

## **Making epistemic distinctions: Gender and the heterogeneity of science**

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Social studies of science have highlighted the heterogeneity of science in contrast to former models of one or two cultures of science. However, little research has been done with respect to gender on the heterogeneous epistemic practices of the different (sub-) disciplines inside large scientific domains, i.e. inside the natural sciences and on epistemological distinctions that are made within the natural sciences. As the gendering effects of these epistemic practices are still under-researched, shedding more light on the connection of these distinctions and gender constructions seems an important endeavor for Gender Studies. Moreover, the question of how (young) scientists' social integration into their respective disciplines takes place in relation to the – in each case – different disciplinary epistemology is worth a further investigation.<sup>1</sup>

### **Theoretical assumptions**

Current Gender Studies scholarship in the Sociology of Science field indicates that the low proportion of women in some disciplines and in higher positions in the (natural) sciences is not due to their assumed 'hardships' and also not necessarily due to social factors external to scientific work itself, e.g. the question of work-family-reconciliation. It shows rather that successful research by women in (natural) sciences is bound profoundly to their social integration into the field, for example in their finding the 'right' mentors, being recruited for new projects, being included in important publications and so on. Hence, the question of how 'successful' integration into a scientific discipline works is vitally important for studying gender relations in science. Furthermore, scientific disciplines and sub-disciplines vary widely in regard to their disciplinary culture and mechanisms of inclusion. Therefore, more detailed information on how the horizontal segregation of young scientists in different specialties of disciplines takes place is important. As a point of departure, it can be assumed that distinctions made on the epistemological level of scientific knowledge are relevant for gender research on this field. Accordingly, the ways in which scientists understand their particular domains, how they distinguish them from others, and how they draw boundaries between their own areas of scholarship and others reveal -- from a sociological perspective -- a social practice of differentiation. This practice, taking place on an epistemic level, can be regarded as having a simultaneous impact on processes of social segregation. In this vein and following social studies of scientific knowledge, we assume that boundary work inside of

disciplines and between different disciplines and sub-disciplines constitutes gender boundaries too. In his concept Thomas Gieryn conceives boundary work as

*“the discursive attribution of selected qualities to scientists, scientific method, and scientific claims for the purpose of drawing a rhetorical boundary between science and some less authoritative residual non-science.”* (Gieryn 1999: 4f.)

While Gieryn’s approach provides an excellent analytical tool for studying processes of epistemic differentiation and self-positioning, he primarily focuses on the general demarcation between science and non-science. In recent years, also the inner disruptions and disunities within the social field of science have gained more and more attention. Accordingly, against the background of the ‘disunity of science’ (Galison & Stump 1996), it seems to be highly important to take a closer look at the dynamics of boundary-work between different domains and sub-domains of science. Like several authors have already shown (e.g. Becher 1989; Hacking 1996; Knorr Cetina 2002) the idea of *one* science, *one* scientific method, or *one* sort of knowledge is far too simplistic. However, the investigation of whether gender is an issue in these processes of boundary work and these different ways of understanding science is currently only in its initial stage (Heintz, Merz & Schumacher 2004; Gilbert 2002; Paulitz 2010). Heintz, Merz and Schumacher have shown the importance of what they call the “gender image of a discipline”. In their understanding this means that disciplines are gender-segregated, known as female or male disciplines, (research) activities are described with skills and qualities that are attributed with femininity or masculinity and close non-scientific areas are coded as female or male as well. Differing slightly from this notion, we include into the study of the gender image of a discipline, firstly, the gendered *structure* of a specific discipline as documented in the proportion of women among students, faculty members and in leading positions. Secondly, we also take a *symbolic* level into consideration when studying the “gender image”, namely by analyzing the use of language (gender-equity) and the presentation of men and women as scientists. Moreover, we also will take the *epistemological* level of science into account by analyzing the interlinks between structural factors, symbolic representation and the epistemological image of scientific disciplines. Accordingly, we theoretically focus on the longer running, more complex intertwining of structure, representation and knowledge in science in order to comprehend the “epistemological gender image” of scientific work.

Simultaneously, the connection between epistemic boundary-work and gender boundaries on an epistemic as well as on a structural level in natural science calls for taking long-term and recent developments in this field of research into consideration. Generally and for a long time, modern natural science has already consisted of a broader palette of disciplines differing in type of research as well as in their relations to the non-scientific world. Chemistry and pharmacy, for example, have a long tradition rooted in practice and industrial

manufacturing. Basically, in the broader field of science, disciplines shaped by experimental research in laboratories coexist alongside disciplines gathering data primarily outside the laboratory 'in the field' and disciplines based mainly on theoretical modeling or, nowadays, on computer simulation. On the other hand, research practices in various scientific disciplines are increasingly characterized by technologies and by newly arising or converging domains situated between science and engineering. With respect to this development towards science as 'technoscience', gender relations can thus particularly be investigated, using the example of current clusters and collaborations at the interface between science and technology.

Considering this heterogeneity, we suggest a more detailed study- with respect to gendered mechanism - of the boundary work

- between different fields of activities in areas, in which technology and natural sciences cooperate,
- between disciplines with different types of scientific work, e.g. laboratory work or field work,
- between disciplines which can be classified as more theoretical or more practical,
- between different sub-disciplines inside of the same discipline.

Thus, it is important to learn more about the different ways of understanding science, the different dynamics of boundary work between different domains, as well as the interlinks between epistemic boundary work and gender boundaries.

### **Research questions in detail**

As we have stated in our theoretical assumptions, the question of how 'successful' integration into a scientific discipline works is vitally important for studying gender relations in science. Also, in light of the disunity of science outlined above, this question of inclusionary mechanisms has to be applied to different scientific (sub-) disciplines in a more differentiated way. What is the broader palette of social processes of integration and demarcation dependent on in the specific disciplinary contexts? How do these processes take place, in the course of which some young scientists start to work in central innovative fields while others work in less noted, border areas? To what extent are the different images of (sub-) disciplines and the different images of scientists and scientific work gendered and how do these gendered images facilitate or impede the access to specific fields?

### **Research design and methodology**

The empirical field of our research is NAWI Graz which is a current joint initiative in innovative research areas of science by the two large universities in Graz, the University of

Graz and the Graz University of Technology. In NAWI Graz, 44 departments or research units of the two universities<sup>2</sup> take part and cooperate in four common areas: 'Molecular Bioscience, Biotechnology, Plant Science' (Biosciences), 'Chemistry, Chemical and Pharmaceutical Engineering' (Chemistry), 'Earth, Space and Environmental Science' (Earth Sciences) and 'Fundamental and Applied Mathematics' (Mathematics). Another part of the joint initiative is to collaboratively run several study programs on the undergraduate as well as on the graduate level. The disciplinary cultures of NAWI Graz and the connection between professional boundary work and social (gender-) differentiation will be explored more precisely in our research.

Firstly, available survey data including the proportion of male and female students and faculty members in the different NAWI Graz areas were gathered to get more information about the segregation in these fields. Secondly, a cross-sectional empirical field study covering all four main areas of NAWI Graz is conducted, comprising qualitative analyses of the members' homepages. This homepage-analysis reveals more about the self-presentation of all 44 members in NAWI Graz and focuses on the gender equity of language, the visualization of scientists on the homepages, occupational images and so on. On the basis of the preliminary results of these two approaches to NAWI Graz's gender image, thirdly, a cross-sectional qualitative semi-structured interview study is currently being conducted. By 'theoretical sampling', representatives of the different NAWI Graz members are selected and asked about their understanding of their particular field, types of scientific work, the position of their specific field in the (natural) sciences and so on. These interviews aim at the epistemic culture, the mindset and the images of scientists in the particular (sub-) disciplines in contrast to other, adjoining (sub-) disciplines. Preliminary outcomes on the basis of the quantitative data and of the homepages will be discussed now.

### **Preliminary outcomes**

Initial results of the quantitative data and the homepage-analysis indicate that the four areas in NAWI Graz differ in relation to their disciplinary gender images as well as to the ways, in which gender is explicitly brought up as an issue at all in their self-presentations.

A secondary analysis of available survey data hints at a distinct horizontal segregation among the NAWI Graz areas concerning the level of female students. In the areas of Biosciences and Chemistry, the proportion of women among the students is significantly higher than in the areas of Earth Sciences or Mathematics. Congruently, the proportion of women in leading positions is higher in the areas of Biosciences and Chemistry. As the homepage-analysis indicates, in these areas the gender-neutral use of language and the representation of women as natural scientists are more common than in the other areas of

NAWI Graz. Consequently, it can be stated that the areas of Biosciences and Chemistry show rather a balanced if not a feminine coded gender image, whereas in contrast, the areas of Earth Sciences and Mathematics are rather dominated by men, an empirical finding that is also reflected on the level of self-presentation where both women as well as gender neutral language are absent.

In addition, further differences can be found inside the NAWI Graz areas between different (sub-) disciplines, too. The homepage-analysis gives first evidence that the number of women among the faculty is higher in those (sub-) disciplines in which scientists predominantly work in laboratories. Vice versa the number of women among the faculty is lower in those (sub-) disciplines, where scientific work is more outdoor field work (even if mostly in combination with the laboratory) or where work is primarily shaped by computer simulations or basically just theoretical. These initial findings potentially hint at the existence of different gender images between and inside different areas of natural sciences that may lead to inclusionary as well as exclusionary social dynamics.

Another striking finding from the analysis of the self-presentation on the internet indicates that - if gender is explicitly mentioned - the issue is always about *women*, who are highlighted as exceptional phenomena. The presentations of unique women in some fields in the biosciences and chemistry deal with them as something special, extraordinary or as select efforts of some exceptional women. Reading this finding in a contrastive way, this means that men's performance seems to be more regarded as the standard and the performance of women as something which needs to be pointed out. Drawing on this, an underlying androcentric culture can be assumed even in those very disciplines, that principally present themselves by showing 'their' women scientists to the public, but presenting them in a specific manner, namely as exceptions. This hypothesis calls for further investigation. To sum up, it can be stated so far that the gender images inside the natural sciences differ in the specific areas and (sub-) disciplines.

## **Outlook**

Further validation for these preliminary findings and further insight into the mechanisms of gendered boundary-work between scientific disciplines and within them shall be provided on the basis of the qualitative interviews and selected field observations. This may allow a step deeper into the ratio of the different disciplinary cultures to learn more about the ways in which 'successful' integration into science can be understood. This strategy promises to offer new insights into the mutual relationship between epistemic demarcations in science on a discursive level of self-positioning, the resulting ideas of scientific work and of the scientist on the one hand, and processes of structural segregation and reproduction of social hierarchies

in the heterogeneous social field of science on the other hand. By focusing on the gendered subtext of this relationship, a more detailed image of inclusionary as well as exclusionary social dynamics that operate on the epistemic level – a level mostly understood as gender neutral – can be expected.

## Notes

1. This paper is based on the currently running research project 'Negotiations of Gendered Boundaries in Science. The Example of the Inter-university Cooperation of Science in Graz' which is located at the University of Graz, Department of Sociology. The project started in November 2010 with a duration of 18 months, under the direction of Tanja Paulitz and funded by NAWI Graz and Land Steiermark.
2. NAWI Graz includes also one member (the Space Research Institute) of the Austrian Academy of Science in the field of Earth, Space and Environmental Science.

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