



LUNDS
UNIVERSITET

What does **Gender** have to do with **Physics**?

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The Positivist Paradox in Physics:

Physics is considered to be objective

– not affected by the sex or gender or ... of the people involved (researcher, teacher, student ...)

... but

Culture of Physics is affected by sex and gender

- Class-rooms, labs, history etc are almost always dominated by men

... seems like a **contradiction** ...



Physics and Gender?

The Physicist looks out in the universe and wonders why there is only matter and no antimatter.

Where did the antimatter go?

Is one of the most prestigious questions in Physics and the **subject of thorough research.**

The Physicist looks out over the classroom or lab and notes that it is dominated by men.

Where did the women go?

Is often a non-question for Physicists and sometimes answered **without scientific method.**

Basic model – Levels of Change

Londa Schiebinger, Stanford University

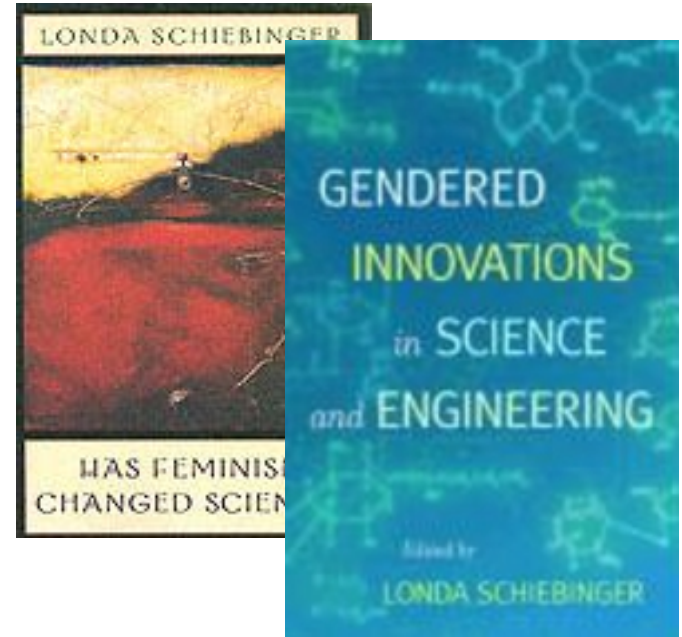
1. Numbers

2. Culture

Gender awareness

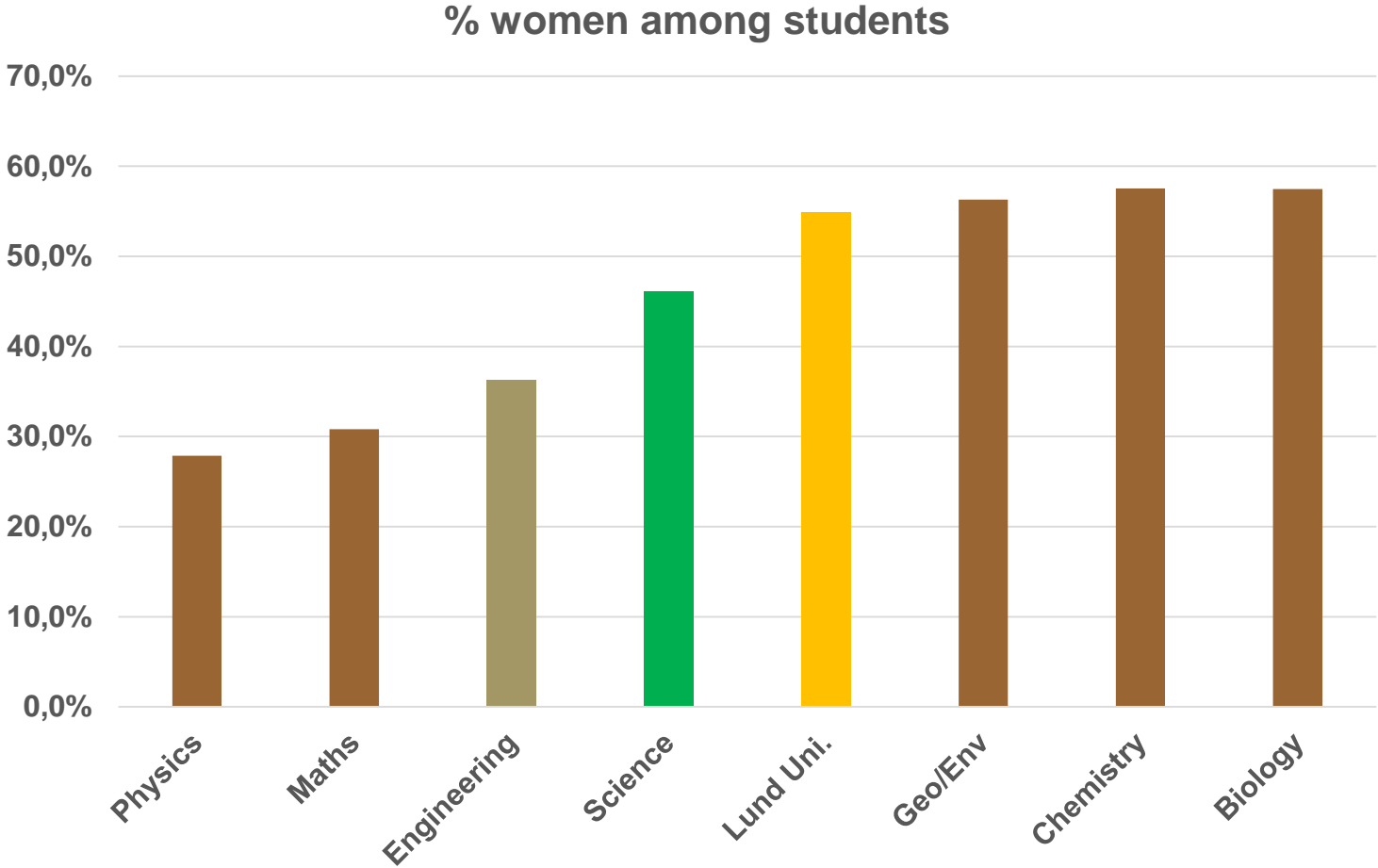
3. Subject

Gender perspective

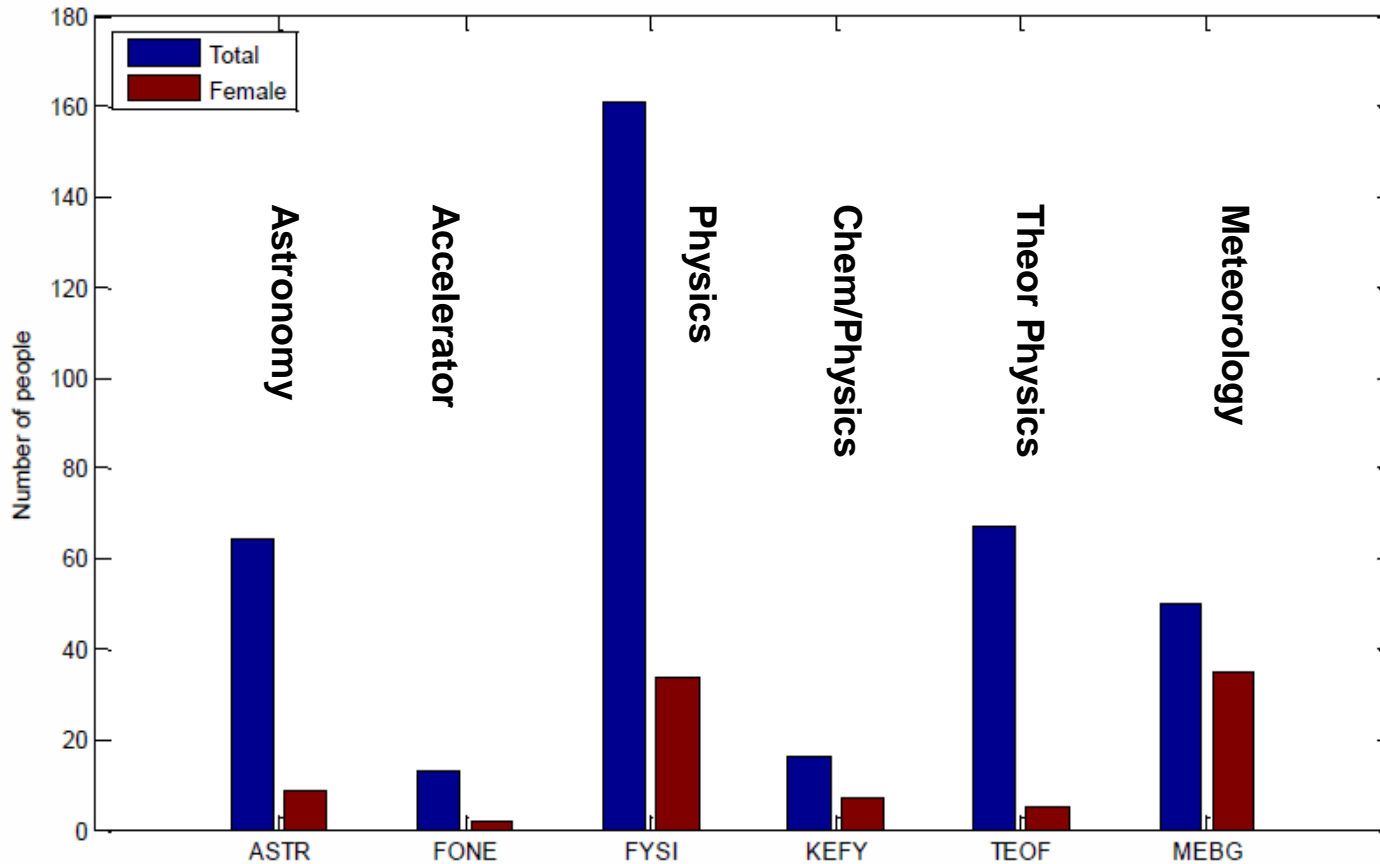


Level 1: Numbers – proof of segregation

Numbers – Horizontal segregation of Science in Lund



Numbers – Horizontal segregation of Physics in Lund

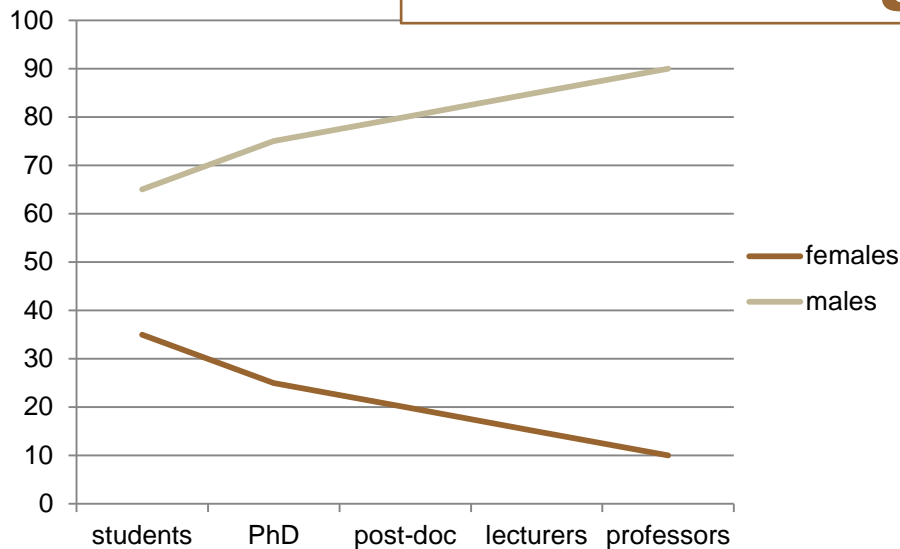
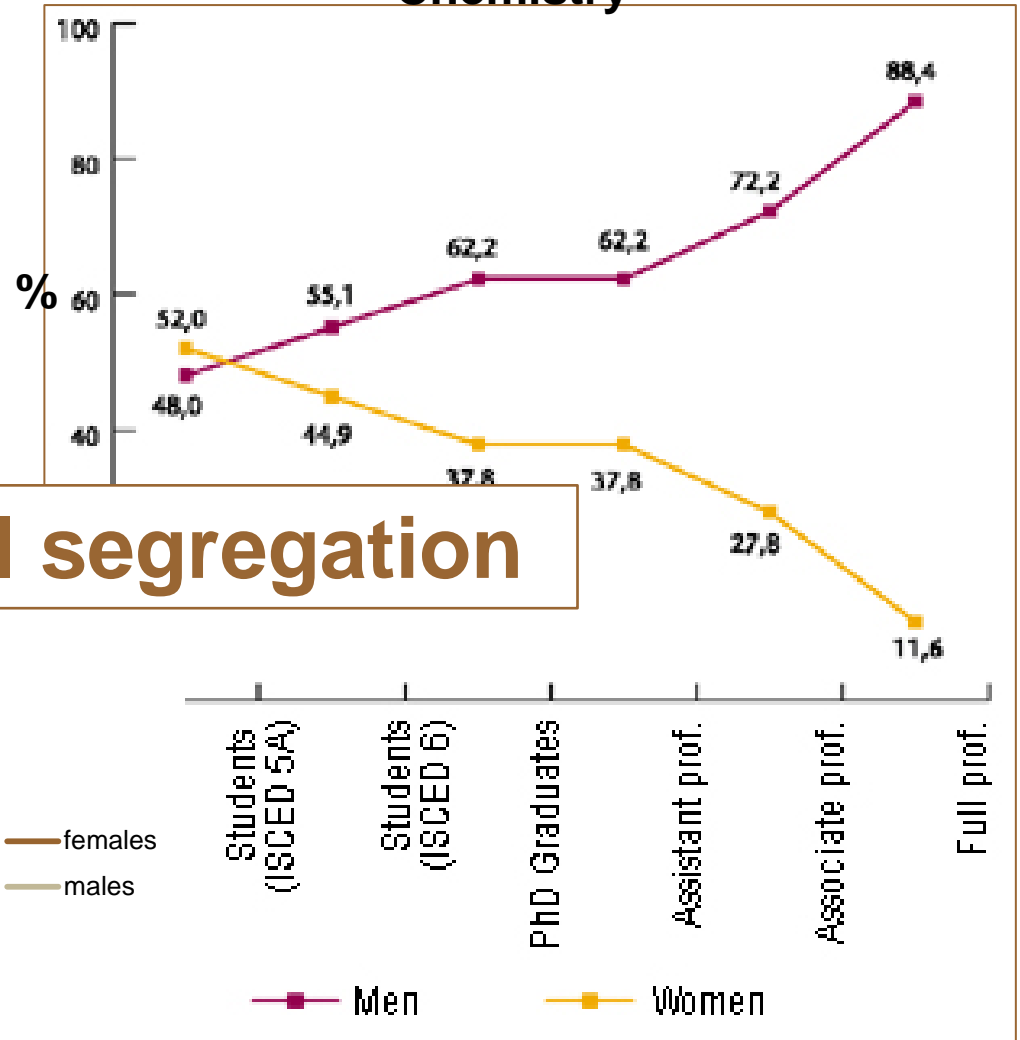


Numbers - The scissors diagram

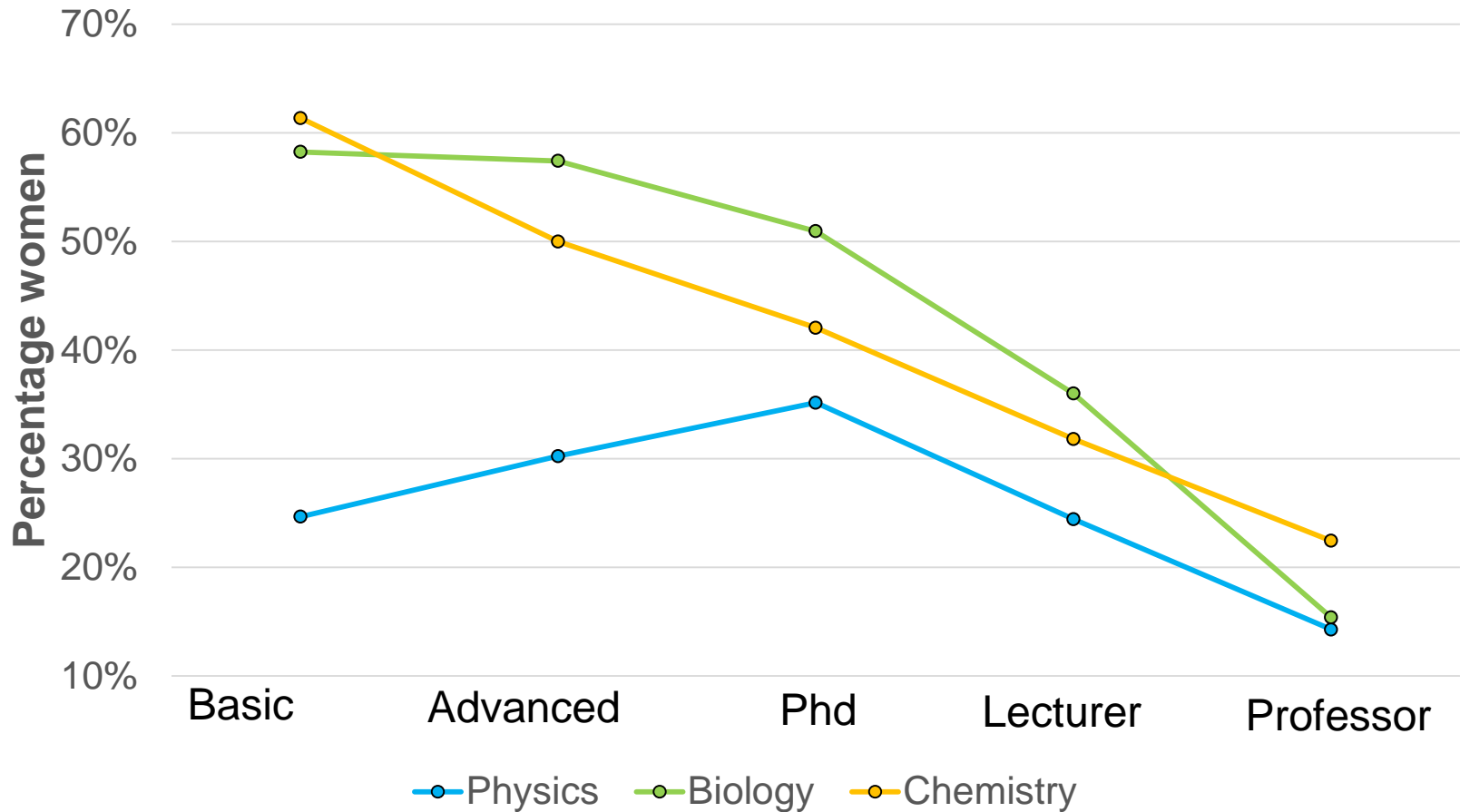
Phys

Vertical segregation

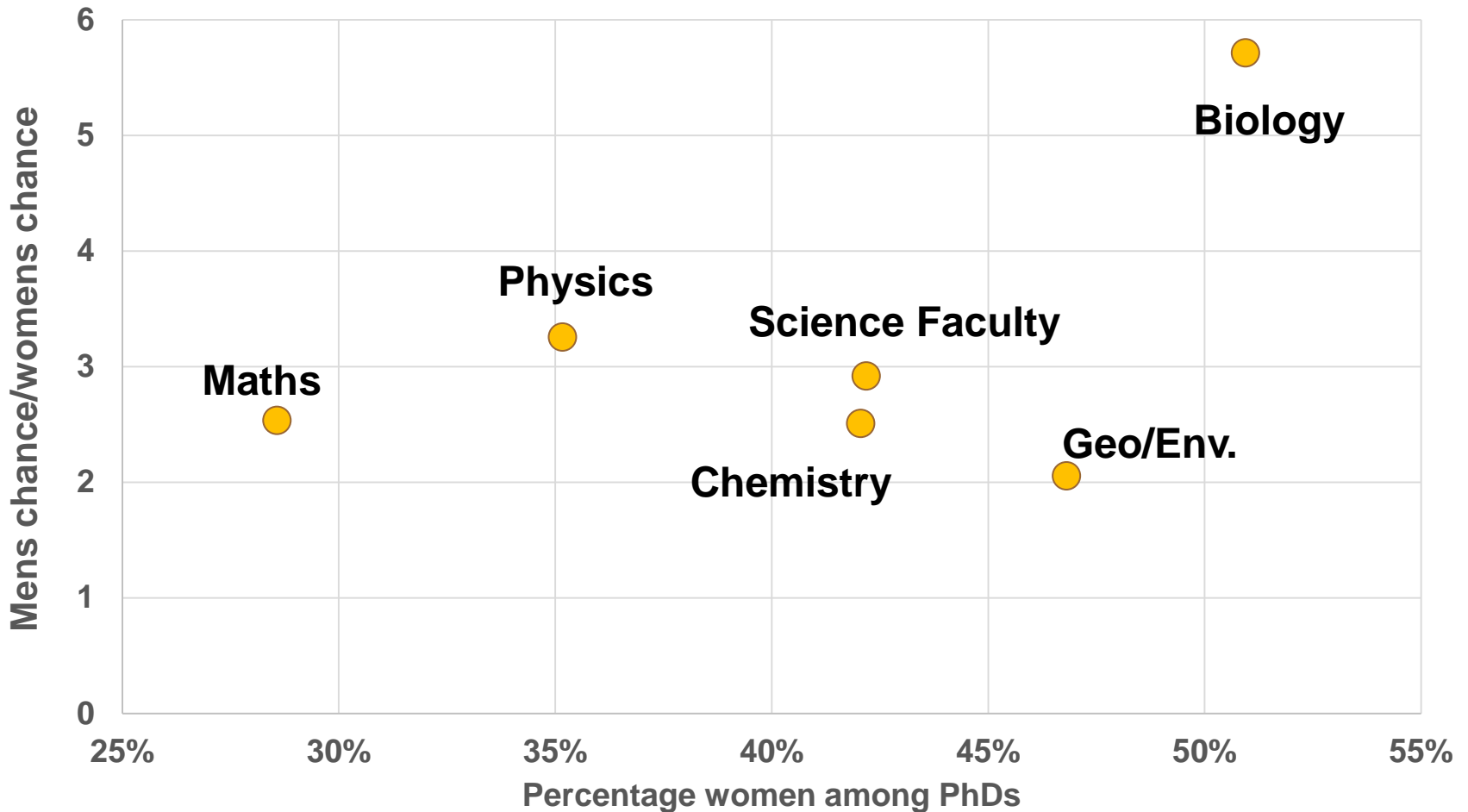
Chemistry



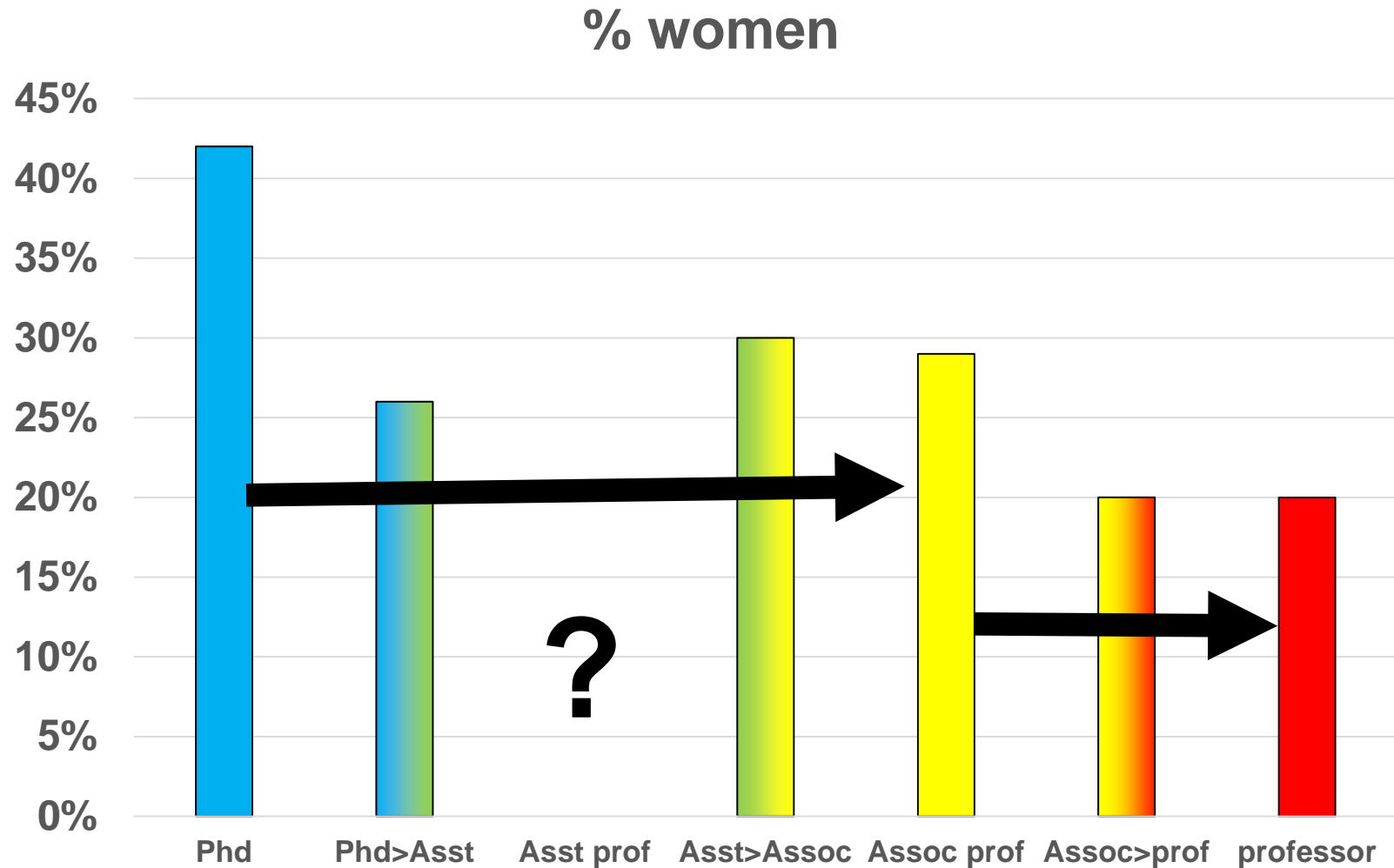
Vertical segregation of Science in Lund



The ratio of men PhD's to women PhD's chance to become a Professor.



Cascading quota – Science Faculty in Lund



Vertical segregation – explanations

From the leaky pipeline ..



.... to the vanishing box

Etzkowitz and Ranga 2011 *Gender Dynamics in Science and Technology ...*, Brussels Economic Review

Advices part 1

- The vertical segregation is there in all subjects – but its strength depends on the institution –it's *the culture at our institutions!*
- We often hear that there are no women to recruit – counter-action is to set a **cascading goal: at least same percentage of women as for one step "below"**

Advice part 2

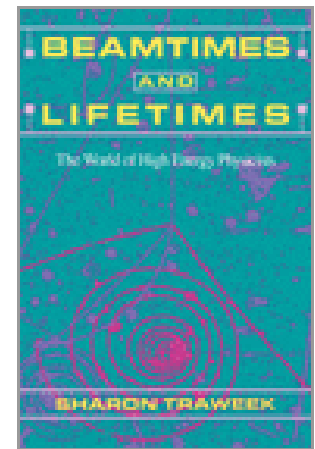
- Very often we focus on the women – e.g in mentor-programs – risk of constantly focus on “changing women”

– **Gender-integrated leadership and coaching programs**

... For women **and** men

Level 2: "Culture":

- stereotypes, attitudes ...**



The Culture of Physics

Antropology – a classic:

Sharon *Traweek* – *Beamtimes and Lifetimes*

- *A culture without culture*
- *what is male, defines excellence*

And since then work in

Pedagogics – with shortcuts for learning

History of Science – false in textbooks

Sociology – it is the culture within Physics

Psychology – Implicit bias and stereotypes

Core values – bias ruins meritocracy

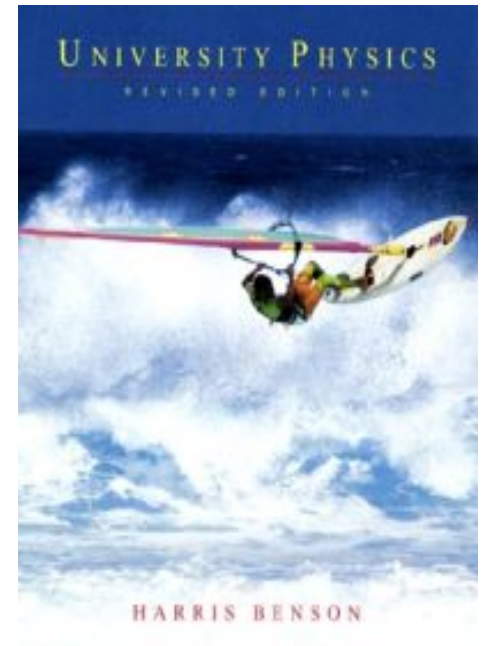
My examples of Culture of Physics:

- One simple investigation
- One example of brilliant research

Culture – visual presentations in textbooks

Calculus based, introductory books

- Benson, University Physics
 - Traditional book

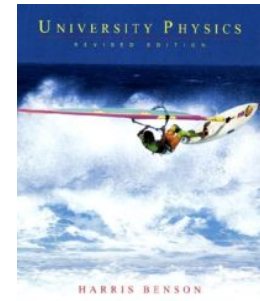


Culture – visual presentations

23. What arrangement of mirrors would produce the multiple images of Ann Margaret shown in Fig. 35.51?



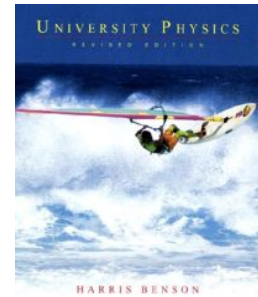
FIGURE 35.51



Benson

Culture – visual presentations

Pictures of women



Benson



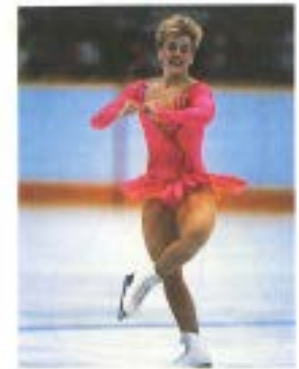
What do you notice about the front wheel?



The net work done on the javelin is equal to the change in its kinetic energy.



During a grand jeté, a ballet dancer appears briefly to "float in air". However, the center of mass still follows a parabolic path.



Elizabeth Manley controls her angular speed by varying her moment of inertia.

Culture – visual presentations

Pictures of men

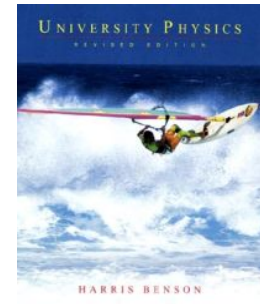


FIGURE 9.1 René Descartes (1596–1650)



FIGURE 1.8 Johannes Kepler (1571–1630)

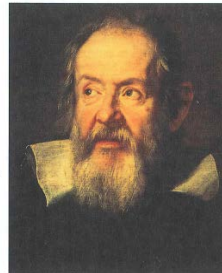


FIGURE 1.9 Galileo Galilei (1564–1642)



FIGURE 9.1 Sir Isaac Newton (1642–1727)



FIGURE 9.2 Gottfried W. Leibniz (1646–1716)



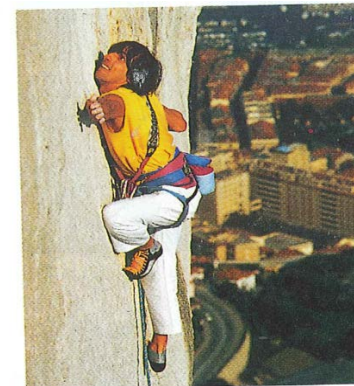
(b)



Although the mass of Edwin Aldrin, Jr., had not changed, his weight on the moon was roughly one-sixth his weight on earth.



A weightlifter does work to lift weights but not to hold them at rest.



The climber has done work to increase his potential energy.

Culture - Sociology:

Hasse and Trentemoller: UPGEM-project (2008)

UPGEM
Understanding Puzzles in the
Gendered European Map

What is the percentage of women among Physics professors?

Denmark, Estonia, Finland, Italy, Poland

Which has the largest percentage?

Which has the smallest percentage?

Culture - Sociology:

Hasse and Trentemoller: UPGEM-project (2008)

What is the percentage of women among Physics professors?

Denmark, Estonia, Finland, Italy, Poland

Denmark – 3%

Estonia – 11%

Finland – 12%

Poland – 14%

Italy – 23%

Is it Physics in culture?

Using "Culture Contrasts" to understand:
Is it Physics in Culture – outside Physics?

1. The Classically schooled Physicist
2. Family culture
3. Religion

Denmark – 3%
Estonia – 11%
Finland – 12%
Poland – 14%
Italy – 23%

No complete correlation!

... Or is it Physics as culture?

Three cultures "discovered":

1. Hercules-culture – the fighter's culture
2. Care taker-culture – the social culture
3. Working bee-culture – the industrious culture

Denmark – 3%
Estonia – 11%
Finland – 12%
Poland – 14%
Italy – 23%

Hercules:

Oh yes, there is a lot of competition. This whole process is extremely competitive. The case that the department needs to make to the university is that I am not only good enough for the job, but I am the best person in the world for this job.

Care-taker:

There's always a team behind a genius. (...) Good teamwork always brings the best results, but of course, not everyone is lucky enough to find a good group to work with. Sometimes when there are very competitive people, it is difficult to form a group..

Working bee:

But in this respect, for us not to show ourselves too much and do no crazy things, we had to sit quiet and pretend we were not there

Investigation of five countries:

Denmark, Finland, Estonia, Poland and Italy

What culture defines Physics departments in the different countries?

Denmark – 3% - Hercules

Estonia – 11% - Working bee

Poland – 14% - Working bee

Italy – 23% - Care-taker

Finland – 12% - not a clear culture

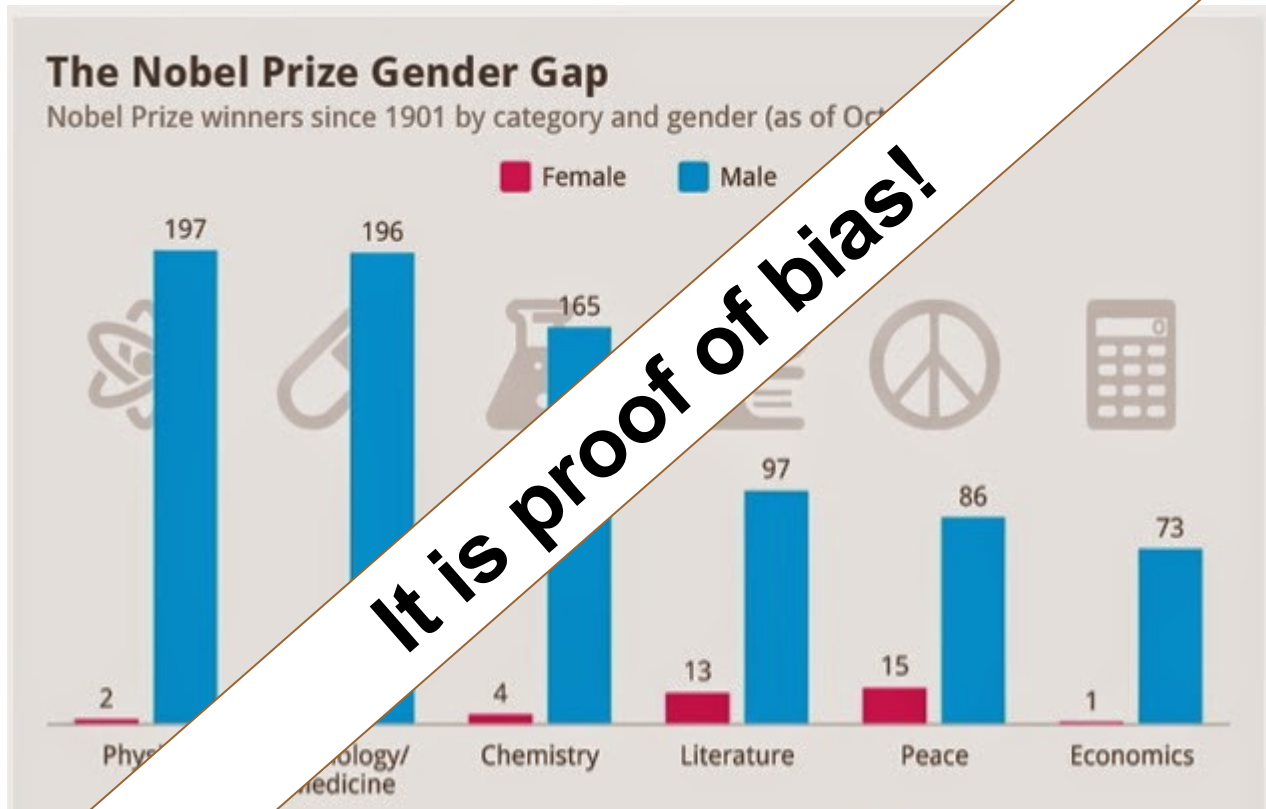
Remember: It is the perception of the culture, but

..... is it really the culture of Physics?

..... what does Hercules do to minoritized groups?

Level 1: Numbers - the highest level

Vertical Segregation – even higher



Source: www.statista.com

.. No women in Physics?



*Marie Curie 1903
(och 1911)*



*Maria Goeppert-
Mayer 1963*



*Lise Meitner
(not 1944!!)*



*Jocelyn Bell
(not 1974!!)*

Level 2: "Culture":

- bias and meritocracy

Ex: Bias

Traditional results – repeated many times:

Judge identical texts, grade 1 (lowest) – 5 (highest):

	Men about		Women about	
	Ingvar (Male)	Ingvor (Female)	Ingvar (Male)	Ingvor (Female)
Credible	4.9	3.4	4.5	3.5
Nonchalant	2.6	2.4	2.7	2.3
Humane	2.9	2.7	3.2	3.8
Competent	4.3	3.0	3.7	3.3

Example of bias against women

- Receive smaller grant allocations
- Worse evaluations of abstracts for conferences
- Fewer citations
- Worse student evaluations
- Men 8 times more likely to win awards (?)
- Fewer leadership positions
- Worse letters of recommendations

Advice 3

- We are all suffering from **implicit bias**, which we need to become aware of – education, information, workshops. (<https://implicit.harvard.edu/implicit/>)
- BUT, this is not enough – we need **”Bias observers”** to remind us during meetings, selection committees etc.

Discr.

Bias and Meritocracy?

Nielsen (2015) Nature 525 427 – Studie vid Aarhus universitet 2004-2013

Appointment of Professors and Lecturers:

- 20% closed (30% later years)
- 40% only one applicant

Women part of appointed professors:

- Closed: 12%
- Open: 23%

Similar results from Netherlands and Finland

Van den Brink (2010) and Husu (2000)



Meritocracy and Equality?

Nielsen (2015) *Nature* **525** 427 – Studie vid Aarhus universitet 2004-2013

We are bias!

Combined with

Myth of Meritocracy

PROBLEMS!

- The bigger the trust in meritocracy, the more bias
- Meritocracy is used as a argument against equality
- and a paradox since If meritocracy worked, then

”The university is a realm of the *justly unequal*”



Level 2: "Culture":

- combining care with career**

Discr.

Parental leave in Sweden

Ex: Parental leave in Sweden – a success-story?

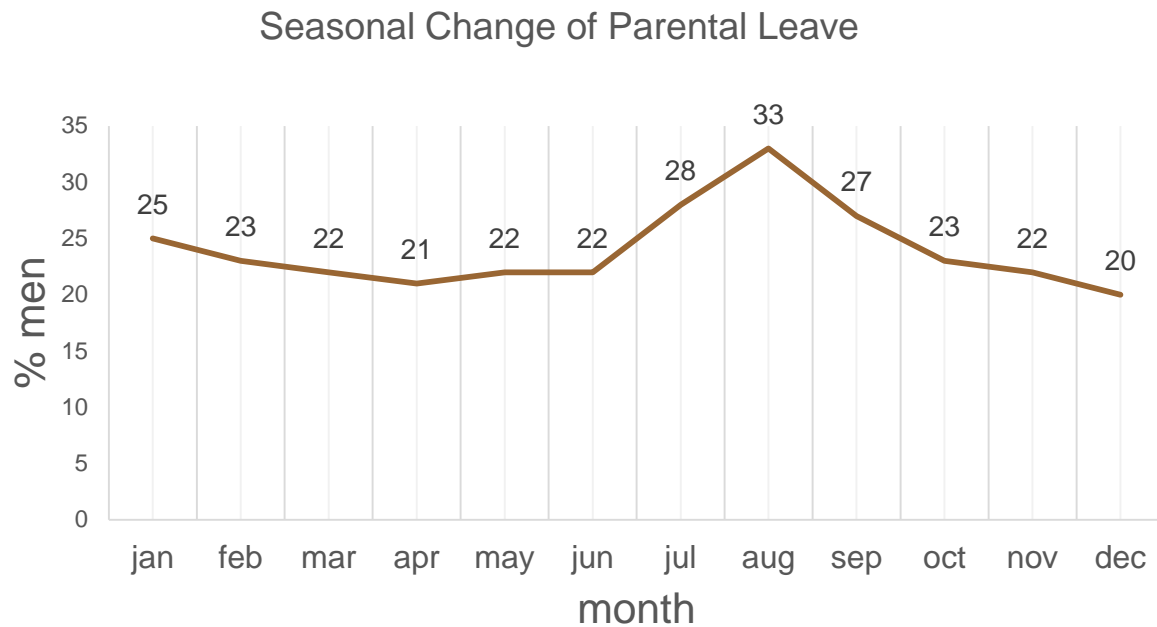
16 months of gender-neutral parental leave

.....but.....

- Only 24% of time taken by dads – in spite of 2 months devoted "Father leave"
- women stack there parental leave – women get behind in career.

Parental leave in Sweden

Need to individualize parental leave?



Level 2: "Culture":

- discrimination and harassment**

Ex 1: Dandelion Physicists

- 4 of 14 women avoid being alone with some people at their work.
- 5 of 14 women have some experience of sexual harassment at work.
- 5 of 14 have experiences of sexual harassment at conferences.

Lundborg and Schönning, investigation of PhD-students situation at the Physics Department, Uppsala 2006



Dandelion Physicists

- Sexual harassment is a non-issue for male PhD-students.
- 15% of the men said that they "*consciously tried to demean the women*". They did not like the women to advance in the society.

Lundborg och Schönning, Uppsala 2006



More investigations:

- 53% of female employees have been harrassed on the grounds of their sex – repeatedly ignored, ridiculed, withhold information, made invisible – for men 23% (*Chalmers 2005*)
- 41% of femal staff claim to have experienced some form of sexual violence – for men 26% (*Quebec 2013*)

.....

A repeated pattern of discrimination:

Power → Suppression techniques



Advice 4

- Discrimination and harassment is common and an essential problem to deal with.
- **Introduce anti-discrimination measures, through courses or workshops**
- Find out **why people leave**

Conclusion 5

- Since some people are marginalised and discriminated
 - **introduce Counter-spaces**
(Maria Ong and co-workers)

Conclusions – Gender and Science

- It is important to move beyond numbers and work on changing the **culture** of Science (and the culture Science is in, of course)
- We are all **bias** – and in Science it works against women.
- Women experience strong **discrimination** based on their gender.
- Bias is a threat to true **meritocracy**.
- Thanks to the research of humanists and social scientists we are getting closer to an understanding of the **segregation** and therefore what to do about it.
- An active, challenging and important field of **research**.

So – what can we do?

1. **Education**, information
2. **Gender-integrated** leadership and carrier planning
3. **Cascading Goals** to preserve percentage of women
4. We are **implicit bias** – we need **bias observers**
5. **Work againsts discrimination** – do not only **affirm women**, but also **confine men** – but get them involved – and find out why people leave
6. **Counterspaces**
7. Awards/Certification for best practices (e.g. Athena Swan or Gender certification)

See LERU WG Gender's "papers":

- *Women, universities and research: excellence without gender bias, 2012*
- *Gendered research and innovation: Integrating sex and gender analysis into the research process, 2015*
- *Implicit bias and the threat to Meritocracy, coming 2017.*
- *Maybe: Discrimination in Science Faculties*

It is not easy...



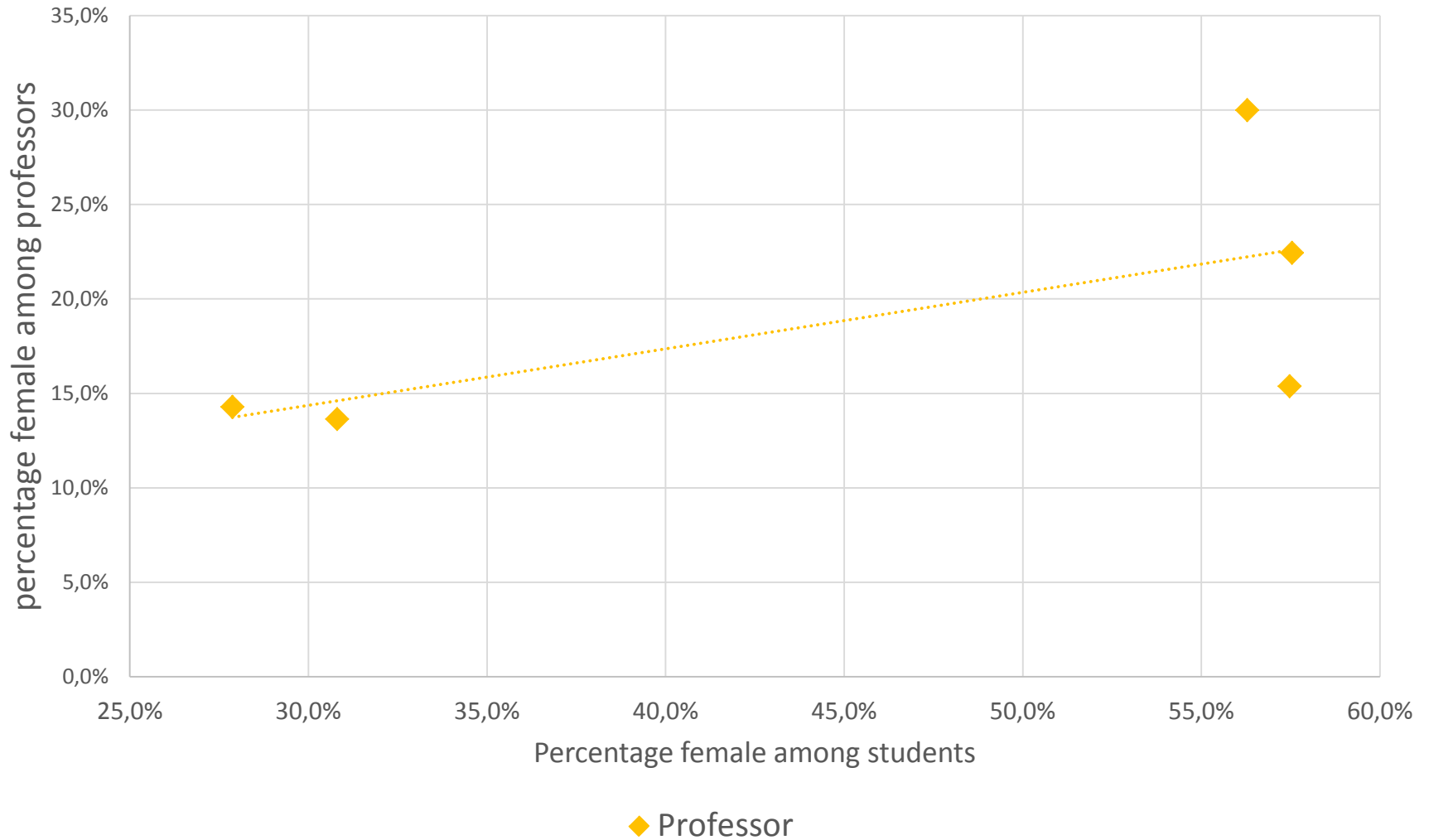
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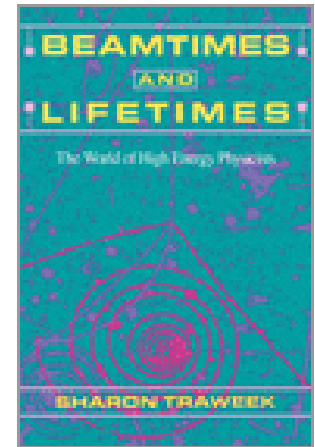
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Is recruiting students the solution?



A classic about culture of Physics – Anthropology



Sharon Traweek – *Beamtimes and Lifetimes*

Physicists assume that we have a culture without culture

Investigations of SLAC (USA) and KEK (Japan)

Different definition of excellence and leadership

....but what is male, defines excellence

Culture – history of Physics



- Often incorrectly described in books

“The Development of Quantum Physics, in Historic Accounts, Textbooks and Classrooms”

Reidun Renstrøm, Agder Universitet in Norway

Ex: Bias

The Matilda effect –
abstract to a
conference.

Q 1:
Excellence?

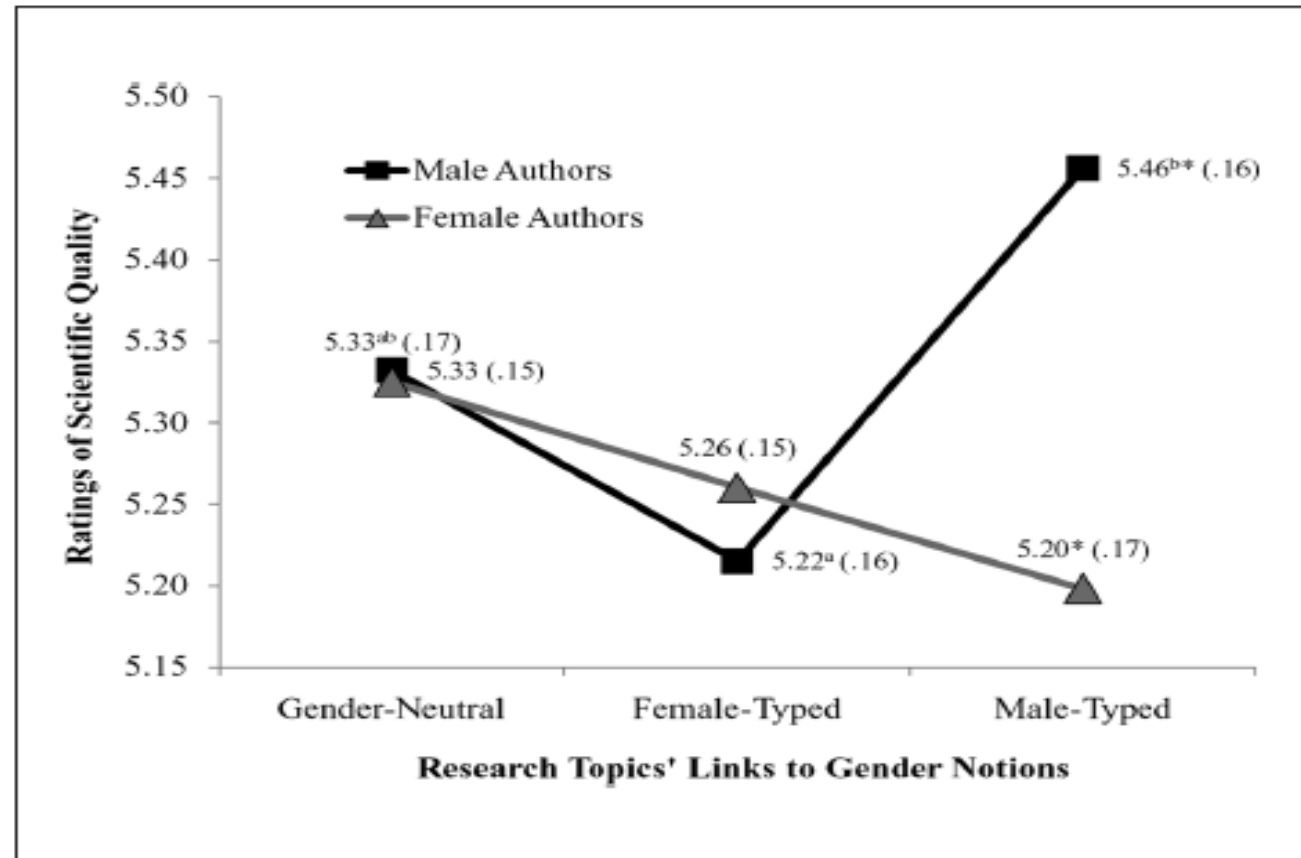


Figure 1. Perceived scientific quality as a function of research topic and author gender.

Note: Graph reports estimated means, with standard errors in parentheses. Means within a research topic category with asterisks and means in a data series with different superscripts differ at $p < .05$.

Ex: Bias

The Matilda effect – abstract for a conference.
Q 2: Interest in collaboration.

Knobloch-Weserwick et al. 2014, Science Commun. 35 (5)

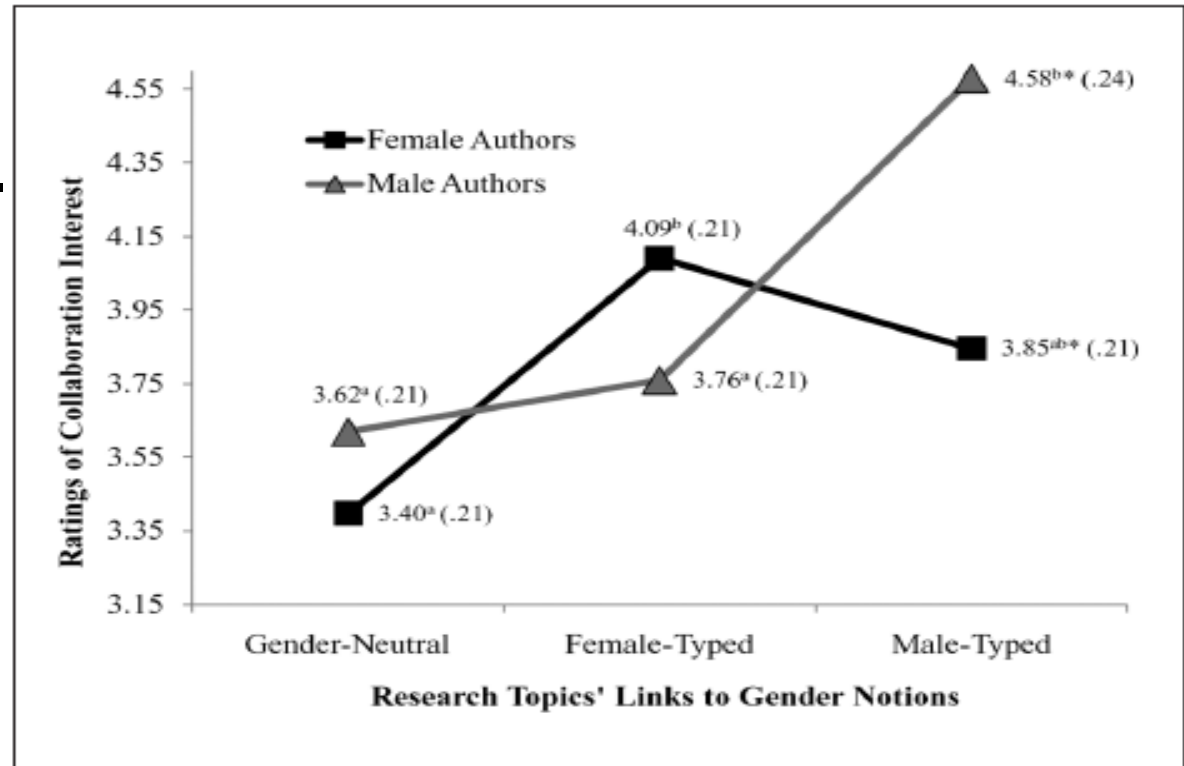


Figure 2. Collaboration interest as a function of research topic and author gender. Note: Graph reports estimated means, with standard errors in parentheses. Means within a research topic category with asterisks and means in a data series with different superscripts differ at $p < .05$.