



Subjectivity, governance, and changing conditions of knowledge production in the life sciences

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Abstract

Knowledge producers are ascribed a key role for societal development today, as they produce a key resource for knowledge-based societies. Even as the institutional, social, and cultural environments of research change (c.f. “evaluation society,” “academic capitalism”), we know surprisingly little about how this results in different research practices and knowledge. Building on experiences of studying research cultures in the life sciences, I argue in this paper that by studying researchers’ subjectification, we learn how changing conditions are actually translated into a transformation of research processes and about the role of researchers as active agents in this transformation. Put differently, I investigate how we can study subjectification as a locus of change in research cultures. I discuss possible methodological cornerstones of using subjectification as conceptual approach for studying research cultures. Along some analytical extracts, I further demonstrate how this enables us to see tacit forms of governance in cultures of knowledge production.

Keywords Cultures of knowledge production · Science and technology studies · Labor studies · Double character · Subjectified work · Methodological design

Introduction

It is widely agreed upon in contemporary societies that knowledge production is key to driving societal change. However, ideas about where this change is headed differ significantly. Current science and innovation policies, supported by respective ideas in innovation studies, often present research and innovation as essential to renewing capitalist social relations in a knowledge-based age (cf. European Commission 2010; Lundvall 1992). At the same time, we have pinned our hopes on science for overcoming the most severe social, health, and environmental crises of our time (cf.

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Stilgoe et al. 2013; von Schomberg 2013). Others place expectations on what is variously called cognitive, immaterial, or knowledge work as key to establishing new societal relations beyond capitalism (cf. Eden 2012; Hardt and Negri [2000] 2003). These contradictory positions all implicitly delegate the mandate for deciding which trajectories this change should take to those who produce knowledge.

Only occasionally do these rather utopian accounts look at the concrete social relations within which knowledge producers perform their everyday work. Particularly for academic research, a growing number of studies show that environmental conditions, and the ongoing neoliberal reorganization of universities in particular, change the character of knowledge work (cf. Lave et al. 2012) and the kinds of knowledge that are produced (e.g., Whitley et al. 2018). The question remains, however, about what leeway researchers have to shape their research cultures and contribute to social change. In this paper, I argue that subjectification is a productive conceptual approach for understanding the role that researchers have (and create for themselves) in contributing to the ongoing transformation processes. Specifically, I want to discuss what we can learn from studying researchers' processes of subjectification about current social and epistemic changes in cultures of knowledge production.

Although there is already an important body of work that explores the implications of policy measures and institutional change for research cultures (e.g., indicator use in evaluation, de Rijcke et al. 2016; societal relevance, Hessels and van Lente 2011; commodification, Jacob 2009) and researchers' identities (e.g., Hakala 2009; Henkel 2005; Lam 2010; Leišytė 2015), these studies rarely foreground the capacity of scientists to shape and change their research cultures. As some rare studies show, researchers may, for example, affirm neoliberal developments by assuming a competitive and entrepreneurial mindset (Shapin 2008) but also resist and subvert them (Thomas and Davies 2005; Anderson 2008). Researchers are thus not just subjected to the conditions they are placed in but co-produce worlds of research and the knowledge that our social worlds build on by their attitude toward their environments and the choices they make from their respective standpoints. In this paper, I place this co-production center stage and discuss what we can learn from studying subjectification as a locus of change in research cultures today (cf. Blackman et al. 2008).

My interest in this approach was triggered by how life science researchers that we interviewed for several research projects on the changing cultures of knowledge production in Austria between 2006 and 2018¹ described their work. In different

¹ The empirical data that this paper builds on were qualitative and mostly biographical interviews conducted between 2006 and 2018 as part of the projects "Re-Thinking biosciences as culture and practice: tracing 'ethics' and 'society' in genome research—a pilot study" (Austrian genome research programme GEN-AU, PI: Ulrike Felt), "KNOWING: Knowledge, Institutions and Gender—an East–West Comparative Study" (EC-FP6, PI/Austria: Ulrike Felt), "Uncertain Research Landscapes" (Austrian Academy of Sciences, Grantee: Lisa Sigl) at the Department of Science and Technology Studies, as well as in the framework of the "Research Platform Responsible Research and Innovation in Academic Practice" (Head: Ulrike Felt) at the University of Vienna. The interview questions ranged from researchers' motivations to how they planned their current and future research. Follow-up interviews and observations allowed me to observe changes over time.



versions, they emphasized that “everything in your scientific work builds on yourself” (PhD), meaning that their work could not be performed without personal inspiration, affectivity, or creativity. While subjective aspects and subjectivities have sometimes been considered in social studies of science, they have rarely served as an analytical approach for studying research cultures and their transformation. I thus suggest using subjectification as conceptual basis for such an analytical approach, starting with a discussion of the notion of “subjectified work” from labor studies and then combining it with a (late) Foucauldian notion of subjectification that considers both how conditions shape subjectivities and the ways in which researchers act upon themselves and their environments. After discussing the methodological cornerstones of such an approach, I explore examples from life science research about the analytical opportunities of focusing on relations and relational work as essential to the processes of subjectification.

Subjective aspects and subjectivities in studies of scientific knowledge

The idea that subjective aspects play a role in knowledge production is a very old, if not foundational, idea in the field of social studies of science. According to Sheila Jasanoff, Ludvik Fleck was the first to study “the formation of new subjectivities, the ‘thought collectives’ who for him are the carriers of science’s development” (Jasanoff 2012). Subsequent laboratory studies emphasized that laboratory life is devoid of “objective statements” and that “common sense” reasoning is inherent in the construction of scientific facts (Latour and Woolgar 1979). Feminist science studies in particular have shown the role of situatedness and subjectivity in how (and what kinds of) knowledge is produced (Bauchspies and de La Bellacasa 2009). They describe “politics of positioning” (Haraway 1988) and “bias(es)” (Harding 1993) that echo researchers’ situatedness. The notion of “strong objectivity,” for example, asserts that we need to acknowledge the necessarily subjective and partial character of any kind of knowledge (Harding 1993). Closely linked are reflections on scientific method: John Law, for example, drew attention to the importance of understanding how we—as knowledge producers—define ourselves in relation to the world. He argues that our subjectivities to a certain extent guide what kind of knowledge we seek and, thus, the realities we help create. Therefore, being attentive to the kinds of subjectivities in research cultures helps us understand how researchers take responsibility for engaging with and changing the world (Law 2004).

This interest in how subjective factors shape knowledge production may be understood as complementary to studies on the role of material agency in knowledge production. While authors who were later located within actor–network theory have typically assumed a symmetry of human and non-human agency, others have argued that while both forms of agency are “constitutively intertwined,” we need to acknowledge that human agency is different, among others because of its “intentional character” (Pickering 1995). So far, however, the acknowledgment of subjective factors for knowledge production has not led scholars in the social sciences



world, while Mialet's scholars are immersed in subjective and bodily experiences of the world that define their agency. In this approach, she follows Fleck's thinking that epistemic subjects are part of different thought collectives and that the way in which they integrate different thought styles defines their subject position and their epistemological capacity (c.f. Fleck [1935] 1994). Similarly, the social ties of Mialet's researchers do not make them more determined by social context but rather create a broader leeway for their agency. They actively shape and create relationships in the social world, thereby actively shaping and changing more than just the environments from which scientific ideas emerge. While Mialet focuses on two outstanding and strongly recognized scientists, she leaves it open to explore what we could learn about research cultures if we shifted our interest from creative individuals to the broader research cultures and scientific communities by studying the subjectification processes of more regular researchers who make decisions in everyday research processes.

Some scholars have already attempted to learn from person-centered analyses about contemporary research cultures. Joseph Hermanowicz (2007) argues that studying how researchers give meaning to their practices and build their careers reveals how governmental conditions shape research and what it means to be a scientist today (*ibid*). Others have followed similar person-oriented approaches to describe how making a scientific career today requires specific relational work (c.f. Müller 2012; Davies and Horst 2015; Duberley et al. 2006; Lam 2010), maneuvering between academic and commercial worlds (Jones 2009), or the ability to create “do-able” problems in the more tightly knit temporalities of contracts and evaluations (Fujimura 1987; Garforth and Cervinková 2009). These observations underline the core role that researchers have in shaping their research cultures.

Further studies have shown that researchers' subjective qualities shape cultures of knowledge production in the life sciences. Natasha Myers has recently described, for example, how researchers imagine that molecules “breathe,” demonstrating how researchers draw on their own bodily experiences in imagining molecules and what functions they perform in our cells (Myers 2015). She describes this intimate relationship of researchers to what they seek knowledge about as crucial for what she calls “moral intuition” (*ibid*: 3), a certain “know-how to make sense of the data” (*ibid*: 4). Her study exemplifies how important the more tacit and embodied entanglements in research processes are for understanding researchers' propensities to act and decide in research processes.

Subjectivities as a locus of change in heterarchical research conditions

Building on such empirical observations, theoretical considerations also lead to the assumption that researchers play a core role in handling the often contradictory expectations toward research today. Ulrike Felt, for example, captures the multifaceted character of current research environments in her concept of “epistemic living spaces” (Felt 2009) where researchers are thought of as entangled with different “symbolic, social, intellectual, temporal and material” structures that “mould, guide



and delimit in more or less subtle ways researchers' (inter)actions, what they aim to know, the degrees of agency they have and how they can produce knowledge" (ibid). Using other theoretical terms, researchers operate under "heterarchical conditions" that create frictions and ambivalences. Regardless of whether these frictions are interpreted as a destructive or constructive force, they become "organized" in some way (Stark 2009). In addition, they are organized by *someone*: individual (and organizational) actors in heterarchical conditions negotiate between and balance expectations, affirming some and rejecting others on the way to becoming who and what they want to be. As Felt and Fochler have argued, they engage in a form of decentered "tacit governance" (Felt and Fochler 2011).

Following this thought, if we want to understand current transformations of research cultures, we need to understand *how* researchers engage in this kind of tacit governance and which policy measures they decide to actualize in their research practices. We need to study what motivates them to act in one way or the other, and we need to understand how researchers—as active subjects—relate to and are guided by these heterarchical conditions. To summarize, we have to assume that expectations are not just translated by researchers into research practices but through the mangle of how researchers understand themselves in relation to their environments.

As will subsequently become clear, this should not be mistaken for the assumption of completely autonomous researchers. Rather, researchers will mostly refer to expectations, so that they become powerful in some way. Just as well, they always rely on what John Law calls the "hinterland of standardised practices" in their research field (2004). The point here, however, is to analytically grasp in *what ways* researchers (decide to) relate and refer to these conditions and to sound out the degrees of freedom that researchers have—and carve out for themselves—in shaping and changing the research world and, ultimately, the epistemic fabric of our social worlds.

Research as subjectified work

How can we think of this more conceptually? Many have argued that the activity of knowledge production can never be fully controlled apart from individual scientists. Max Weber spoke of personal motivation as prerequisite for good research (Weber [1922] 1946). As mentioned above, this still resonates with the personal attitude that scientists describe toward their work. Especially in the life sciences, there is often a notion that researchers *have always been* curious seekers from childhood onwards (Felt et al. 2010), and many find it unintuitive to view their activity as waged, detached, and alienated work (Sigl 2012).

To distinguish types of work that rely on such personal traits (as we find them in knowledge-producing sectors but also in the creative or service sector), labor studies have suggested speaking of "subjectified work," which accounts for workers' investment of subjective factors such as motivation, affectivity, creativity, and communicative skills (Lazzarato 1996; Lohr and Nickel 2009; Moldaschl and Vos 2003). Historically, the concept is linked to notions of "post-Fordist" labor and the observation that, from the 1970s onwards, ever fewer sectors were organized according



to Fordist industrial labor relations (Baethge 1991; Sennett 1998; Hardt and Negri [2000] 2003; Boltanski and Chiapello [1999] 2006). While the latter tend to be organized according to Taylorist forms of rationalization, such as division of work, clear instructions, and mass production (epitomized by the assembly line), post-Fordist (or subjectified) labor was characterized by flexible and autonomous work organization and a less rigid division of work. In this sense, “subjectified work” came to signify work that required more self-determination and self-responsibility in structuring procedures. These kinds of work cannot be understood by traditional dichotomies of mental and manual labor since workers are “‘active subjects’ in the coordination of the various functions of production, instead of being subjected to it as simple command” (Lazzarato 1996).

This resonates with observations about how research relies on tacit knowledge and tacit craft skills such as trust, social interaction, and affect (e.g., Collins 2001, Delamont and Atkinson 2001; Vähämaa 2013; c.f. Polanyi 1985). For this reason, scholars have argued that scientific activity is a classic example of subjectified work since it requires a degree of freedom to make strategic decisions during often uncertain research processes, such as choosing a research topic, building hypotheses, gathering and analyzing data, theory building, writing, and interpreting (e.g., de Angelis and Harvie 2006; Gill 2014; Shapin 2012).

Conceptual approaches of subjectification have crucial advantages over concepts of identity. First, they capture the idea that we cannot understand subjective aspects (such as creativity or motivation) in research in essentialist ways. Even though social analysis has in the meantime often shifted to weaker notions of identity to describe the more unstable, multiple, and fluid self-understandings in late modernity, “it is not obvious why the word identity (still) captures the meaning being conveyed” (Brubaker and Cooper 2000; cf. Giddens 1991; Harvey 1990). Similarly, Stuart Hall has noted very early that, however, multiple, weak, flexible, or fluid identities may be thought of, “identity” always seems to presuppose a quest for stability and a favored trajectory for arriving there (Hall 1992). Beyond this, authors have hinted at the oppressive potential of essentializing notions of identity tending to deny the plurality of one’s affiliations and the agency in deciding upon one’s self-understandings (Sen 2006). Instead, concepts of subjectivity allow to think “the subject always in a process of becoming, extending any notion of singularity to a plane of vectors, speeds, multiplicities and movements” (Blackman et al. 2008). Further, particularly the tradition of critical psychology has also emphasized the importance of relationality and argues for “anti-individualist, pro-social perspectives” on subjectification (ibid).

I argue here that we need a similar move within science and technology studies. While the “interest-model” in the tradition of the sociology of scientific knowledge (SSK) (e.g., Shapin 1979) had assumed relatively stable and homogenous identities and interests (such as an interest in maintaining a reputation or securing funds in science), conditions of post-Fordist governance require a conceptual approach that allows for more diversity in what motivates researchers. We rather have to assume that different interests and reasons for doing things are present at the same time in one individual (c.f. Fleck, [1935] 1994), and that propensities to act are developed in a temporally emergent process of subjectification. Particularly, within post-Fordist



forms of governance, we even have to assume that people can act against what we would traditionally call an “interest” (e.g., forms of the so-called “voluntary self-exploitation” Moosbrugger 2008).

Another advantage of opening up notions of stable identities is that this provides a way of seeing and conceptualizing change. Allowing self-understandings to be fluid opened “the possibility of new articulations, the forging of new identities, the production of new subjects” (Hall 1992), and therewith to see how societal change is entangled with a change in self-understandings. Stuart Hall captures this in rephrasing Laclau: “*Without this... there would be no history*” (Hall 1992). It is for these reasons that using subjectification as conceptual approach does a better analytical job in studying how researchers co-produce and change the research cultures they live in.

Working subjects between “techniques of domination” and “techniques of the self”

Governing subjectified work from the outside seems difficult. If you want a self-motivated worker to adhere to expectations, you must convince him/her that it is the right thing to do. In other words, for subjectified workers to follow expectations, they must—at least to a certain extent—build the normative assumptions of such expectations into how they understand themselves. However, as empirical studies have shown, certain leadership styles and work organization can effectively harness self-motivation and personal creativity for the productive process. Some have even argued that what Foucault called “techniques of domination” can lead to even deeper forms of alienation that reach into subjectivities, described as “self-exploitation,” “subjectified taylorisation,” and “alienated self-optimisation” (Matuschek et al. 2007; cf. Beynon and Nichols 2006).

In this light, researchers appear both as actively deciding subjects and as subjected to and affected by the conditions surrounding them. This (double potential) has been shown quite convincingly through the methods researchers use to engage with indicators of research evaluation: individual researchers’ value orientations can be aligned over time with those of indicator systems (Fochler et al. 2016), but they also learn to strategically “play the indicator game” and creatively distance themselves from evaluative measures (Fochler and de Rijcke 2017; Burrows 2012; cf. Winiecki 2007). This suggests that performance indicators—as a governance measure—change practices and self-understandings, but in non-deterministic ways. As researchers learn to play with, scrutinize, and reflect these indicators in relation to their own motivation, they also decide how they allow them to enter their subjectification.

Building on such observations, I choose a Foucauldian concept of subjectification that implies a relational process in addressing the question of where the sources of resistance come from (Blackman et al. 2008, p. 9). Particularly, I build on the later Foucauldian assumption that subjectivities are shaped by existing power



mechanisms but also encounter and creatively use the ruptures in them. Papadopoulos captured this concept nicely:

Foucault began to introduce an idea of subjectification as a tool for grappling with the possibility that subjects encounter not only ruptures in discourse, but also opportunities to render these ruptures intelligible by questioning the paralyzing solidity of power mechanisms...he examines all these shady, intermittently shifting possibilities for modifying the conditions of visibility in a given discourse, ruptures which give rise to doubts about the prearranged, persistent borders of existing practices. (Papadopoulos 2008)

This reflects a distributed notion of power that draws attention to people's agency: by creatively using and changing their environments, they engage in "techniques of the self." In Foucault's words, these techniques

permit individuals to affect, by their own means, a certain number of operations on their own bodies, on their own souls, on their own thoughts, on their own conduct, and this in a manner so as to transform themselves, modify themselves, and to attain a certain state of perfection, of happiness, of purity, of supernatural power, and so on. (Foucault 1993)

This notion of subjectivity brings together existing power relations and a certain *Eigensinn* in shaping relations, practices, and subjectivities, inviting us to search for both ways in which structural conditions guide action and ways in which people use them to go beyond existing relations and create something new. This has caused some to rather use the term "self" instead of "subjectivity," as the latter would assume giving priority to processes of "being subjected to" (Burkitt 2008). Using "self," though, does not solve the problem either, as it gives priority to "Eigensinn" and autonomy. Regardless of terminological questions, an increasing number of authors seem to agree that we need to acknowledge this dual character of subjectified work (Eden 2012; Holloway 2010) to understand such workers' potential to be agents of change.

In studying research cultures, this dual character perspective recognizes people as critical-reflexive actors who actively engage with and change their environments and themselves. This perspective acknowledges the dialectics of social change and reproduction that often escape the dualism of "'compliance with' versus 'resistance to'" (Thomas and Davies 2005; Gill 2008). This implies a process character of researchers' subjectification, meaning that it cannot be understood as a fixed entity but as permanently becoming and continuously shaped by their research environments and their agency in shaping their relations to these environments.

Methodological design for studying subjectification

Studying processes of subjectification requires suitable methodological designs that should build on two basic understandings: First, that subjectification is a non-deterministic process by which actors come to understand themselves in relation to their



particular social, cultural, and institutional environments and, second, that this process is coproduced by their situatedness and their active relational work. The focus on relations in studying processes of subjectification is akin to the argument of relational sociologists that we can understand agency only in relational context (Burkitt 2016). At that, it is vital to keep a broad analytical scope in looking for relations that matter for researchers' self-understanding and making epistemic decisions, e.g., by a Grounded Theory approach and open coding procedures (Glaser and Strauss [1998] 2005). Even though it is likely that researchers narrate relations to their immediate research environment first, an analysis of subjectification processes should consider that relevant relations may be 'outside' the scientific world, date back to past experiences, or be linked to anticipated futures (e.g., whom someone wants to become).

It can be an advantage to use a biographical perspective in qualitative interviews to capture that processes of subjectification are always in the making: they enable interviewees to draw a picture of themselves as having become—and having made themselves into—who they are in relation to their environments. The analysis of such interviews must avoid the "biographical illusion" (Bourdieu 1990), i.e., not to take biographical narrations as matter-of-fact historical incidents. Rather, biographical narrations can help explain how individuals have come to make sense of themselves, and how decisions in the present may result from past processes of subjectification. Further, a longer-term research design (ideally at least 2 years for gathering material) can explain processes of subjectification as never finished, and as being shaped by researchers' relational work. The methodological design should be responsive enough to follow relations that turn out to be specifically relevant.

During the analysis, the focus lies on the quality of these relations. Similar to what Adele Clarke has suggested for situational analyses, one can do "relational analyses," i.e., write memos about how the researcher relates to respective elements in a mapping exercise (Clarke 2003). These maps can then be compared across researchers and across different points in time. As Clarke emphasizes, it is vital to reflect absences in these maps, as they potentially indicate relations that are not deemed legitimate reference points, or are taboos within respective research cultures. In subsequent phases of the research, it is then possible to make such silences speak (cf. *ibid.*).

Qualifying relations—some analytical extracts

The analytical work thus goes beyond identifying relevant relations into qualifying relations to understand which relations become powerful in shaping research cultures. I want to demonstrate this via some analytical extracts from biographical parts of interviews with three postdoctoral life scientists (PD-X, PD-Y, and PD-Z) and three principle investigators (PI-A, PI-B, PI-C). As mentioned above, the interviews derive from four larger bodies of empirical data from studies on the changing cultures of knowledge production in the life sciences between 2006 and 2018 in Austria. With the postdoctoral researchers, we did interviews at two points in time: 2006/2007, in their mid-career postdoctoral period, and 2009, in a senior



postdoctoral period. I indicate whether quotes are from the first or the second interview by the subscripts ₁ and ₂.

When PD-X was asked during the first interview what conditions were relevant for guiding her research, she explained as follows:

The structure of [this institute] is barely related to what I am actually doing ... because I am not an employee of the institution but of the project. That means that I am not involved in meetings of the institute and am not involved in room arrangements. I am *quasi-detached* from ... these actual structures, and [my boss] keeps me detached. ... I am a *guest* there as a *project worker* and do not have anything to do with organizational framework conditions. (PD-X₁; emphases by the author)

She is eager to communicate here that her situatedness mainly makes her care for the project: being largely unrelated to other organizational entities, she understands herself as a “guest” to the institution but as part of the project as a “worker.” Notably, her self-understanding does not fully correlate with her formal position: her contract is at all times issued by the university (even though it is funded by the project), and she relies on university administration and infrastructure. However, since her employment is linked to the project duration, she seems to relate more strongly to the project. This stronger attachment to the project had not changed by 2009, when half of her salary was derived from a university position:

I only *have* [university] funding for a half-time position, but I need a full-time position to be able to continue my work, and this is where the [new] project comes in. And within the [new] project, I have sort of advanced to *being* project leader. So, the component [X] of the project is where *I am* group leader. (PD-X₂; emphases by the author)

She still describes her relationship to the university as rather instrumental (expressed by the verb “have”), whereas she expresses her relation to the project in personal terms, as defining her self-understanding (expressed by the verbs “being” and “am”). This strong relation to the project also affects how she plans her epistemic work. Asked whether researchers align their ideas with funding opportunities, she says:

Very much. ... you need to see ... *how much am I allowed* to observe, to get it funded. So that is very much adjusted, because that’s the only way it works. ... You really start planning from the beginning, *what will I be able* to publish, *what experiments will I need* for a paper, what can I do. That sounds far more *calculating* than when you naively start a *research career*, right? (PD-X₁; emphases by the author)

This quote is a profound reflection of how she relates her research to what funding conditions allow but also to what she deems publishable and to what she personally expects to need for the future career she anticipates.² Such narratives tell us how

² In her narratives, we recognize what Joan Fujimura has described as “constructing ‘do-able’ problems” (1987).



researchers reflect on and define their rooms of maneuvering: the opportunities they see and seize but also how and why they define limits of their agency.

Comparing her case to that of PD-Y demonstrates that, despite quite similar employment conditions, researchers experience and assess their environment differently, making them see different epistemic opportunities and engage in different kinds of relational work. Similar to PD-X, he is funded by a project during the first interview and later has advanced to a subgroup leader, being funded 50/50 by the university and the project. Nevertheless, he narrates his relations to the projects, his epistemic work and his research institution very differently:

In many cases, the project is *merely a source of money*. Every year, you need to get a project funded so that you can renew this, and from its budget, you can cover the running expenses [of the epistemic work]. And it can happen that *someone formally changes from one project to another* because the first project is over and the second is just starting, but this doesn't change the actual work." (PD-Y₂; emphases by the author)

Here, the relation to the project is rather instrumental as "merely a source of money" and is hardly a source of self-understanding. Rather, project money is handled pragmatically as catering to larger epistemic projects and respective social reference points. PD-Y's self-understanding appears much more tied to his epistemic work and to what he calls his scientific "family." In explaining the genealogy of his relations, he also explains how he has learned to pragmatically deal with project funding and maintain a connection to his research community via active relational work:

There are maybe ... three or four labs worldwide that do similar things. And actually, they all descend from my postdoc supervisor. That's a *family tree*... That's eight hours by plane, but I was there [recently], and it was all very nice. So, generally, the contact is still there. ... And they develop the method further. And I went there to look at the newest developments ... and just to *cultivate the contacts* because we basically live alongside them. Because *the more they develop, the more we can apply*. And that is the worldwide leading lab in this field; the better the contacts are, the better it is." (PD-Y₂; emphases by the author)

By conceptualizing himself as part of this "family tree," he suggests that these relations are still constitutive of how he currently understands himself as a researcher but also of how he recognizes epistemic opportunities based on what this family develops. This is an example for how longer-term active relational work matters for processes of subjectification and for how researchers learn to engage in relational work. While he continues to explain how he has learned to deal with certain conditions within this "family," it becomes clear that collective subjectivities and propensities to act shape both the social and epistemic fabric of research cultures.

Analyzing the quality of relations can also bring into view subtle dynamics of inclusion and exclusion. Other than Mr. Y, who emphasizes the importance of his scientific family, PD-Z, a postdoctoral researcher, has two children with her



partner (PD-Y) and tends to narrate her scientific life through the lens of other relational priorities:

It is not compatible because in science, you need to work so much to stay competitive with all the other people who work so much. ... For me, a part-time job, 25 h per week, would be compatible with the rest without coming under huge stress. So that I can manage everything with calmness and balance. ... And that is even though my children are in kindergarten and school full-time. ... So, there was a time when I had *the feeling that I am in the right place* [in science], but I do not have that feeling anymore. (PD-Z₂; emphases by the author)

While in this quotation she explains how her relation to science changed as care responsibilities entered her life, she frames the story of how she chooses to place more priority on private care relations also as a story of rejecting highly competitive relations among colleagues. The notion of not being in the right place tells us that she perceives her research environment as excluding certain relational choices, i.e., as normalizing certain subjectivities. In interpreting her life choices as “not compatible,” she had started to detach from the academic work culture long before actually leaving academia only 6 years later. Paying attention to processes of subjectification thus may detect excluding dynamics long before they become formally visible. At the same time, we also learn that researchers do not simply comply with expectations they find represented in their environments (in PD-Z’s case, the invocation to compete with other researchers), but act and form relations according to their subjective values and priorities. We may find, though, that in academic work cultures, there are more subjectivities and propensities to act than current normalizing career patterns suggest.

Analyzing subjectification also helps in understanding how far external expectations or internal motivation guides research practices. In the following, I discuss three examples of senior researchers (principle investigators, PI-A, PI-B, and PI-C) who all work on rather basic research questions. Despite being placed in similar institutional and cultural contexts, they give divergent accounts of how they experience expectations and policy measures to conduct research in societally responsible ways and how they act upon them in practice. Answering a question about whether he had heard of “Responsible Research and Innovation,” PI-A answers:

[T]his is something that you hear a lot and you ... address in every grant proposal, etc. But it almost become kind of a *bureaucratic thing* that you just deal with it and you know, you put some *standard sentences* in; ... people don’t really think about it. (PI-A; emphases by the author)

Like many other senior researchers, PI-A is keen to demonstrate that such external expectations do not have an impact on his research and that their relationship to such policy measures is rather strategic to get funding. Many would even argue that once a researcher lets him-/herself be guided by external expectations (instead of by curiosity), the quality of science is easily compromised. Consider this account of PI-B:



I think it is true that *researchers should follow their scientific curiosity, because otherwise they will not be good researchers*, simply nobody does well something that he or she is not curious about. (PI-B; emphases by the author)

In analyzing in more detail the relations to particular causes though, we see that it is more accurate to say that both, PI-A and PI-B distance themselves from external expectations, rather than from societal responsibilities per se. In later sections of the interviews, both PIs explain on a personal note what they feel responsible for. Like many other PIs in the life sciences, they feel responsible for their staff. PI-A for example says:

I'm responsible towards the people that I work with ... I'm *responsible for their wellbeing* ... both like in their day to day working, but also in their future. So, I need to make sure that they have a future which means that we need to be successful, we need to have some publications, etc. (PI-A; emphases by the author)

As becomes clear in this quote, his relationships within the lab play a role for how research is set up and planned. By the way he qualifies this relation to his staff (as involving a sense of care), it becomes clear that he feels responsible not only for their present wellbeing, but also for their future professional success.

Further, despite keeping a distance to external expectations to be societally responsible, both, PI-A and PI-B express an affinity to broader social concerns. While reflecting his personal attitude, PI-A explains how he feels responsible to the public:

We are responsible, because in a way we are *funded by the public*, right? So, the public somehow cares about what we do and cares to basically give some of their earnings to us ... this means that the work that we do should at the end ... somehow benefit to the betterment of the society. ... we should not basically lose sight of this and ... engage with the public ... and *we should actively seek for this* kind of opportunities. (PI-A; emphases by the author)

As this quote shows, his sense of responsibility is made visible by how he engages in directed relational work toward the public as funder of his research. I chose PI-A as an example here not because he represents the dominant way in which life science researchers related to societal responsibilities (which would rather be a detached relation), but precisely because he deviates and seems to search for new ways of doing things. He, for example, explains how he just recently had made a conscious shift to more basic research questions, but is "already thinking of how we could apply this" (PI-A): As becomes clear throughout the interview, this "thinking" already includes an intense engagement in building relations to other stakeholders and researchers to get collaborative projects funded to study potential applications. Thus, by analyzing researchers' relational work, we can study how they operationalize their self-understanding and their motivation in practice: in this case, we learn how a caring relation to a societal concern shapes research practices.

A further example is that of PI-C who had earlier worked as a doctor, but then changed to a PhD in the life sciences and had had several postdoctoral positions



around the world. In describing what she feels responsible for, she makes clear links to her personal biography:

[E]ven though we do mainly basic research ... because my *educational background* is a [doctor], I always feel that at some point, not maybe directly or maybe not in the next five years, something has to link with human health ... for example ... how [this] response is regulated in our body. ... Because we do spend actual *budget from taxpayers'* money, so I really hope that I do feel responsibility ... [to] *come back to society* in a good way, definitely, yes." (PIC; emphases by the author)

Having been trained as a doctor seems to have established a durable caring relationship to causes of human health that subtly guide even her basic research questions in the present. Her earlier subjectification process continues to have an effect even while having been engaged in different social, national, and institutional environments since then.

These examples are specific to (parts of the) life sciences in that they derive from a research community whose research arrangements and career paths are often flexible enough for researchers to be guided by personal attachments (e.g., responsibility considerations) and to re-orient their research at strategic points in their careers (e.g., in applying for certain funds).

Summary and conclusions

Social studies of science have long established that subjective aspects and subjectification play a role in the processes of knowledge production. In this paper, I develop this observation further into an analytical approach for studying research cultures in the life sciences and their transformation. To do so, I use the notion of subjectified work from labor studies and use it as a point of departure for considering the role of researchers' subjective capacities to shape research cultures. I argue that knowledge production is a kind of work that not only allows subjective aspects to play a role but also requires subjective aspects (creativity, self-motivation, etc.) to look beyond what is already known. I combine this with the (late) Foucauldian understanding that subjects are not just subjected to their environments but—in non-deterministic ways—can and do carve out spaces of agency to shape their subjectivities, the knowledge they produce, and the worlds they live in. Concepts of subjectification that imply a relational process are different from how researchers as epistemic subjects have mostly been depicted in previous studies of research cultures, as “derivative of,” or determined by, “machineries of knowledge production” (Knorr-Cetina 1999; c.f. Miallet 1999).

Using subjectification as conceptual approach in contrast allows to analyze researchers as subjects that actively engage with and change their environments as well as the epistemic fabric of the knowledge they produce. This perspective can be understood as complementary to approaches that look at material agencies in knowledge production, helping to answer the question of what makes human agency specific (cf. Pickering 1995) and what aspects (e.g., organizational features, policy



tools) play a role in shaping human agency. The analytical examples suggest that at least in the life sciences there is a certain leeway for individual, strategic decisions about which research questions are asked (e.g., related to societal responsibilities). Beyond studies of life science research cultures though, concepts of subjectification could also be an interesting angle in comparative studies to see differences between research cultures, e.g., regarding the question how entanglements with material agencies and research objects play out differently in different research fields (or even in different sub-fields within the life sciences).

To analyze the ways in which processes of subjectification contribute to shaping and changing research cultures, I suggest an analytical focus on (the quality of) relations and relational work. To grasp the process character of subjectification, it is advisable to choose a rather long-term research design and certain methodological sensitivities, such as how and why the self-understanding of researchers changes over time, and flexibility and openness to grasp all relevant relations. This offers analytical opportunities regarding the rooms of maneuvering that researchers create for themselves in increasingly complex, heterarchical research environments. As illustrated by the analytical examples, using subjectification as conceptual approach opens up a perspective for understanding how far researchers embrace or subvert currently dominant neoliberal forms of governance (e.g., the project-modus of doing research), what policy tools are experienced as actually shaping their practices and which not. It helps to show how policy tools never work in direct ways but are mediated by how researchers interpret, evaluate, and act upon them. In how they narrate and perform their relations and their relational work, we find traces of how they balance different possibilities to act, what matters to them in planning their scientific work, what spaces of agency they experience, and how they (decide to) fill those spaces. We also find traces of how they negotiate and struggle with themselves about who they want to be as researchers and in the social worlds beyond science. If it is true that ways of being in this world reflect the ways in which we choose to know the world, then ultimately, learning about subjectivities will also help us understand the ways in which we produce the realities that we aim to know (c.f. Jasanoff 2004; Law 2004). In this sense, focusing on relations and relational work sheds light on the situated character of the reflective decision-making processes in knowledge production.

Longer-term studies of how subjectivities develop and change over time in current research environments could help us understand how far the subjective agency of researchers is relevant for shaping the broader trajectories of research fields. We may also learn that contemporary research environments support certain kinds of subjectification while marginalizing others. In addition, we may learn how researchers also subvert such normalizing pressure, e.g., in choosing kinds of relations that reflect their personal values and priorities rather than those suggested by research environments. Drawing attention to subjectivities may thus also shed light on the values that are cultivated in research communities and on implicit ideas about what research questions are worth following and which lives in research are worth living.

Particularly within the heterarchical conditions in which research currently operates, analyzing subjectification processes allows us to better understand the tacit governance of research cultures today (cf. Felt and Fochler 2011). Longer-term studies



could further help elucidate whether and how research cultures and their epistemic trajectories change along policy imperatives, such as those of “academic capitalism” (cf. Slaughter and Leslie 1997), the “evaluation society” (cf. Dahler-Larsen 2012), or responsible research and innovation (RRI) (Owen et al. 2013). Analyzing subjectification may also help us understand whether and how policy tools to realize societal responsibilities (such as RRI) become performative in research practices, remain mere “bureaucracies of virtue” (cf. Felt 2017), or can help generate new collective subjectivities who act upon a sense of societal responsibilities within scientific communities. It could further be complementary in studies on which conditions enable researchers to embrace values of societal responsibility (cf. Felt 2017; Fochler and de Rijcke 2017), and which social relations support researchers in realizing their potential to contribute to progressive societal change.

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