Commentary

Nature **442**, 133-136(13 July 2006) | doi:10.1038/442133a; Published online 12 July 2006

Does gender matter?

Ben A. Barres[1 (#a1)]

1. Ben A. Barres is at Stanford University School ofMedicine, Department of Neurobiology, Fairchild Building Room D235, 299 Campus Drive, Stanford, CA 94305-5125, USA
Email: **barres@stanford.edu** (mailto:barres@stanford.edu)

Abstract

The suggestion that women are not advancing in science because of innate inability is being taken seriously by some high-profile academics. Ben A. Barres explains what is wrong with the hypothesis.

M. GOLDWATER/ALAMY

When I was 14 years old, I had an unusually talented maths teacher. One day after school, I excitedly pointed him out to my mother. To my amazement, she looked at him with shock and said with disgust: "You never told me that he wasblack". I looked over at my teacher and, for the first time, realized that he was an African-American. I had somehow never noticed his skin colour before, only his spectacular teaching ability. I would like to think that my parents' sincere efforts to teach me prejudice were unsuccessful. I don't know why this lesson takes for some and not for others. But now that I am 51, as a female-to-male transgendered person, I still wonder about it, particularly when I hear male gym teachers telling young boys "not to be like girls" in that same deroga-tory tone.

Hypothesis testing

Last year, Harvard University president Larry Summers suggested that differences in innate aptitude rather than discrimination were more likely to be to blame for the failure of women to advance in scientific careers[1 (#B1)]. Harvard professor Steven Pinker then put forth a similar argument in an online debate[2 (#B2)], and an almost identical view was elaborated in a 2006 essay by Peter Lawrence entitled 'Men, Women and Ghosts in Science'[3 (#B3)]. Whereas Summers prefaced his statements by saying he was trying to be provocative, Lawrence did not. Whereas Summers talked about "different availability of aptitude at the high end," Lawrence talked about average aptitudes differing. Lawrence argued that, even in a utopian world free of bias, women would still be under-represented in science because they are innately different from men.

Lawrence draws from the work of Simon Baron-Cohen[4 (#B4)]in arguing that males are 'on average' biologically predisposed to systematize, to analyse and to be more forgetful of others, whereas females are 'on average' innately designed to empathize, to communicate and to care for others. He further argues that men are innately better equipped to aggressively compete in the 'vicious struggle to survive' in science. Similarly, Harvard professor Harvey Mansfield states in his new book, *Manliness*[5 (#B5)], that women don't like to compete, are risk adverse, less abstract and too emotional.

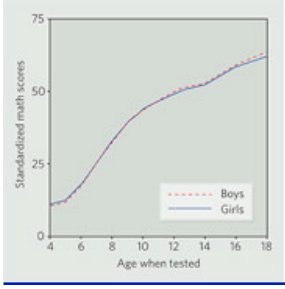
I will refer to this view — that women are not advancing because of innate inability rather than because of bias or other factors — as the Larry Summers Hypothesis. It is a view that seems to have resonated widely with male, but not female, scientists. Here, I will argue that available scientific data do not provide credible support for the hypothesis but instead support an alternative one: that women are not advancing because of discrimination. You might call this the 'Stephen Jay Gould Hypothesis' (see left). I have no desire to make men into villains (as Henry Kissinger once said, "Nobody will ever win the battle of the sexes; there's just too much fraternizing with the enemy"). As to who the practitioners of this bias are, I will be pointing my finger at women as much as men. I am certain that all the proponents of the Larry Summers Hypothesis are well-meaning and fair-minded people, who agree that treatment of individuals should be based on merit rather than on race, gender or religion stereotypes.

> Few tragedies can be more extensive than the stunting of life, few injustices deeper than the denial of an opportunity to strive or even to hope, by a limit imposed from without, but falsely identified as lying within.
> Stephen Jay Gould

The sums don't add up

Like many women and minorities, however, I am suspicious when those who are at an advantage proclaim that a disadvantaged group of people is innately less able. Historically, claims that disadvantaged groups are innately inferior have been based on junk science and intolerance[6 (#B6)]. Despite powerful social factors that discourage women from studying maths and science from a very young age[7 (#B7)], there is little evidence that gender differences in maths abilities exist, are innate or are even relevant to the lack of advancement of women in science[8 (#B8)]. A study of nearly 20,000 maths scores of children aged 4 to 18, for instance, found little difference between the genders (**Fig. 1** (#f1))[9 (#B9)], and, despite all the social forces that hold women back from an early age, one-third of the winners of the elite Putnam Math Competition last year were women. Moreover, differences in maths-test results are not correlated with the gender divide between those who choose to leave science[10 (#B10)]. I will explain why I believe that the Larry Summers Hypothesis amounts to nothing more than blaming the victim, why it is so harmful to women, and what can and should be done to help women advance in science.

Figure 1: Maths-test scores for ages 4 to 18. (/nature/journal/v442/n7099/fig_tab/442133a_F1.html)



(/nature/journal/v442/n7099/fig_tab/442133a_F1.html)

In the United States there is little to distinguish the maths-test scores of boys and girls throughout school.

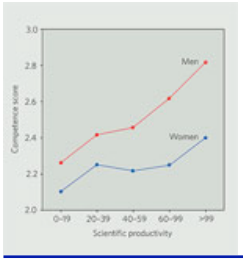
High resolution image and legend (20K) (/nature/journal/v442/n7099/fig_tab/442133a_F1.html)

> I am suspicious when those who are at an advantage proclaim that a disadvantaged group of people is innately less able.

If innate intellectual abilities are not to blame for women's slow advance in science careers, then what is? The foremost factor, I believe, is the societal assumption that women are innately less able than men. Many studies, summarized in Virginia Valian's excellent book *Why So Slow?*[11 (#B11)], have demonstrated a substantial degree of bias against women — more than is sufficient to block women's advancement in many professions. Here are a few examples of bias from my own life as a young woman. As an undergrad at the Massachusetts Institute of Technology (MIT), I was the only person in a large class of nearly all men to solve a hard maths problem, only to be told by the professor that my boyfriend must have solved it for me. I was not given any credit. I am still disappointed about the prestigious fellowship competition I later lost to a male contemporary when I was a PhD student, even though the Harvard dean who had read both applications assured me that my application was much stronger (I had published six high-impact papers whereas my male competitor had published only one). Shortly after I changed sex, a faculty member was heard to say "Ben Barres gave a great seminar today, but then his work is much better than his sister's."

Anecdotes, however, are not data, which is why gender-blinding studies are so important[11 (#B11)]. These studies reveal that in many selection processes, the bar is unconsciously raised so high for women and minority candidates that few emerge as winners. For instance, one study found that women applying for a research grant needed to be 2.5 times more productive than men in order to be considered equally competent (**Fig. 2** (#f2))[12 (#B12)]. Even for women lucky enough to obtain an academic job, gender biases can influence the relative resources allocated to faculty, as Nancy Hopkins discovered when she and a senior faculty committee studied this problem at MIT. The data were so convincing that MIT president Charles Vest publicly admitted that discrimination was responsible. For talented women, academia is all too often not a meritocracy.

Figure 2: Competence scores awarded after peer review. (/nature/journal/v442/n7099/fig_tab/442133a_F2.html)



(/nature/journal/v442/n7099/fig_tab/442133a_F2.html)

Peer reviewers in Sweden award lower competence scores to female scientists than to similarly productive male scientists.

High resolution image and legend (21K) (/nature/journal/v442/n7099/fig_tab/442133a_F2.html)

In denial

P. TURNLEY/CORBIS

Few women, as well as men, are willing to admit that there is discrimination in academia.

Despite these studies, very few men or women are willing to admit that discrimination is a serious problem in science. How is that possible? Valian suggests that we all have a strong desire to believe that the world is fair[11 (#B11)]. Remarkably, women are as likely as men to deny the existence of gender-based bias[13 (#B13)]. Accomplished women who manage to make it to the top may 'pull up the ladder behind them', perversely believing that if other women are less successful, then one's own success seems even greater. Another explanation is a phenomenon known as 'denial of personal disadvantage', in which women compare their advancement with other women rather than with men[11 (#B11)].

My own denial of the situation persisted until last year, when, at the age of 50, several events opened my eyes to the barriers that women and minorities still face in academia. In addition to the Summers speech, the National Institutes of Health (NIH) began the most prestigious competition they have ever run, the Pioneer Award, but with a nomination process that favoured male applicants[14 (#B14)]. To their credit, in response to concerns that 60 of 64 judges and all 9 winners were men, the NIH has revamped their Pioneer Award selection process to make it fairer. I hope that the Howard Hughes Medical Institute (HHMI) will address similar problems with their investigator competitions. When it comes to bias, it seems that the desire to believe in a meritocracy is so powerful that until a person has experienced sufficient career-harming bias themselves they simply do not believe it exists.

My main purpose in writing this commentary is that I would like female students to feel that they will have equal opportunity in their scientific careers. Until intolerance is addressed, women will continue to advance only slowly. Of course, this feeling is also deeply personal to me (see **'Personal experiences'** (/nature/journal/v442/n7099/box/442133a_BX1.html)). The comments of Summers, Mansfield, Pinker and Lawrence about women's lesser innate abilities are all wrongful and personal attacks on my character and capabilities, as well as on my colleagues' and students' abilities and self esteem. I will certainly not sit around silently and endure them.

Mansfield and others claim that women are more emotional than men. There is absolutely no science to support this contention. On the contrary, it is men that commit the most violent crimes in anger — for example, 25 times more murders than women. The only hysteria that exceeded MIT professor Nancy Hopkins' (well-founded) outrage after Larry Summers' comments was the shockingly vicious news coverage by male reporters and commentators. Hopkins also received hundreds of hateful and even pornographic messages, nearly all from men, that were all highly emotional.

Taboo or untrue?

J. WEST/ALAMY

At school, girls and boys show similar levels of ability in the sciences.

There is no scientific support, either, for the contention that women are innately less competitive (although I believe powerful curiosity and the drive to create sustain most scientists far more than the love of competition). However, many girls are discouraged from sports for fear of being labelled tomboys. A 2002 study did find a gender gap in competitiveness in financial tournaments, but the authors suggested that this was due to differences in self confidence rather than ability[15 (#B15)]. Indeed, again and again, self confidence has been pointed to as a factor influencing why women 'choose' to leave science and engineering programmes. When women are repeatedly told they are less good, their self confidence falls and their ambitions dim[16 (#B16)]. This is why Valian has concluded that simply raising expectations for women in science may be the single most important factor in helping them make it to the top[11 (#B11)].

> Simply raising expectations for women in science may be the single most important factor in helping them make it to the top.
> Virginia Valian

Steven Pinker has responded to critics of the Larry Summers Hypothesis by suggesting that they are angry because they feel the idea that women are innately inferior is so dangerous that it is sinful even to think about it[17 (#B17)]. Harvard Law School professor Alan Dershowitz sympathizes so strongly with this view that he plans to teach a course next year called 'Taboo'. At Harvard we must have veritas; all ideas are fair game. I completely agree. I welcome any future studies that will provide a better understanding of why women and minorities are not advancing at the expected rate in science and so many other professions.

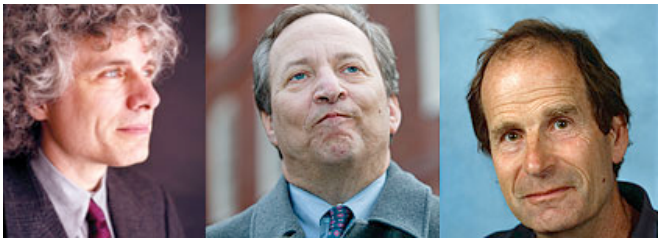
But it is not the idea alone that has sparked anger. Disadvantaged people are wondering why privileged people are brushing the truth under the carpet. If a famous scientist or a president of a prestigious university is going to pronounce in public that women are likely to be innately inferior, would it be too much to ask that they be aware of the relevant data? It would seem that just as the bar goes way up for women applicants in academic selection processes, it goes way down when men are evaluating the evidence for why women are not advancing in science. That is why women are angry. It is incumbent upon those proclaiming gender differences in abilities to rigorously address whether suspected differences are real before suggesting that a whole group of people is innately wired to fail.

What happens at Harvard and other universities serves as a model for many other institutions, so it would be good to get it right. To anyone who is upset at the thought that free speech is not fully protected on university campuses, I would like to ask, as did third-year Harvard Law student Tammy Pettinato: what is the difference between a faculty member calling their African-American students lazy and one pronouncing that women are innately inferior? Some have suggested that those who are angry at Larry Summers' comments should simply fight words with more words (hence this essay). In my view, when faculty tell their students that they are innately inferior based on race, religion, gender or sexual orientation, they are crossing a line that should not be crossed — the line that divides free speech from verbal violence — and it should not be tolerated at Harvard or anywhere else. In a culture where women's abilities are not respected, women cannot effectively learn, advance, lead or participate in society in a fulfilling way.

Take action

Although I have argued that the Larry Summers Hypothesis is incorrect and harmful, the academic community is one of the most tolerant around. But, as tolerant as academics are, we are still human beings influenced by our culture. Comments by Summers and others have made it clear that discrimination remains an under-recognized problem that is far from solved. The progress of science increasingly depends on the global community, but only 10% of the world's population is male and caucasian. To paraphrase Martin Luther King, a first-class scientific enterprise cannot be built upon a foundation of second-class citizens. If women and minorities are to achieve their full potential, all of us need to be far more proactive. So what can be done?

First, enhance leadership diversity in academic and scientific institutions. Diversity provides a substantially broader point of view, with more sensitivity and respect for different perspectives, which is invaluable to any organization. More female leadership is vital in lessening the hostile working environment that young women scientists often encounter. In addition to women and under-represented minority groups, we must not forget Asians and lesbian, gay, bisexual and transgendered folks. There are enough outstanding scientific leaders in these racial and gender groups that anyone with a will to achieve a diverse leadership in their organization could easily attain it.



H. BORDEN; R. FRIEDMAN/CORBIS; MRC CAMBRIDGE

Stephen Pinker, Larry Summers and Peter Lawrence (left to right) all argue that innate differences are at least partly to blame for the failure of women to advance in science.

Second, the importance of diverse faculty role models cannot be overstated. There is much talk about equal opportunity, but, in practice, serious attention still needs to be directed at how to run fair job searches. Open searches often seem to be bypassed entirely for top leadership positions, just when it matters most — search committees should not always be chaired by men and the committee itself should be highly diverse[14, 18]. Implementation of special hiring strategies and strong deans willing to push department chairs to recruit top women scientists are especially effective. It is crucial in the promotion process that merit be decided by the quality, not quantity, of papers published.

Women faculty, in particular, need help from their institutions in balancing career and family responsibilities. In an increasingly competitive environment, women with children must be able to compete for funding and thrive. Why can't young faculty have the option of using their tuition benefits, in which some universities pay part of the college tuition fees for the children of faculty, for day care instead? Tuition benefits will be of no help if female scientists don't make tenure. And institutions that have the financial capability, such as HHMI, could help by making more career-transition fellowships available for talented women scientists.

Speak out

Third, there should be less silence in the face of discrimination. Academic leadership has a particular responsibility to speak out, but we all share this responsibility. It takes minimal effort to send a brief message to the relevant authority when you note a lack of diversity in an organization or an act of discrimination. I don't know why more women don't speak out about sexism at their institutions, but I do know that they are often reluctant, even when they have the security of a tenured faculty position. Nancy Hopkins is an admirable role model, and it is time that others share the burden. It doesn't only have to be women that support women. I was deeply touched by the eloquent words of Greg Petsko[19] following Summers' comments. And it has been 30 years since I was a medical student, but I still recall with gratitude the young male student who immediately complained to a professor who had shown a slide of a nude pin-up in his anatomy lecture.

Fourth, enhance fairness in competitive selection processes. Because of evaluation bias, women and minorities are at a profound disadvantage in such competitive selection unless the processes are properly designed[11, 12, 14, 18]. As the revamped NIH Pioneer Award demonstrates, a few small changes can make a significant difference in outcome. By simply changing the procedure so that anyone can self-nominate and by ensuring a highly diverse selection committee, the number of women and minority winners went up to more than 50% from zero. This lesson can and should now be applied to other similar processes for scientific awards, grants and faculty positions. Alas, too many selection committees still show a striking lack of diversity — with typically greater than 90% white males. When selection processes are run fairly, reverse discrimination is not needed to attain a fair outcome.

Confidence booster

Finally, we can teach young scientists how to survive in a prejudiced world. Self-confidence is crucial in advancing and enjoying a research career. From an early age, girls receive messages that they are not good enough to do science subjects or will be less liked if they are good at them. The messages come from many sources, including parents, friends, fellow students and, alas, teachers. When teachers have lower expectations of them, students do less well. But we are all at fault for sending these messages and for remaining silent when we encounter them. Teachers need to provide much more encouragement to young people, regardless of sex, at all stages of training.Occasional words of encouragement can have enormous effects.

All students, male and female, would benefit from training in how to be more skillful presenters, to exert a presence at meetings by asking questions, to make connections with faculty members who may help them to obtain grants and a job, and to have the leadership skills necessary to survive and advance in academia. Because women and minorities tend to be less confident in these areas, their mentors in particular need to encourage them to be more proactive. I vividly recall my PhD supervisor coming with me to the talks of famous scientists and forcing me to introduce myself and to ask them questions. There is a great deal of hallway mentoring that goes on for young men that I am not sure many women and minorities receive (I wish that someone had mentioned to me when I was younger that life, even in science, is a popularity contest — a message that Larry Summers might have fo und helpful as well). It is incumbent on all of us who are senior faculty to keep a look out for highly talented young people, including women and minority students, and help them in whatever way possible with their careers.

References

1. Summers, L. *Letter to the Faculty Regarding NBER Remarks* **http://www.president.harvard.edu/speeches/summers/2005/facletter.html** (http://www.president.harvard.edu/speeches/summers/2005/facletter.html) (2005).
2. *The Science of Gender and Science. Pinker vs. Spelke: A Debate* **http://www.edge.org/3rd_culture/debate05/debate05_index.html** (http://www.edge.org/3rd_culture/debate05/debate05_index.html) (2005).
3. Lawrence, P. A. *PLoS Biol.* **4**, 13–15 (2006). | **Article** (http://dx.doi.org/10.1371/journal.pbio.0040013) | **ChemPort** (http://chemport.cas.org/cgi-bin/sdcgi?APP=ftslink&action=reflink&origin=npg&version=1.0&coi=1:CAS:528:DC%2BD28XntVehtw%3D%3D&pissn=0028-0836&pyear=2006&md5=f4442fea853bf827f2870dee387e7805) |
4. Baron-Cohen, S. *The Essential Difference: Men, Women, and the Extreme Male Brain* (Allen Lane, London, 2003).
5. Mansfield, H. *Manliness* (Yale Univ. Press, New Haven, 2006).
6. Gould, S. J. *The Mismeasure of Man* (W. W. Norton & Co, New York, 1996).
7. Steele, C. M. *Am. Psychol.* **52**, 613–629 (1997). | **Article** (http://dx.doi.org/10.1037/0003-066X.52.6.613) | **PubMed** (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?holding=npg&cmd=Retrieve&db=PubMed&list_uids=9174398&dopt=Abstract) | **ChemPort** (http://chemport.cas.org/cgi-bin/sdcgi?APP=ftslink&action=reflink&origin=npg&version=1.0&coi=1:STN:280:ByiA3MjjslU%3D&pissn=0028-0836&pyear=2006&md5=c85718c27b7adf6e1499a67903024a64) |
8. Spelke, E. S. *Am. Psychol.* **60**, 950–958 (2005). | **Article** (http://dx.doi.org/10.1037/0003-066X.60.9.950) | **PubMed** (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?holding=npg&cmd=Retrieve&db=PubMed&list_uids=16366817&dopt=Abstract) |
9. Leahey, E. & Guo, G. *Soc. Forces* **80.2**, 713–732 (2001).
10. Xie, Y. & Shauman, K. *Women in Science: Career Processes and Outcomes* (Harvard Univ. Press, Cambridge, 2003).
11. Valian, V. *Why So Slow?* (MIT Press, Cambridge, 1998).
12. Wenneras, C. & Wold, A. *Nature* **387**, 341–343 (1997). | **Article** (/doifinder/10.1038/387341a0) | **PubMed** (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?holding=npg&cmd=Retrieve&db=PubMed&list_uids=9163412&dopt=Abstract) | **ISI** (http://links.isiglobalnet2.com/gateway/Gateway.cgi?&GWVersion=2&SrcAuth=Nature&SrcApp=Nature&DestLinkType=FullRecord&KeyUT=A1997XA49600031&DestApp=WOS_CPL) | **ChemPort** (http://chemport.cas.org/cgi-bin/sdcgi?APP=ftslink&action=reflink&origin=npg&version=1.0&coi=1:CAS:528:DyaK2sXjsVars7s%3D&pissn=0028-0836&pyear=2006&md5=ec129fa4ed4f4c87af199347a4f9291a) |
13. Rhode, D. L. *Speaking of Sex: The Denial of Gender Inequality* (Harvard Univ. Press, Cambridge, 1997).
14. Carnes, M. *et al. J. Womens Health* **14**, 684–691 (2005). | **Article** (http://dx.doi.org/10.1089/jwh.2005.14.684) |
15. Gneezy, U. , Niederle, M. & Rustichini, A. Q. *J. Econ.* **18**, 1049–1074 (2003).
16. Fels, A. *Necessary Dreams* (Pantheon Press, New York, 2004).
17. Pinker, S. *New Repub.* 15 (14 Feb, 2005).
18. Moody, J. *Faculty Diversity: Problems and Solutions* (Taylor and Francis, New York, 2004).
19. Petsko, G. A. *Genome Biol.* **6**, 1–3 (2005).

Top

Nature

ISSN: 0028-0836

EISSN: 1476-4687

- **About NPG**
- **Contact NPG**
- **Nature jobs.com**
- **Privacy policy**
- **Legal notice**
- **Accessibility statement**
- **RSS web feeds**
- **Help**