Brain Drain: Why Women Scientists/Engineers Leave Academe and Industry

Anne C Petersen, PhD
CASBS
Stanford University
Causes of Women’s Departures

- Recent studies in both academe and industry demonstrate that while there still is a “leaky” pipeline, increasing numbers of women are reaching terminal degrees in most S&T fields.
- In the workplace (and earlier) women are choosing better opportunities rather than “chilly” workplace climates.
- Stereotype threat operates for all humans and is one likely mechanism operating for women in S&T work settings.
Recent Studies

- Academe
  - *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering* (NAP, 2007)
  - *NSF Science & Engineering Indicators* (NSF, 2006)

- Industry
  - *The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology* (HBR, 2008)
  - *Climbing the Technical Ladder: Obstacles and Solutions for Mid-Level Women in Technology* (Anita Borg Institute & Clayman Institute, Stanford University, 2008)
Academic Pathways

- Women leave S&T degree programs more often than men of similar ability.
- Reason: better opportunities elsewhere; why are other opportunities more attractive?
- Yet women are now persisting to S&T degrees at higher rates than ever before.
- Similar pattern at every level.
Female share of S&E bachelor's degrees, by field: 1983–2002

NOTES: Physical sciences include earth, atmospheric, and ocean sciences. Data not available for 1999.


Science and Engineering Indicators 2006
Female U.S. graduate S&E enrollment, by field: 1983 and 2003


Science and Engineering Indicators 2006

Percent

Non-S&E  Social/behavioral sciences  Life sciences
Physical sciences  Math/computer sciences  Engineering

NOTES: Physical sciences include earth, atmospheric, and ocean sciences. Life sciences include biological sciences, agricultural sciences, and medical/other life sciences.


Science and Engineering Indicators 2006

Degrees (thousands)

NOTES: Foreign includes permanent and temporary residents. Minority includes Asian/Pacific Islander, black, Hispanic, and American Indian/Alaska Native. Degree recipients with unknown citizenship omitted.


Science and Engineering Indicators 2006
Composition of academic doctoral S&E workforce by race/ethnicity, sex, and citizenship at degree conferral: 1989–2003

NOTES: Non-U.S. citizens include both permanent and temporary visa holders. Other categories include only U.S. citizens.

SOURCE: National Science Foundation, Division of Science Resources Statistics, Survey of Doctorate Recipients, special tabulations. See appendix table 5-25.

Science and Engineering Indicators 2006
Attrition in Academe

- Women less likely than men to apply for faculty positions
- No productivity differences among men and women faculty
- Among reviewed faculty, women as likely as men to be tenured
- Pre-review attrition due to feelings of isolation, lack of respect, difficulty integrating work and family roles
Academic Attrition of Women

- At every educational transition, women less likely to opt for next level, despite prior achievement/talent
- Women more likely to opt out at each work level, despite achievement/talent
- Reasons involve both pushes (isolation/rejection) and pulls (other opportunities) – women’s achievements and talents are not the cause
Sample Recommendations for Academe

- Leadership must communicate a priority on diversity goals, and hold others accountable for results, with training to accomplish these.
- Change processes for recruitment, retention, and assessment of faculty to be more transparent and objective (ie, without bias).
- Provide equal support for men and women faculty at every stage.
- Change culture from male model of faculty (with wife) to human model of faculty.
Women as proportion of employment in S&E occupations, by broad occupation: 1993 and 2003

All occupations

Computer/math scientists

Life/related scientists

Physical/related scientists

Social/related scientists

Engineers

Percent


Science and Engineering Indicators 2006
Situation in Industry

- Claim a high value for diversity of perspective – leads to innovation
- Women highly dedicated; pursue S&T to serve society
- High attrition of women (51%), peaking after ten years
- Huge waste following great investment
S&T Industry Climate for Women

- Few women at high levels
- Fewer women at each level of workforce
- Women perceived as not fitting into technical culture
- Workplace regarded by both men and women as competitive (not cooperative) and requiring access to power/mentoring – which contrasts with espoused value for teamwork
She finally crashed through the glass ceiling. Two broken legs and 37 stitches later ...
Recommendations from Industry Reports

- Provide professional development
- Foster positive culture
- Walk the talk on family friendliness
- Train for effective management
- Diversify pathways to advancement
Unlike most species, it is the male seahorse that carries and gives birth to their young.

Hey! How come *you* got the promotion and I didn’t?!

Just tell them it's a beer gut, dear.
Striking Similarities Between Academe and Industry in Situation of Women and Recommendations to Remedy Situation

- Both sectors note the high cost of losing high performing women
- Both focus on providing setting/culture for effective performance
- Both note the importance of leadership on the value of women scientists/engineers
- Both create systems change in policies and practices to implement values
Policies & Practices Matter

- Research on stereotype threat demonstrates that all humans are vulnerable to suppressed performance given hostile context.
- Experimental research done in many settings with many groups demonstrates this powerful effect, including behavior observed for women in S&T settings.
- Stanford colleague Claude Steele is leading researcher in this area.
Stereotype Threat & Standardized Math Test Performance Among Women

Gender Difference

No Gender Difference

Women
Men
Stereotype Threat & Performance on Raven’s Progressive Matrices by Among African American Students

- Puzzle: Black Students (25) > White Students (22)
- Standard: Black Students (23) < White Students (24)
- IQ: Black Students (21) < White Students (25)

Legend:
- Black Students
- White Students
Research on Stereotype Threat

- Also operates with white men
  - threat in athletic performance where “natural ability” invoked
- Every group has some vulnerability
- Threat operates only if person cares about high performance
- Threat resides in social mistrust not self-doubt
- Remedy is to create social trust
Addressing Stereotype Threat

- Affects all humans in contexts where the stereotype is that they don’t do as well (despite objective skill/capacity)
- This prevails in S&T work settings against women
- Antidote to threat is social trust
- Requires
  - Objective policies/practices to create effective performance
  - Leadership messages to address perceptions
Both Stereotype Threat and Social Trust are Common Experiences

- At Penn State every faculty search required to interview at least one woman and one minority
  - conveyed that such candidates existed
  - they did!

- Existence or lack of role models can dispel or convey social trust
  - example of elite professor selection

- Requires similar policies practices at each level
  - Changed mindset
Diversity and Ability

- People tend to select similar others
  - this “seems” natural but may have pernicious effects
  - Example of field death

- Research demonstrates that diversity of perspectives plus ability are more effective than ability alone for selection

- Scott Page research: diversity trumps ability for innovation & effectiveness
Bottom Line

- Women have dramatically increased
  - S&T degrees
  - Participation in academic and industrial workforces
- Data suggest great interest and dedication as well as higher dropout: great waste
- Why do women drop out?
  - Stereotype threat
  - Lack of social trust
Need Workplaces that Enhance Performance of All

- Possible? Sure!
- Men and women want the same thing
  - Being valued
  - Having opportunity
  - Having a life as well as rewarding work
- Power and privilege corrupt systems, undermine effectiveness
- Need to create workplaces that optimize effectiveness
Thanks!