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### OUR ESSAYS

April 5, 2010

On Women, STEM and Hidden Bias

By Susan Pinker



If only Carole Carrier and her peers felt more aggrieved, the new report released by the American Association of University Women on women in science would make more sense. On the day the AAUW report was released, Carrier, a 34 year-old mechanical engineer who works part-time, was walking down the street in early spring with her 20 month old son, Luke, and her mother, Anita. They were on their way to see the spring flower display in the municipal greenhouse when we all stopped for a neighborly chat. "I've never experienced bias," said Carrier her pale eyes registering surprise when I described the gist of the report. Standing on the sidewalk, I summarized its main points: that women avoid going into STEM careers (science, technology, engineering and math) because hidden cultural signals have persuaded them that women don't have what it takes to succeed in those fields. The few women who do buck these stereotypes then tend to abandon their career plans due to implicit gender biases and university science programs that make women feel unwelcome. Hence, a ratio of women in physical science and math that won't budge past 20 percent, and the title of the report, "Why So Few?"

But Carrier, like many female engineers and scientists I've spoken to over the past five years, was frankly puzzled about why anyone might see her as a victim. All along she has felt her choices were entirely her own. She always liked math and was encouraged by her parents, especially her father, who also likes numbers, to study Pure and Applied Science. Then she went into a Forestry program, but she switched out of that because "it was too touchy-feely. It was like, is this environment good for squirrels? I needed to go into something where there's a right answer." So she transferred into agricultural engineering, and told me she enjoyed it immensely--- the university program, as well as the work that came afterwards. So, what about the AAUW's conclusion that women avoid studying engineering because role models are scarce, and university programs are hostile to women? "Hostile environment? Not at all. We had excellent professors. Many female professors, too." There were also many other young women in the program, she said, because students could specialize in food or water treatment and most of the women planned to work in the developing world. Not Carole. "From university I went to work at a cement company because of my love of heavy machinery. They have their own open pit mine, and it was fantastic! I loved every minute of it. I loved the work, and the people there. We worked extremely well together. I started out as a mechanical engineer working on reliability issues, then worked on production, then on machinery output." The company was good at staff development, offering courses and the opportunity to advance, she added, and she "mixed well" with employees, and was well-liked, especially on the shop floor, where she considered other employees' real life expertise as instructive as her academic training. She even had an octogenarian male mentor. Hers seemed like an unequivocally happy story, so thin on the ground these days.

Still, before too long Carrier had handed in her resignation. Why? It turned out that her employer had offered her a promotion, but company policy stipulated that professional staff had to relocate in order to advance. "They wanted to ship me to Albany. Then after that they wanted me to go somewhere else. And I thought, uproot your entire family for a few more dollars? No thanks. I love my city. I love my mom and dad, who live here too. So, no."

The yawning gap between Carrier's expectation of her career -that it could be combined with a stable and fulfilling personal life---and the reality of the lockstep, geographic moves expected in most engineering and computer firms (not to mention academe), is just one of many explanations for the STEM gender gap that is missing from the AAUW report. Though it weighs in at over a hundred pages, the report trains its sights on the

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suggestion of subtle, hidden stereotypes, and rarely questions how many women are actually that keen to sign on to all aspects of "male-typical" STEM careers; to wit, frequent moves, prioritizing salary and promotions over personal happiness, or sacrificing one's deep interests in other fields, say in history, human development, or public policy---all in order to fix, sell or distribute widgets, or, as one disgruntled female engineer put it, to spend the best years of one's life planning air conditioning ductwork for luxury condos.

Starting from the assumption that anything predominantly "male" is the desirable standard, the AAUW report never questions why women should choose technical fields over other disciplines, except to echo the sixties era notion that any ratio that tilts towards male must reflect something worth having. It does state, reasonably, that women in STEM careers have the opportunity to earn more, quoting as evidence the starting salary of a mechanical engineer (\$59,000), versus the starting salary for someone with a bachelor degree in economics (just under \$50,000). What the authors leave out is that several non-STEM careers where women now predominate pay nearly twice this much. The median salary of first-year lawyers---60 percent of whom are now women-- is \$110,000, whereas recent medical, veterinary, or pharmacy graduates, the majority of whom are also women, earned over \$150,000 in 2008, according to the US Bureau of Labor Statistics. In any case, for most women career decisions are not all about money, according to research by the American economist, Sylvia Ann Hewlett, and population studies by the British economist, Catherine Hakim. For 75 to 85 percent of women, other values came first, such as flexibility, autonomy, the ability to make a difference, or to work with people they respect. These values--- more than a chilly university climate-- are often what motivate them to avoid or exit physical science careers. One woman in her early forties who was among the top 10 percent of students in her university engineering class, told me she was cheered on by her engineer father and male science professors ("Ninety-nine percent of my professors were great," she told me), and enjoyed a full-speed-ahead engineering career for over a decade.... until a cancer scare got her acquainted with her priorities in a jiffy. "I just got tired of mixing petrochemicals and debugging software" she told me when I asked why after such success she radically changed tacks. "I wanted to spend more time with people I love. I like how I now get to manage my time."

The decades-long, longitudinal research project on gender differences in career motivations across the lifespan, by research psychologists Camilla Benbow and David Lubinski, is another area this report omits. A person's genuine interests play a role in what they choose to study, including the nature and breadth of the questions one gets to ask, in the lecture hall and ever after. My own field, psychology, is broad enough to allow me to draw on biology, economics, neuroscience and literature, among other interests, and the fact that computing theory, or materials science doesn't enter into that mix is a matter of choice, not hardship. As a woman picking social science as my area of study I am hardly alone. Three quarters of the graduate students in psychology are now female, as are most of the professors, and the social scientists who wrote the AAUW report have similar backgrounds. Its three authors, Catherine Hill, Christianne Corbett, and Andresse St. Rose, have advanced degrees in public policy, cultural anthropology and education, respectively, and 12 of the 15 female members of its advisory committee are social scientists with PhDs in psychology or education. Not, as Jerry Seinfeld would say, that there's anything wrong with that.

In fact there's good evidence that on average, women choose different disciplines than men do--or in different proportions--and they do so with their eyes and options open. While some women are like Carole--they feel confident about their math skills and just love big earth-moving machines, there are many other women with a math and science bent whose career choices and achievements are invisible in this AAUW report. What about Margaret Chan, the head of the World Health Organization and arguably the world's most powerful public health official, or all the other talented women who go into biology, medicine, dentistry, ecology, pharmacology, neuroscience, or veterinary science, all science programs that were mostly male forty years ago, but are now dominated by women on every university campus? Do the women really choose these fields over physics and engineering because they've been convinced by subliminal forces that their math skills are sub-par?

A mountain of published research stretching back a hundred years shows that women are far more likely than men to be deeply interested in organic subjects---people, plants and animals---than they are to be interested in things and inanimate systems, such as electrical engineering, or computer systems---but none of this research is mentioned in this report. One pertinent study, published in 2009, by the economist Joshua Rosenbloom and his colleagues at the University of Kansas also asked the 'Why So Few?' question. Rosenbloom set out to discover why fewer women than men go into information technology despite powerful efforts to entice them. If we don't know why women are less likely than men to choose IT, he explained, how will we know whether investments such as the National Science Foundation's annual \$19 million budget for gender equity workshops and mentoring in computer science, will ever pay off? He compared the interests of hundreds of professionals working in IT to

those working in careers with greater gender balance, all while controlling for possible other causes, such as differences in math ability, educational background, previous math coursework, marital status, race, age and work hours. Ultimately, he discovered that choosing a computing career had little to do with math aptitude or confidence in one's skills. The distinguishing factors were personal preferences and interests. People who chose careers in computing enjoyed working with tools and machines---and irrespective of math ability---men were more likely than women to say that these were their interests on personality and vocational tests. All other things being equal, women were half as likely as men to choose IT careers. Their interests and preferences explain 83 percent of the difference between men and women who go into IT.

Despite these elisions, I heartily agree with one basic premise of the report, that any woman---and in my view anyone at all---who is interested in studying physics, computers or engineering should be encouraged and have every opportunity to succeed. But equal opportunity does not create a mathematically equal result. None of the eight studies included in the report shows that prejudice is the driving force behind people's career choices, or that if gender biases were stripped away, all disciplines would be split 50-50. And the research the report does quote--confidently and at length---includes studies considered preliminary by their authors, or highly contentious by other scientists. One example is the research on stereotype threat, which according to the reports' authors, goes a long way to explain why girls underperform on math tests and then self-select out of STEM careers. The idea of stereotype threat is that women (or other minorities) may choke up with anxiety and perform more poorly on some achievement tests because they fear that they'll confirm negative stereotypes about their group that are floating in the cultural ether. But if you tell them before a test that all people are equally talented on what's being tested, their performance improves.

In its transformative optimism, the idea vaguely reminds me of the runaway bestseller, *The Secret*. But it would certainly be a cheap and benign way to improve test scores, so why not try it? The problem is that experiments aiming to prove the existence of stereotype threat have not been confirmed by meta-analyses. Nor have they been replicated with a great deal of success outside small clusters of undergraduates attending elite universities. It's a tantalizing proposition--- and a "sticky" idea widely covered in the media-- but the experimental effects aren't really generalizable to the real world, as Joshua Aronson, one of the originators of the stereotype threat research, readily acknowledges. "We overstated the situational side of the case, suggesting that the threat was located primarily 'in the air,' and not in some combination of person and social context," he wrote in a book chapter on women in science. "I believe we were so excited about the power of the situation that we justifiably but insufficiently emphasized the theoretical role of individual differences in stereotype threat in our initial paper."

That kind of nuanced statement--one that takes account of the multiple, cumulative factors at play in the complex nature of gender differences in science--is what has gone AWOL from this federally funded report. Gender discrimination still exists in some corners, to be sure, and if discrimination is no longer a legal, ethical or socially tenable position, then perhaps traces of it have gone underground and are hidden from view. The concealed nature of gender bias is the report's resounding theme. But to focus on hidden discrimination as the main reason why women are statistically less likely to study engineering, computers or math on today's college campus is to willfully ignore all evidence that doesn't support your thesis, an approach that ironically, is hardly scientific. "What you see depends on where you look," is how Diane Halpern, an esteemed psychologist who was on the AAUW's advisory board, characterized this area. "Every time you think you have your hands on the answer it slips away." Now if only that sense of scientific caution could be combined with the data on the interests, motivations and life goals of women like Carole Carrier, we'd have real progress.

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*Susan Pinker is a psychologist and a columnist with the Globe and Mail whose last book, **The Sexual Paradox**, was published in paperback by Scribner last fall.*

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In many cases, women have the luxury of choosing more "interesting," but lower paying, professions because they are paired with a male who is breaking his back in a less "fulfilling," high paying job.

It is wonderful that women have the special place in the world to have this luxury at the expense of men. It is odd that this luxury is now being used to bash the very men who provide this luxury.

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Posted by ACF | **April 6, 2010 1:39 PM**

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Published by the Manhattan Institute

