating read of the science, with 26 pages of footnotes. She has a web site on the subject so you can get an idea of her before you buy her books. I was stunned by how much non science I believed.

You can see a graphic difference in the workings of men's and women's brains in the study done at U. Penn. here: http://www.uphs.upenn.edu/news/news_releases/2013/12/verma/
#2 is right there are biological differences between men & women

Why the Gender Gap is Overblown
http://www.pbs.org/newshour/making-sense/truth-women-stem-careers/

Our hormones and biology contribute to our career choices. 2 examples.

Study shows link between testosterone and women's choice to enter finance
http://news.uchicago.edu/article/2009/08/25/study-shows-link-between-tes...

Study shows high testosterone & low cortisol in CEOs

Men, on average, have a larger inferior parietal lobe which is why they tend to be better at math/visual spatial tasks
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2680714/
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Last summer, researchers at Yale published a study proving that physicists, chemists and biologists are likely to view a young male scientist more favorably than a woman with the same qualifications. Presented with identical summaries of the accomplishments of two imaginary applicants, professors at six major research institutions were significantly more willing to offer the man a job. If they did hire the woman, they set her salary, on average, nearly $4,000 lower than the man's. Surprisingly, female scientists were as biased as their male counterparts. The new study goes a long way toward pr