

“I never am really satisfied that I understand anything; because understand it well as I may, my comprehension can only be an infinitesimal fraction of all I want to understand”

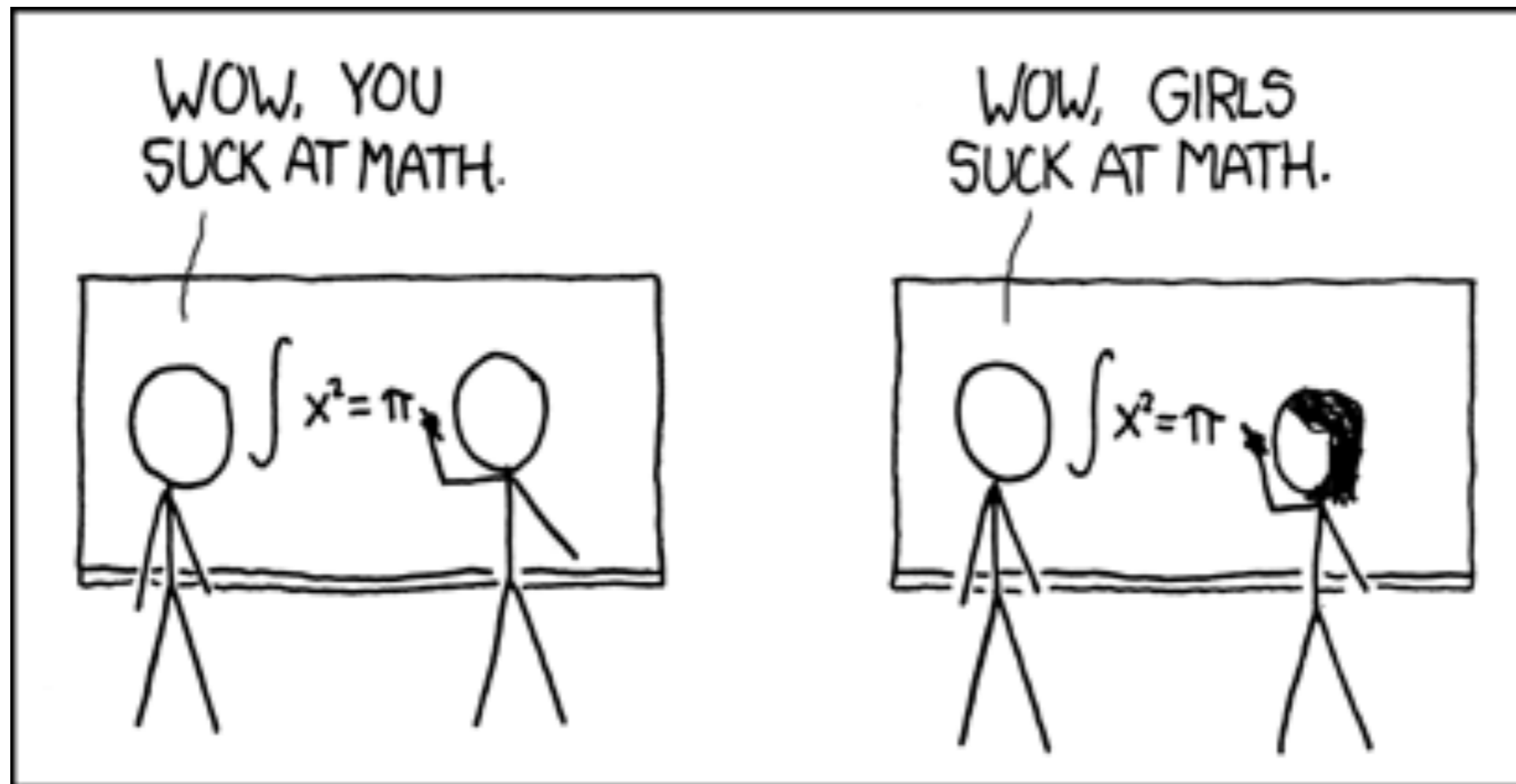
Ada Lovelace



Women in Science and
Engineering

October 18, 2013
Women in Physics Club
Lauren Lui

Generalizations...



xkcd.com

Generalizations...

THESE WOMEN HAVE CHANGED
THE WORLD WITH SCIENCE
- TOO BAD A MAN WAS GIVEN ALL CREDIT -


CECILIA PAYNE

Discovered what the sun is made of. Was told not to publish her work by reviewer Henry Norris Russel. Four years later he repeated her work, published it and was given all the credit

Discovered the first pulsar. Her senior Anthony Hewish put himself on the paper, he got all the credit and the Nobel Prize.


JOCELYN BELL BURNELL

Co-discovered Nuclear Fission, her colleagues intentionally published the paper without her name. They went on to win the Nobel Prize, she went on to be forgotten.


LISE MEITNER

Discovered sex was determined by chromosomes. Sent her work to Thomas Morgan. In public he dismissed her and called her 'just a technician'. He published his own book on sex determination and took all the credit.


NETTIE STEVENS

"AN ERROR THAT ASCRIBES TO A MAN WHAT WAS ACTUALLY THE WORK OF A WOMAN HAS MORE LIVES THAN A CAT"
- HERTHA AYRTON -

WomenRockScience.tumblr.com 

Promote awareness,
not blame!

Outline

- Why should everyone care about imbalanced gender ratios in science?
- Historical perspective
- Examples of gender bias
- Video talks
- Special topics and Studies
 - Leaky pipeline
 - Stereotype threat
 - Gender Bias

Questions...

- Do you know the percentage of women receiving engineering degrees?
- Why don't more women enter the physical sciences, engineering and computing-related fields? and why is this weird?
- Why is it important to have a 50/50 ratio of women/men in STEM fields?

Questions...

- Why don't more women enter the physical sciences, engineering and computing-related fields? and why is this weird?
- Why is it important to have a 50/50 ratio of women in STEM fields?
 - Diversity for the workforce
 - Gender-balanced teams do a better job
 - consider airbag safety for children and small adults
 - If the field doesn't reflect the demographics in the population, the field isn't drawing from the full talent pool that it can

Things we hear...

- “Science is a meritocracy – the best scientists naturally rise to the top.”

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- “Science is a meritocracy – the best scientists naturally rise to the top.”
 - If this were the case, wouldn't there already be fair representation of all backgrounds?
 - This assumption ignores factors that disproportionately affect students of some backgrounds (e.g., stereotype threat)

Things we hear...

- “Biases against women and minorities in STEM are a thing of the past. The reason why women and minorities are not well-represented at the faculty level is that it takes a while for them to progress through their careers. In time, the numbers will catch up.”

Institute for Scientist & Engineer Educators, 2013

Things we hear...

- “Biases against women and minorities in STEM are a thing of the past. The reason why women and minorities are not well-represented at the faculty level is that it takes a while for them to progress through their careers. In time, the numbers will catch up.”
 - True that as we reduce biases, it will take time for numbers to catch up, **however**
 - Biases do still exist (see supplementary reading)

Institute for Scientist & Engineer Educators, 2013

Scientist and Engineering Stereotypes in the Media



Pacific Rim



Thor



Historical Perspective - Rima Apple

- Agnes Fay Morgan
 - BS 1904, MS 1905 - Chemistry from Univ of Chicago
 - PhD 1914 - Organic Chemistry from Univ of Chicago
- 1915 - Assistant professorship at UC Berkeley in home economics
- Conducted nutrition research, despite being in home economics, difficulties with funding
 - feminized department: as a home ec department, called upon to do aspects of nutrition that were closely connected with the home-front, not research.
 - in 1965: Morgan” “My first troubles were budgetary. A tight-fisted board of research gave us \$600 one year for research for the department and I considered this a remarkable windfall. However, I found later that they had given the Chemistry Department \$13,000 for their research. This I considered obviously unfair. I think on one would agree with me then or now.”
 - Home Ec could not grant PhDs, despite Morgan’s national reputation and numerous awards
 - Nutritionists trained by Morgan received degrees through interdepartmental group.

Historian of the Family and Gender

- Male breadwinner - mid 20th century “aberration”
- Rebalancing when women entered paid workforce
 - 1970s in America
 - 1960s ads - “you must be really beautiful”
 - 1993 - sexual harassment becomes illegal
- Current state of affairs
 - No national childcare standards
 - No subsidized leave to take care of babies
- Thoughts
 - Second class in the workplace or in the home?
 - Worker’s right to the family life



http://poptech.org/popcasts/stephanie_coontz_gender_gaps

Anecdotes on Gender Bias

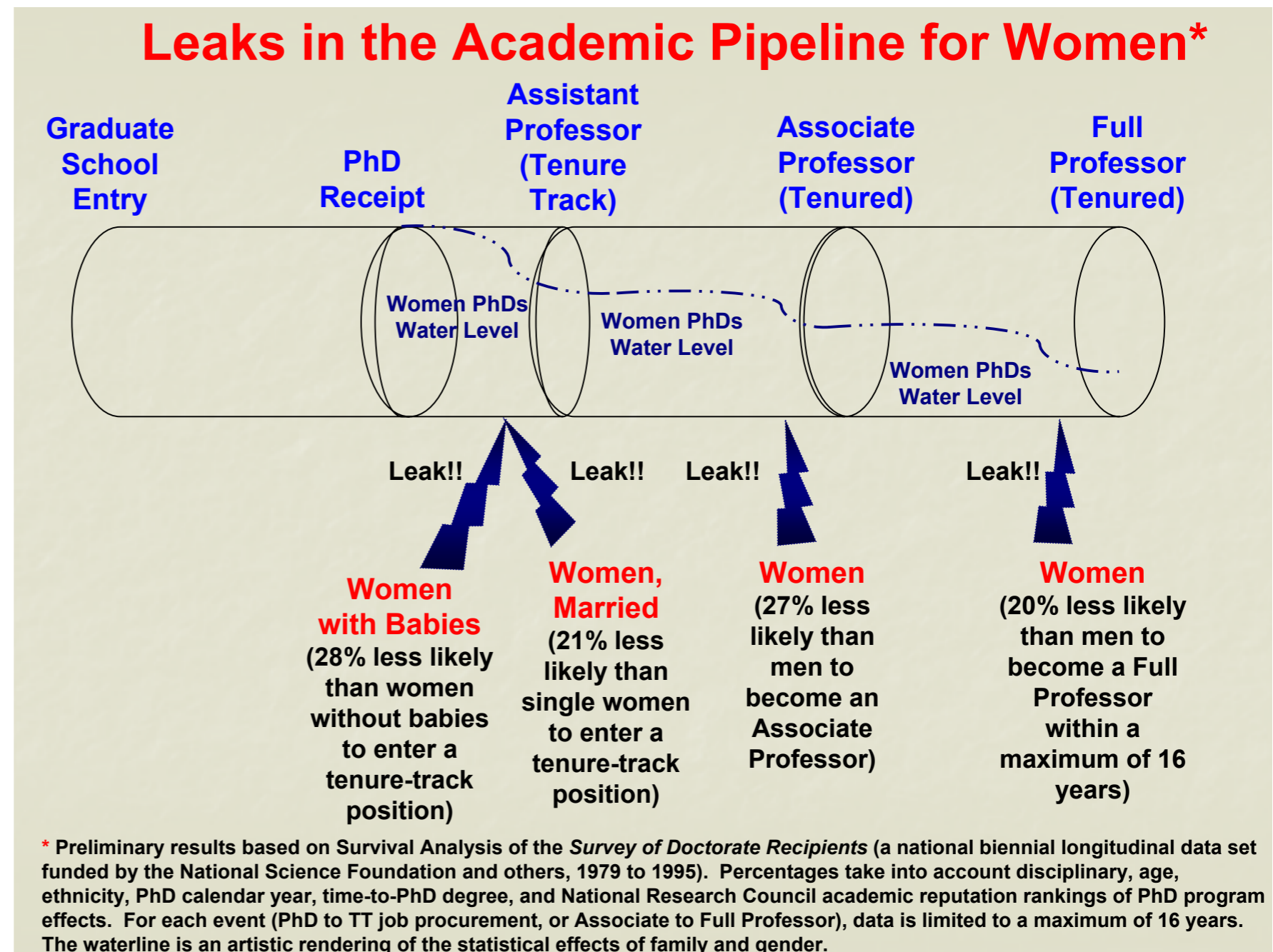
- 2005 Larry Summers - President of Harvard
 - Comment: innate differences account for why there are fewer women in science
 - http://www.boston.com/news/education/higher/articles/2005/01/17/summers_remarks_on_women_draw_fire/?page=full
- 2013 - I Fucking Love Science!
 - People were surprised that the person who runs the “I Fucking Love Science” facebook page was a woman
 - Sample comments:
 - "You're beautiful."
 - "you mean you're a girl, AND you're beautiful? wow, i just liked science a lil bit more today ^^"
 - "You're...a woman...?"
 - "OMFG! You are a beautiful GIRL!!! I admit I never expected you to be **a girl and on top of** that a beautiful one. My sincere apologies."
 - *points, mouth open* GIRL!!!
 - "Holy crap I pictured. A 30 sumthin harvard geek Imfao thanks for makin science more enticing ;)"
 - "wow who would've thought!! you're a girl and kindda pretty! LOL"
 - <http://www.dailydot.com/society/facebook-fcking-love-science-elise-andrew/>

“Leaky Pipeline” and “Glass Ceiling”

- Miss Representation: <http://www.missrepresentation.org>
- Sheryl Sandberg
 - Ted: <http://www.youtube.com/watch?v=18uDutyIDa4>
 - At Grace Hopper: <http://www.youtube.com/watch?v=rMVCSrm65kg>
 - 9:20 (numbers), 19:00, 23(ambition gap), 25(stereotype threat), 31:20
- Nora Denzel
 - <http://www.youtube.com/watch?v=242Z5BhJAC8>

Mary Ann Mason: “Do Babies Matter?”

- http://www.aps.org/programs/women/workshops/gender-equity/upload/Mason_Mary_Ann_APS_Gender_Equity_Conference.pdf



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Reasons Most Commonly Cited by UCB PhD Students for Shifting Career Goal away from Professor with Research Emphasis				
% citing factor as "Very Important" in career goal shift		Total	Men	Women
1	Negative experience as PhD student	48%	50%	46%
2	Other life interests	41%	39%	41%
3	Feelings of isolation/alienation as PhD student	37%	35%	39%
4	Professional activ. <u>too</u> time consuming	37%	31%	41%
5	Issues related to children	31%	16%	42%
6	Geographic location Issues	29%	24%	32%
7	Issues related to spouse/partner	27%	19%	32%
8	Lack of encouragement/mentor	25%	28%	22%
9	Job security	24%	28%	21%
10	Bad job market	23%	25%	22%
11	Career advancement issues	23%	26%	21%
12	Other career interests	22%	27%	19%

N=262 to 313 107 to 134 154 to 177

Yellow shading indicates the group's response is significantly higher than the other group's response (P<.05).

Source: Mason, Mary Ann and Marc Goulden. 2006. "UC Doctoral Student Career Life Survey." (<http://ucfamilyedge.berkeley.edu/grad%20life%20survey.html>).

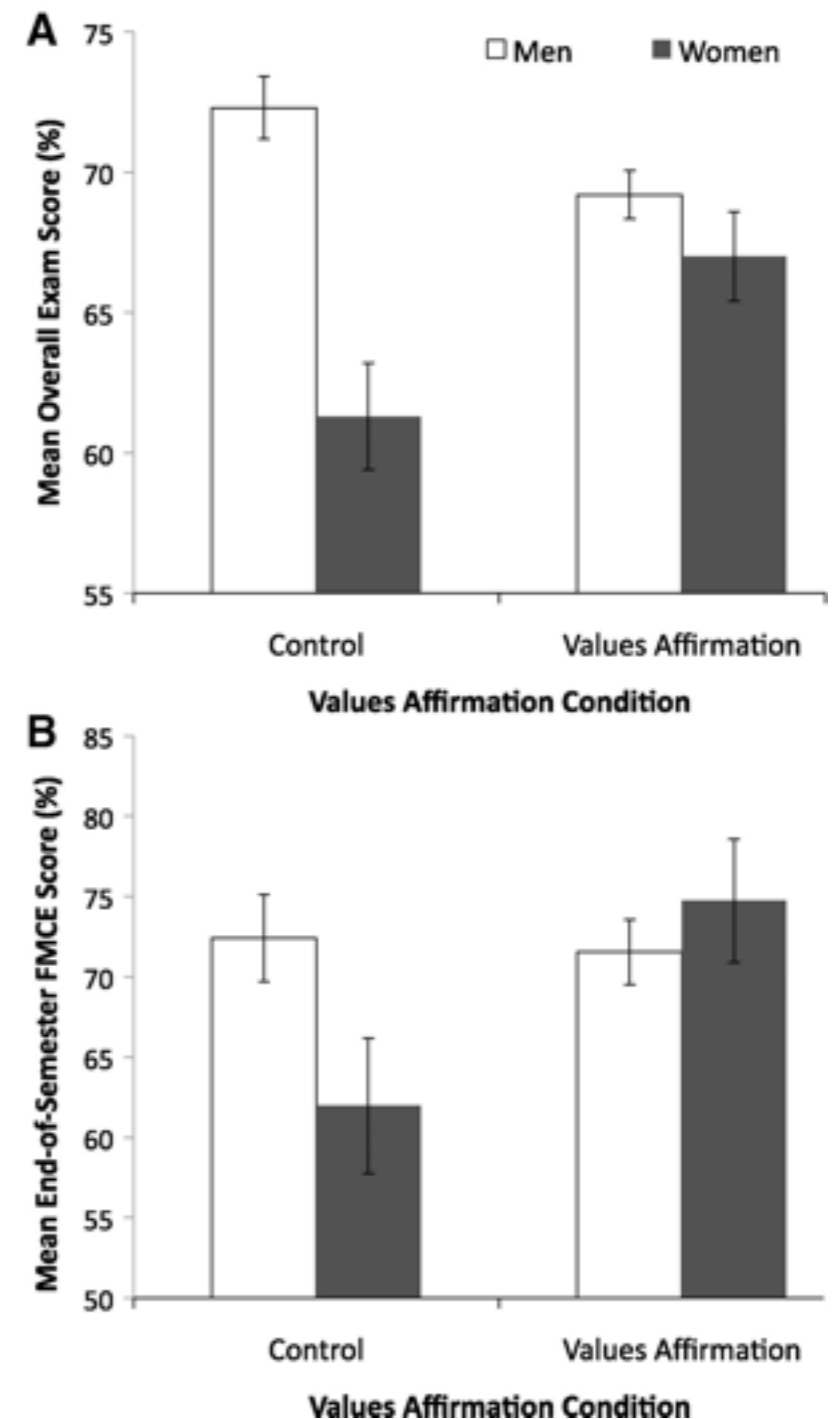
C-MORE work-life balance seminar

- Center for Microbial Oceanography Research and Education
- Information about your legal rights to raise a family while having a career in higher education (grads, postdocs, professors)
- Studies about the issue
- Suggestions on strategies



Stereotype threat

- Stereotype threat: experience of anxiety or concern in a situation where a person has the potential to confirm a negative stereotype about their social group
- Claude Steele
 - http://www.leedsmet.ac.uk/carnegie/learning_resources/LAW_PGCHE/SteeleandQuinnStereotypeThreat.pdf
- Reducing the Gender Achievement Gap in College Science: A Classroom Study of Values Affirmation
 - <http://www.sciencemag.org/content/330/6008/1234.abstract>
 - Values affirmation improves physics test scores for women

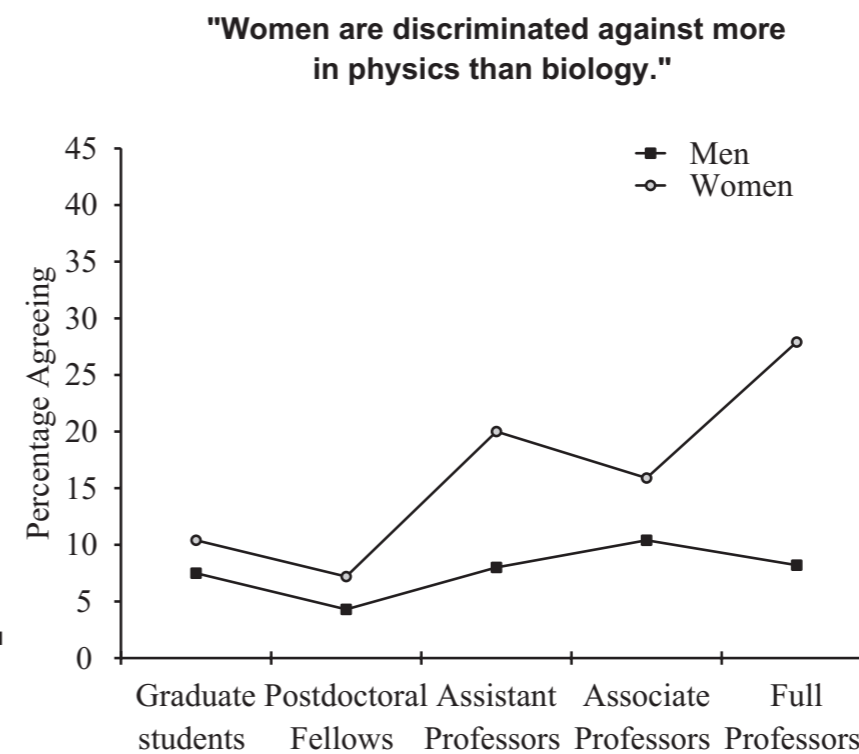
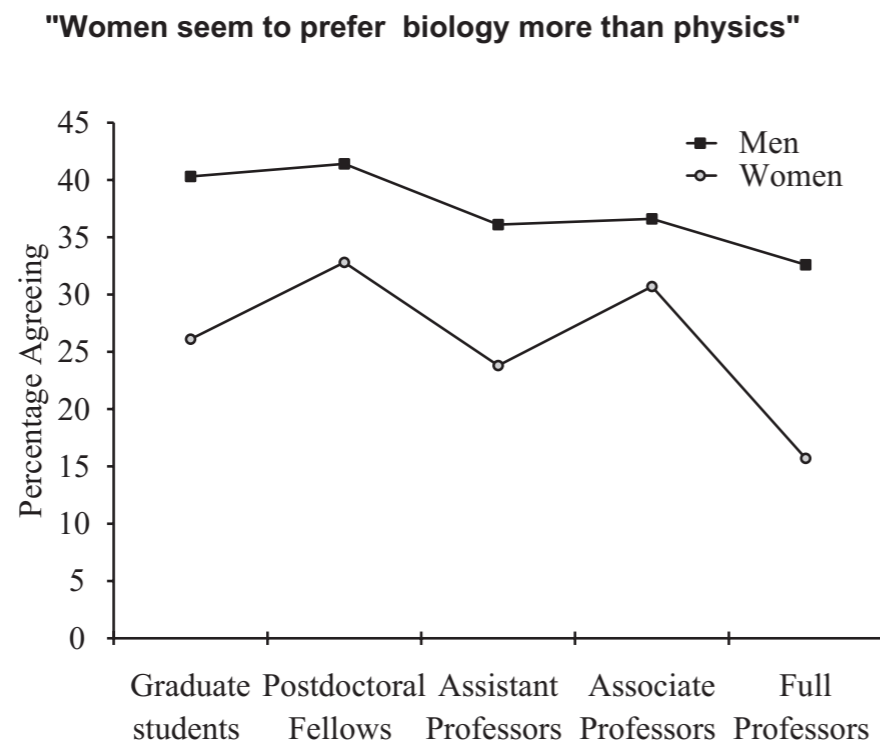


Study: Why fewer women in physical sciences?

- “Gender Segregation in Elite Academic Science”
 - Ecklund et al. 2012 Gender and Society
 - <http://gas.sagepub.com/content/26/5/693.abstract>
 - “Why are women more likely to biology than physics?”
 - Women were more likely to cite discrimination
 - Men were more likely to cite brain differences or “problems” in math
- <http://www.buzzfeed.com/annanorth/what-male-and-female-scientists-say-about-women-in>

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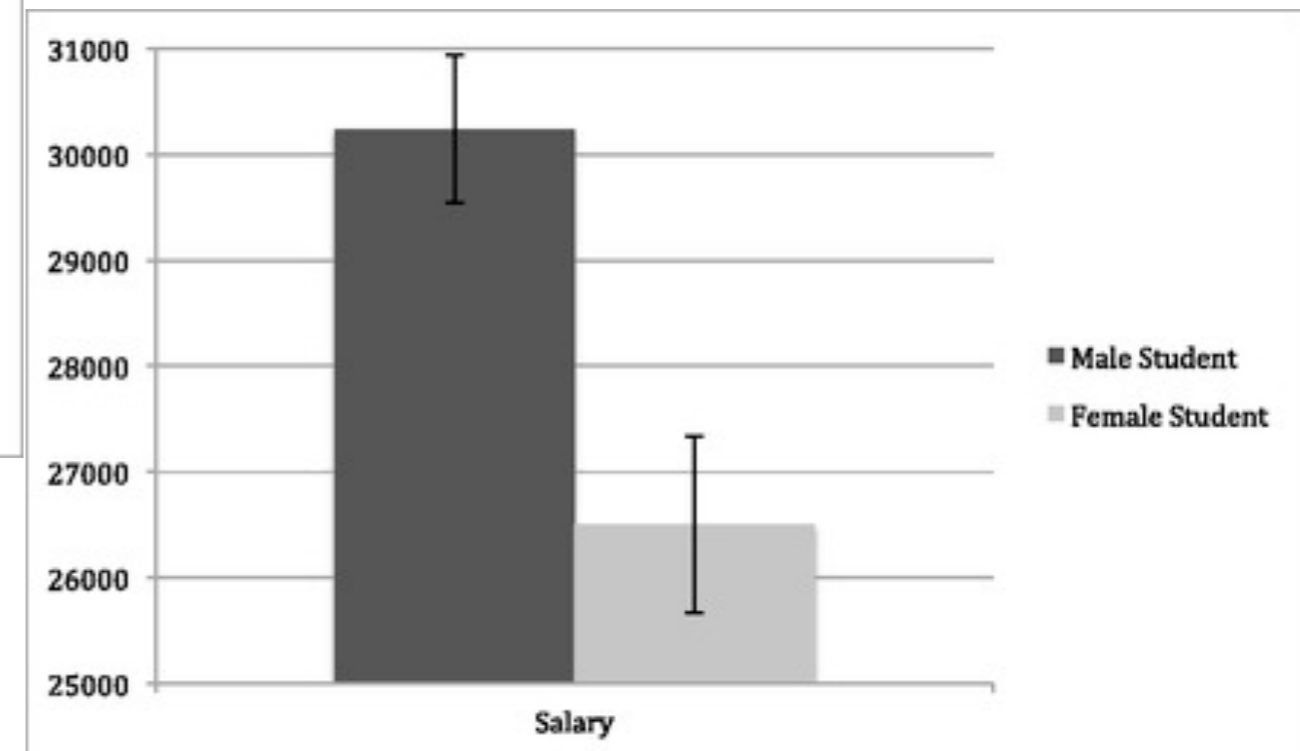
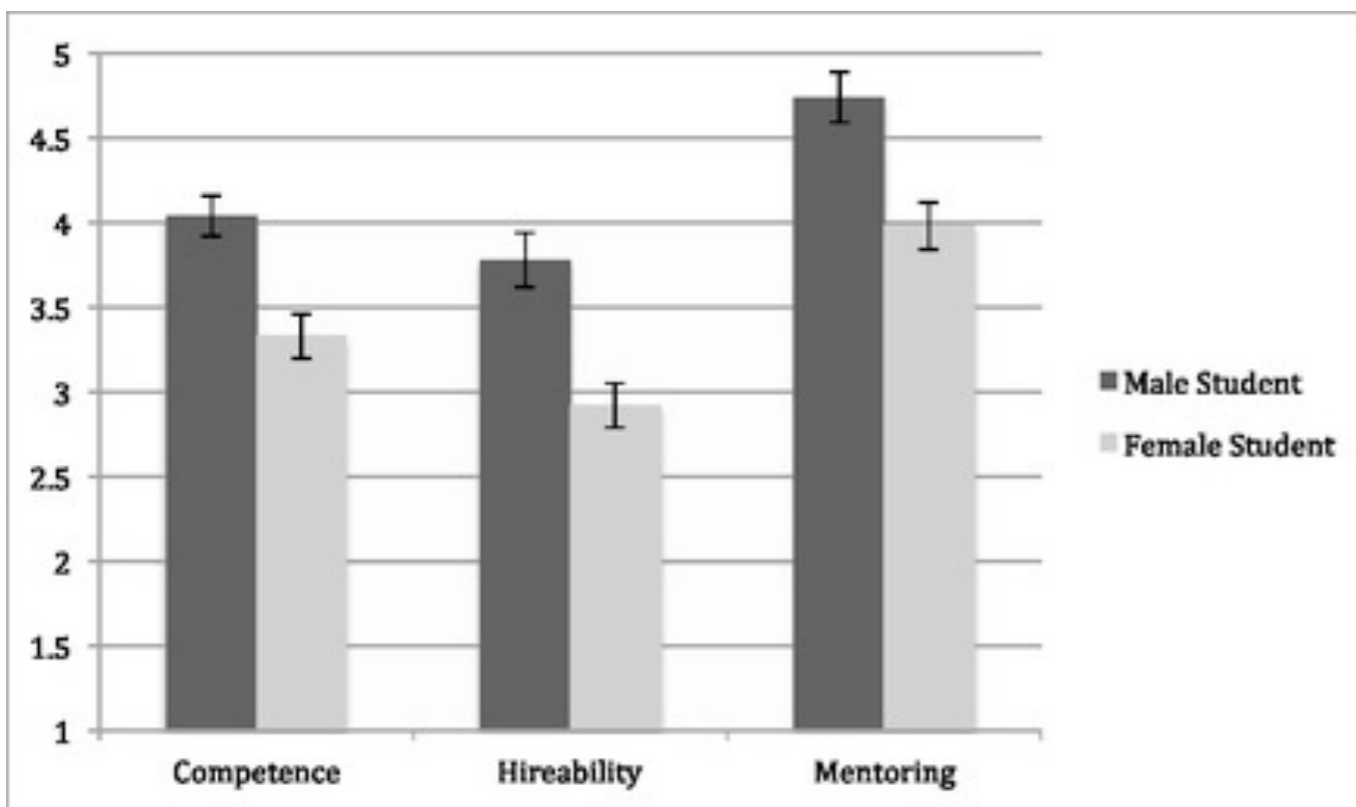


Study: Gender Bias

- “Science faculty’s subtle gender biases favor male students”
 - Moss-Racusin et al 2012 PNAS
 - <http://www.pnas.org/content/early/2012/09/14/1211286109>
 - Faculty participants rated male applicants as significantly more competent than the (identical) female applicant
 - Equally strong among female and male scientists, no variation by age, race, or discipline
- <http://www.sciencemag.org/content/337/6102/1592.full?sid=4c0653a6-38c9-4852-bf47-c48a2969bf7b>
- http://www.nytimes.com/2012/09/25/science/bias-persists-against-women-of-science-a-study-says.html?_r=0

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Study: Gender Bias

- Women need to publish more to receive the same peer-review rating as a man
 - 3 more papers in major journals or 20 more in minor journals
- <http://news.sciencemag.org/scienceinsider/2010/09/six-ways-to-keep-women-in-science.html>

Ways to keep women in science and engineering

- Recruitment
 - Encourage more women to enter STEM fields
 - Project Awesome (<http://awesome.soe.ucsc.edu/>)
- Retention
 - Mentoring
 - “Stop the clock on tenure”
 - test for unconscious bias
- Realize myths
 - <http://www.livescience.com/7349-top-5-myths-girls-math-science.html>