



## TOP ISSUES AND SOLUTIONS FOR WOMEN FACULTY IN SCIENCE AND ENGINEERING

### Issues

**1. Recent analyses demonstrate that at the NIH there are gender differences in funding even after controlling for background variables such as age, degree, and institution.** There are no significant gender differences in funding at the NSF and USDA. Across all three agencies, women comprise a small proportion of researchers who apply for grants, especially at the NIH. See:

Hosek, S.D., Cox, A.G., Ghosh-Dastidar, B., Kofner, A., Ramphal, N., Scott, J., and Berry, S.H. (2005). *Gender Differences in Major Federal External Grant Programs*. Santa Monica, CA: RAND Corporation.  
[http://www.rand.org/pubs/technical\\_reports/TR307/](http://www.rand.org/pubs/technical_reports/TR307/)

**2. Peer reviewers of postdoctoral fellowship applications hold women to higher standards of publication than they do men.** In one study of postdoctoral fellowship applications in Sweden, being female and not having personal connections to someone on the peer review committee placed women at a significant disadvantage in the peer review system despite controls for productivity. See:

Wenneras, C., and Wold, A. (1997). Nepotism and Sexism in Peer Review. *Nature*, 387, 341-343.  
<http://www.nature.com/nature/journal/v387/n6631/index.html>

**3. In scientific laboratories, male and female scientists fall easily into stereotypical behaviors, which may unintentionally perpetuate women's subordinate status.** In a study of gender dynamics in laboratories, men and women were asked to divide tasks listed on a sheet of paper. Men typically chose fewer "feminine" tasks for themselves when they believed that their partner was a woman than when they believed their partner was a man. Women also took on more feminine tasks if they believed their partners were men, even though they were not given information about the men's expectations. See:

Bielby, W. (1991). Sex Differences in Careers: Is Science a Special Case? In H. Zuckerman, J. Cole, and J. Bruer, (Eds.), *The Outer Circle: Women in the Scientific Community* (pp. 171-187). New York: Norton.

**4. Student evaluations reveal that women professors are held to standards that are consistent with the traditional female gender role.** This means that female instructors must do more “emotional work” inside and outside the classroom to earn a positive student evaluation than do male instructors. See:

Centra, J.A., and Gaubatz, N.B. (2000). Is There Gender Bias in Student Evaluations of Teaching? *The Journal of Higher Education*, 71, 17-33.  
<http://www.jstor.org/browse/00221546/di014837/01p0125t?frame=noframe&userID=ab400abd@stanford.edu/01cc99334100501c7d6f1&dpi=3&config=jstor>

**5. Both men and women are significantly more likely to vote to hire a male applicant versus a female applicant with the same academic record.** See:

Steinpreis, R.E., Ritzke, D., and Anders, K.A. (1999). The Impact of Gender on the Review of the Curricula Vitae of Job Applicants and Tenure Candidates: A National Empirical Study. *Sex Roles*, 41, 509-528.  
[http://infotrac.galegroup.com/itw/infomark/395/722/108133041w3/purl=rc1\\_EAIM\\_0\\_A59426455&dyn=6!xrn\\_2\\_0\\_A59426455?sw\\_aep=stan90222](http://infotrac.galegroup.com/itw/infomark/395/722/108133041w3/purl=rc1_EAIM_0_A59426455&dyn=6!xrn_2_0_A59426455?sw_aep=stan90222)

**6. Gender bias extends to the letter of recommendation.** A recent study shows that letters for male applicants tend to be longer and substantively different from those for female applicants, meaning that letters for men tend to include more references to “research” and “skills” (as opposed to “teaching” and “training”) with fewer “doubt raisers” embedded in the text. See:

Trix, F., and Psenka, C. (2003). Exploring the Color of Glass: Letters of Recommendation for Female and Male Medical Faculty. *Discourse and Society*, 14, 191-220.  
[http://newfirstsearch.oclc.org/WebZ/FTFETCH?sessionid=fsapp6-56967-emf8t18x-gk0e39:entitypagenum=4:0:rule=100:fetchtype=fulltext:dbname=ECO\\_FT:recno=5:resultset=6:ftformat=PDF:format=BI:isbillable=TRUE:numrecs=1:isdirectarticle=FALSE:entityemailfullrecno=5:entityemailfullresultset=6:entityemailftfrom=ECO\\_FT:](http://newfirstsearch.oclc.org/WebZ/FTFETCH?sessionid=fsapp6-56967-emf8t18x-gk0e39:entitypagenum=4:0:rule=100:fetchtype=fulltext:dbname=ECO_FT:recno=5:resultset=6:ftformat=PDF:format=BI:isbillable=TRUE:numrecs=1:isdirectarticle=FALSE:entityemailfullrecno=5:entityemailfullresultset=6:entityemailftfrom=ECO_FT:)

**7. Women are underrepresented in department leadership positions.** Among Association of American Universities research institutions, approximately nine out of ten department chairs in engineering, mathematics, and physical sciences are men. Across all science and engineering departments, Earth Science has the highest percent of female department chairs (12 percent). Compared to the number of women who are eligible for department chair positions (i.e., full professors), women scientists are underrepresented in academic leadership by about two to three percent. See:

Niemeier, D.A., and Gonzalez, C. (2004). Breaking Into the Guildmasters' Club: What We Know About Women Science and Engineering Department Chairs at AAU Universities. *NWSA Journal*, 16, 157-171. <http://muse.jhu.edu>

**8. Performance evaluations in industry can favor characteristics of the dominant group, leaving female scientists (and minority male scientists) at a disadvantage.** At research and development science laboratories in private companies, measures of performance and perceptions of competence can be conflated with characteristics of people who occupy positions of leadership, i.e., predominantly white men. See:

Smith, D.R., DiTomaso, N., Farris, G.F., and Cordero, R. (2001). Favoritism, Bias, and Error in Performance Ratings of Scientists and Engineers: The Effects of Power, Status, and Numbers. *Sex Roles*, 45, 337-358.  
<http://www.metapress.com/openurl.asp?genre=article&eissn=1573-2762&volume=45&issue=5&spage=337>

**9. Gender-based discrimination and sexual harassment still exist in academic medicine. For women, the likelihood of experiencing discrimination and harassment may increase with age and rank.** A national survey revealed that women faculty were far more likely than were men to report incidents of discrimination and harassment. See:

Carr, P., Ash, A., Friedman, R., Szalacha, L., Barnett, R., Palepu, A., and Moskowitz, M. (2000). Faculty Perceptions of Gender Discrimination and Sexual Harassment in Academic Medicine. *Annals of Internal Medicine*, 132, 889-896.  
<http://annals.org/cgi/reprint/132/11/889.pdf>

**10. Images of scientists are persistently masculine.** Decades of “draw-a-scientist” research indicates that children tend to depict scientists as men. This gender-linked stereotype is even reproduced at the undergraduate level: both male and female college students more often depict scientists as men than as women. See:

Rahm, J., and Charbonneau, P. (1997). Probing Stereotypes Through Students Drawings of Scientists. *American Journal of Physics*, 65, 774-778.  
<http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=AJPIAS000065000008000774000001&idtype=cvips&gifs=yes>

**11. Gender stereotypes can directly affect—and undermine—performance.** The fear of confirming negative stereotypes about ability in a particular domain impedes performance in that domain. Girls, for example, who are aware of negative stereotypes concerning women and math tend to underperform on math tests. See:

Steele, C.M. (1997). A Threat in the Air: How Stereotypes Shape Intellectual Identity and Performance. *American Psychologist*, 52 (6), 613-629.  
<http://search.lanl.gov/>

**12. Characteristics associated with leadership are perceived as incongruent with the female gender roles.** This means that women may face prejudice in leadership evaluations. See:

Eagly, A.H., and Karau, S.J. (2002). Role Congruity Theory of Prejudice Towards Female Leaders. *Psychological Review*, 109, 573-598.  
<http://search.lanl.gov/>

**13. Male and female faculty typically devote more hours per week to work than do men and women in most other occupations. The long faculty work week is true for professors at all ranks.** The time demands on faculty may be especially discouraging to women who tend to take more responsibility than do men for family obligations. See:

Jacobs, J.A. (2004). The Faculty Time Divide. *Sociological Forum*, 19, 3-27.  
[http://www.springerlink.com/\(h5unxe55qtk2gr45pfmyg0iw\)/app/home/contribution.asp?referrer=parent&backto=issue,2,10;journal,8,76;linkingpublicationresults,1:104974,1](http://www.springerlink.com/(h5unxe55qtk2gr45pfmyg0iw)/app/home/contribution.asp?referrer=parent&backto=issue,2,10;journal,8,76;linkingpublicationresults,1:104974,1)

**14. Women scientists more than men are partnered with professionals. This means that the “two-body” problem hits women especially hard.** For example, 17 percent of male physicists vs. 68 percent of female physicists are married to other scientists. Both married and domestic partners in dual-career academic relationships have decreased job mobility and, therefore, fewer opportunities for career advancement. See:

McNeil, L., and Sher, M. (1998). Dual Science Career Study.  
<http://www.physics.wm.edu/~sher/survey.html>

Wolf-Wendel, L., Twombly, S.B., and Rice, S. (2003). *The Two-Body Problem: Dual-Career-Couple Hiring Policies in Higher Education*. Baltimore, MD: Johns Hopkins University Press.

**15. Having a partner and getting tenure seem to be mutually exclusive for more women than men.** Tenured female scientists are twice as likely to be unpartnered as are tenured male scientists. See:

Mason, M.A., and Goulden, M. (2002). Do Babies Matter? The Effect of Family Formation on the Lifelong Careers of Academic Men and Women. *Academe*, 88 (6), 21-27. <http://www.aaup.org/publications/Academe/2002/02nd/02ndmas.htm>

**16. Women who achieve tenure are less likely to have children than are men who achieve tenure, across all disciplines.** Among women and men who have children early in their academic careers, men are far more successful at earning tenure than are women. See:

Mason, M.A., and Goulden, M. (2002). Do Babies Matter? The Effect of Family Formation on the Lifelong Careers of Academic Men and Women. *Academe*, 88 (6), 21-27.  
<http://www.aaup.org/publications/Academe/2002/02nd/02ndmas.htm>

**17. The salary gap between women and men in academe persists, even after controlling for variables such as academic rank and number of publications.** Recent studies show that women scientists earn less than do males of similar rank. Some scholars attribute the persistent pay gap to the periodic disruptions to women's careers due to family obligations, which can have cumulative effects on total productivity and salary. See:

Umbach, P. (2006). *Gender Equity in the Academic Labor Market: An Analysis of Academic Disciplines*. Paper presented at the 2006 meeting of the American Educational Research Association.  
[http://myweb.uiowa.edu/pumbach/AERA2006\\_equitypaper.pdf](http://myweb.uiowa.edu/pumbach/AERA2006_equitypaper.pdf)

## TOP SOLUTIONS

**1. The underrepresentation of women in science and engineering may violate Title IX.** In a recent report, the U.S. Government Accountability Office (GAO) suggested that enforcing Title IX may energize current efforts to recruit and retain more female scientists and engineers. See:

United States Government Accountability Office. (2004, July). *Gender Issues: Women's Participation in the Sciences Has Increased, But Agencies Need to Do More to Ensure Compliance with Title IX*. GAO-04-639:  
<http://www.gao.gov/new.items/d04639.pdf>

**2. As part of its ADVANCE grant from the National Science Foundation, the University of Michigan has implemented innovative programs to increase the number of female faculty in science and engineering on campus.** UM programs demonstrate that internal committees of scientists and engineers who have studied the literature on gender and science, and convey these findings to their colleagues are especially effective. Michigan's recruitment record since receiving ADVANCE funding is impressive: women comprised 39 percent of new hires in science and engineering in 2004, versus 13 percent in 2001. Similarly, 41 percent of all tenure-track offers in science and engineering went to women in 2004, compared to 15 percent in 2001. A total of eight women have been appointed department chairs in science and engineering since ADVANCE programs began. See:

University of Michigan Recruitment Slide Show:  
<http://www.umich.edu/~advproj/STRIDE%202004%20PowerPoint.ppt>

Stewart, A.J., LaVaque-Manty, D., & Malley, J.E. (2004). Recruiting Female Faculty Members in Science and Engineering: Preliminary Evaluation of One Intervention Model. *Journal of Women and Minorities in Science and Engineering*, 10, 361-375.  
<http://www.begellhouse.com/journals/00551c876cc2f027.html>

NSF ADVANCE website: <http://research.cs.vt.edu/advance/tiki/tiki-index.php>

**3. Gender analysis, when turned to science, medicine, and engineering, can advance human knowledge.** Removing gender bias opens science and engineering to new perspectives, new questions, and sometimes new fields of research. Examples come from biomedicine, human evolution, and genetic models of sex determination (among others). Emerging evidence also reveals that women will **not** become equal participants in science and engineering until we solve question of gender bias in scientific knowledge. See:

Schiebinger, L. (forthcoming). Getting More Women into Science and Engineering: Knowledge Issues. In L. Schiebinger (Ed.), *Gendered Innovations in Science and Engineering*.  
[http://www.stanford.edu/group/IRWG/People/schiebinger\\_sg.pdf](http://www.stanford.edu/group/IRWG/People/schiebinger_sg.pdf)

**4. Reentry programs compensate for work/family responsibilities shouldered by women.** The NIH offers research supplements in particular fields to facilitate reentry of scientists who have taken time off to care for a child or parent (for a period of 1-8 years). See:

Reentry supplement website at: <http://www.niaid.nih.gov/ncn/training/reentry.htm>

**5. Some universities and higher education systems have adopted a comprehensive set of policies designed to promote the advancement of faculty careers in conjunction with major life transitions and circumstances.** One example is the University of California's Faculty Family Friendly Edge, which offers to faculty employees a range of services and benefits including: postdoctoral fellowships for reentry women and men, and tenure-clock stoppage and active service-modified duties for ladder-rank faculty who have significant responsibility for care of young children. See:

UC Faculty Family Friendly Edge website:  
<http://ucfamilyedge.berkeley.edu/initiatives.html>

**6. Corporate initiatives such as the L'Oreal-UNESCO "For Women in Science Program" (FWIS) expand the types of funding and support available to women scientists around the world.** The FWIS program grants laureate awards to five women scientists annually (one per continent) as well as fellowships to promote young women's science careers and cross-cultural collaboration. See:

L'Oreal-UNESCO FWIS Website:  
[http://www.loreal.com/\\_en/\\_ww/index.aspx?direct1=00007&direct2=00007/00001](http://www.loreal.com/_en/_ww/index.aspx?direct1=00007&direct2=00007/00001)

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