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Why Can't a Woman Be More Like a Man?

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Women earn most of America's advanced degrees but lag in the physical sciences. Beware of plans to fix the "problem."



Math 55 is advertised in the Harvard catalog as “probably the most difficult undergraduate math class in the country.” It is legendary among high school math prodigies, who hear terrifying stories about it in their computer camps and at the Math Olympiads. Some go to Harvard just to have the opportunity to enroll in it. Its formal title is “Honors Advanced Calculus and Linear Algebra,” but it is also known as “math boot camp” and “a cult.” The two-semester freshman course meets for three hours a week, but, as the catalog says, homework for the class takes between 24 and 60 hours a week.

Math 55 does not look like America. Each year as many as 50 students sign up, but at least half drop out within a few weeks. As one former student told *The Crimson* newspaper in 2006, “We had 51 students the first day, 31 students the second day, 24 for the next four days, 23 for two more weeks, and then 21 for the rest of the first semester.” Said another student, “I guess you can say it’s an episode of ‘Survivor’ with people voting themselves off.” The final class roster, according to *The Crimson*: “45 percent Jewish, 18 percent Asian, 100 percent male.”

Why do women avoid classes like Math 55? Why, in fact, are there so few women in the high echelons of academic math and in the physical sciences?

Women now earn 57 percent of bachelors degrees and 59 percent of masters degrees. According to the Survey of Earned Doctorates, 2006 was the fifth year in a row in which the majority of research Ph.D.’s awarded to U.S. citizens went to women. Women earn more Ph.D.’s than men in the humanities, social sciences, education, and life sciences. Women now serve as presidents of Harvard, MIT, Princeton, the University of Pennsylvania, and other leading research universities. But elsewhere, the figures are different. Women comprise just 19 percent of tenure-track professors in math, 11 percent in physics, 10 percent in computer science, and 10 percent in electrical engineering. And the pipeline does not promise statistical parity any time soon: women are now earning 24 percent of the Ph.D.’s in the physical sciences—way up from the 4 percent of the 1960s, but still far behind the rate they are winning doctorates

in other fields. “The change is glacial,” says Debra Rolison, a physical chemist at the Naval Research Laboratory.

Rolison, who describes herself as an “uppity woman,” has a solution. A popular anti–gender bias lecturer, she gives talks with titles like “Isn’t a Millennium of Affirmative Action for White Men Sufficient?” She wants to apply Title IX to science education. Title IX, the celebrated gender equity provision of the Education Amendments Act of 1972, has so far mainly been applied to college sports. But the measure is not limited to sports. It provides, “No person in the United States shall, on the basis of sex...be denied the benefits of...any education program or activity receiving federal financial assistance.”

Harvard's legendary Math 55 class does not look like America. The class roster at semester's end? '45 percent Jewish, 18 percent Asian, 100 percent male.'

While Title IX has been effective in promoting women’s participation in sports, it has also caused serious damage, in part because it has led to the adoption of a quota system. Over the years, judges, Department of Education officials, and college administrators have interpreted Title IX to mean that women are entitled to “statistical proportionality.” That is to say, if a college’s student body is 60 percent female, then 60 percent of the athletes should be female—even if far fewer women than men are interested in playing sports at that college. But many athletic directors have been unable to attract the same proportion of women as men. To avoid government harassment, loss of funding, and lawsuits, they have simply eliminated men’s teams. Although there are many factors affecting the evolution of men’s and women’s college sports, there is no question that Title IX has led to men’s participation being calibrated to the level of women’s interest. That kind of calibration could devastate academic science.

But unfortunately, in her enthusiasm for Title IX, Rolison is not alone.

On October 17, 2007, a subcommittee of the House Committee on Science and Technology convened to learn why women are “underrepresented” in academic professorships of science and engineering and to consider what the federal government should do about it.

As a rule, women tend to gravitate to fields such as education, English, psychology, biology, and art history, while men are much more numerous in physics, mathematics, computer science, and engineering. Why this is so is an interesting question—and the subject of a substantial empirical literature. The research on gender and vocation is complex, vibrant, and full of reasonable disagreements; there is no single, simple answer.

There were, however, no disagreements at the congressional hearing. All five expert witnesses, and all five congressmen, Democrat and Republican, were in complete accord. They attributed the dearth of women in university science to a single cause: sexism. And there was no dispute about the solution. All agreed on the need for a revolutionary transformation of American science itself. “Ultimately,” said Kathie Olsen, deputy director of the National Science Foundation, “our goal is to transform, institution by institution, the entire culture of science and engineering in America, and to be inclusive of all—for the good of all.”

Women comprise 19 percent of tenure-track professors in math, 11 percent in physics, and 10 percent in electrical engineering. The pipeline does not promise statistical parity.

Representative Brian Baird, the Washington-state Democrat who chairs the Subcommittee on Research and Science Education, looked at the witnesses and the crowd of more than 100 highly appreciative activists from groups like the American Association of University Women and the National Women’s Law Center and asked, “What kind of hammer should we use?”

For the five male, gray-haired congressmen, the hearing was a happy occasion—an opportunity to be chivalrous and witty before an audience of concerned women, and to demonstrate their goodwill and eagerness to set things right. It was also a historic occasion—more than the congressmen realized. During the past 30 years, the humanities have been politicized and transformed beyond recognition. The sciences, however, have been spared. There seems to have been a tacit agreement, especially at the large research universities; radical activists and deconstructionists were left relatively free to experiment with fields like comparative literature, cultural anthropology, communications, and, of course, women’s studies, while the

hard sciences—vital to our economy, health, and security, and to university funding from the federal government, corporations, and the wealthy entrepreneurs among their alumni—were to be left alone.

Departments of physics, math, chemistry, engineering, and computer science have remained traditional, rigorous, competitive, relatively meritocratic, and under the control of no-nonsense professors dedicated to objective standards. All that may be about to change. Following years of meticulous planning by the activists gathered for the hearing, the era of academic détente is coming to an end.



The first witness was Donna Shalala, president of the University of Miami and secretary of health and human services in the Clinton administration. She had chaired the “Committee on Maximizing the Potential of Women in Academic Science and Engineering,” organized by several leading scientific organizations including the National Academy of Sciences (NAS), Academy of Engineering, and Institute of Medicine. In 2006 the committee released a report, “Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering,” that claimed to find “pervasive unexamined gender bias.” It received lavish media attention and has become the standard reference work for the “STEM” gender-equity movement (the acronym stands for science, technology, engineering, and math).

At the hearing, Shalala warned that strong measures would be needed to improve the “hostile climate” women face in the academy. This “crisis,” as she called it, “clearly calls for a transformation of academic institutions....Our nation’s future depends on it.”

Shalala and other speakers called for rigorous application of Title IX and other punitive measures. Witness Freeman Hrabowski, president of the University of Maryland, Baltimore County, stressed the need to threaten obstinate faculties with loss of funding: “People listen to money.... Make the people listen to the money talk!”

The idea of “title-nining” academic science was proposed by Debra Rolison in 2000. She has promoted Title IX as an “implacable hammer” guaranteed to get the attention of recalcitrant faculty. Prompted by Rolison and a growing chorus of activists, the Senate Subcommittee on Science, Technology, and Space held a 2002 hearing on “Title IX and Science.” Later, in 2005, former subcommittee chairmen Senators Ron Wyden (D-OR) and Senator George Allen (R-VA) held a joint press conference with feminist leaders. Wyden declared, “Title IX in math and science is the right way to start.” Allen seconded, “We cannot afford to cut out half our population—the female population.” The Title IX reviews have already begun.

'Our goal,' says the deputy director of the National Science Foundation, 'is to transform...the entire culture of science and engineering in America, and to be inclusive of all.'

At the October 2007 subcommittee meeting, Representative Vernon Ehlers, a Michigan Republican and self-described “recovering sexist,” cheerfully suggested we declare science a sport and then regulate it the way we do college athletics. He was joking, but it is important to recognize that science is not a sport. The

purpose of college sports is to develop the skills and confidence of young athletes and to promote school spirit, while the goal of science is to advance knowledge. Success in fields like math, physics, computer science, and engineering is critical to our national security and well-being.

There is another essential difference between sports and science: in science, men and women play on the same teams. Very few women can compete on equal terms with men in lacrosse, wrestling, or basketball; by contrast, there are many brilliant women in the top ranks of every field of science and technology, and no one doubts their ability to compete on equal terms. Yet a centerpiece of STEM activism is the idea that science, as currently organized and practiced, is intrinsically hostile to women and a barrier to the realization of their unique intellectual potential. MIT biologist Nancy Hopkins, an effective leader of the science equity campaign (and a prominent accuser of Harvard president Lawrence Summers when he committed the solecism of suggesting that men and women might have different propensities and aptitudes), points to the hidden sexism of the obsessive and competitive work ethic of institutions like MIT.

“It is a system,” Hopkins says, “where winning is everything, and women find it repulsive.” This viewpoint explains the constant emphasis, by equity activists such as Shalala, Rolison, and Olsen, on the need to transform the “entire culture” of academic science and engineering. Indeed, the charter for the October 17 congressional hearing placed primary emphasis on academic culture: “The list of cultural norms that appear to disadvantage women...includes the favoring of disciplinary over interdisciplinary research and publications, and the only token attention given to teaching and other service during the tenure review process. Thus it seems that it is not necessarily conscious bias against women but an ingrained idea of how the academic enterprise ‘should be’ that presents the greatest challenge to women seeking academic S&E [science and engineering] careers.”

When the women-in-sports movement was getting underway in the early 1990s, no one suggested that its success would require transforming the “culture of soccer” or putting an end to the obsession with competing and winning. The notion that women’s success in science depends on changing the rules of the game seems demeaning to women—but it gives the STEM-equity movement extraordinary scope, commensurate with the extraordinary power that federal science funding would put at its disposal.

Already, the National Science Foundation (NSF) is administering a multimillion-dollar gender-equity program called ADVANCE, which, as Olsen told the subcommittee, aims to transform the culture of American science to make it gender-fair. Through ADVANCE, the NSF is attempting to make academic science departments more cooperative, democratic, and interdisciplinary as well as less obsessive and stressful. And the “Gender Bias Elimination Act,” introduced by one of the subcommittee members, Representative Eddie Bernice Johnson, Democrat of Texas, a few weeks before the hearing, would mandate not only stringent Title IX reviews but also bias-awareness workshops for academics seeking government funding.

Baron-Cohen believes that men are, on average, wired to be better systematizers and women better empathizers. It's a daring claim, but he has the data to back it up.

These proposed solutions assume a problem that might not exist. During her presidential campaign, Hillary Clinton has noted that “women comprise 43 percent of the workforce but only 23 percent of scientists and engineers” and insists that government take “diversity into account when awarding education and research grants.” But what is the basis for this and other attempts to balance the statistics? If numerical inferiority were sufficient grounds for charges of discrimination or cultural insensitivity, Congress would be holding hearings on the crisis of underrepresentation of men in higher education. After all, women earn most of the degrees—practically across the board. What about male proportionality in the humanities, social sciences, and biology? The physical sciences are the exception, not the rule.

So why are there so few women in the high echelons of academic math and in the physical sciences? In a recent survey of faculty attitudes on social issues, sociologists Neil Gross of Harvard and Solon Simmons of George Mason University asked 1,417 professors what accounts for the relative scarcity of female professors in math, science, and engineering. Just 1 percent of respondents attributed the scarcity to women’s lack of ability, 24 percent to sexist discrimination, and 74 percent to differences in what characteristically interests men and women.

Many experts who study male/female differences provide strong support for that 74 percent majority. Readers can go to books like David Geary's *Male, Female: The Evolution of Human Sex Differences* (1998); Steven Pinker's *The Blank Slate: The Modern Denial of Human Nature* (2002), and Simon Baron-Cohen's *The Essential Difference: The Truth about the Male and Female Brain* (2003), for arguments suggesting that biology plays a distinctive—but not exclusive—role in career choices.

Baron-Cohen is one of the world's leading experts on autism, a disorder that affects far more males than females. Autistic persons tend to be socially disconnected and unaware of the emotional states of others. But they often exhibit obsessive fixation on objects and machines. Baron-Cohen suggests that autism may be the far end of the male norm—the “extreme male brain,” all systematizing and no empathizing. He believes that men are, “on average,” wired to be better systematizers and women to be better empathizers. It's a daring claim—but he has data to back it up, presenting a wide range of correlations between the level of fetal testosterone and behaviors in both girls and boys from infancy into grade school.

Harvard psychologist Marc Hauser has what seems to be the appropriate attitude about the research on sex difference: respectful, intrigued, but also cautious. When asked about Baron-Cohen's work, Hauser said, “I am sympathetic...and find it odd that anyone would consider the work controversial.” Hauser referred to research that shows, for example, that if asked to make a drawing, little girls almost always create scenes with at least one person, while males nearly always draw things—cars, rockets, or trucks. And he mentioned that among primates, including our closest relations the chimpanzees, males are more technologically innovative, while females are more involved in details of family life. Still, Hauser warns that a lot of seemingly exciting and promising research on sex differences has not panned out, and urges us to treat the biological theories with caution.

Nevertheless, it is hard not to be attracted to theories like Simon Baron-Cohen's when one looks at the way men and women are distributed in the workplace. After two major waves of feminism, women still predominate—sometimes overwhelmingly—in empathy-centered fields such as early-childhood education, social work, veterinary medicine, and psychology, while men are overrepresented in the “systematizing” vocations such as car repair, oil drilling, and electrical engineering.

Rachel Maines, a visiting scholar in science and technology studies at Cornell University, recently wrote an essay expressing amazement with women's progress in veterinary medicine compared with engineering. Nationally, women now comprise fully 77 percent of students in veterinary schools, compared with 8 percent in the 1960s. Maines writes, “To be sure, puppies are cuter than microchips, but most of what veterinarians do isn't about cute. Veterinary medicine...remains irreducibly bloody, messy, and often hazardous.... It certainly requires a rigorous scientific education that is at least as difficult and daunting as what engineering demands.”

If numerical inferiority were sufficient grounds for charges of discrimination, Congress would be holding hearings on the underrepresentation of men in higher education.

Maines is surprised that women have managed so rapidly to take over this male-centered, science-based field without the benefit of bias workshops or federal equity initiatives. Cornell, she notes, just received a \$3.3 million grant from the NSF to build a “critical mass” of women in all the STEM disciplines—ASAP. It is a first principle of the equity movement that role models and mentors are essential for helping women to move ahead in a field. But where, asks Maines, were the mentors and role models in veterinary medicine? She urges her colleagues to study the mystery of what happened.

Theorists like Baron-Cohen may have solved the mystery. If he is right, veterinary medicine would be a dream job for the scientifically gifted but empathy-driven female. This challenging and exciting field appeals to the feminine propensity to protect and nurture—and the desire to work with living things. There is an immense literature documenting male and female differences in choice of vocation. It also goes without saying that there are a lot of women who will defy the stereotype of their sex and gladly enter systematizing fields, free of people, children, or animals—professions like mechanical engineering, metallurgy, or agronomy. But the number of men eager to enter these fields is markedly greater.

Back to Math 55 for a moment. Baron-Cohen, along with many other scholars who write about cognitive sex differences, would not be surprised to learn that students who show up in 55 are overwhelmingly male.

The Harvard registrar's office reports that a total of 17 women have completed the course since 1990. Still, the equity activists could be right that the few women who defy the stereotype and take such a course have to overcome a "chilly environment."

I located two female survivors—Sherry Gong, currently enrolled, and Kelley Harris, who completed Math 55 with an A last year. "Did you encounter a hostile environment in that class?" I asked Miss Harris. She laughed. "I loved my classmates!" When she once thought of dropping out, it was her male friends in the course who persuaded her to stay. Sherry Gong was taken aback when inquired whether she felt that women in math were unwelcome or marginalized. It was as if I had asked whether women had the vote. "It is 2007!" she reminded me. Sergei Bernstein, a young man now enrolled, told me, "We would like to have more girls."

Professor Emanuel said that although the discrimination report was 'widely praised in public, it was privately deplored and disparaged in the hallways of MIT.'

The research emphasizing the importance of biological differences in determining women's and men's career choices is not decisive, but it is serious and credible. So the question arises: How have so many officials at the NSF and NAS and so many legislators been persuaded that we are facing a science crisis that Title IX enforcement and gender-bias workshops can resolve?

The answer involves a body of feminist research that purports to prove that women suffer from "hidden bias." This research, artfully presented with no critics or skeptics present, can be persuasive. A brief look at it helps explain the mind-set of the critics and their supporters. But it is a highly ironic story. For the three recognized canons of the literature are, in key respects, travesties of scientific method, and they have been publicized and promoted in ways that have ignored elementary standards of transparency and objectivity. If they are auguries of how the STEM-equity activists intend to transform the culture of science, the implications are deeply disquieting. We begin with the famous, and mysterious, MIT study.

In 1994, 16 senior faculty women, led by biologist Nancy Hopkins, complained to the administration about sex discrimination in their various departments. MIT's president, Charles Vest, and the dean of the School of Science, Robert Birgeneau, dutifully set up a committee to review the complaints. But rather than bring in outsiders, they put the protesters (joined by three male administrators) in charge of investigating their own grievances. Under Hopkins's leadership, the committee produced a 150-page study that found MIT guilty on all counts. Women, according to the document, had lower salaries, less laboratory space, and fewer resources. They felt "invisible" and "marginalized." Vest and Birgeneau quickly responded with generous salary raises, improved lab space, and more equity committees. The women professed to be satisfied and the case was closed. The report was deemed "confidential" and "sensitive," and to this day it has never been made public.

It is odd that a single study of postgraduate fellowships at a Swedish university should play such a prominent role in a campaign to eliminate 'hidden bias' in American universities.

What was released to the press, in March of 1999, was a brief summary of the report's findings along with letters from Vest and Birgeneau admitting guilt. As *The Chronicle of Higher Education* reported, "MIT released a cursory report of the study it conducted, so it is difficult for outsiders to judge what the gap was between men and women."

The summary of the report, nevertheless, created a sensation in the media and in universities for two reasons: (1) it appeared to be based on hard data, and (2) it had the full endorsement of MIT's top administrators. The *New York Times* carried the story on the front page under the headline, "MIT Admits Discrimination Against Female Professors." Professor Hopkins was soon everywhere in the press and on April 8, 1999, was invited to attend an Equal Pay Day event at the White House. Referring to Hopkins and her team, President Clinton said, "Together they looked at cold, hard facts about disparity in everything from lab space to annual salary."

But cold, hard facts had little to do with it. After reviewing the available evidence and interviewing some insiders, University of Alaska psychologist Judith Kleinfeld concluded, "The MIT report presents no objective evidence whatsoever to support claims of gender discrimination in laboratory space, salary,

research funds, and other resources.” Readers are told in the summary report that women faculty “proved to be underpaid.” But we also learn that the “salary data are confidential and were not provided to the committee.” So on what basis did they conclude there were salary disparities? Hopkins and the other authors explain, “Possible inequities in salary are flagged by the committee from the limited data available to it.” But “possible” soon became “actual,” and by the time it reached President Clinton it had morphed into “cold, hard facts.”

There were other oddities. The report claimed that the problems confronting women faculty were universal, but the summary concedes, “Junior women felt included and supported by their departments.” Instead of acknowledging that the problem might be generational and confined to a small group of senior women from three departments, Hopkins and the other authors of the report claimed that the junior women were naïve and simply did not know what was in store for them: “Each generation of young women began...by believing that gender discrimination was solved in the previous generation and would not touch them.”

Mathematics professor Daniel Kleitman, one of the three males on the Hopkins committee, told the Chronicle that he “never saw any evidence” of discrimination against women. He concedes the senior women were unhappy, and he does not fault the administrators for trying to remedy the situation. But, as he explained, you can find unhappy professors in all universities. “I am not sure what the women were experiencing was unique to women,” he said.

I recently asked Kerry Emanuel, an MIT professor in Earth, Atmospheric, and Planetary Science, about the report. He told me that although it was “widely praised in public, it was privately deplored and disparaged in the hallways of MIT.” His department was accused of bias, so he expected to see the evidence. “But it was never made available.”

When a reporter from The Chronicle of Higher Education asked Mary-Lou Pardue, an MIT biology professor who was among those who originally complained to the dean, about all the irregularities and the absence of data, she replied, “This wasn’t meant to be a study for the rest of the world. It was meant to be a study for us.... We weren’t trying to prove anything to the world.”

'We don't accept biology as destiny,' says Valian. 'We vaccinate, we inoculate, we medicate...I propose we adopt the same attitude toward biological sex differences.'

But the world thought otherwise. Vest and Birgeneau gave the impression that the report presented solid factual evidence of pervasive gender bias. When a Wall Street Journal editorial faulted the study, the two sent a letter claiming that the work of their committee had “successfully identified the root causes of a fundamental failure in American academia.” Feminist groups like the National Women’s Law Center and the American Association of University Women were electrified and got ready for action. And action they got. As a direct result of the MIT report, the Ford Foundation, along with an anonymous donor, came forward with grants in excess of \$1 million to fund more equity studies and to promote more initiatives to fight gender bias in academic science—and then the NSF followed suit with its ADVANCE institutional transformation campaign.

In May 1997, the distinguished British journal Nature published a provocative article titled, “Nepotism and Sexism in Peer-Review.” The authors, Christine Wenneras and Agnes Wold, two Swedish scientists from the University of Goteborg, claimed to have found blatant gender bias in the peer-review system of the Swedish Medical Research Council. After reviewing the relevant data, they concluded that to win a postgraduate science fellowship, a female applicant had to be at least twice as good as a male applicant.

The Wenneras-Wold article caused a sensation both in Europe and the United States and is now a staple in the gender-equity literature. A recent article in Scientific American referred to it as the one and only “thorough study of the real-world peer-review process” and judged its findings “shocking.” When the NSF polled 19 institutions that had received gender-equity ADVANCE grants, it asked which materials “had proved the most effective in their institutional transformation projects?” The Wenneras-Wold study made it to the NSF short list of four must-read “top research articles.” The Shalala/NAS “Beyond Bias” report describes the piece as a “powerful” tool for educating provosts, department chairs, and search committees about bias. The charter for the October 17 House subcommittee hearing gave particular prominence to the

Swedish study.

'At bias-awareness workshops, physicists and engineers watch skits where overbearing male faculty ride roughshod over hapless but intellectually superior female colleagues.

But what does the article actually show? Wenneras and Wold investigated the peer-reviewing practices of the Medical Research Council in 1994 after they had both been denied postgraduate fellowships. When they sought to review the data on which the council's decisions were based, the Council refused to grant them access, insisting the information was confidential. But the two researchers went to court and won the right to see the data.

The Swedish study, unlike the MIT report, was actually published, and it presents data and describes its methodology. But there are serious grounds for skepticism: once again, it was a case of women investigating their own complaints; furthermore, what they concluded seemed a little improbable. According to their calculations, to score as well as a man, a woman had to have the equivalent of three extra papers in world-class science journals such as *Science* or *Nature* or 20 extra papers in leading specialty journals such as *Radiology* or *Neuroscience*.

I sent the Swedish study to two research psychologists, Jerre Levy (professor emerita, of Chicago) and James Steiger (professor and director, Quantitative Methods and Evaluation, Department of Psychology and Human Development, Vanderbilt) for their review. They both immediately zeroed in on a troubling methodological anomaly: Wenneras and Wold had run separate regressions for only one productivity variable at a time. Since it is unlikely that any single variable adequately characterizes academic productivity, the obvious approach would have been to enter several of the productivity variables into a single regression equation. In any event, the dramatic results of the factor-by-factor approach that Wenneras and Wold used should have been tested against the more inclusive, realistic approach.

Steiger wrote to Wenneras and Wold requesting copies of the data so he could review them himself. Wold wrote back that she would gladly send the data, except that they had gone missing: "They were in a computer of a guy at the Statistics department and I got them on a diskette many years ago and I am afraid I will not be able to find it anymore." Wenneras did not reply at all.

Certainly, researchers lose data. But these were pretty special data: The researchers had invested the substantial time and expense of a lawsuit to obtain them, and they were the basis of a highly celebrated study with singular findings.

But even assuming that the research held up, it is odd that a single study of postgraduate fellowships at a Swedish university should play such a prominent role in a campaign to eliminate "hidden bias" in American universities. Is it twice as hard for women to receive postgraduate fellowships in the science departments of Berkeley or the University of Miami? If it is, would it not be straightforward to demonstrate the problem through at least one good study—one that followed customary statistical procedures and could stand up to peer review?

In fact, the NSF did do a review of its own grant-review process in 1997, and found no evidence of bias against women. In 1996, for example, it approved grants from approximately 30 percent of female applicants and 29 percent of male applicants. A formal outside study, done in 2005 by the RAND Corporation—titled "Is there Gender Bias in Federal Grants Programs?"—reached the same conclusion: "Overall, we did not find gender differences in federal grant funding outcomes in this study."

But unlike the Swedish study, the RAND study did not make it to the NSF/NAS list of essential literature on gender bias. Two other items in the "top four" are weak statistical studies of marginal issues that have never been rigorously evaluated. A final item in the STEM-equity canon is a book by feminist Virginia Valian that purports to be scientific, but is not.

Most scientists have no idea of the power and scope of the equity crusade. The business community and citizens at large are completely in the dark. This is a quiet revolution.

Virginia Valian, a psychologist at Hunter College, is one of the most cited authorities in the crusade to

achieve equity for women in the sciences. Her book *Why So Slow?* (MIT Press, 1998) is indispensable to the movement because it offers a solution to a vexing problem: women's seemingly free but actually self-defeating choices. Not only do fewer women than men choose to enter the physical sciences, but even those who do often give child care and family a higher priority than their male colleagues. How, in the face of women's clear tendencies to choose other careers and more balanced lifestyles, can one reasonably attribute the scarcity of women in science and engineering to unconscious bias and sexist discrimination? Valian showed the way.

Her central claim is that our male-dominated society constructs and enforces "gender schemas." A gender schema is an accepted system of beliefs about the ways men and women differ—a system that determines what suits each gender. Writes Valian: "In white, Western middle-class society, the gender schema for men includes being capable of independent, autonomous action...[and being] assertive, instrumental, and task-oriented. Men act. The gender schema for women is different; it includes being nurturant, expressive, communal, and concerned about others."

Valian does not deny that gender schemas have a foundation in biology, but she insists that culture can intensify or diminish their power and effect. Our society, she says, pressures women to indulge their nurturing propensities while it encourages men to develop "a strong commitment to earning and prestige, great dedication to the job, and an intense desire for achievement." All this inevitably results in a permanently unfair advantage for men.

To achieve a gender-fair society, Valian advocates a concerted attack on conventional gender schemas. This includes altering the way we raise our children. Consider the custom of encouraging girls to play with dolls. Such early socialization, she says, creates an association between being female and being nurturing. Valian concludes, "Egalitarian parents can bring up their children so that both boys and girls play with dolls and trucks.... From the standpoint of equality, nothing is more important."

But what if our daughters are not especially interested in trucks, as almost any parent can attest (including me: when my son recently gave his daughter a toy train to play with, she placed it in a baby carriage and covered it with a blanket so it could get some sleep)? Not a problem, says Valian.

"We don't accept biology as destiny.... We vaccinate, we inoculate, we medicate.... I propose we adopt the same attitude toward biological sex differences." In other words, the ubiquitous female propensity to nurture should be treated as a kind of disorder or disease.

Valian is intent on radically transforming society to achieve her egalitarian ideals. She also wants to alter the behavior of successful scientists. Their obsessive work habits, single-minded dedication, and "intense desire for achievement," not only marginalize women, but also may compromise good science. She writes, "If we continue to emphasize and reward always being on the job, we will never find out whether leading a balanced life leads to equally good or better scientific work."

Valian may be a leader in the equity-in-science movement, but she is not an empirical thinker. A world where women (and resocialized men) earn Nobel Prizes on flextime has no relation to reality. Unfortunately, her outré worldview is not confined to women's studies. It is a guiding light for some of the nation's leading scientific institutions.



Valian's book is trumpeted on the NSF/NAS "Top Research" list, and Valian herself has inspired the NSF's ADVANCE gender-equity program. In 2001, the NSF awarded Valian and her Hunter colleagues \$3.9 million to develop equity programs and workshops for the "scientific community at large." Should Congress pass the Gender Bias Elimination Act, which mandates workshops for university department chairs, members of review panels, and agency program officers seeking federal funding, Valian will become one of the most prominent women in American scientific education.

The NSF has an annual budget of \$5.9 billion devoted to "promoting the progress of science" and "securing the national defense." It is not easy to understand how its ADVANCE program or its deep association with Virginia Valian is serving those goals.

Alice Hogan, former director of ADVANCE, explained in a 2005 interview that the MIT study had been a wake-up call for the NSF. In the past, she said, the NSF had funded programs to support the careers of individual women scientists, but the MIT report persuaded its staff that "systemic" change was imperative.

Since 2001, the NSF has given approximately \$107 million to 28 institutions of higher learning to develop transformation projects. Hunter College, the site of Valian's \$3.9 million program, is one of them. The University of Michigan has received \$3.9 million; the University of Puerto Rico at Humacao, \$3.1 million; the University of Rhode Island, \$3.5 million; and Cornell, \$3.3 million. What are these schools doing with the money?

Some of the funds are being used for relatively innocuous, possibly even beneficial, projects such as mentoring programs and conferences. But there are worrisome programs as well.

Michigan is experimenting with "interactive" theater as a means of raising faculty consciousness about gender bias. At special workshops, physicists and engineers watch skits where overbearing men ride roughshod over hapless but obviously intellectually superior female colleagues. The director/writer, Jeffrey Steiger of the University of Michigan theater program, explains that the project is inspired by Brazilian director Augusto Boal's book *Theatre of the Oppressed* (1974). Boal writes, "I believe that all the truly revolutionary theatrical groups should transfer to the people the means of production in the theater." To this end, the Michigan faculty members don't just watch the plays, but are encouraged to interact with the cast and even join them on stage. Some audience members will find the experience "threatening and overwhelming," and Steiger aims to provide them a "safe" context for expressing themselves.

The NSF showcases this program as a "tried and true" success story. Michigan is not alone in using theater to advance the progress of science. The University of Puerto Rico at Humacao devoted some of its NSF-ADVANCE grant to cosponsor performances of Eve Ensler's raunchy play "The Vagina Monologues," a celebration of women's intimate anatomy. The University of Rhode Island lists among its ADVANCE "events" a production of "The Vagina Monologues," along with a visit by Virginia Valian. Rhode Island change agents, led by psychologist Barb Silver, are also trying to affect institutional transformation with a program called TTM—"Transtheoretical Model for Change." The program, adapted from one used by

clinicians to help patients overcome bad habits and addictions such as smoking, overeating, and taking drugs, aims to break the Rhode Island faculty of its addiction to “traditional gender assumptions” and sexist behavior.

More mainstream schools are using their ADVANCE funds more conventionally—to initiate quota programs. At Cornell, as of 2006, 27 of 51 science and engineering departments had fewer than 20 percent women, and some had no women at all. It is using its NSF grant for a program called ACCEL (Advancing Cornell's Commitment to Excellence and Leadership), dedicated to filling science faculty with “more than” 30 percent women in time for the university's sesquicentennial in 2015.

Sensible people—emphatically including the no-nonsense types who become scientists and engineers—will be inclined to dismiss the ADVANCE programs, the enthusiastic promotion of weak and tendentious bias studies, and the blustering senators and congressmen, as an inconsequential sideshow in the onward march of mighty American science and technology. The NSF, like any government agency with a budget of \$6 billion, can be expected to spill a few million here and there on silly projects and on appeasing noisy constituent groups. Unfortunately, the STEM-equity campaign is not going to rest with a few scientific bridges-to-nowhere.

For one thing, the Title IX compliance reviews are already underway. In the spring of 2007, the Department of Education evaluated the Columbia University physics department. Cosmology professor Amber Miller, talking to Science magazine, described the process as a “waste of time.” She was required to make an inventory of all the equipment in the lab and indicate whether women were allowed to use various items. “I wanted to say, leave me alone, and let me get my work done.” But Miller and her fellow scientists are not going to be left alone. Most academic institutions are dependent on federal funding, and scientists like Miller and her colleagues can be easily hammered.

Equally ominous is the fact that the NSF and NAS—America's most prestigious and influential institutions of science—have already made significant concessions to the STEM-equity ideology. So have MIT and Harvard. Can Cal-Tech be far behind?

The power and glory of science and engineering is that they are, adamantly, evidence-based. But the evidence of gender bias in math and science is flimsy at best, and the evidence that women are relatively disinclined to pursue these fields at the highest levels is serious. When the bastions of science pay obsequious attention to the flimsy and turn a blind eye to the serious, it is hard to maintain the view that the science enterprise is somehow immune to the enthusiasms that have corrupted other, supposedly “softer” academic fields.

Few academic scientists know anything about the equity crusade. Most have no idea of its power, its scope, and the threats that they may soon be facing. The business community and citizens at large are completely in the dark. This is a quiet revolution. Its weapons are government reports that are rarely seen; amendments to federal bills that almost no one reads; small, unnoticed, but dramatically consequential changes in the regulations regarding government grants; and congressional hearings attended mostly by true believers.

American scientific excellence is a precious national resource. It is the foundation of our economy and of the nation's health and safety. Norman Augustine, retired CEO of Lockheed Martin, and Burton Richter, Nobel laureate in physics, once pointed out that MIT alone—its faculty, alumni, and staff—started more than 5,000 companies in the past 50 years. Will an academic science that is quota-driven, gender-balanced, cooperative rather than competitive, and less time-consuming produce anything like these results? So far, no one in Congress has even thought to ask.

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