Jan Büssers
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Myriam Raboldt
Rebecca Wiesner (eds.)

Gendered Configurations of Humans and Machines

Interdisciplinary Contributions

L'AGENda, Band 8
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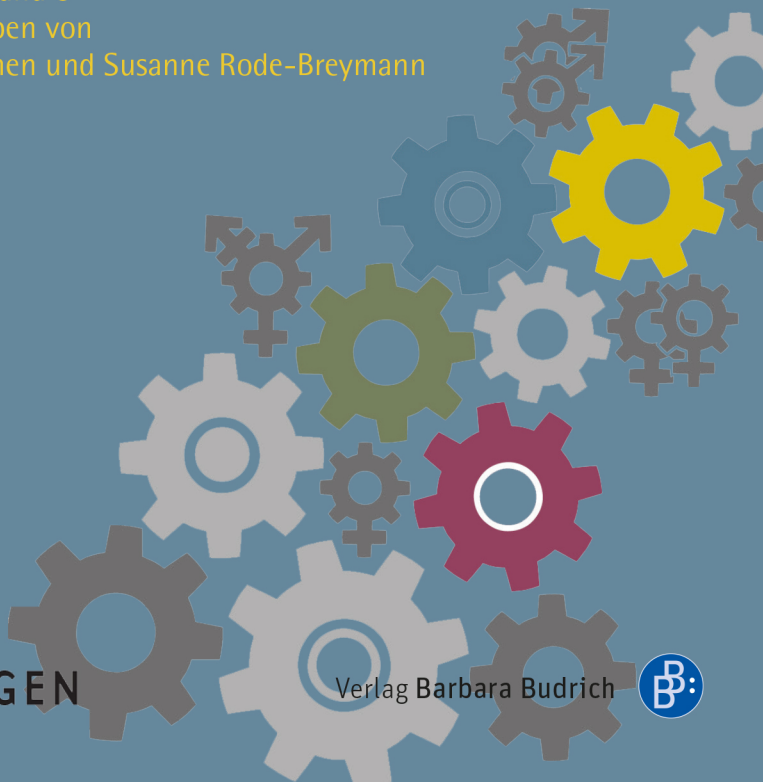
Corinna Onnen und Susanne Rode-Breymann



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Gendered Configurations of Humans and Machines

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With the cooperation of
Prof. Dr.-Ing. Corinna Bath, Technische Universität Braunschweig, Germany
Prof. Dr. Bettina Wahrig, Technische Universität Braunschweig, Germany

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Content

Greeting

Juliette Wedl

A lot of time has passed since the hours I spent with Bettina Wahrig in 2011 working on the application for the Maria-Goeppert-Mayer Professorship[1] "Gender, Technology and Mobility" ("Gender, Technik und Mobilität"). It has been more than nine years since this spontaneous idea, which has matured more and more into an ambitious concept, culminating in a professorship held by Prof. Dr.-Ing. Corinna Bath at the Faculties of Mechanical Engineering of the Technische Universität Braunschweig and the Ostfalia University of Applied Sciences since the end of 2012. In that period, the activities of the working group "Gender, Technology and Mobility" (GTM) have created a number of innovative impulses for both universities: The outcomes of gender studies have found their way into teaching and research at both institutions. To name just two initiatives, the booklet "Gender, Technology and Mobility" (Bath 2015) outlined the general ideas and context of the new research field; and, most recently, the working group's post-doctoral researcher, Dr Sandra Buchmüller, was granted the Junior Research Project "Human Demands of Sustainable Aviation"[2] in the Cluster of Excellence "Sustainable and Energy Efficient Aviation" (SE^2A) funded by the German Research Foundation (DFG). This project aims at using participatory methods to research the interests and needs of different stakeholders and their diverse life situations regarding the future of aviation. The results will be integrated into technology development processes. The other initiative mentioned, the booklet, set out to explain the importance of the perspective of gender for engineering sciences, a perspective that is now an integral part of the Cluster of Excellence.

In addition to the doctoral program, which I will go into in a moment, the project "GenderING. Gender Studies in the Engineering Sciences" (Draude

1 The Maria Goeppert Mayer Program for International Gender Studies was launched in Lower Saxony in 2001. With this program, the Ministry of Science and Culture (MWK) aims to promote, strengthen and internationalize women's and gender studies in the state of Lower Saxony. Through this program, the creation of centers for gender studies was supported, many guest professorships were made possible, and with the last two calls for proposals in 2011 and 2017, regular professorships focussing on or including gender research were established at universities in Lower Saxony. The TU Braunschweig and Ostfalia HaW successfully applied for funding within this framework.

2 Project page: https://www.tu-braunschweig.de/gtm/human-demands-of-sustainable-aviation.

n.y.) exemplifies the participatory and egalitarian approach of the GTM research team. The project supported interdisciplinary cooperation between engineering sciences and gender studies by enabling actors to meet as equals in research and teaching. The aim of the project was to take into account the analytical findings of gender-technoscience research on the one hand and the methods of research and development and the professional cultures of engineering sciences on the other. Accordingly, in the project GenderING,[3] a tandem team from both subjects exemplarily reconceptualized the course "Introduction to Car Body Development" ("Einführung in die Karosserieentwicklung") at the Institute for Engineering Design at TU Braunschweig, combining findings from gender studies with engineering science and integrating them into teaching. This concept of translation between disciplinary cultures was also applied to the course "Automated Driving"[4] ("Automatisiertes Fahren"), and teaching experiences from that course led to a scientific collaboration (see Buchmüller et al. 2018).

The GenderING projects show that interdisciplinarity contributes to the development of "socio-political competencies as important key competences"[5] (Leicht-Scholten 2018) in the engineering sciences. Entangling different disciplinary perspectives with the teaching and practice of engineering helps to open these disciplines towards questions of gender and diversity in terms of didactics, content, and personnel, attracting new groups of students to the engineering sciences. Through the influence of gender studies, taking the forms of research on inequality and reflection on science and technology, on engineering classes and the practice of engineering that focuses on development tasks, technical developments can be geared more closely towards the real needs of users, instead of being based on stereotypical assumptions. Moreover, an orientation towards research-based and problem-based learning appeals to other types of learners, and the consideration of the social aspects of technology appeals to new groups of students, making engineering sciences more attractive to diverse target groups. This is a forward-looking answer to the problems of today, which engineering sciences also must face.

The doctoral program "Gendered Configurations of Humans and Machines. Interdisciplinary Analyses of Technology (KoMMa.G)," established in 2017 and funded by the Ministry of Science and Culture of Lower Saxony, is an outstanding enterprise when it comes to interlinking gender and engineering perspectives. By focusing on the category of gender from a

3 The year-long GenderING project was funded within the innovation program Good Teaching; the follow-up project within the transfer program. Both funding instruments are part of the BMBF project teach4TU at the TU Braunschweig and part of the federal and state program for better study conditions and more quality in teaching. More information: www.tu-braunschweig.de/teach4tu.

4 For more information, visit https://www.tu-braunschweig.de/gendering-automatisiertes-fahren.

5 Translated from the German publication.

transdisciplinary perspective, it investigates how human-machine configurations that support inequality and injustice emerge and aims to propose changes to address that inequality. The challenges of transdiciplinary cooperation and communication between doctoral students and their supervisors across the traditional boundaries – the program included disciplines from humanities, social sciences, and media studies, on the one hand, and natural sciences, technology, and engineering on the other – became clear in the four years of the program, demonstrating the enormous innovative potential of concrete research and learning exchange. In the course of KoMMa.G, the hurdles of the so-called *great interdisciplinarity* became just as apparent as the promotion of mutual understanding – although much remains to be done before such transdisciplinary research collaborations matter in Germany. In view of this, the professorship "Gender, Technology and Mobility," though installed only recently, has already had a lasting impact on gender and technoscience research. The present volume, the result of the final conference of the doctoral program, and the work of the doctoral students will contribute to attracting international attention to these achievements in Braunschweig. I wish all those involved every success and all readers an informative read!

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Editors' Note

Jan Büssers, Anja Faulhaber, Myriam Raboldt and Rebecca Wiesner

This volume is a collection of contributions deriving from the "Interdisciplinary Conference on the Relations of Humans, Machines and Gender" which took place in Braunschweig (October 16–19, 2019). It aims to give insights into the configurations of humans and machines, taking the perspective of gender studies from various disciplinary viewpoints – including contributions from the humanities and STEM (short for natural sciences, technology, engineering, and mathematics). In its range, the volume mirrors the diversity of disciplines involved in our doctoral program, "Gendered Configurations of Humans and Machines" (abbreviation: KoMMa.G), a joint endeavor of Technische Universität Braunschweig, Ostfalia University of Applied Sciences and Braunschweig University of Art (2017–2020).[1]

Finding companions in pursuing such an interdisciplinary approach to reflect on science, technology, and gender from various disciplinary angles was (and is) an aim of the conference and this volume. Interdisciplinary approaches are necessary if we are to address contemporary challenges successfully. But the fruitfulness of this work must not overshadow the obstacles that such projects have to overcome. Having learned how demanding and time-consuming working in interdisciplinary contexts can be ourselves, this volume is a plea for staying with the trouble and making kin along this winding road.

We thank the Niedersächsischen Ministerium für Wissenschaft und Kultur for supporting our research with scholarships and grants with which we were able to finance the conference and this volume. Furthermore, our special thanks go to Corinna Bath and Bettina Wahrig for their ambitious work as speakers of the doctoral program and their support in the making of this volume. The same goes for our coordinators, Corinna Melcher and Annette Bartsch, whose work not only guided us through all stages of the doctoral program but who were also incredibly helpful in making the conference happen. Our gratitude for doing such a great job in finalizing the texts for this volume and staying with the trouble of bringing together all the different styles of our texts goes out to Thomas Nyckel, the internal copy-editor of this volume. In this manner, we are also very grateful for the wonderful

1 More details on the development of the KoMMa.G-program can be found in Corinna Bath's and Bettina Wahrig's "Introduction" to this volume.

work of Anna Panagiotou and all her helpful advice for improving these texts as the proof-reader of this volume. We thank all of the authors for their contributions to the conference as well as this volume. None of this could have been achieved without the care, time and attention of everyone participating. Last but not least, we would like to thank our publisher, Barbara Budrich, and the series L'AGENda for publishing our book. A special thanks to Vivian Sper for her supportiveness in answering all of our questions in the publishing process.

So, by turning the page, we invite you as the reader to join our endeavor: meeting us halfway in our texts, entangling with our thoughts and maybe, through enjoying and struggling with these texts, becoming a companion in our pursuit of reconfiguring human-machine relations and doing interdisciplinary work by overcoming the seemingly distinct boundaries of humanities and STEM.

Looking Through the Mirror: The PhD Program KoMMa.G[1]

Bettina Wahrig and Corinna Bath

1. Introduction

Can you look through a mirror? Of course not. But yet… Plain mirrors usually have a reflective *and* a transparent component. A transparent surface, like water or glass, will reflect some of the light rays falling on it, depending on the angle of incidence and the perspective of the onlooker. By using the reflecting surface of this volume, which was the last joint project of the members of the PhD program "Gendered Configurations of Humans and Machines" ("Konfigurationen von Mensch, Maschine und Geschlecht, KoMMa.G," 2017–2020) we are looking back at three years of intensive and often joyful collaboration and striving to catch a glimpse of the future. Hence our paradoxical title "Looking through the mirror," i.e., casting a glance both backwards and ahead, taking account of the recent past and guessing what may become of that endeavor in the future. The conference itself was organized by the PhD researchers in KoMMa.G, and this volume is also a fruit of their initiative.

Over the past three years of working in the PhD program KoMMa.G, funded by the Ministry of Science and Culture in Lower Saxony, our PhD researchers and the Principal Investigators (PI) have held conversations at the intersections of a broad range of disciplines. The initial fifteen principal investigators and PhD projects represented disciplines cutting across the fields of technology and engineering, natural sciences, social sciences, science and technology studies (STS), film and media studies, and history of science. We also garnered associated investigators from literary studies, history, and informatics, to name just the most important ones. The overall aim of this project was to understand gender relations and implicit gendering within the disciplinary fields of science and engineering. In this context, our questions

1 This short preface is the written and overhauled version of our welcome address to the final conference of the Doctoral Program "Gendered Configurations of Humans and Machines" ("Konfigurationen von Mensch, Maschine und Geschlecht, KoMMa.G," 2017–2020) held in October 2019 in Braunschweig.

were: How do different forms of gender knowledge arise within these fields? In what way do they play out at the sites where knowledge and technologies are produced? How do technologies configure gender as a structural-symbolic category of inequality and, vice versa, how does gender configure knowledge and technologies? Our PhD researchers, previously educated in science, engineering, or the social sciences and humanities, acquired knowledge about other disciplines and about the way Gender and Queer Studies provide frames of understanding and analyzing them. They did so by actively participating in workshops, seminars and discussions, and through invited guest lectures, many of which they organized themselves. They also developed and organized the conference documented in this volume. Consequently, PhD researchers from our program are its principal editors.

Within the limited time of three years' funding, and in addition to working on their own projects, the PhD researchers and the Principal Investigators have taught each other what their disciplines of origin are about. The PhD researchers have nudged their mentors and inspired one another to cast a fresh look at their fields of research. They reframed their habitual disciplinary perspectives by gazing through the looking glass of unfamiliar research methods and approaches that they had not yet considered.

The PhD researchers' short accounts of their completed and ongoing work included in this volume testify to the difficulties of developing an inter- and transdisciplinary perspective, inspired by questions arising from different strands of Gender Studies, but centered on a given research topic in their disciplines of origin. The task of combining innovative research & development (R&D) with current approaches in gender studies, or, vice versa, of undertaking a journey into the world of R&D, equipped with a gender toolbox taken from the arts and media or social studies, has been challenging. It is an endeavor, an issue of daily struggles, of getting lost, of misunderstanding each other, and of eventually making sense of that incomprehension. This might even lead us to a short, and paradoxical, definition of *interdisciplinarity* and *transdisciplinarity*: Interdisciplinary and transdisciplinary work are the process of NOT understanding each other, which then makes us start to spell out WHY these moments of misunderstanding continue to happen, with the effect of either transforming well-trodden paths or clinging to the traditional epistemologies we have been taught. With this definition – or, to phrase it more modestly – with this formula for what happens at the intersections between disciplines, we have already taken the step from *reflecting on* science, technology, and gender to *reflecting on the way we perform this reflection*. But on what does this reflection on reflection depend? We intended – and still intend – to tap into inter- and transdisciplinary reflection as a resource to understand better how we, as researchers and as humans, change and are changed in a series of co-configurations in technology-driven processes (see among others Barad 2007; Barla 2019; Suchman 2007; 2012).

The necessity of such a transdisciplinary reflection process in a globalized, technology-driven world, which is thoroughly structured by inequality and by dangerously anti- or a-social power relationships, is highlighted by the central research object of our PhD program, namely the growingly complex human-machine configurations, as we formulated in our project outline: "Machines, which can be understood as object-centered technologies, open up new possibilities for mobility and communication, they relieve us of tedious tasks, and allow us to share information or overcome physical limitations and geographical borders. At the same time, technical products influence the way we think, act, and feel, i.e., our forms of subjectification. Machines are thus not only configured by humans, but they represent an essential part of the (re)configuration of the human […]. The same applies more generally to technical artifacts in research and development."[2]

Gender Studies in STS, Queer Studies and approaches to intersectionality have helped us to contextualize scientific and technological developments within the larger picture of social interaction, to understand research practices and disciplinary cultures, to conceptualize their economical, juridical, and political frameworks (Cipolla et al. 2017; Escobar 2018; Harding 2015; Suchman 2008; Thakor/Molldrem 2017; Verran 2002; Wajcman 2010). Science and technology are social enterprises; they constitute webs of signification and power relationships, to which we all belong. Like the challenges of the climate crisis, the ongoing pandemic is a striking example of how urgently we need approaches encompassing and entangling cultural, historical, and techno-scientific insights, in addition to a new understanding of what it means to be human, in order to solve the current existential global problems (see among other Bath et al. 2017; Haraway 2016; Puig de la Bellacasa 2017; Stengers 2015; Tsing 2017).

2. How to Conceptualize an Interdisciplinary PhD Program

When, together with the other PIs, we started to write up the proposal for the doctoral program back in 2015, we were confronted with the challenge of how to organize a joint exploration of research fields and methods. At first, each of us developed outlines of case studies for possible PhD projects. For example, we sketched out projects touching on gender aspects in the ergonomics of human-computer interaction, gender in the planning processes of steel construction or, the task of developing a revision of actor-network theories with the aid of the critical tools developed by gender studies.

2 See: https://www.tu-braunschweig.de/kommag, last accessed August 11, 2020.

Thus, in order to create a living and productive atmosphere of interdisciplinarity, we needed a space for mutual translations and collaborations. KoMMa.G turned out to be such a space. How did we conceptualize this space? We initially aimed at a tandem or double supervision for PhD projects, so that each project would have one supervisor with a science or engineering background and one with a gender studies background. These tandems, we thought, would be able to inform each other both on the thematic side and the methodological side. For example, how are gender relations and lab automation entangled? The tandem project for this research in pharmacy was to be located in the history of science: Can prosthetics re-constitute the cis-male body? In both projects in this tandem, artifacts and humans were intermixed and entangled. But how do lab automation and the development of prosthetics in the wider sense resonate? How do human-artifact relations change human-human relations and vice versa? In the course of the program, the first project (on lab automation) has been realized, the second one (on prosthetics) thoroughly modified.

In hindsight, we can name some more pairs of projects that mirror each other somehow. Still, in the period of refining the program, we soon realized that this approach was too schematic because we were encompassing such a large number of different disciplines. We were still confident that resonances between the PhD projects would arise over time, and we had already detected quite a number of them. But on further elaboration, they turned out to be elusive, and, more importantly, the thematic interactions were not simple resonances, but rather patterns of resonances and interferences, like the patterns one may see on a liquid surface observed from different angles and over an extended period. Moreover, we had to adapt the formal requirements of the curriculum and the supervision of doctoral students to the regulations of three different universities. A schematic dual mentoring would have brought too many structural inequalities into the group.

Therefore, we decided to propose another model of mutual interdisciplinary instruction: We defined four research areas and allocated between three and five PhD projects to each, making sure that experts both for gender studies and for science and engineering were present in every group of potential supervisors. The four research areas were *Abstractions and Modeling*; *Creativity and Design*; *Materialization, Virtualization, Representation*; and *Networks and Emotions*. This concept of structuring the program and facilitating interdisciplinarity convinced the reviewers of our proposal. Thus, in 2016, we received the funding for the PhD program by the Ministry of Science and Education in Lower Saxony.

3. Working with PhD Researchers and Their Supervisors Across Disciplines

We started our program in January 2017 with eighteen PhD researchers. Fifteen of them received a three-year grant, and three were associated with the PhD program. They were, and continue to be, supervised by fourteen professors at eleven institutes or departments from three universities in and around Braunschweig: The TU Braunschweig, the Ostfalia University for Applied Sciences and the Braunschweig University of Arts.

As expected, the doctoral students brought a large number of new perspectives into the program. Many of them joined the research areas with projects of their own.[3] As a consequence, the dynamics emanating from the interdisciplinarity within the four groups differed enormously from what we had expected and among these research areas. Although the backbone of the accompanying curriculum was stable, these differences necessitated repeated adjustments of the program's details.

Looking back, we might say that the fruitful process of *not understanding* each other went on throughout the program, and we continuously got better at it. Understanding and being engaged in interdisciplinary processes is a complex skill that involves capacities of interpersonal and trans-methodological communication, but also of finding one's place in an array of existing disciplinary fields. From the beginning, we encouraged the PhD researchers and the Principal Investigators to look for individual paths of qualification in a well-defined discipline, while also gathering experience in interdisciplinary work. We placed a relatively strong emphasis on disciplinary frameworks in view of the fact that, after receiving their doctoral degree, PhD researchers will have to gain access to established professional and disciplinary fields, even though, in the third millennium, professional work is undergoing enormous changes. This also applies to research and development. The balance between intradisciplinary and inter-/transdisciplinary work remained difficult for almost every one of us. In nearly all the projects, research tandems, and clusters, it was continuously negotiated and re-negotiated.

In spite of all of us having to handle this demanding task, we look back on one element of our curriculum as particularly successful, namely the workshops. These were our discursive and experimental spaces for the reflection of and training in inter- and transdisciplinary research. These workshops

3 One of the first experiences of interdisciplinarity we had when discussing in the group of PIs were differences in the recruiting processes of the PhD researchers: Graduate programs in the social sciences and the humanities usually recruit PhD researchers by asking them to come up with their own project proposal and announce decisive criteria for being selected for the program. In contrast, supervisors in sciences and engineering offer pre-defined PhD projects within the framework of their own working programs.

were conceptualized and organized by the PhD researchers themselves, who introduced other members of their respective groups to the most important theoretical concepts, methods, and practices of their own (disciplinary) field. On the request of the PhD researchers, the Principal Investigators also gave broader, additional information about their fields and specific methods of research during the workshops. Our PhD program was a program *on the move*, with workshop meetings at different locations within the participating universities. We rarely used one meeting room twice, since we wanted to see the PIs and PhD researchers *at work* in their academic homes: in seminar rooms, libraries, steel construction halls, simulator labs near the airfield, etc. We climbed simulators, watched and analyzed films, worked hard to understand texts, while saying hello to the robot Pepper, filling heaps of flipcharts, talking/walking, and playing the "lotto of identities."[4]

The concept of the workshops and their realization gave rise to new questions linking science and technology with gender studies. To name just a few examples: What are the concepts and practices behind feedback control systems, programming, robotics, simulators, test and interview techniques, ethnographic research, or life science research? What are Gender and Queer Studies, and how do they relate to postcolonial studies? Is research always *politics by other means* (Haraway 1986) and if so, how do we as researchers position ourselves explicitly? How can we combine cultures of innovation with concepts of care and responsibility?

4. Looking Through the Mirror: Impacting Future Research and Technologies

Given the broad range of disciplines and research questions, the projects of the program could only include a small number of case studies on the gendered relations and entanglements of humans and machines, both in science and engineering, and in their representations in media and film. Theoretical-methodological projects complemented these case studies. Now, at the end of the funding period, we understand some of those entanglements better. However, since research, which aims at providing us with answers to questions, necessarily ends up with yet more questions, we have also identified new research lacunae. Some of these are specific to individual projects. Others concern the central question of the program, namely, how to integrate reflex-

4 The "Identitätenlotto" is a game to explore diverse identities. It aims at playfully introducing intersectional gender studies to educational settings and was developed by Juliette Wedl (Braunschweig Competence Centre for Gender & Diversity Studies) and her team: https://identitaetenlotto.de/, last accessed October 25, 2020.

ive (or diffractive) capacities, inspired by Gender Studies, into engineering processes.

Moreover, it turned out that the character of Gender Studies itself was a matter of dispute, both among the Principal Investigators and among the PhD researchers. Most of us agreed that Gender Studies are more than taking account of gender differences in the development of, access to, and use of technologies, although these are still important questions to ask. Gender and Queer Studies open up ways of asking how other categories of inequality come into the world, how the binary gender system can be diversified, how gendered power relations materialize in machines, technologies, and knowledge apparatuses, how gendered social structures stubbornly persist . Some of the differences among us – both senior and PhD researchers – boiled down to contrasting epistemologies, some to different cultures of living and researching. Depending on how questions of identity, hierarchies, and materiality are answered, the category of gender may be framed in many different and, sometimes, conflicting ways. How relevant, however, were those ontological and epistemological questions? Would the differences arising from them impede the common struggle for a more sustainable and just environment? Do we need new terminologies and methodologies for describing how we want to produce knowledge and technologies, such as the framework of agential realism (Barad 2007) or the concept of the Chthulucene (Haraway 2016)?

The problematic status of disciplines in general is just another essential facet of understanding the role of Gender and Queer Studies as catalysts for innovation and interdisciplinary work. In the academic world, disciplines are considered necessary in order to create consensus about methods and develop them further. But disciplines and their innate hierarchical order can also impede innovation, both at an institutional level and in the professional fields for which our graduates are training. The PhD researchers in KoMMa.G have to get their degree within *one* particular discipline. This was and still is creating frictions, since we have been asking the PhD researchers to engage in a self-contradictory process. In (post-)industrial academia, disciplines do not have fixed boundaries. Shifts and reconfigurations are happening on a daily basis, yet the etymological kinship between *disciplining* and *discipline* is still significant. *Discipline* is one of the many academic names for *power*. This is one of the reasons why we will have to continue fighting against them, with them, and over them. But as long as we (can) keep arguing, there is still hope.

Disciplining and overcoming disciplinary boundaries is not only an issue of content and methods but also a matter of time and resources. It has often been stated that PhD projects, in general, can hardly ever be completed within three years. This is even more true of transdisciplinary projects. Thus, we are happy to see that a considerable number of the KoMMa.G projects are in, or near, completion. Moreover, some of the graduates have found new work

opportunities that enable them to continue their research. But these individual solutions are not satisfying. Gender studies and the institutionalizing of inter- and transdisciplinary research at the intersection of engineering/science and social sciences/humanities need more support from politics, research, and funding institutions.

Thinking out of the box takes time, and it is urgently needed to meet current problems all around the world. We are convinced that Gender and Queer Studies contribute to thinking and acting beyond established models and concepts, both within given disciplines and for establishing research across disciplinary boundaries. Future projects can rely on these strengths. Reflections on science from a perspective of responsibility, care, and democracy, which are at the core of Gender and Queer Studies, are currently needed to address the issues at the top of the world's agenda: Global justice, the fight against racism and antisemitism, the struggle for a sustainable future, and, lately, a globally just and effective response to the current pandemic, which highlights the shortcomings of societies that have neglected concepts of mutualism, relating, equality, and care.

The PIs of this PhD program and some new allies have already started further initiatives, and we hope to continue our collaboration in the future. We, furthermore, welcome and invite all engaged researchers that participated in KoMMa.G, its final conference, this publication, and beyond – to elaborate Gender and Queer Studies as well as science and technology studies in order to join in this vast enterprise of entangling Gender Studies with science and engineering.

5. Gendered Configurations of Humans and Machines: About This Volume

Before we come to the single contributions, we would like to mention some of the most salient points of reference both for the past work of the doctoral program and for the contributions collected in this volume. As mentioned above, the joint venture of transdisciplinary experience and theoretical reflection was one of the pillars of the program, both in research and postgraduate teaching. The introduction of the concept of experience was one of the early interventions by feminist theory (Alcoff/Potter 1993). This move had an impact on more traditional accounts in STS, centering on experiments and observations (e.g. Latour 1987). Experience matters. It mediates between past and present, and it is permeated by power relationships. In different ways, and amongst many others, Donna Haraway and Michel Foucault (Foucault 1971: 10 and passim; Foucault 1996: 85) have insisted on this. Donna Haraway, with a sharp eye on gender woven into power relationships within

knowledge production (Haraway 1997), has not only elaborated on this, but she is also suggesting communication practices among humans, and between humans and non-humans, avoiding mutual othering in order to invent livable futures (Haraway 2016). Apparatuses of knowledge production are situated in experiences and power relations.

Questioning the sovereign subject of knowledge has been a recurrent topic in feminist philosophy. With Judith Butler's interventions (1990; 1993), this type of criticism has been firmly established in Gender Studies since the 1990s. These critical accounts of knowledge production make us question traditional basic assumptions like mind-matter hierarchies and rigid categorization systems. Networks of subject-object hybrids are the sites of new insights, and this is the ground for deranging implicit assumptions in science and engineering such as the I-methodology (Akrich 1995; Rommes 2002) or methodological dogmatism (Wajcman 2004: 38). By dismantling the distinction between being and knowing, Karen Barad (2007) has developed one more important account in this respect. She moves away from the differentiation of ontology and epistemology inherent in those assumptions and suggests a relational attitude towards practices producing scientific and technological knowledge. Her contributions most explicitly linked feminist theory to *response-able* knowledge and technology production (Barad 2018) and have inspired many of the PhD projects in this volume.

We would now like to make a few remarks on the contributions assembled in this volume, which documented the concluding conference of the "KoMMa.G" program, held between the 16th and the 19th of October 2020 in Braunschweig. This volume collects the elaborated versions of contributions from our PhD researchers, of papers presented on the basis of submitted abstracts, and invited keynotes of the conference. There are many thematic overlaps between the sections, and we also see some common threads running through most of the papers. One of those threads is the challenge of a rapidly changing, already technology-imbibed/infused world, a process that is often dubbed *digitalization* in public discourse, but also *rationalization* and *automation*. Artificial intelligence, robots and big data are on top of the agenda of science policy makers, and hence also of those scientists who are trying to keep pace with an ever-accelerating process of *technological innovation*. With this volume, we aim at describing and questioning this narrow understanding of innovation as an ever-growing avalanche of *technological fixes* to problems we no longer have the time to understand. Many of the papers collected here aim at understanding these problems. They will lay the power relationships in these processes bare and they will present ways of *bringing the human factor back in*. Feminist science and technology studies have for several decades contributed to analyzing science and technology concerning the power relationships interwoven in the configurations of humans and machines, mediated by artifacts and dispositives. How do these

relationships play out in fields like communications, arts, body policy and body politics, design, and everyday life? Do the general terms *humans* and *machines* sufficiently address the challenges that we so urgently need to confront, such as climate change, ongoing colonial and postcolonial violence, gender discrimination, etc.? In short, do we need new terminologies, concepts, and agencies against the current tendency of proposing old, violent, dysfunctional solutions to the problems these concepts of the modern or postmodern human and machine have caused? How can we conceive of a new relatedness and togetherness, beyond myths and dominance, but also imaginative enough to help technological change onto the path of "response-ability" (Barad 2018; Haraway 2008), of understanding ourselves as being able to respond to the current problems in the world, including a de-centering of the human, for instance in the sense of "critters" (Haraway 2016)?

6. Structure of the Volume and Contributions: A Short Overview

The contributions in this edited collection are organized into four sections that reflect the structure of the conference program. Between the conference and the writing of this volume, some contributions have been allocated to a different section. This illustrates that clear-cut boundaries between the thematic blocks are hard to find. We hope that the resonances between contributions are noticeable to the readers of this volume, beyond ourselves and the editors.

The first section "Interdisciplinarity: Boundaries, Transgressions and Politics" engages with tensions between disciplinary approaches on the level of collaboration and addresses methodological questions immanent in research projects. Diffractions are detected in a guided tour through Braunschweig (Büssers), in the technical problem of tread profiles (Metzger), and also in cross-cultural aspects of fiction and non-fiction reflecting the phenomenon of so-called *guest workers* of the 1960s (Dayıoğlu-Yücel). Like Barad's diffractive approach, Actor Network Theories are instrumental for methodological reflection in Gender Studies (Bednarek), and we also find an account of how the discipline-transgressing work of interdisciplinarity, in turn, disciplined our PhD researchers (Heuer/Sonneck).

"Artificial Intelligence * Bodies as Artefacts" is the title of the second section, which provides a tour-de-force through gender-biased algorithms (Wellner), problems of CATPCHAs (Nyckel) and metaphysical machines (Zakablukovskij), while in the wake of a waning cisgender identity, the individual body, situated between self-fashioning and naturalization, is becoming fragile (Raboldt). Fragile natural bodies may, in some cases, be reinforced

with “bullet-proof coffee” and other nutrition-based biohacking techniques (Trittelvitz).

The third section, “Humans and Machines in Everyday Life,” juxtaposes different technologies of human-machine interaction with the question of how *Verlässlichkeit* – the double capacity of being relied on and of being left (Crutzen) – could help us conceive technologies of the future. Emotions can lure us forward into innovations, while simultaneously propelling our roots of traditional personal identities yet further into the ground. Renewable energies, calculating their own in- and output can provide owners with “solar delight” (Lorenz-Meyer). Can Crutzen’s vision of *Verlässlichkeit* be transferred to the reliability of flight assistant systems (Faulhaber)? Mhealth applications are another instance of the precarious reliability and the open question of respons-ability within apps and the Internet of Things (Gabel). Laboratory robots can only succeed with labor that is strictly regulated, hence, in a sense, automated – and they apparently have to be humanized and gendered in turn (Wiesner). Can these technical dispositives safely and respons-ably be *left alone*?

The fourth section, “Digitalization und Cultures of Translation” opens up yet another variety of perspectives on the relationships between humans and human-made artifacts. Digital technologies have the potential of communicating and mediating between different cultures of knowledge, of building bridges between the digital age and other local/regional cultural techniques. In those connections, identities both change and get stabilized (Verran). New transcultural concepts are also needed for intersectional approaches to the tech professions. Following the trajectories of female doctoral researchers from India and China to Germany puts male connotations of computer science into question, particularly the assumption that informatics and computer science are a domain of white males everywhere in the world (Losch). Digitalization enables new bridges between performance and teaching (Leuschner/Petersen) and has inspired teaching experiments that successfully bridge the apparent gap between the arts and academic teaching (Britton). Yet, the making of new, un-gendered identities is no safe harbor regarding global surveillance. What are we afraid of? A new breed of digital monsters, the(ir) kingdom of bullshit, or rather the unruly versions of feminist media studies that bring them to our attention (Dannenberg)?

Not as a consequence and not as a final fiction, but as a reading that can make us start everything all over again, “Zero” (Pumará) is both a fictional and a non-fictional text that helps us fall into the abyss of not knowing how to think and write.

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