Title: Equity, Diversity, and Inclusion for Scientists

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Abstract: There is a profound lack of diversity in science labs and classrooms, which has a negative impact on productivity. Scientific research demonstrates that diverse groups are more creative and better able to solve problems. Though the perception is that things are improving, NSERCâ€™s recently released report shows that attrition rates in Canadian STEM fields are higher for women than for men at all career stages and that the percentage of women has not changed substantially in the last 15 years. Racialized and Indigenous people are also underrepresented at Canadian universities. This seminar will explore the scientific research surrounding EDI in hiring, writing reference letters, reviewing grants, and managing trainees. Also included are tips and tricks for incorporating EDI into grant applications.

Equity, Diversity, and Inclusion for Scientists

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Proper language

Equity – Providing people what they need to succeed

Diversity – People who are different

Inclusion – Making sure everyone has the opportunity to participate

Sex – Biological attributes: chromosomes, hormones, reproductive organs. Mostly binary (male/female)

Gender – Socially constructed roles and identities. Fluid and non-binary

Racialization/racialized person – “the process by which societies construct races as real, different and unequal in ways that matter to economic, political and social life” Ontario Human Rights Commission (http://www.ohrc.on.ca)

Socioeconomic background

Overt discrimination

Unconscious bias

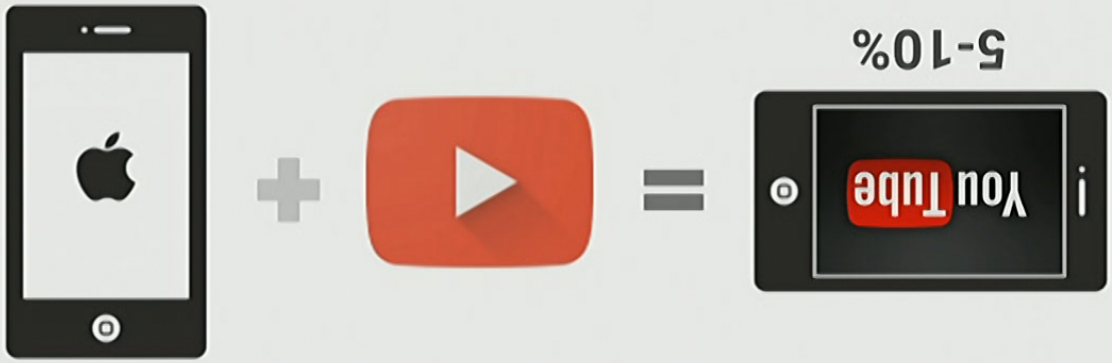
Unconscious bias: Behavior that is shaped by implicit or unintended biases, stemming from repeated exposure to pervasive cultural stereotypes

People who value their objectivity and fairness are paradoxically particularly likely to fall prey to biases, in part because they are not on guard against subtle bias

YOU are biased.

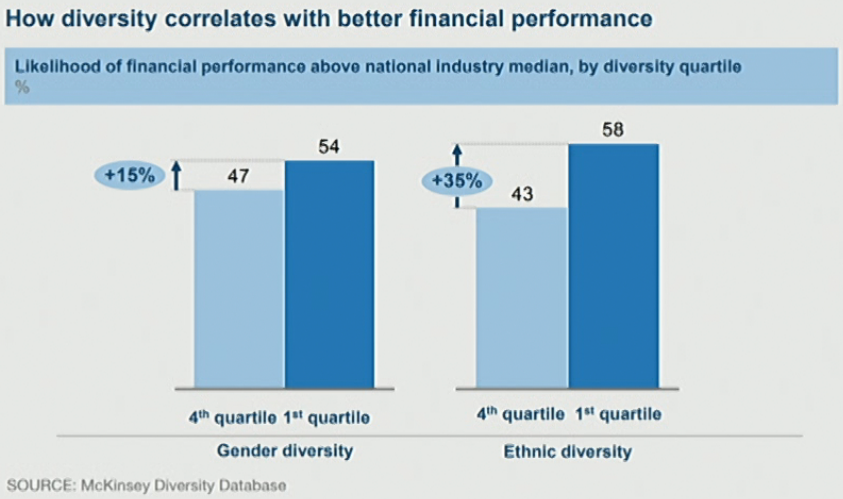
It matters.

Why is gender parity/diversity important?



Companies perform better with increased diversity

McKinsey is one of the world's largest management consulting groups
Data from 2015



Diverse teams:

- Focus More on Facts
- Process Those Facts More Carefully
- Are More Innovative

Ethnic diversity is important for team science

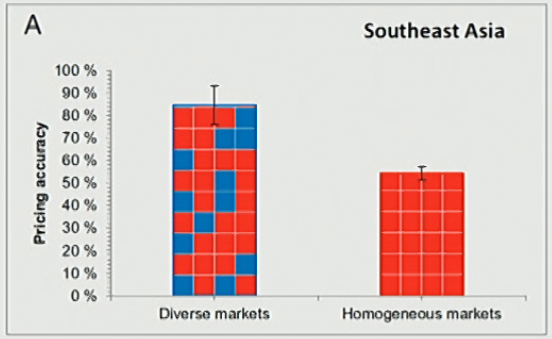
- 2.5 million research papers published between 1985 and 2008
  - Authors in US only
  - 11 scientific fields, including biomedicine, physics and geosciences
- Authors with English surnames were **more likely have co-authors with English surnames than would occur by chance**; those with Chinese names were more likely to have co-authors with Chinese names, and so on. The trend held for seven other groups, including Russian and Korean populations.
- Papers with 4 or 5 authors of different ethnicities had 5–10% more citations on average than papers from authors of all the same ethnicity

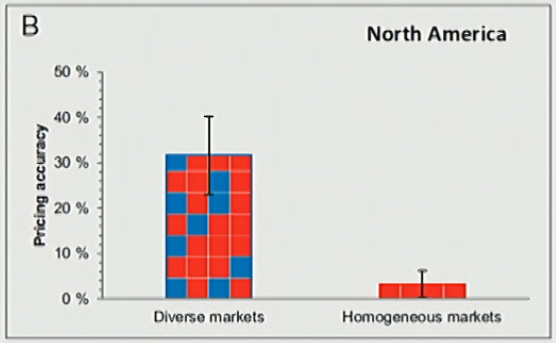
Freeman, R.B. & Huang, W. *Nature* **513**, 305 (2014)

Ethnic diversity is important for team science

Bubbles emerge when traders err collectively in pricing, causing a persistent misfit between the market price and the true value (also known as "intrinsic" or "fundamental" value) of an asset, such as a stock

"We find that price bubbles are fueled by the ethnic homogeneity of traders. Homogeneity, we suggest, imbues people with false confidence in the judgment of coethnics, discouraging them from scrutinizing behavior."

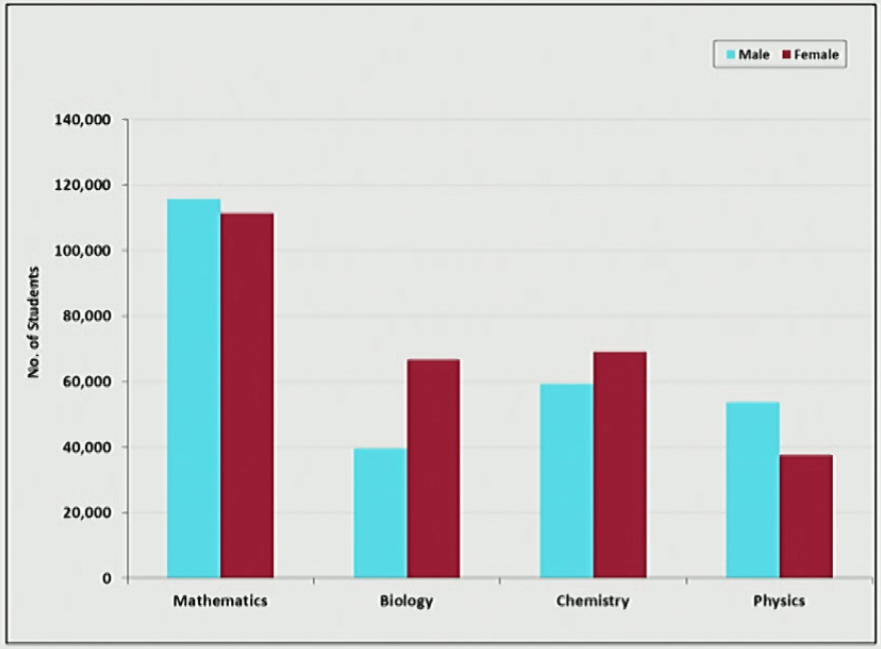




Levine, et al. *PNAS* 2014

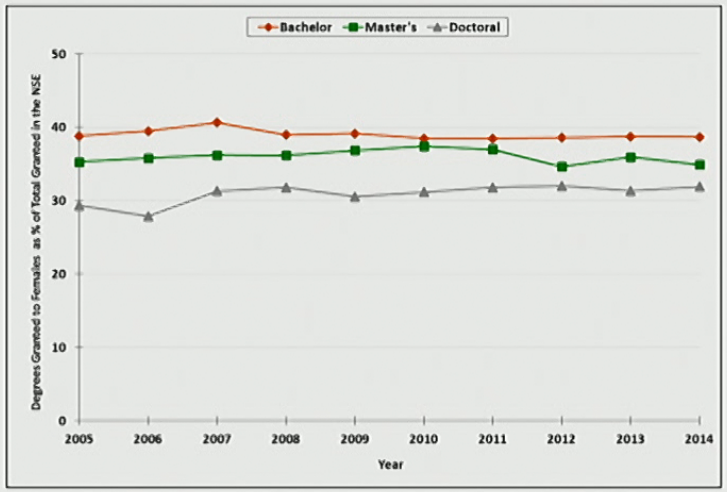
Breakdown of students by STEM field

Figure 2.2 Number of Students Enrolled, or Writing Provincial Exams for Grade 12, Secondary 5 and Cégep, 2013

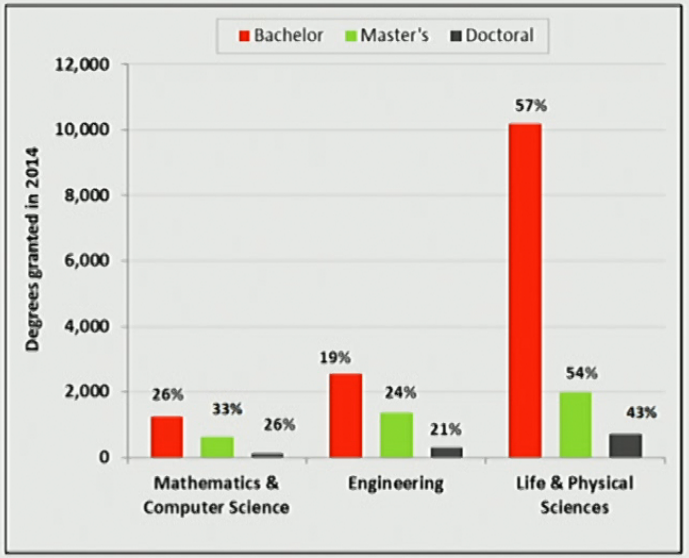


http://www.nserc-crsng.gc.ca/_doc/Reports-Rapports/WISE2017_e.pdf

Degrees granted to female students in NSE



Degrees granted to female students in NSE as a percentage of total granted in NSE



http://www.nserc-crsng.gc.ca/_doc/Reports-Rapports/WISE2017_e.pdf

Careers for NSE Bachelor Degree Holders (25 – 34 yo)

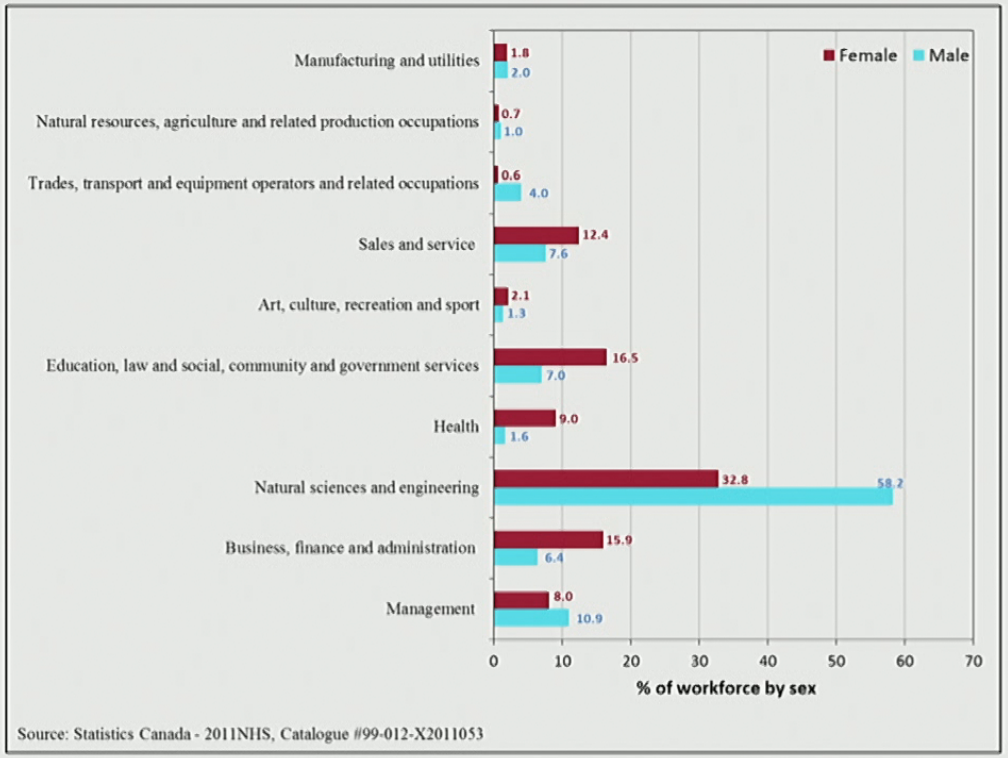
Occupation	% Female				
	1995	2000	2005	2010	2015
General					
NSE-Related Occupations	19.2	20.9	20.7	21.8	23.1
R&D Careers					
University Faculty	11.5	12.5	15.9	18.3	n/a
Government Scientists	10.7	13.9	17.2	20.1	23.7
Industry Researchers	n/a	n/a	21.1*	n/a	n/a

Source: Statistics Canada

n/a: not applicable

*: Industry research percentage is for 2003.

Remember:
40% of Bachelor Degree Holders are female



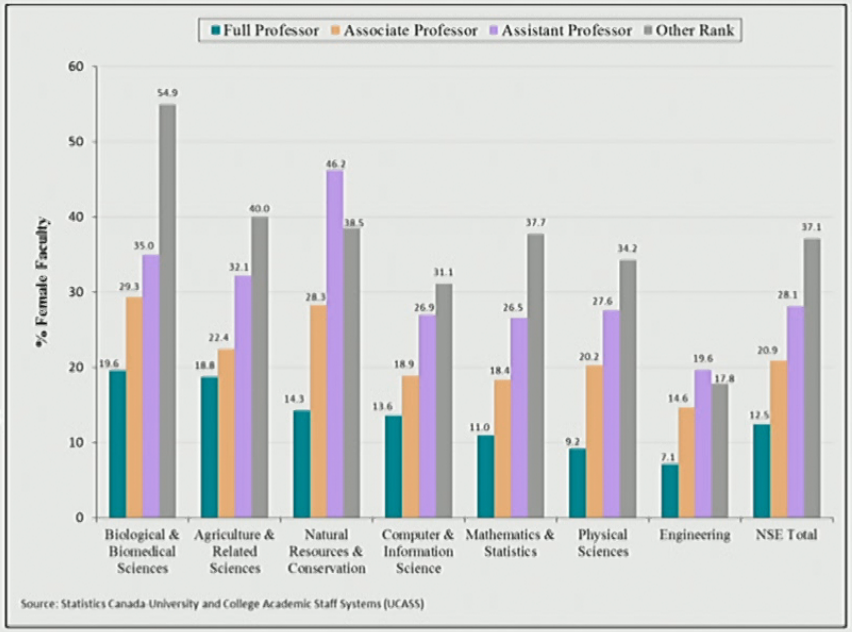
http://www.nserc-crsng.gc.ca/_doc/Reports-Rapports/WISE2017_e.pdf

Women are less likely to be hired as professors

Remember:
~40% of PhD Holders in Life and Physical Sciences are female

Women at the Perimeter Institute:
8% of Faculty
15% of Associate Faculty
13% of Distinguished Visiting Research Chairs

Figure 3.10 Full-time Female Faculty in the NSE as a Percentage of Total NSE Faculty by Discipline and Rank, 2010–2011



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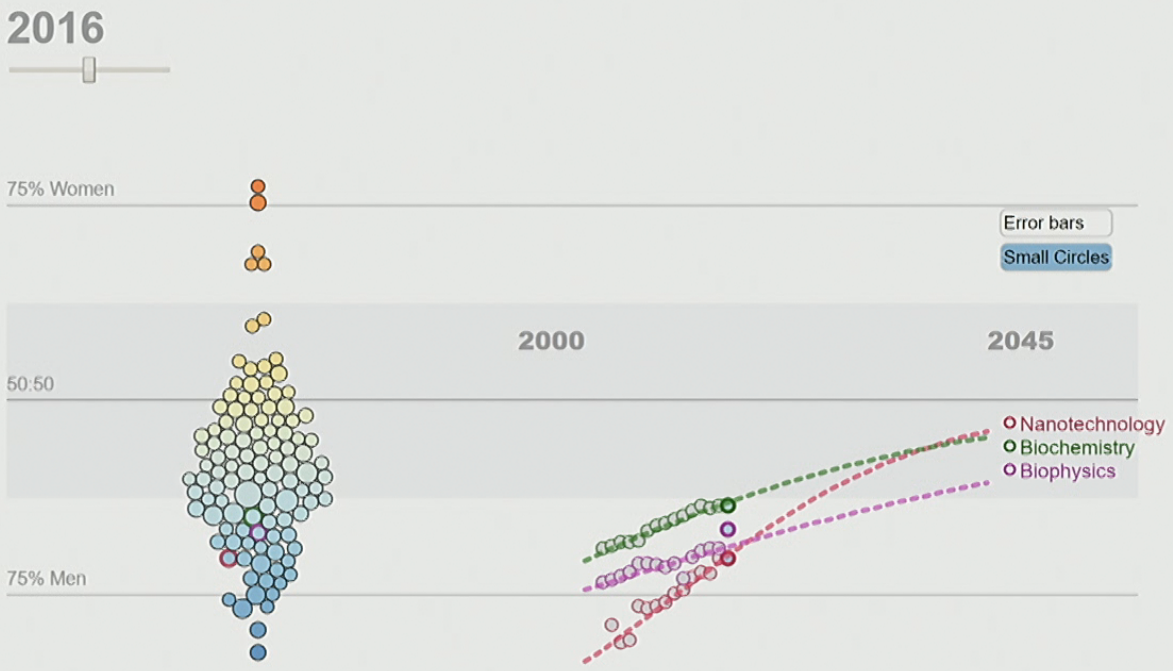
Women are less likely to publish



Holman *et al*. Plos Biol 2018
https://lukeholman.github.io/genderGap/

Data for all countries – all authors

Racialized students and faculty are underrepresented

Percent of students intending to major in natural sciences who do not graduate with a natural sciences degree (National Science Board 2016):

1.5 % White

7.0 % Asian

20 % Latino

40 % Black

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Henry *et al.* (2017) The Equity Myth: Racialization and Indigeneity at Canadian Universities. UBC Press.

5 – 17% of faculty at Canadian Universities are racialized

In 2016, 22.3% of Canadians self-identified as visible minorities

What are the barriers to gender parity/diversity?

Hidden Brain Drain—a private sector task force comprising 43 global companies—launched a research project targeting women with degrees in science, engineering, and technology (SET) who have embarked on careers in corporations. Sponsored by Alcoa, Cisco, Johnson & Johnson, Microsoft, and Pfizer. First report in 2008, second in 2014

Over 50% of junior SET employees are female but 32% say they are likely to quit within a year
Reasons were:

- Hostile macho cultures
- Isolation
- Scarcity of effective sponsors
- Difficulty with executive presence

Hewlett, S. A., Buck Luce, C., Servon, L. J., Sherbin, L., Shiller, P., Sosnovich, E., & Sumber, K. (2008). The Athena factor: Reversing the brain drain in science, engineering, and technology. Harvard Business Review.

Bias in STEM exists

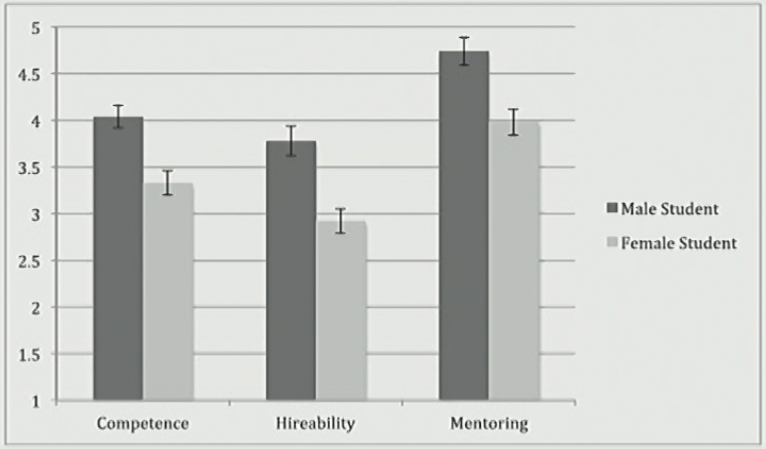
127 biology, chemistry, physics profs in USA were given the resume of an undergrad who intends to go to grad school and has recently applied for a laboratory manager position

Asked to rank (i) perceived student competence; (ii) salary offers, which reflect the extent to which a student is valued for these competitive positions; and (iii) the extent to which the student was viewed as deserving of faculty mentoring on a scale of 1-7

½ given John, ½ given Jennifer (double blind)

Offered $26508 to Jennifer and $30238 to John

Faculty members' bias was **independent of their gender**, scientific discipline, age, and tenure status



Moss-Racusin, et al. *PNAS* 2012

What does bias look like in science?

Disrespect:
- Interrupting
- First name/last name
- Language/jokes/music
- Leaving out of group emails
- Expectations/stereotypes
  - Lab roles/committee roles
- Inclusion in social activities

Lack of opportunities:
- Speaker invitations
- Collaborations
- Funding/awards/peer review
- Letters of reference
- Insider information
- Sponsors

Lack of acknowledgement:
- Credit for ideas
  - Two person teams
  - Group meetings
- Reference letters

Double standard:
- Higher penalty
  - Speaking in groups
  - Risk taking
  - Negotiating
  - Cold calls (hiring)
- Family
- Supervisor feedback
- Executive presence