

Gender & Diversity in the Cultures of Physics

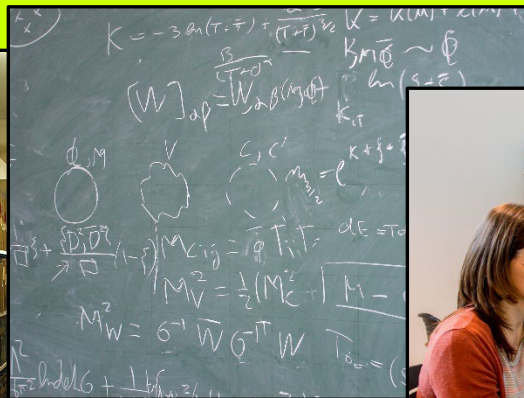
The Dark Matter Landscape. From feeble to strong interactions
MITP – Mainz Institute for Theoretical Physics,
Johannes Gutenberg University Mainz

11th September 2024

Outline

- I. What are "disciplinary cultures"?
- II. Disciplinary cultures and gender & diversity
- III. Research results on gender and diversity in the cultures of physics

What are "disciplinary cultures"?



I.1 The notion of "disciplinary cultures"

- Comprises not only: the research objects, the scientific knowledge, the research methods of an academic discipline,
- but also: typical **patterns of judging**, definitions of **what counts as "scientific"**, argumentation and thought styles
- interaction styles, **norms and values**, conventions, the **Do's and Don'ts** of the community.

(Huber 1991; Arnold & Fischer 2004)



1.2 The adoption of the disciplinary culture

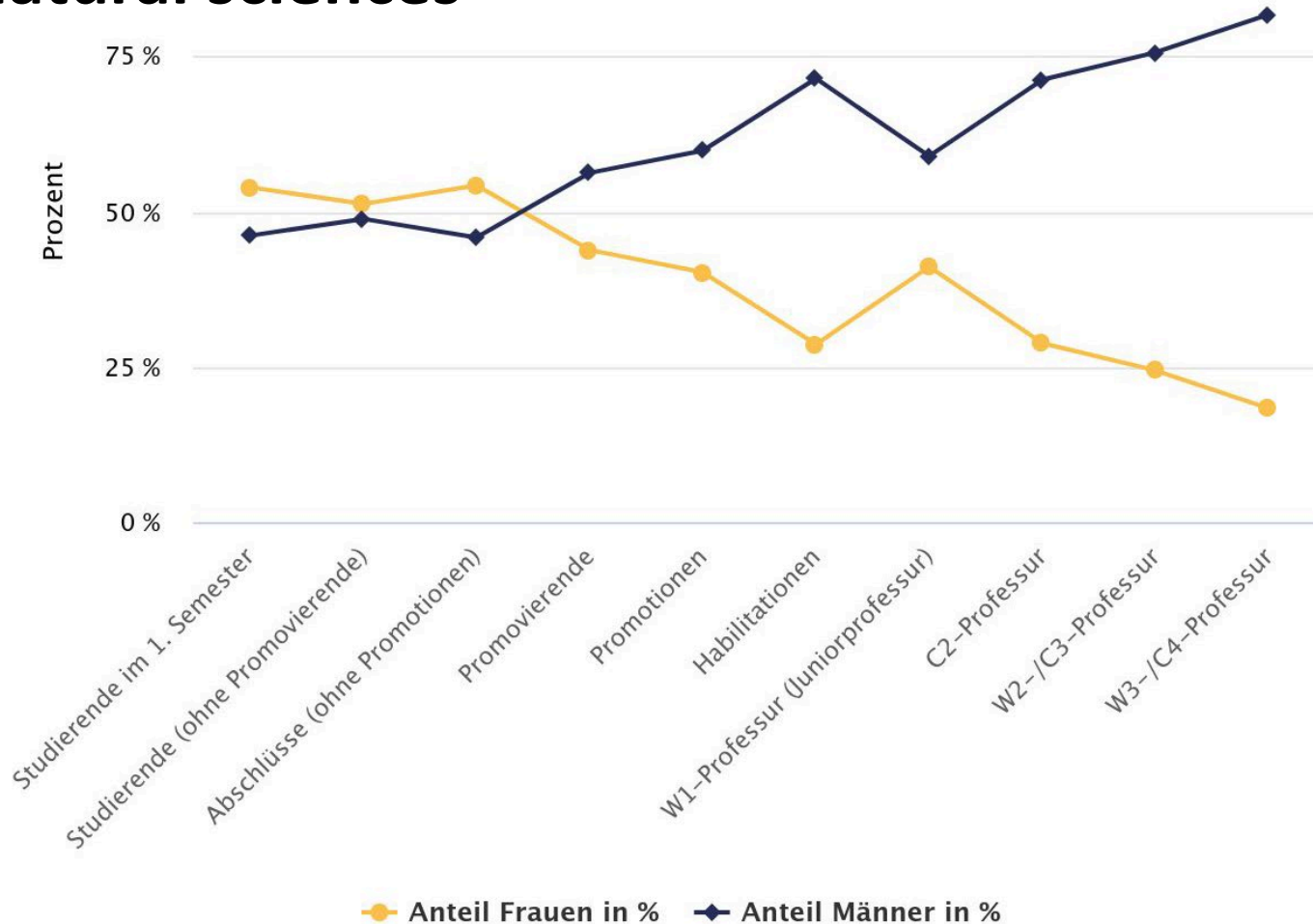
- The collectively experienced disciplinary culture creates a **sense of belonging** to the scientific community so that **membership** to the community is **perceived** and experienced as more or less **self-evident**.
- How to **adopt** a specific disciplinary culture is implicitly conveyed by scientists who are already part of the community and serve as **role models** to the students and **young scientists**.
- A sense of belonging to a scientific community is **created** through the formation of the specific **habitus** and the **related self-image**, but it must also **be perceived, recognised and acknowledged** by more **senior members** of the community.
- For members of **underrepresented** groups **more difficult** to be perceived as belonging to the community.

II Disciplinary cultures and gender & diversity

II.1 Segregation processes in science

- Women outnumber men in the first semester, but the share of **female professors in all fields** approximately 27% in Germany,
→ Effect of so-called **vertical** segregation
- **Separation** of women and men into **different fields**, e.g. low proportion of women at the beginning of studies in fields like physics vs. high proportion of women in e.g. the humanities
→ Effect of so-called **horizontal** segregation
- **Vertical** segregation processes also for other categories of social inequality, e.g. **first generation students, BIPOCs**
- For **physics** main drop-out during the **Post-doc phase**

II.1 Vertical Segregation in mathematics and the natural sciences



Quelle: Statistisches Bundesamt 2023; eigene Berechnungen.

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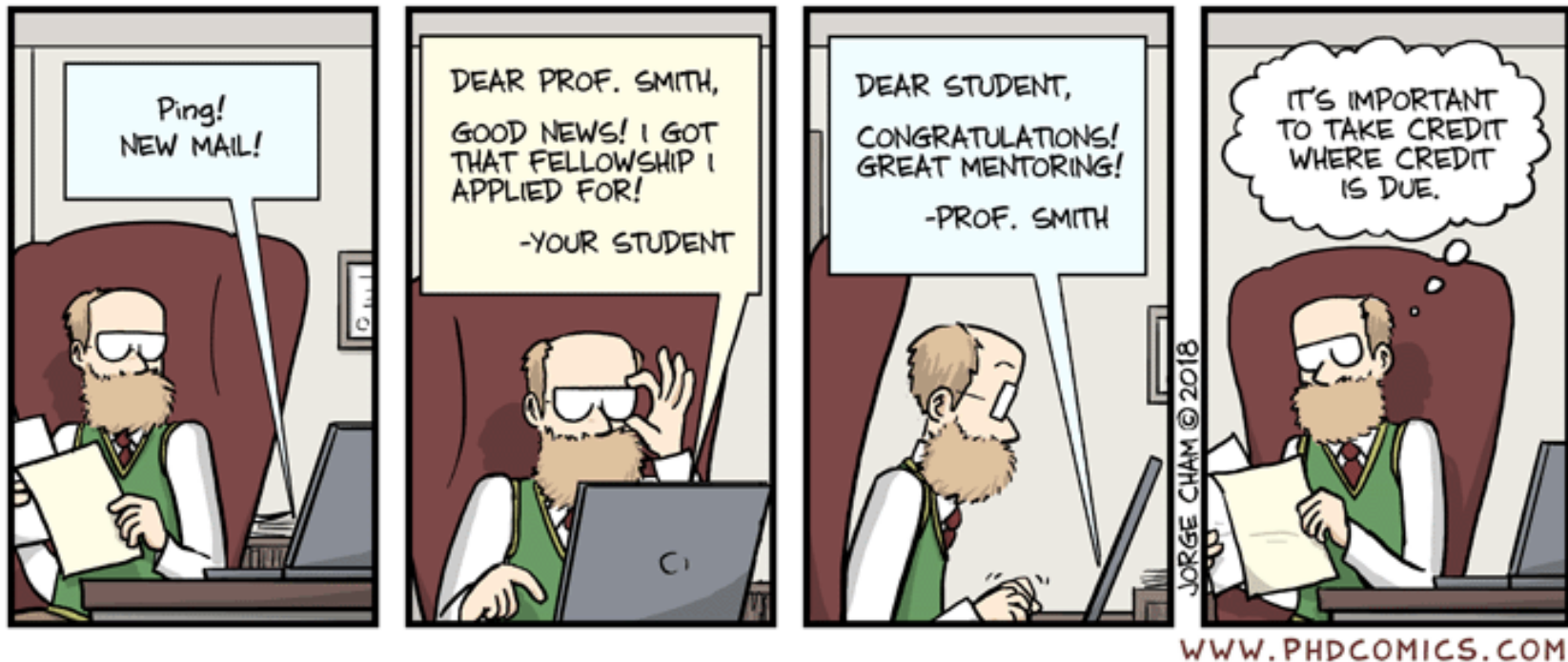


II.2 PostDoc as crucial career phase

- Requirements for PostDoc researchers
 - Applying for **funding** for own, independent research topics
 - Publishing research results in **peer review science journals**
 - Presenting research results on **conferences**
 - Developing an own, **independent research profile**
- High **competition** among young researchers
- **Decisions** on funding or on acceptance for publication made by reviewers, committees, i.e. by other, **more senior, members** of the scientific community.

II.2 Seniors as mentors for PostDocs

Senior researchers functioning as mentors



II.3 Gender & diversity in science careers

Findings across STEM-disciplines :

- **Willingness to fulfil career requirements more likely to be attributed to men than women** (see e.g. Beaufaÿs, Engels & Kahlert 2012)
- **Women less integrated in informal networks** (see e.g. Dautzenberg, Fay & Graf 2011)
- Gender stereotypes effect **attributing lower competence** and performance to women, men receiving more recognition and acknowledgement (see e.g. Beaufaÿs 2003; Könekamp 2007; Langfeldt & Mischau 2018 for maths + physics)
- Indications that **social background** has an impact on women's career success (see e.g. Möller 2018)
- Research on the situation of **People of Colour** (see e.g.) and on the role of **religion** and **ethnicity** (see e.g. Ong 2005, Ko et al. 2014, Rosa & Mensah 2016 for physics, Thomson 2018, Avraamidou 2019 for physics)

III Research results on gender and diversity in the cultures of physics

III.1 Cultures of physics in a European comparison

- UPGEM (Understanding Puzzles in the Gendered European Map) funded by the 6th EU-Framework Programme 2005-2008
- Analysis of workplace cultures in five European countries: Denmark, Finland, Estonia, Poland, Italy
- Starting point: The share of women in physics differs widely across Europe
- 235 qualitative interviews conducted at more than 20 universities
- Half of the interviewees had been active researchers ("stayers"), half had left research ("leavers")

UPGEM

Understanding Puzzles in the
Gendered European Map

Hasse & Trentemøller (2008): *Break the Pattern*, Tartu

Hasse & Trentemøller (2008): *Draw the line!*, Tartu

III.1 Cultures of physics in a European comparison

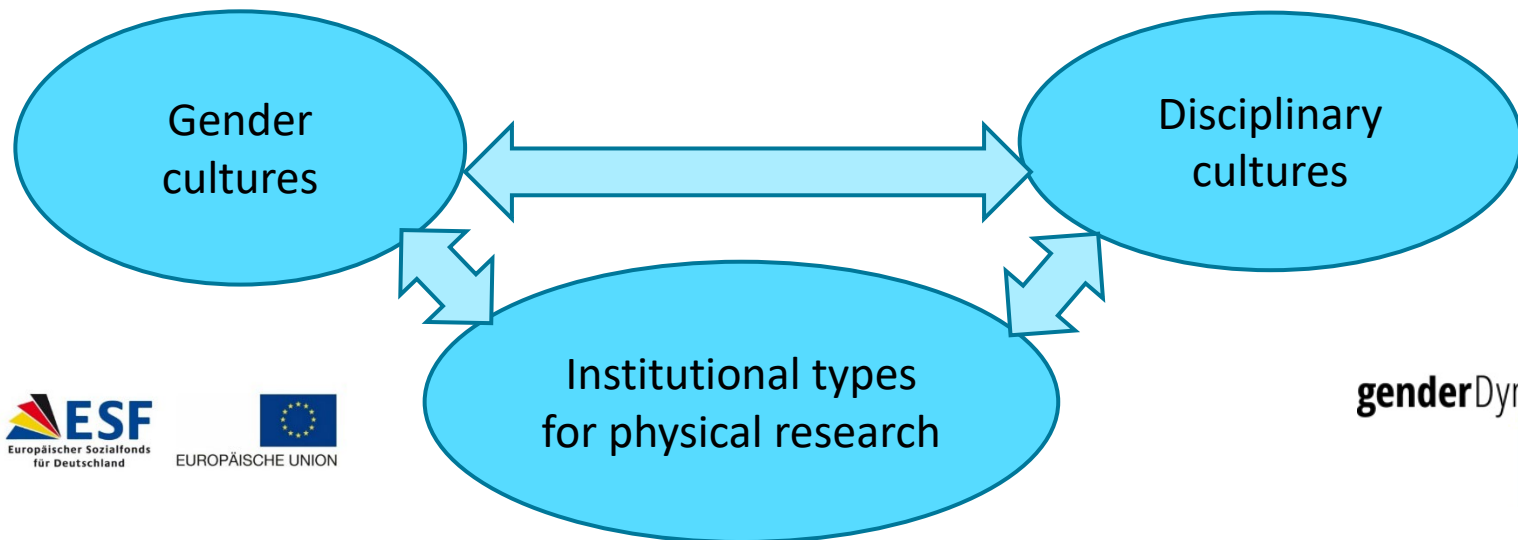
3 ideal-typical workplace cultures:

Hercules culture:	competitive climate, strategic action to the detriment of others accepted, no intersections with private lives
Caretaker culture:	competition within the working group is taboo, strong group commitment required, work-life-balance important
Worker Bee culture:	Individual career is less important, work as a fulfilment of duty towards the head of the team

- Elements of the Hercules culture dominate in the country with the **lowest** share of women: Denmark with 10% assoc. professors and 3% full professors
- Elements of the Caretaker culture dominate in the country with the **highest** share of women: Italy with 33% of assoc. professors and 23% of full professors

III.2 Disciplinary cultures and gender cultures: "genderDynamics"

- "genderDynamics: Disciplinary Cultures and Research Organizations in Physics"
- How are gender cultures and disciplinary cultures in physics entangled when comparing **different organisational types** of **research institutions**?
- **12 case studies** in **3 sub-projects** on **universities**, non-university institutes and excellence clusters resp. CRCs
- **Ethnographies**: Participant observation over a period of several months combined with qualitative interviews with physicists



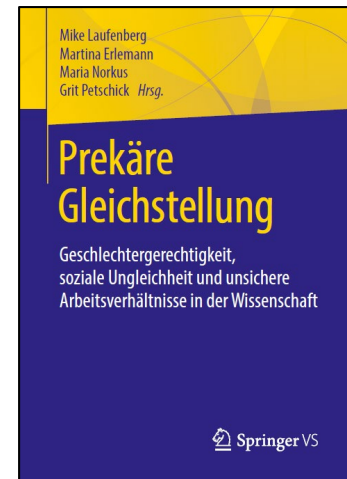
III.3 Case institutes in the project

"genderDynamics"

Case	Universities Research on four sites	Non-university research Research on four sites	Novel forms of organising research Research on two sites
1	Experimental Solid State Physics	Max-Planck-Institute, basic research, theoretical physics	Experimental chemistry, part of interdisciplinary excellence cluster
2	Experimental physics, close to chemistry	Helmholtz-Institute, Applied / experimental physics	Experimental physics, part of application-oriented excellence cluster
3	Particle Physics	Helmholtz-Institute, basic research, experimental physics	Basic research-oriented CRC
4	Experimental Physics, close to biophysics	Fraunhofer-Institute, applied physics	Application-oriented CRC

III.2 Snapshots of results of "*genderDynamics*"

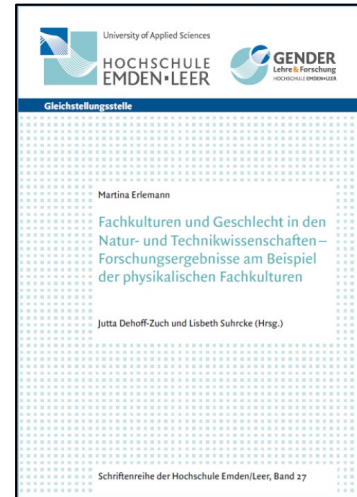
- Tacit acceptance of asymmetrical forms of gendered division of labor
 - Setup, support and maintenance of **technical equipment** exclusively carried out by **male team** members
 - **Supervision** and consulting students delegated to **female team** members
- Genderings that were brought in by **team leaders** have severe **effects onto the team**, especially when the team communication is strongly governed by the leading person.



Laufenberg, Erlemann, Norkus, Petschick (Hg.) (2018): *Prekäre Gleichstellung. Geschlechtergerechtigkeit, soziale Ungleichheit und unsichere Arbeitsverhältnisse in der Wissenschaft*. Springer, Wiesbaden.

III.2 Snapshots of results of "genderDynamics"

- Team leaders who judge gender parity as important for the group, mostly show positive attitudes also towards gender equality actions. Has an effect on the attitude of team members.
- Reasons for the low rate of women in physics are seen in the structures of academia and in the research cultures of physics and not in the women themselves.



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Thank you for your attention!

Questions?

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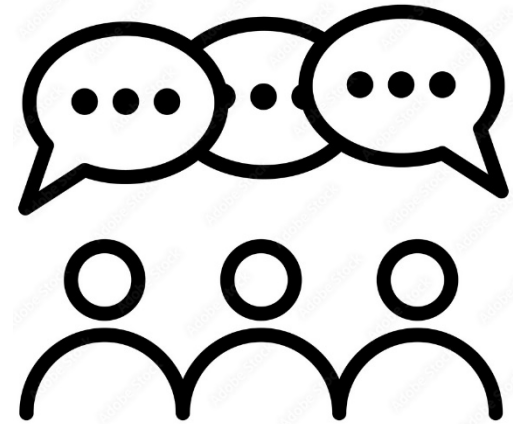
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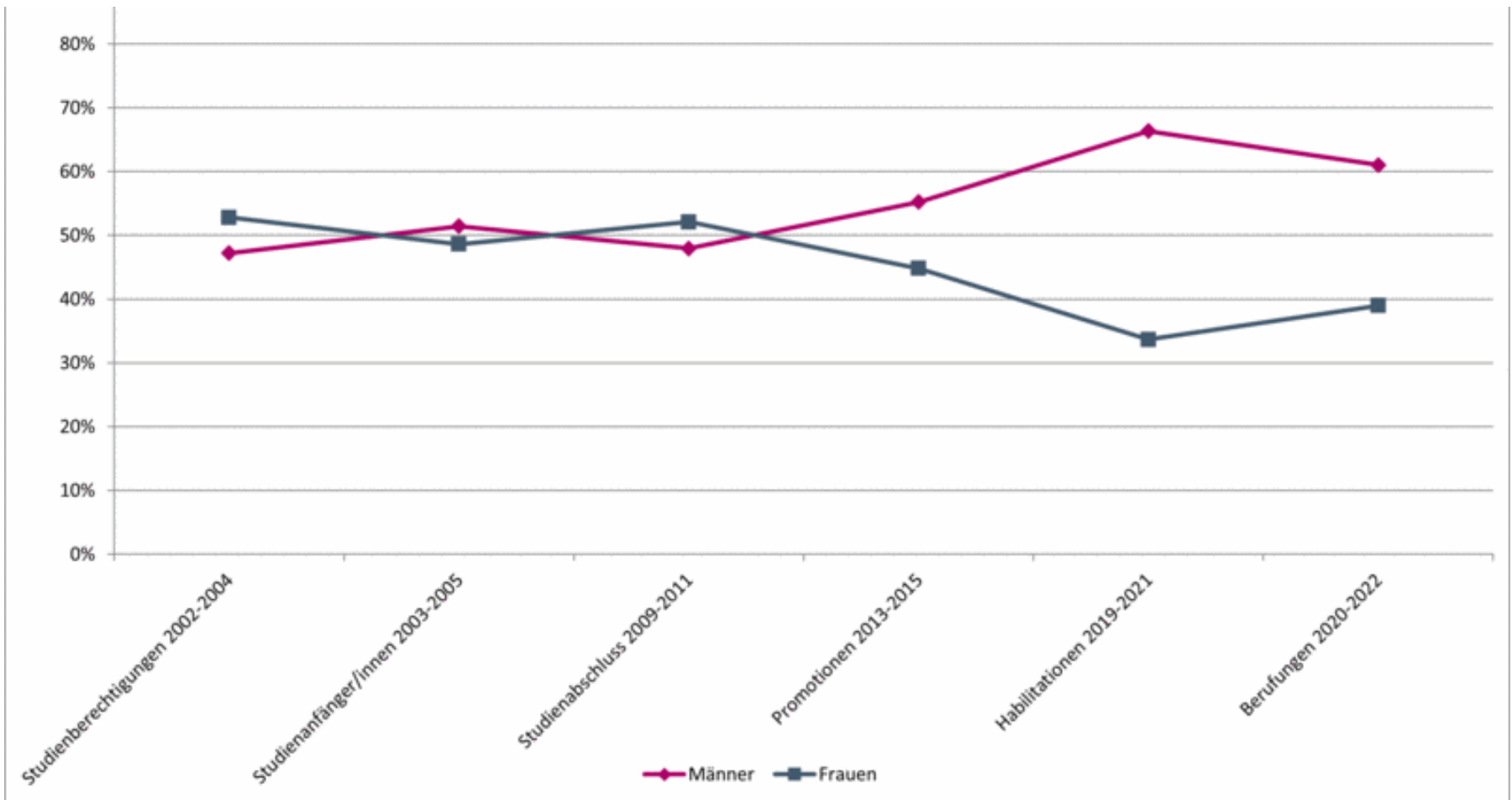
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Workshop: Topics for discussion in groups

- What are your experiences with the physics workplace concerning equity, inclusiveness and potential discrimination?
- If you would wish it being different: How can this be achieved? What should happen for this a change of culture?
- What about positive experiences/observations regarding physics developing as a more equitable field?
- What do you think are the major outstanding challenges to making physics a more equitable field?



Retrospective progression analysis (all fields)



Examples for genderings

- Gender differences among team members are constructed or stressed.
- The gender of a person is explicitly addressed although being irrelevant.
- A person is ascribed a certain competence due to his or her gender.
- Example of an interaction where gender differences are constructed:
 - In a meeting the team leader gives work order to a male team member to measure a sample:
„X is such a nice girl. Come on, be a gentleman and measure your colleague's samples“.