What does Gender and Diversity have to do with Physics?

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Lund university, Sweden
and
Steering group for LERU PG-EDI
Genera Network
GenderEX Horizon 2020 project
Who am I and why am I here?

- Professor of Physics, interested in Computational Atomic Physics and Laboratory Astrophysics
- I have been involved in Equality issues for 25 years.
- Intensified when asked to participate in “action group against sexual harassment” 20 years ago.
  .... I was horrified by what I learned ...
- We decided to become action-oriented – awareness workshops.
- I started to focus on the theoretical background and found:
  Gender/Diversity and Science is a rich and exciting field.
- In parallel more and more involved in actions to change culture – on local and European level. SAGE, INTEGER ...
- LERU PG EDI steering group, GENERA network, GenderEX Horizon 2020.
- Aim: find and implement actions that work and to translate Gender Science (Sociology, Psychology ...) for Scientists.
Disclaimer

• We should use evidence and research

• … but here, I will only be able to describe it briefly.

• I will use it to illustrate useful concepts,

• … but for full understanding and critical evaluation – go to original work.
The Positivistic 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, gender, …
- Class-rooms, labs, history, board rooms are almost always dominated by white men

… seems like a contradiction …
Basic model – Levels of Change

Londa Schiebinger, Stanford University

1. Fix the numbers
2. Fix the women
3. Fix the institutions – Culture
4. Fix the knowledge – Subject

Focus!

Indicator
Inclusive teaching

Answers

Number: Segregation

Culture: Stereotypes/ Hercules

Culture: Bias and Meritocracy

Culture: Discrimination

Subject: GRI

End
Level 1: Numbers – proof of segregation
Horizontal segregation in LU

% women among students

- Physics
- Maths
- Engineering
- Science
- Lund Uni.
- Geo/Env
- Chemistry
- Biology
Horisontal segregation Physics, LU
Numbers - The scissors diagram

Vertical segregation
The ratio of men PhD’s to women PhD’s chance to become a Professor.

Hidden quota for men!
Flexible cascade model
- Science Faculty in Lund

% women

Finish Physics Days 2021-03-24
Vertical segregation explanations

From the leaky pipeline …

…. to the vanish box

… or diverse pipelines

*Etzkowitz and Ranga 2011*
*Ong et al 2017 and the Harvard project*
Actions against horizontal segregation

It is not about ”fixing the women” – but:

1. **Rethink** how we describe, define, apply
   ...Physics

2. Find **areas** with qualified women first
   – then open a position
Actions against vertical segregation:

1. Simple action: Set **cascade goals**
   – they show if you exclude women

2. From traditional mentors program (learn "the trick of the trade") to **mentoring for change**
   and analyse **sponsoring**
   *(de Vries et al. 2011 and 2012)*
Or at least:

3. Simple action: **Ask** "minorities" to apply!
Inclusive teaching

Answers

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Level 2: “Culture”
- Stereotypes
Basic concepts for understanding

- Fundamental model of Power!
- Documented by segregation

- Cultural stereotypes – myths in Physics:
  - Culture without culture
  - Priesthood (Pythagoras’ trousers)
  - Hercules culture
  - Myth of effortless success
The Culture of Physics

*From culture-without-culture to Hercules to Effortless Excellence*

**Antropology – a classic:**
Sharon Traweek – *Beamtimes and Lifetimes*
- A culture without culture
- *what is male, defines excellence*

Later studies:
The dangerous myth of objectivity
- makes us more subjective!
What is the percentage of women among Physics professors? Denmark, Estonia, Finland, Italy, Poland

Questions for the audience:

Which has the largest percentage?

Which has the smallest percentage?
What is the percentage of women among Physics professors? Denmark, Estonia, Finland, Italy, Poland

Denmark – 3%
Estonia – 11%
Finland – 12%
Poland – 14%
Italy – 23%
Culture of society does not give full correlation ..
It is the culture of Physics!

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?
We focus on strong individuals …
But diversity exists in teams!
... And diversity gives quality!

Collaboration: Strength in diversity

M. W. Nielsen et al., Nature, human behaviour 2 726
Making gender diversity work for scientific discovery and innovation

These labs are remarkably diverse – here´s why they’re winning in science.
Being inclusive gives research groups a competitive edge. It also happens to be the right thing to do
Myth of effort-less success?

FACTS: boys and girls/men and women are equally

• interested in methods, but in different applications/fields
• enthusiastic about Physics, but something happens later …

CONCLUSION: It is not only about recruitment

• Identities are not static – neither of people nor subjects
• Some identities causes friction – renegotiations!
• Specific problem: “The myth of effort-less success”
  • Background – school and preparation
  • Choice of examples – sports, machines, superheroes …
  • Self-confidence contra anxiety – who belongs?

Gonsalves and Danielsson 2020
Some books …

Stewart and Valian 2018

Drew and Canavan 2021

… and linked to Core values, with examples

Brage and Lövkrona 2016
Position paper

From LERU PG EDI

On WHY we need to change!

Equality, diversity and inclusion at universities: the power of a systemic approach

LERU position paper
September 2019

Advice against Hercules

1. **Question the myth** of the single, herculian, effortlessly excellent researcher – promote the idea of teams!

2. Promote minorities, but also **restrain** men!

3. Find out **why people leave**

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

Number: Segregation

Culture: Stereotypes/Hercules

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Inclusive teaching

End
Level 1: Numbers
- the highest level
Vertical Segregation – even higher

The Nobel Prize Gender Gap
Nobel Prize winners between 1901 and 2020 by category and gender

- Female
- Male

<table>
<thead>
<tr>
<th>Category</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>4</td>
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<tr>
<td>Medicine</td>
<td>7</td>
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<td>Chemistry</td>
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<td>Literature</td>
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<td>Peace</td>
<td>90</td>
<td>38</td>
</tr>
<tr>
<td>Economics</td>
<td>2</td>
<td>84</td>
</tr>
</tbody>
</table>

Total: 876

It is proof of bias!
Level 2: "Culture":
- bias and meritocracy
Ex 3: Bias

Traditional results – repeated many times:
Judge identical texts, grade 1 (lowest) – 5 (highest):

<table>
<thead>
<tr>
<th></th>
<th>Men about</th>
<th>Women about</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ingvar (Male)</td>
<td>Ingvar (Female)</td>
</tr>
<tr>
<td></td>
<td>Ingvor (Female)</td>
<td></td>
</tr>
<tr>
<td>Credible</td>
<td>4.9 3.4</td>
<td>4.5 3.5</td>
</tr>
<tr>
<td>Nonchalant</td>
<td>2.6 2.4</td>
<td>2.7 2.3</td>
</tr>
<tr>
<td>Humane</td>
<td>2.9 2.7</td>
<td>3.2 3.8</td>
</tr>
<tr>
<td>Competent</td>
<td>4.3 3.0</td>
<td>3.7 3.3</td>
</tr>
</tbody>
</table>
Example of bias against women

• Receive smaller grant allocations
  *(VR-Swedish Research Council 2020)*

• Worse evaluations of abstracts for conferences

• Worse student evaluations

• Men 8 times more likely to win awards (?)

• Fewer leadership positions

• Worse letters of recommendations
Actions against bias:

- **Awareness training** – education, information, workshops. ([https://implicit.harvard.edu/implicit/](https://implicit.harvard.edu/implicit/))

- It is not enough – could be damaging!

- Need ”Bias observers” to remind us during meetings, selection committees etc. ([LERU advice paper on bias and meritocracy 2018 and pilot education at LU 2020-2021](https://leru.org/en/publications/bias-meritocracy-report)).
Does Meritocracy work?


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

If meritocracy worked, then

"The university would be a realm of the *justly unequal*"

*Contradiction!*

Bias and non-objectivity destroys meritocracy

which is emphasized by "procedures" to circumvent it
Actions against bias:

• Create open and transparent selection processes

• Monitor meeting procedures – educate chairs.

• **Students** are also bias – analyse the way they are asked to do evaluations and the results.

See: VR reports and
*LERU advice paper on bias and meritocracy 2015, 2018*
Level 2: "Culture":
- discrimination and harassment
Tellus-survey 2020

Experience of Sexual Harassment in Lund University:

- Employee experience: 25%
- Employee witnessed: 26%
- Students experience: 27%
- Students witnessed: 24%
- Students rape: 2.1%

Legend: women in green, men in yellow.
Doctoral survey 2016

Proportion of doctoral students who report that at some time during their studies they have experienced discrimination on different grounds:

%
Mole hills?
Rosser: *Breaking into the Lab* (2012), Husu (2001)

Sue Rosser describes: "*Why women in Science are still controversial after thirty years*"

**Micro-inequities**

For discrimination – "every day" things,

**Non-events**

**Micro-agressions**

Small differences add up – bias and discrimination.

.. But it is a challenge to measure it!
Advice against discrimination

1. Discrimination and harassment is common and an essential problem to deal with. Focus on micro-aggressions and prevention!

2. Introduce anti-discrimination measures, through courses or workshops

3. Find out why people leave

4. Since some people are marginalised and discriminated
   – introduce Counter-spaces
     (Maria Ong and co-workers)
Answers

Number: Segregation

Culture: Stereotypes/ Hercules

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Culture: Discrimination

Subject: GRI

Inclusive teaching

resistance

End
Level 3: The subject
Gender in Research and Innovations

http://genderedinnovations.stanford.edu/
Sometimes an obvious gender/sex perspective

Sometimes sex/gender is a characteristic of what we study – biophysics, medical physics, applied physics, … etc

… but this dimension is often forgotten …

http://genderedinnovations.stanford.edu/
Always a Gender and Diversity Perspective

Electrons and Stars do not have e.g. gender, but

Science is what Scientists do
i.e. what we teach – what we do research on

Culture and Subject are intertwined – who has the power to decide what should be researched and taught?

Curiosity-driven Science, but who’s curiosity?

Metaphors, examples, representation, role models …

All Science is situated with limited sight (Harraway)
Example of useful methods from GRI

- Rethinking research priorities and outcomes
- Rethinking language and visual presentations
- One example – Combustion Physics in Lund
Answers

Number: Segregation

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Inclusive teaching

resistance

End
... Resistance and Physics students...
Are brains gendered/sexed?

• The most researched field in "Gender Science", with the largest funding.

• Does different bodies lead to different brains – and therefore capabilities – and therefore less women in Physics?

Problems:

• Wide bell curve

• Epigenetics

• Plastic brain (sociology->biology)

A simple illustration of Gender and Physics
Simple example – visual representation

Calculus based, introductory books

- Benson, University Physics
  - Traditional book
If you have lived here, this picture might mean something else to you ...
Visual presentations

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

If you have lived through sexual harassment, this picture might mean something else to you …
Visual presentations

Pictures of women

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.
Visual presentations

Pictures of men

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

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

The climber has done work to increase his potential energy.
Conference “in” Lund October 21-22, 2021

GENERA conference on

“Gender Dimensions in Physics and other Math-intensive Research and Teaching”

About new ways to approach Gender perspectives on these fields. More information on home page of

www.genera-network.eu
It is not easy...
Thank you for your attention!
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