

Comment

The story they missed

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The news made the front page of my home-town newspaper, *The Boston Globe*. Stories about Harvard or Massachusetts Institute of Technology (MIT) often do. Because such stories sometimes cast the institution in question in an unfavorable light, I'm often glad that my own little university, Brandeis, is so small that it tends to fly under many reporters' radar screens. The headline alone made it clear that this story would not be one that MIT would use in its recruiting literature: *Tenure at MIT still largely a male domain* [http://www.boston.com/news/education/higher/articles/2007/12/06/tenure_at_mit_still_largely_a_male_domain/].

I started reading it with the same *Schadenfreude* that Boston-area faculty who aren't employed at Harvard or MIT often experience when either of these two 500-pound educational gorillas slips up. But as I read it, that feeling went away, replaced by one I hadn't expected in this context: compassion. I felt sorry for MIT because I thought the story missed the point, missed it in such a way that the institute was unfairly blamed. And by the time I was finished reading it, I was also convinced that the real story was so much more interesting, and so important, that it was worth writing about.

The article starts with the statement that "just one out of 25 faculty members granted tenure this year at MIT is female" and continues, "a gender imbalance that appears to contrast with the university's decade-old effort to boost the status of women." There's much more, of course, including much gnashing of teeth on the part of the MIT administration and references to the history of gender inequality at MIT, where a famous effort, spearheaded by biology professor Nancy Hopkins, detailed systematic discrimination against women faculty through low pay, inadequate space, and a host of other inequalities. Since 2001, MIT has implemented policies designed to redress gender bias, and in fact, the institute is now headed by its first woman President, neurobiologist Susan Hockfield. So the *Globe* article caused consternation in its seeming demonstration that bias still existed in the matter of tenure.

But does it really? A close examination of the data suggests otherwise. True, only one woman was granted tenure at MIT last year out of 25 total promoted faculty, but the year before the figure was 5 out of 19, and the year before that, 6 out of 19. During the past ten years, the number of junior faculty women granted tenure at MIT has ranged from zero to eight a year, while the number of junior faculty men granted tenure has ranged from 10 to 24. These are very small numbers, and small numbers are prone to large statistical fluctuations. The average number of women tenured at MIT is about 5 per year in recent years, compared with about 16 per year for men, not unreasonable at an institution where only 20% of the faculty are women. I'm not arguing that MIT doesn't still discriminate against women - I have no special knowledge one way or the other. What I am saying is that the data don't prove that it does. In fact, the data are more consistent with the hypothesis that it doesn't: of junior faculty who could have vied for tenure during the last decade, 41% of 104 women were granted tenure, compared with 48% of the 372 men hired.

But could these same figures be used to show that MIT discriminates against women in hiring? After all, only 22% of new hires at MIT during the last decade were women. To answer that question, we need to look at the broad picture of women in the sciences in the US during the past quarter century or so.

Here are the facts, taken from *Science and Engineering Indicators 2008*, published by the National Science Board, part of the National Science Foundation (NSF; it's available as an online document that provides a broad base of quantitative information on the US and international science and engineering enterprise [<http://www.nsf.gov/statistics/indicators/>]). Among US citizens, the proportion of doctoral degrees earned by women in science and engineering has risen considerably in the past two or more decades, reaching a record high of 46% in 2005. During this period, women made gains in all major fields, although considerable differences by field

still exist. Women earn half or more of doctorates in the social/behavioral sciences (which the report counts, along with math, physics and so on, as part of the sciences and engineering), and in the life sciences, but they earn considerably less than half of doctorates in physical sciences (29%), math/computer sciences (24%), and engineering (20%). Still, these figures are substantially higher than was the case in 1985 (16%, 17%, and 9%, respectively). MIT is largely a physical sciences and engineering institution, so a figure of 22% female for new hires doesn't look wildly out of line.

The increase in the number of science and engineering doctorates earned by women occurred in most major fields. For example, the number of engineering doctorates earned by US women increased from 119 in 1985 to 396 in 2005; biological sciences doctorates from 1,032 to 2,024; physical sciences doctorates from 323 to 516; and social/behavioral sciences doctorates from 2,224 to 3,117.

Things look similar when we consider post-education employment. For example, in 2003, women constituted 52% of social scientists, compared with 29% of physical scientists and 11% of engineers. Since 1993, the percentage of women in most science and engineering occupations in NSF's labor force surveys has gradually increased from 23% to 27% across all scientific occupations, but notably from about 35% to 45% in the life sciences, numbers that parallel the percentage of earned doctoral degrees (however, in mathematics and computer sciences, the percentage of women in the labor force actually declined about 2 percentage points between 1993 and 2003).

If we focus on the academic employment of women in science and engineering, we find that it too rose sharply. In 2006, women constituted 30% of full-time faculty, compared with 7% in 1973 - but this increase includes the social and behavioral sciences. Relative to male faculty, female faculty remain more heavily concentrated in the life sciences, social sciences, and psychology, with correspondingly lower shares in engineering, the physical sciences, mathematics, and computer sciences. As for the question of tenure, women hold a larger share of junior faculty positions than positions at either the associate or full professor rank. However, their share of all three positions rose substantially between 1973 and 2006. In 2006, women constituted 19% of full professors, 34% of associate professors, and 42% of junior faculty; the latter figure is comparable to their share of recently earned science and engineering doctorates.

These overall figures paint a fairly rosy picture, but the color changes when, once again, we examine the numbers in more detail. Let's focus on the life sciences, since that's the field that genomics is in, with the physical sciences as a counterpart. Right now, 63% of college students who study the life sciences are female, compared with 42% in the physical sciences. Women make up 58% of recipients of

bachelor's degrees in the life sciences, and 40% in the physical sciences. Fifty-one percent of graduate students in the life sciences are female; the figure for the physical sciences is 32%. And when we get to the PhD degree, 44% of those awarded in the life sciences go to women, and 26% in the physical sciences. In other words, the closer we get to actual post-educational employment, the smaller the percentage of women at every stage, regardless of the field. The drop-off is remarkable, almost 50% in the physical sciences and a third in the life sciences. Women start out just about as interested in the sciences as men, but they drop out along the way at a much greater rate. The real problem, I think, is not that women aren't being hired in the sciences in academia, nor that they are not being tenured (of course, either or both of these may be a problem at some particular institutions, but the data suggest that it is not a systemic problem, at least not any more). The real problem is the pipeline.

Where do all these talented and accomplished women go? Many of them go into industry; the pharmaceutical and biotechnology companies hire significant numbers of women scientists every year. Others go into a variety of different professions, ranging from medicine to science journalism to patent law.

I don't know why the pipeline to academic jobs is so leaky for women - NSF hasn't done extensive surveys on that topic and the *Globe* hasn't covered the problem either. But I can offer some possibilities, based solely on anecdotal evidence, gathered from years of teaching and mentoring women scientists. I think the leak is caused by a number of factors. I don't know how important each one is, but taken together, I believe they constitute a serious problem with the culture of academic science.

A number of women have told me that they find our profession lacking in the opportunities it presents to help people directly. This is certainly one of the attractions of medicine, and part of the attraction of big pharma and biotech may also be the chance to work on treatments for human diseases. It's possible that our obsession with 'basic' research as the highest form of academic science, and the concomitant second-class citizenship that we often bestow on 'applied' research, may be driving away people who want to see the fruit of their work more immediately in terms of an improvement in the human condition.

Another problem is the increasing feeling that academic scientists must work long hours 7 days a week in order to be successful. Many women have told me that one attraction of industry is its relatively predictable work-day schedule, which is easier to integrate into a life involving children and their schedules. They have also indicated that they wanted the freedom to devote their weekends to their families and other pursuits without feeling guilty or inadequate.

Some fields have a macho culture of aggressive competition and self-promotion that is unappealing to women (and to many men, in fact). Synthetic organic chemistry, high-energy physics, most fields of engineering, and some branches of computer science are a few of many examples. Genomics is too new to have established a defined gestalt, but given its engineering connections it's worth keeping an eye on.

Finally, just look at the way academic life seemingly ignores the very existence of concerns that many women have. Research seminars are often scheduled for 4 or 5 pm - exactly the time when many women need to collect their children from day care or be home when they arrive from school. Visitors are taken out to dinner - a practice that often excludes women who need to prepare and serve dinner to their families. Men are increasingly helping out with these duties, but the majority of child-care and domestic concerns are still the province of women, whether by choice or necessity.

If I'm right about these things, then the problem isn't unique to MIT, and fixing it will require all of us to do our part. We have to work together to change the culture of academic science, to make it more friendly to women (and in the process, I bet it will become less stressful to men, too). I think even small changes would make a big difference. For example, why can't research seminars be held in the morning, or early afternoon? Why can't visitors be taken to lunch by the faculty, and to dinner with students, instead of the other way around? Why don't institutions see that providing day care is as important as offering health care? Why do we have to insist that work must consume 12-16 hours of every day? I've worked in Europe, and European scientists produce terrific science working chiefly 9 to 5 on weekdays only. (This is partly because when they are at work, they actually work - a lot of those 12-16 hours a day in the US are unproductive, in my experience.) And maybe we need to rethink our knee-jerk denigration of applied research.

That's the story I wish *The Boston Globe* had really reported on. There'd be no conclusions, of course, because the data don't exist. NSF hasn't studied this in depth and we male academic scientists haven't sat down with our female colleagues and asked them what we need to do to make our profession more welcoming to women. Maybe a newspaper story would provoke people to get those data and ask those questions. Of course, it wouldn't be as dramatic a story as a report based on the perception that gender bias was still prevalent at MIT.

Perception always has a hard time catching up to reality. And negative perceptions often make good stories. But in this case, reality is the better one.