



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** ...

Basic model – Levels of Change

Londa Schiebinger, Stanford University

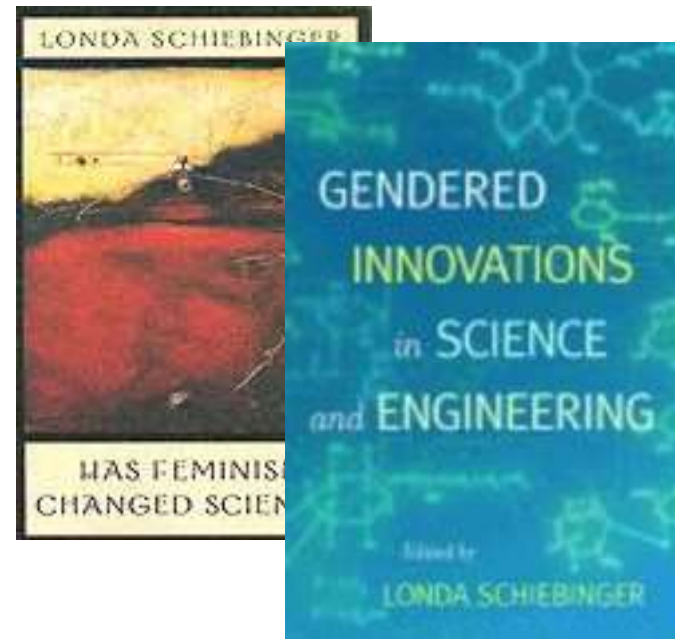
1. Numbers

2. Culture

Gender awareness

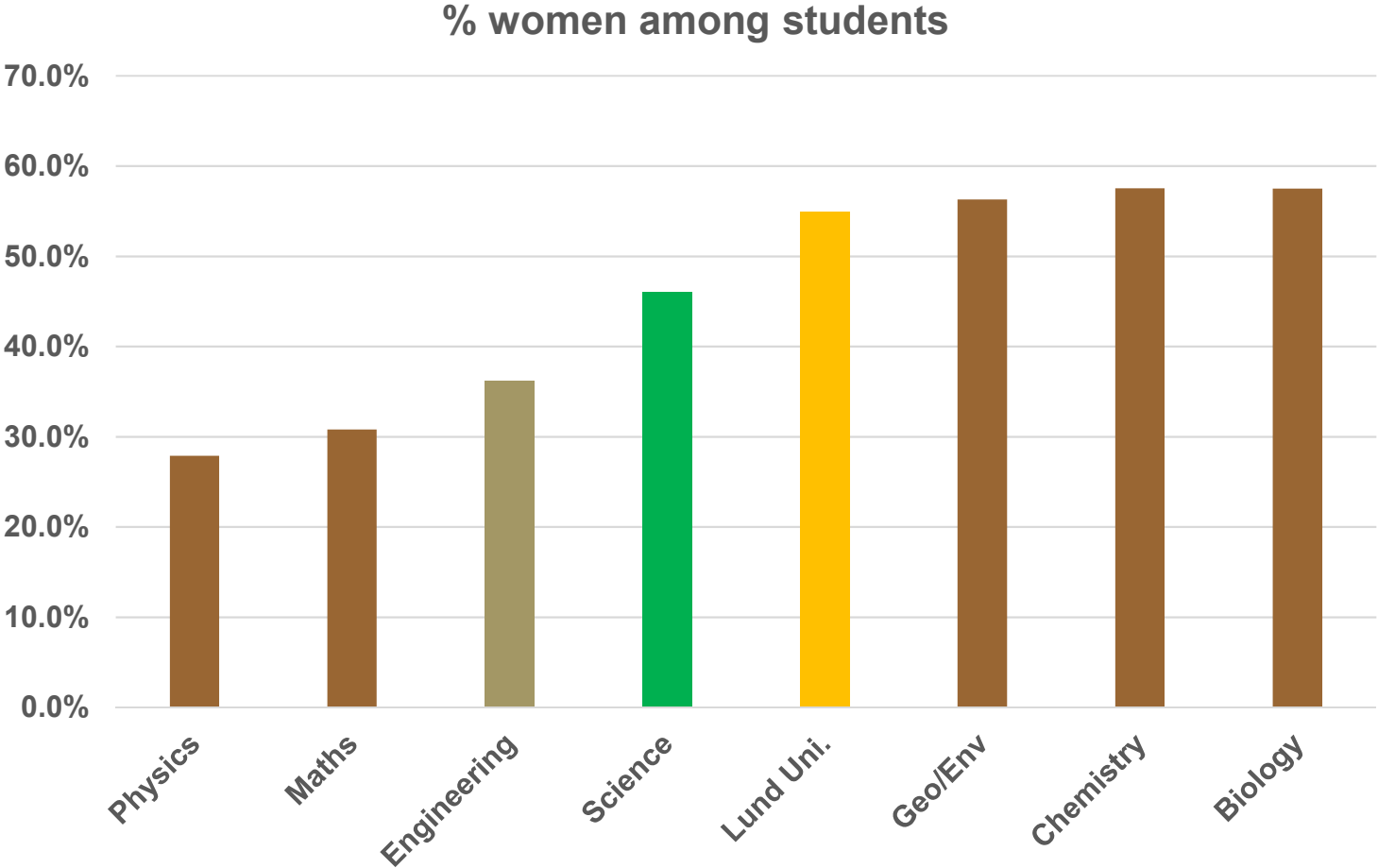
3. Subject

Gender perspective

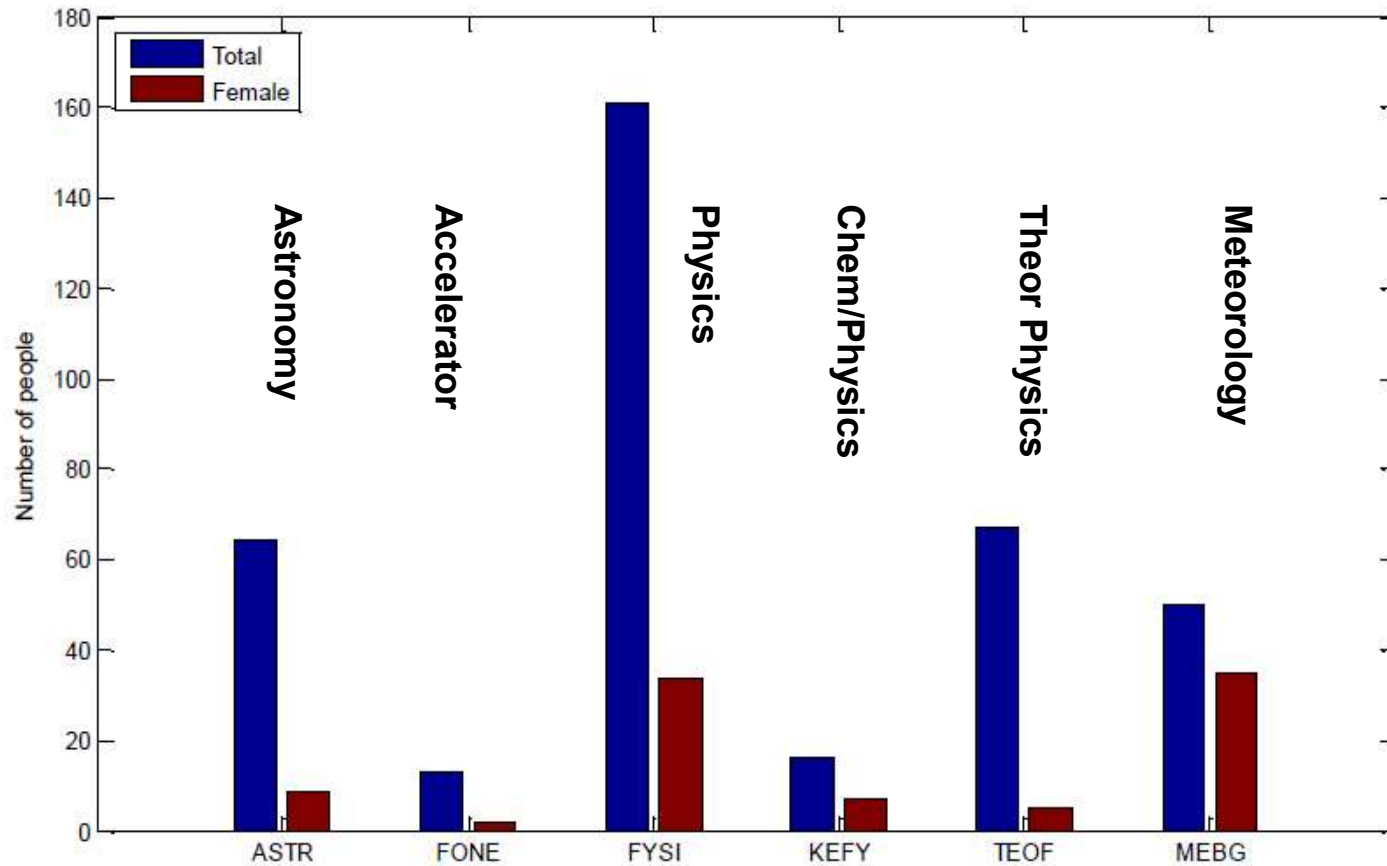


Level 1: Numbers – proof of segregation

Numbers – Horizontal segregation of Science in Lund



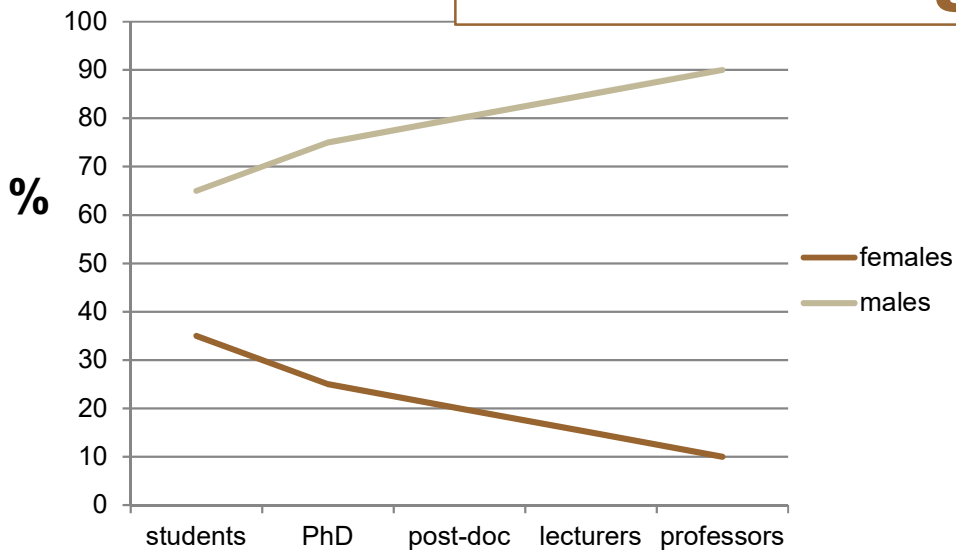
Numbers – Horizontal segregation of Physics in Lund



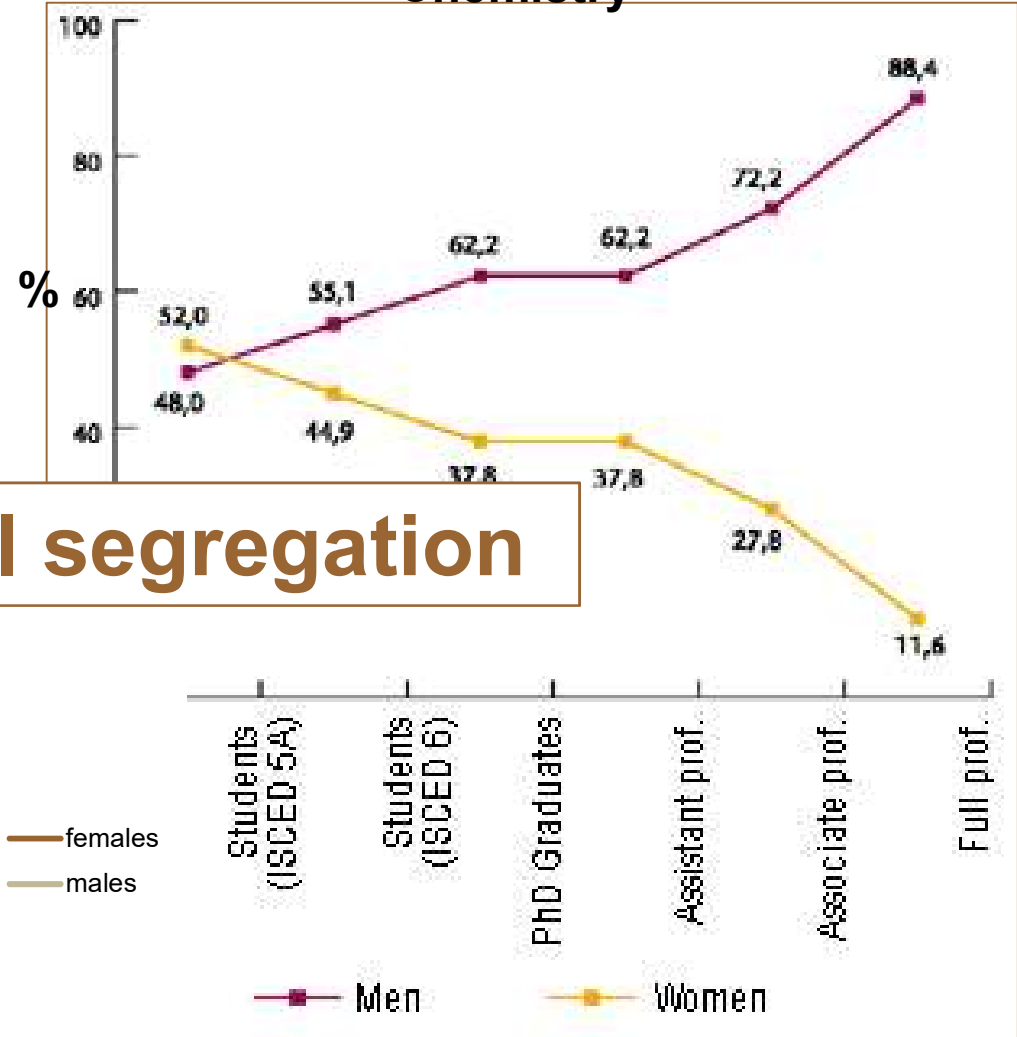
Numbers - The scissors diagram

Phys

Vertical segregation

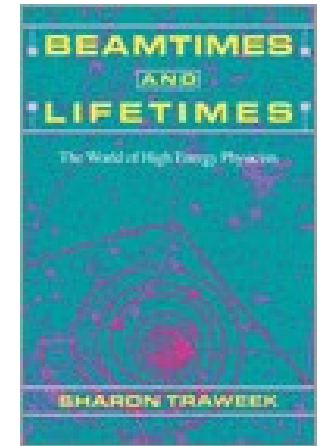


Chemistry



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

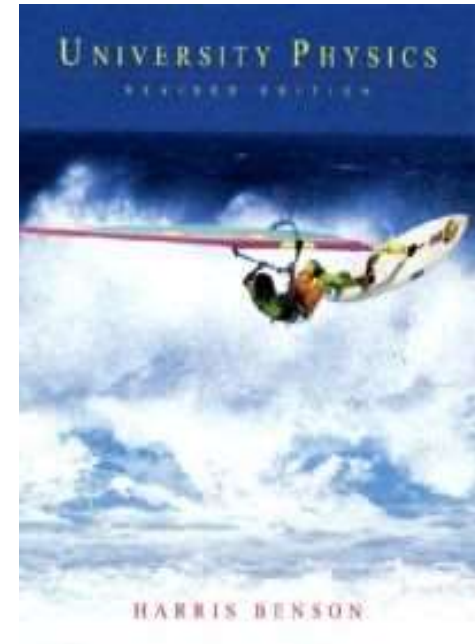
Psychology – Implicit bias and stereotypes

Core values – bias ruins meritocracy

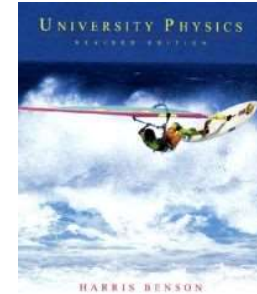
Culture – visual presentations in textbooks

Calculus based, introductory books

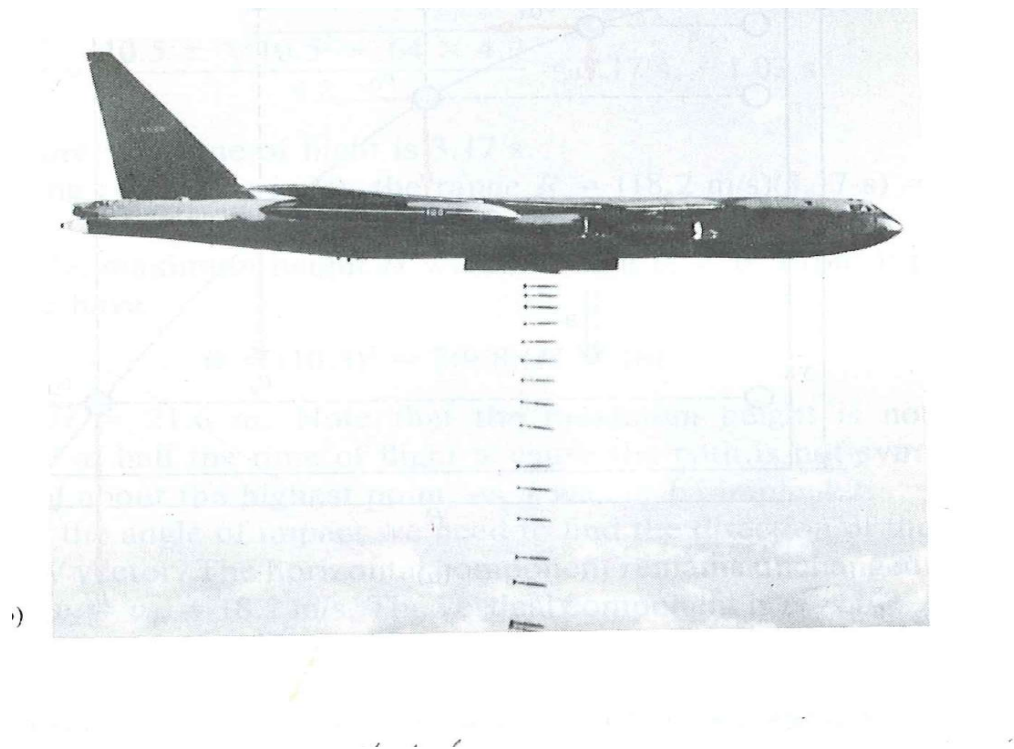
- Benson, University Physics
 - Traditional book



Culture – visual presentations



Benson

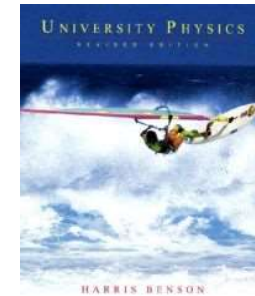


Culture – visual presentations

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



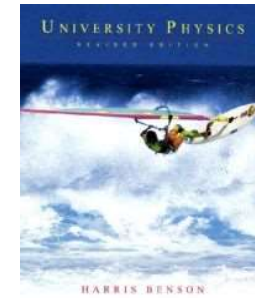
FIGURE 35.51



Benson

Culture – visual presentations

Pictures of women



Benson



What do you notice about the front wheel?



The net work move on the jute 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

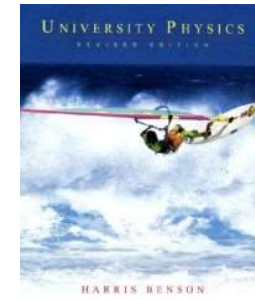


FIGURE 9.1 René Descartes (1596–1650)



FIGURE 1.8 Johannes Kepler (1571–1630)



FIGURE 1.9 Galileo Galilei (1564–1642)



FIGURE 5.1 Sir Isaac Newton (1642–1727)



FIGURE 6.1 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 of Science – pedagogics



(Jacqueline Spears: Gender in computer school rooms)

Learning and Gender

Ex: how learning can be shortcircuted in exercises

Culture – role models



Isaac Newton

- **Smart**
- **Born in Europe**
- **Man**
- **Right family**
- **According to the norm**
- **Personality?**

Culture – how do we talk about the history of Physics?

- Often incorrectly in books

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

- Idols instead of the Sociology of Physics
- Physics is superior

The culture of Physics

Is Physics understandable?

*If you think you understand Quantum Mechanics,
you don't understand Quantum Mechanics.*

Richard Feynman

Culture of Physics – the language

How was the language of Physics created?

Collisions

Annihilation

Cascades

Culture – learning styles

Inclusive teaching is varied teaching.

Learning styles (ex: Barbe et al)

1. Visualising
2. Auditory
3. Kinesthetic

Mix techniques and become inclusive to minoritised groups.

Gender-conscious teaching

Important to recognize that there are power structures.

Who owns the room?

Who owns the time?

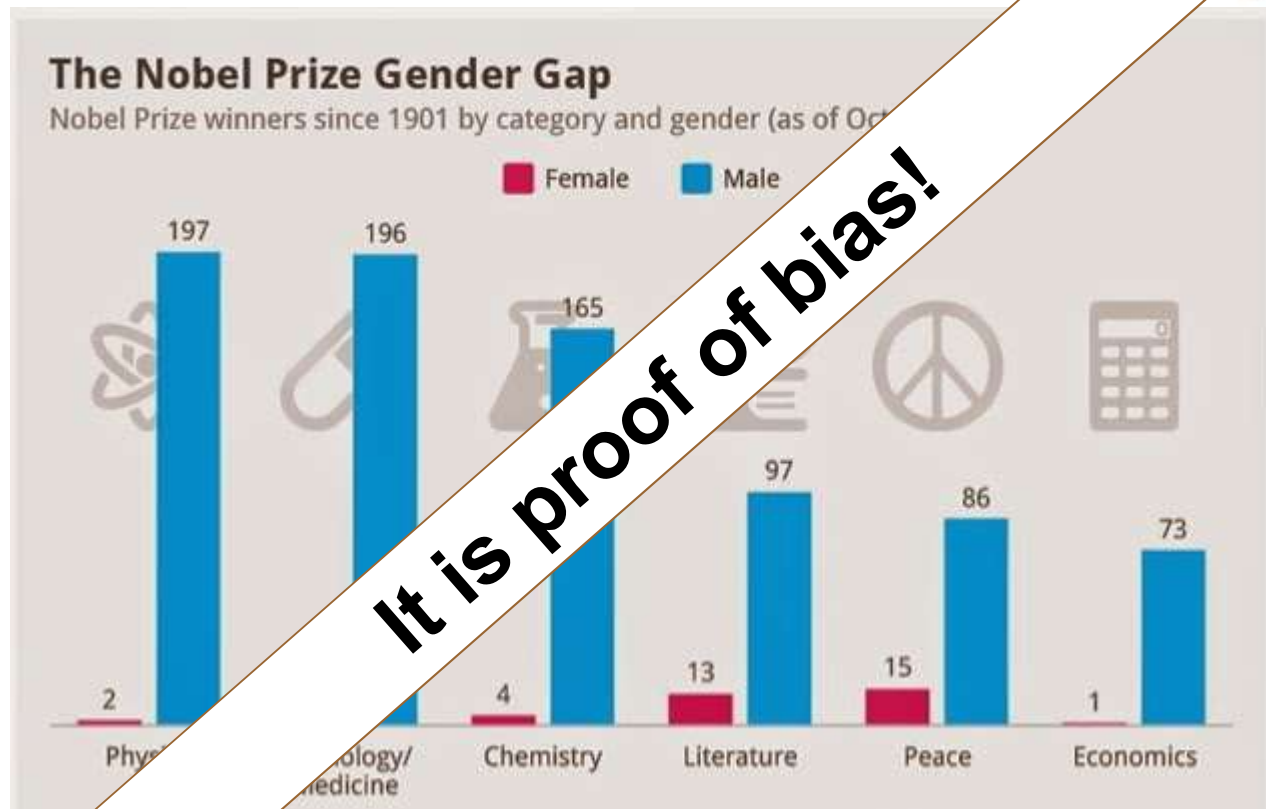
Who is listened to and heard?

When are women taking all the space?

How do we support women and men?

Level 1: Numbers - the highest level

Vertical Segregation – even higher



Source: www.statista.com

It is proof of bias!

.. 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

Ex 3: 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

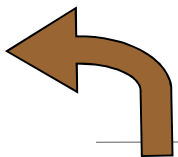
Level 2: "Culture":

- 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



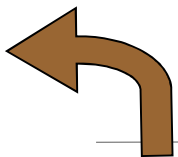
Geneva, February 2018



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



Geneva, February 2018



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

- 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

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

Conclusions

Level 2: "Culture": - combining care with career

Conclusions

”Higher-order effects”

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

0th-order: Parenthood = Motherhood

Need to include fathers!

1st-order: Parental leave follows child (in Sweden 16 months)

.....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.

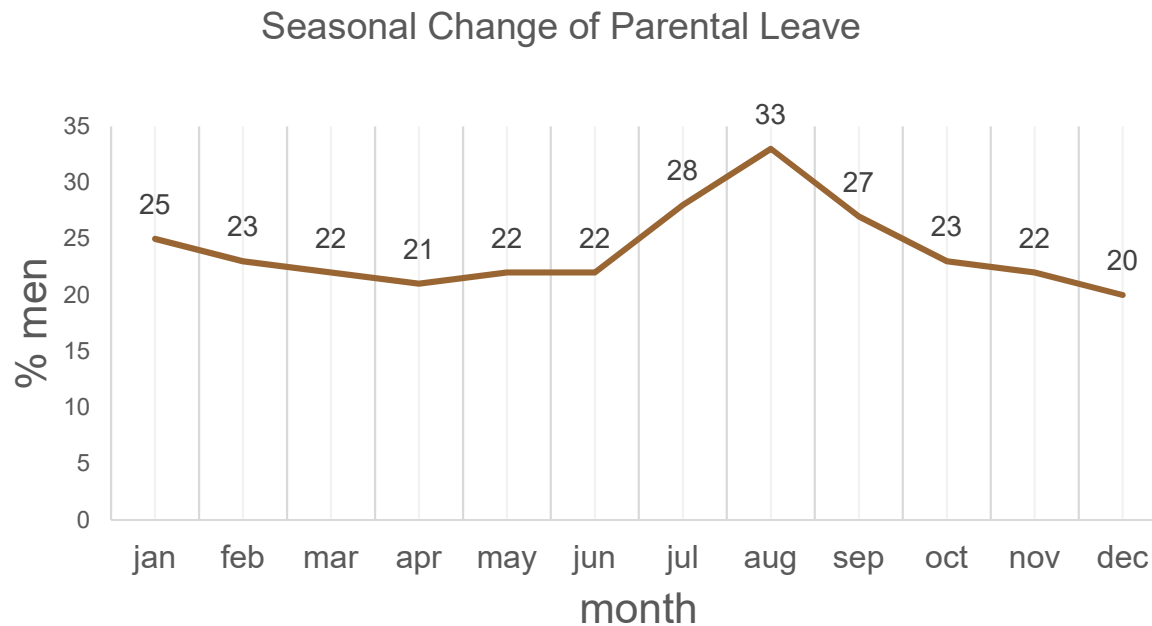
Need to individualize parental leave?

”Higher-order effects”

Ex: Parental leave in Sweden

2nd-order: Individualized Parental leave – equal shares

...but..... Seasonal variations:



”Higher-order effects”

Ex: Parental leave in Sweden

2nd-order: Individualized Parental leave – equal shares

...but....:

Fathers seems to be punished harder

Legislation is not enough!

We need to change the culture!

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.
- 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**.

It is not easy...



Thank you for your attention!



References

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- Nielsen 2015, *Nature* **525** 427
- Rosser 1995, *Teaching the Majority*, Teacher's college press
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- Schiebinger et al: <https://genderedinnovations.stanford.edu/>

Case study: The presentation

Johanna, a project administrator, and Nils, who is the project manager and a professor, are to present the rules and application procedures for a new project together, to a mixed gathering of lecturers. Johanna has carefully prepared for the meeting and feels excited. She goes through her well-written powerpoint presentation, describing the process. She feels that she is struggling to gain the audience's attention and that many people are glancing towards Nils, who is standing at the other end of the podium, smiling towards the audience.

After her presentation, Nils steps forward and opens with the words “What Johanna has described can be summarised as” going on to give a brief version of her presentation.

Johanna feels ill at ease and would rather leave the “stage”.

