Borderlands of Good Scientific Practice Investigating a global phenomenon in its local versions

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1. Introduction and problem definition: Growing concerns over research integrity

Transgressions of what is seen as good scientific practice (GSP)—be it fraud, plagiarism, fabrication of data or diverse other kinds of violation of the tacit moral norms science is based on (Merton 1973 [1942], Polanyi 1962)—have by now become a widespread matter of concern in scientific communities, for science policy makers, but also in public arenas. Sites where discussions on this phenomenon take place range from academic journals, over professional associations, academic institutions, funding agencies and science policy makers on national and supranational levels to mass media and numerous blogs.¹ A core concern is that these transgressions of GSP might not only cause a decline in public trust in science and scientific expertise more generally, but also disrupt the trust relations, essential to the very making of scientific knowledge (Shapin 1995).

Indeed, in recent years, violations of research integrity have challenged "the assumptions about the efficacy of self-policing in the scientific community, often resulting in the imposition of new regulations, procedures and oversight bodies" (Martin 2013, 1005). The first World Conference on Research Integrity was held in Lisbon in 2007, co-organised by the European Science Foundation (ESF) and the US Office of Research Integrity (ORI). It can be seen as a clear sign for the growing awareness that both principles and practices of research integrity need more attention. (Felt 2015) In the years following this conference the ESF Member Organisation Forum on Research Integrity together with All European Academies (ALLEA) produced a consensus document "The European Code of Conduct for Research Integrity" (ESF&ALLEA 2011), which was presented at the Second World Conference on Research Integrity in 2010. This European code addresses questions of good practice and identifies what should count as inacceptable conduct in science, which in turn is meant to offer a basis for renewed trust and integrity across national borders (ESF 2010). Simultaneously, experts groups at the European level addressed issues of ethics and integrity in research (e.g., EC 2007, see also Felt et al. 2007, 2013), expressing a range of different concerns regarding the developments in research and development. In the Austrian context, which will be the focus of this project, this concern led by the end of 2008 to the creation of the Austrian Agency for Research Integrity (OeAWI) by 12 Austrian universities as well as the Austrian Academy of Sciences, the Vienna Science and Technology Fund (WWTF), IST Austria and the Austrian Science Fund (FWF). It became part of ENRIO, an (informal) European Network of Research Integrity Offices, founded the same year , to enhance research integrity within Europe in a world with growing international cooperation."²

These concerns come at a time when research and innovation are more than ever seen as *the* forces driving societal developments (Felt, Barben, et al. 2013). In the European context, this has been

¹ See for example the following two internet platforms: (1) http://pubpeer.com debates issues of post-publication peer-review; (2) http://retractionwatch.com is specialized on discussing and documenting the growing number of retracted papers.

² For details see the web pages: http://www.oeawi.at/en/index.html and http://www.enrio.eu/

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made explicit in the Europe 2020 Flagship Initiative: "At a time of public budget constraints, major demographic changes and increasing global competition, Europe's competitiveness, our capacity to create millions of new jobs to replace those lost in the crisis and, overall, our future standard of living depends on our ability to drive innovation in products, services, business and social processes and models." (CEC 2010, 2) Highlighting this central role of innovation has also led to gradual transformations of research systems. Thus, as "interdependences between research activities, scientific fields, funding opportunities and societal visions" (Rip and van Lente 2013, 8) grow, research and technological developments are increasingly requested to respond to societal values and challenges. This shift has become particularly palpable through the emergence of a new policy narrative centred around the notion of "responsible research and innovation" (RRI) (Owen, Macnaghten, and Stilgoe 2012). Research should find adequate new ways of fostering a mutually supportive co-development of techno-science and society. These adequate ways often contain one or more of the following three elements: research following the idea of RRI should engage with a diverse set of societal actors and build new relations; it should be able to address divergent values; and it should foster inter- and transdisciplinary collaboration. Yet, how this can be realized in academic practice remains unclear. While the notion of acknowledging different values is often highlighted here, there has been little explicit reflection how assuring research integrity in practice would be central to turning the ideal of responsible research and innovation into practice. (for a discussions of the problems implementing RRI in academic environments see, Felt 2016b)

Over the past decades, there have been studies investigating specific transgressions such as plagiarism and fraud, we find efforts to normatively define what should count as transgression, analysis of institutional responses or analysis of the situation based on surveys in order to find out how researchers perceive this phenomenon. Some of the key-issues will be outlined in more detail below. These studies show that there is little agreement on the size of the phenomenon, on what should be counted as questionable research practice, and on the role considerations on good practice play in researchers' lives. What is virtually absent from the research on transgressions of good scientific practice are qualitative studies which aim at understanding how researchers actually perceive and live with transgressions in their everyday contexts, what kinds of micro-transgressions seem "acceptable" to them and for what reasons, and how they see the mechanisms that deal with or should deal with transgressions. What we know from the debates is the complex role of whistle blowers (Malek 2010), which turns transgressions into one of the largest taboo topics in research. Furthermore, while the transgression of boundaries of good scientific practice is an international phenomenon—as is research more broadly speaking—the local conditions, i.e., the lab, the group, the institution, the working climate for research seem to matter enormously and have not been studied in much detail.

This study proposes to contribute to filling this gap. It will investigate how under the changing conditions in research and innovation issues of respecting good scientific practice come up and how they are dealt with. In doing so it plans to investigate a specific institutional, epistemic and local context, i.e. an Austrian University and the field of life sciences/biomedicine, while looking at it through the lens of international debates. The project will not start from a fixed normative definition, but much rather follow the notion of good scientific practice (GSP) through researchers narratives, institutional structures and wider societal narratives. Even if institutions set normative standards, they are negotiated in everyday contexts and have to get meaning in scientific practice. We will therefore

work with and develop the notion of "the borderlands of good academic practice". Like that it wants to acknowledge the good scientific practice is often not as clear-cut as it might seem ex-post, but needs continuous assessment and negotiation among researchers. "Borderlands" are those zones and moments where negotiations (with oneself and with others) take place over what, in which situation is still an acceptable practice and what would go beyond. This points at the fact that what counts as good practice is always negotiated in context-specific ways and that there are grey-zones researchers regularly encounter/navigate, where they have to decide on the kind of scientific practice they are ready to engage. We actually know very little about the dynamics at work. This project proposes to contribute to a better understanding of the micro-dynamics at work when it comes to make judgement about the limits of good scientific practice and to show how the conditions of contemporary research might contribute to fostering transgressions rather than hindering them. In order to better understand the situated character of transgressions of good academic practice, the proposed project will focus on the field of the life-sciences/biomedicine in a particular Austrian university environment.

2. State of the art and current debates

The proposed project is embedded and will contribute to two major bodies of literature. One that is actually addressing the many different aspects related to research integrity, how norms of good practice are defined, what counts as transgressions and why is it problematic. The second addresses major structural changes in contemporary academia, what it means to be a researcher today as well as how this matters when it come to following the ideals of good scientific practice. These two strands therefore need to be seen as deeply entangled, structural changes being a key-factor in how researchers can do their work while at the same time violations of research integrity often triggering structural change.

2.1. Studying transgressions scientific practice

Is there a problem of too many transgressions of good scientific practice? Indeed, controversial debates persist when it comes to the question whether the frequency with which researchers fabricate and falsify data, plagiarize or commit other forms of scientific misconduct has actually risen, or if we are solely confronted with a system that has become much more attentive to these transgressions. Others again, point to the fact that this discrepancy in judging the size of the problem might be linked to what we count into the category of misconduct. "On the one hand, there are those that believe misconduct is uncommon and seek to narrow its scope only to fraud, fabrication, and plagiarism. On the other hand are those wishing to expand the definition of misconduct to include many unethical practices beyond fraud, fabrication, and plagiarism (such as conflicts of interest and exploitation of subordinates)." (Sovacool 2008, 275) However, at least two indicators seem to actually support the hypothesis that we are confronted with a growing problem:

(1) The first is the rising number of retractions of scientific papers from quality journals (see Fig. 1; Steen et al. 2013)³. While we can see a clear increase in retractions, interpretations are diverging here. While some interpret this rise of retractions as a growth of deviations from the principles of research integrity, others argue that this is a sign of better detection possibilities and more rigorous policies by journals and institutions to openly discuss such cases. Also van Noorden (2011) supports this thesis: Indeed more papers are retracted because part of their argument is not supported by the data or because results cannot be replicated—a number outpacing the rise of journal articles in total (see Van Noorden (2011) or go to, http://retractionwatch.com). "In the early 2000s, only about 30 retraction notices appeared annually", Van Noorden (2011, 26) reports, while in 2011, "the Web of Science [was] on track to index more than 400—even though the total number of papers published has risen by only 44% over the past decade".

Even though retraction rates are still relatively small in percentage of the overall production, some analysts see the problem more in the unknown number of fraudulent papers that were never identified/retracted. It is argued that these retractions nevertheless point to serious **vulnerabilities of the research system** and indicate a potential lack of a **culture of research integrity**. To pay attention to the retraction dynamics is all the more important as research builds on the mutual trust of researchers as well as on the use of other researchers' knowledge to advance ones own ideas and retractions represent major disruptions in these trust relations.





Retractions

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Fig. 1a. Papers published and retracted per year since 1973. Note that the multipliers are different. For the sake of simplicity, error here includes all infractions except fraud (*e.g.*, scientific error, plagiarism, duplication, other). Apparent declines in recent years must be interpreted with caution as additional papers may be retracted in the future, thereby reversing this decline. (Steen, Casadevall, and Fang 2013)



sc/integrity/retractions

³ For following some of the debates see http://retractionwatch.com/, a webpage dedicated to discussing retraction cases and other policy issues related to research integrity.

(2) Therefore, some researchers argue that it is not so much the sheer number of papers retracted that should cause concerns, but rather how researchers start to perceive their colleagues and their own work from the perspective of research integrity. In that sense, Fanelli (2009) looks at how researchers themselves assume that "questionable research practices" are quite wide spread and, as interview studies with researchers revealed (Fanelli 2009; see Fig. 2.), one third of the interviewees would admit having used such practices themselves.





This means that the number of actual transgressions might be much higher than those currently identified and closer attention needs to be paid to the way research is practiced in everyday contexts. Thus developing and implementing formal regulations and rules of good scientific practice might not suffice to address these developments. And we would need a better understanding what researchers actually refer to when calling something a "questionable research practice".

These reflections clearly call for reflecting the question of *what counts as transgression*. Multiple authors point to the fact that notions such as misconduct or even fraud are very differently defined (by researcher themselves as well as by the analysts studying them) and that this leads to different sensibilities towards the problem at stake. As Hermerén (2014, 85) reminds us, definitions of what counts as deviant behaviour are never innocent, as "decisions about meaning are bound to have distinctive consequences for both empirical and normative issues". This definition is at the same time related to our broader imaginary of how the scientific community functions as a self-regulatory system. "Those who accept the "misconduct is rare" theory and its cousin, the "bad apples" hypothesis," as Resnik (2003, 127) argues, generally tend "to narrow the scope of the definition of misconduct to cover only FFP (fabrication, falsification and plagiarism)." Others again, plead for considering wider sets of unethical practices as they are perceived as undermining the integrity of research. Depending on the definition chosen, we could see misconduct as a rare phenomenon or as a commonplace in contemporary research. Defining this boundary of GSP in turn is linked to the question of how much "external" oversight and regulation science would like to or is ready to have. Going for a narrow definition would allow to keep external actors widely out, while once defining misconduct as including things like "conflicts of interest, honorary authorship, exploitation of subordinates, and so on" (Resnik 2003, 128) this would mean holding researchers accountable for their work in a much broader sense acknowledging a broader set of values. Furthermore, with every new practice of data generation also new reflections of good practice would be needed. This has become more recently visible in the discussions around digital image processing, raising the questions what could count as a still acceptable embellishment of visualizations and what not. (Frow 2012) This is all the more important as major fraud cases often involve image manipulation. Yet, some analysts also argue for the importance of not including "honest error or different opinion" (George 2016, 16) into what is seen as part of violating research integrity.

Why does all this matter so much? De Vries, Anderson, and Martinson (2006, 43) have argued that it is not the big fraud cases that are of concern—here "wrongdoers are caught and disciplined, assuring the public that the bad apples of science cannot long survive"—, but much rather it is the minor transgressions which seem to undermine the trust of researchers. In one of the rare qualitative studies on transgressions of good academic practice based on focus groups, they "found that while researchers were aware of the problems of FFP [fraud, falsification and plagiarism], in their eyes misconduct generally is associated with more mundane, everyday problems in the work environment". At the core of our concerns, so their argument, should thus be "normal misbehaviours", i.e., the more mundane transgressions of good practice which are part of the everyday life of researchers. From these discussions with researchers they find that they are actually less concerned about major fraud cases or plagiarism, but much rather about problem areas such as "the meaning of data, the rules of science, life with colleagues, and the pressures of production in science" (ibid., 43).

In that sense De Vries and coauthors agree with Chubin (1985) who has already pointed very early in the debates to fact that such smaller transgressions might not only slow scientific developments, but above all undermine trust in the research process and in their fellow researchers, and, on the long run, increase the call for a tighter regulation of research practices. In a similar line, Fetterman and Sassenberg (2015) pointed to the importance of dealing more openly with failed replications as this might otherwise harm the well functioning and the mutual trust in the scientific community. That trust has become an important question is also visible in a recent survey which had asked among other whether researchers trust their peers in the review process of project applications. In the Austrian context only 21% of all researchers would disagree to the statement: "The danger is high that reviewers appropriate an idea from the proposal and use it for their own purposes." (Neufeld, Hinze, and Hornbostel 2014, 35)



Fig.3. The danger is high that reviewers appropriate an idea from the proposal and use it for their own purposes

(Neufeld, Hinze, and Hornbostel 2014) DFG = German equivalent of the FWF Scale: don't agree – partly agree – completely agree FWF 2014 total/FWF 2014 Profs/ DFG 2010 (Profs) This leads directly to a last set of discussions which gravitate around the structural causes for and the institutional answers to a growing number of misconduct, but also around issues of responsibility. Time and again, larger and smaller cases of fraud and scientific misconduct surface and show worrying links between perceived career pressures, time structures in research, and the responsibility scientists have for the quality of the work they feed into the common pool of knowledge. "Can the scientific ethos still be saved?" Peter Weingart (1998) asked, pointing at the major reorderings the research system was undergoing, shaking the conventions upheld within the system and explaining the flurry of formal rules emerging (e.g. need to sign forms complying to "good scientific practice"). Some studies identify the changing workplace climate as an essential problem when it comes to transgressions of GSP (e.g., Pascual-Ezama et al. 2015), stressing that for example "perceptions of regulatory committees, data confidentiality and treatment of trainees" might in the end "influence research practices and can spawn behaviour such as poor record-keeping or plagiarism." (Baker 2015, 713) Others link, for example, the research integrity to the role organizational justice plays. Results of a survey with early and mid- career researchers "indicate that when scientists believe they are being treated unfairly they are more likely to behave in ways that compromise the integrity of science" (Martinson et al. 2006, 51)

When looking at the different explicitly formulated calls for research integrity in the European context and beyond, the basic values guiding research integrity are generally identified as honesty, objectivity, independence and impartiality. They are mentioned together with the obligation to care for the next generation. In that sense, it is often also described as the duty of supervisors and mentors, to identify and correct minor misdemeanours which might remain undetected and nevertheless harm the system. Furthermore, not being socialized to think and act in terms of research integrity could lead to more serious forms of misconduct. (see next section) This means to convey information as openly as possible and acknowledge the contributions of others, to report about research in a careful manner trying to avoid mistakes, to use resources in a balanced manner (which is often an issue when it comes to the use of animals for research), as well as to store and present data in a mode to allow others to perform independent interpretations (see e.g., ESF&ALLEA 2011).

While there is large agreement on these values, it is more complex when it comes to proposing and implementing processes, and structures to support and foster research integrity in practice. We encounter, for example, difficulties when institutions have to address issues of research integrity openly. In most of the major fraud cases, instead of reflecting on the structural conditions that fail to prevent or may even foster deviant behaviour, institutions tend to perform a four-stage "cleaning ritual". First identify a very small group, in the best case an individual, and demonstrate his/her guilt; second, try to shown that it was a human failure, a moral or psychological weakness of a person; third, underline that this case is on all levels an exception and could only happen due to unfortunate conditions; finally, stage a cleaning ritual and show publicly that "in the end good science wins" and that therefore there is no reason to worry for the research system. (Felt 2005)

Also academic journals have gradually admitted that they hold an essential role in assuring good scientific practice. Every major fraud case, the discovery of inappropriate funding relations or indepth studies on reproducibility of published results have led to intense debates over the role of editors and the peer-review system in assuring high quality research. (e.g., Allison et al. 2016, Bosch et al. 2012, Hollander 1990, Resnik, Peddada, and Brunson 2009)

While there is large agreement on the values knowledge generation should follow, it is more complex when it comes to proposing and implementing processes and structures to support and foster research integrity in practice. Indeed, we have seen for sure in many institutions and countries a shift from implicit norms to explicit behavioural prescriptions, with strong managerial oversight. (Montgomery and Oliver 2009) What most suggestions have in common is that they propose to implement prevention programs through education and awareness raising activities as well as through training in good practices of data collection and storage. Furthermore, exchange of experiences and good practice is seen as a central element. All this should be accompanied by the creation of governance structures which care for research integrity and transparent procedures for handling cases of transgression. Governance is mainly conceptualised on the national or even institutional level, even though global agreements are seen as the ultimate goal.

2.2. Research systems in transition

As already indicated above, when thinking about prevention of violations of good scientific practice, it is essential to more broadly reflect the ways in which contemporary research systems change, how they implement a core logic of competition and speed and how this potentially prepares the grounds for scientific misconduct. Indeed, science and technology studies has been very good at studying cultures of knowledge production, aiming at an analysis of the co-production of epistemic and social orders in whole research domains (Knorr-Cetina 1999, Traweek 1988). Yet, this line of research has often been critiqued for solely looking at micro practices and not sufficiently engaging with institutional and structural changes and how these might affect knowledge production practices (Garforth and Kerr 2010). And they have added little to our understanding of how individual researchers deal with the complexities of contemporary research environments. It will therefore be essential to connect structural elements as well as individual lives in order to better grasp the dynamics at work.

To this end the project will make use of the concept of researchers' "epistemic living spaces", i.e., researchers' individual or collective perceptions of "the multi-dimensional structures—symbolic, social, intellectual, temporal and material—which 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" (Felt 2009, 19). This concept draws attention to researchers' room for manoeuvre they have in doing their research, for following their ideas, arranging their private lives and engaging with societal issues—which is often implicitly set equal with quality of life in research. This epistemic living space is shaped by the forces, such as the need to produce results that count, the specific value and reward structures in place, the institutional traditions, career structures and many more. The exact form of an epistemic living space differs according to the moment in a researcher's career, the epistemic subfield in which s/he is working, as well as by respective institutional structures.

What are these changes the research system is undergoing, which impact the researchers' epistemic living space and indirectly also the way the limits of GSP are perceived and respected? Indeed, the research system is facing quite turbulent times and has been undergoing considerable change over the past decades. A certain unrest, a perceived need to be able to continuously reinvent oneself in order to face new challenges seems to have become an integral part of contemporary

research systems. As a result, today's researchers find themselves and their work embedded in a wider societal context characterized by a set of dominant narratives ranging from the demand for a fast and steady flow of innovations to assure society's progress, over our need to speed up knowledge generation and technological development in order to stay competitive in the international race to the threat that the public might at any moment become a problem for innovation activities/processes if they do not support them sufficiently. (Felt et al. 2007, Felt, Barben, et al. 2013)

Taking a closer look at the ways in which contemporary research is changing (e.g., Fochler, Felt, and Müller 2016, Felt 2016a), we can identify the implementation of a new public management logic, which is expected to increase output and efficiency of research and help to meet the expectations of an ever faster flow of innovations. This also leads to important changes in the "orders of worth" (Stark 2009) at work in academia. Four shifts seem of particular importance when looking at the phenomenon of transgressions in GSP.

(1) Auditing and ranking structures have been put in place, measuring the scientific output and other features which are supposed to allow to compare people and institutions against each other (e.g.,Fochler, Felt, and Müller 2016, Felt 2016a); this increasingly means that only those academic activities count which can be counted. These seemingly objective forms of measuring academic output have been shown to have significant governance effects on the practices of institutions and individuals (Strathern 2000, Shore 2008), in particular when they come side by side with a growing discourse of efficiency and productivity. Institutions and researchers internalize auditing criteria and adapt their behaviour to "game" specific aspects of the system, often leading to undesired effects. (Espeland and Sauder 2007) It seems essential to critically reflect how these more or less subtle processes of auditing and quantification in contemporary cultures of knowledge production matter when good scientific practice norms are being transgressed.

(2) This goes hand in hand with a quite deep restructuring of the **temporal logics** guiding academic lives and epistemic work. Today the logic of projects—what gets often labelled as "projectification" — structures research (and the questions that can be asked). Knowledge is thus produced in the three-year-rhythms of projects, structured by road maps, milestones, work packages and a flow of papers; careers have become fragmented, often in junks of very few years in particular in the post-doc phase; assessment exercises and publication cycles are yet other time structure organising research. (Felt 2009) Outputs of whatever kind are expected to be produced with a relatively high frequency. Thus researchers describe a feeling of constant pressure, an acceleration of research as well as a growing number of different timelines impinging on their lives and their work (Sauder and Espeland 2009). They describe it as being in a state of constant readiness to have all the assets needed for the next contract extension, the next job interview or the next assessment exercise (Felt 2016a).

This logic might push people to go beyond the limits, in particular when it comes to get access to the needed resources. This is visible in the responses when researchers are asked whether being completely open and honest in project applications might hinder the chance of succeeding. (see Fig.4.) No less than 37% of all researchers funded by the Austrian funding agency FWF fully agree that openness and honesty does not provide the best chances for success, with further 45% agree at least partially. Finally, as already during the socialization process of young scholars temporal pressures are

omnipresent (Müller 2014) together with a strong feeling to have to comply to the auditing logic, this might lead to the danger to accept transgressions in order to serve the overall strategy developed to survive in academia.



Fig. 4. A researcher who is completely open and honest in their application will not always have the best chances Scale: don't agree – partly agree – completely agree FWF 2014 total/FWF 2014 Profs/DFG 2010 (Profs)

(3) The **reward systems**, or more commonly what gets valued in research, has also undergone considerable change. Indeed, more and more young researchers describe that in research and in the competition prevailing only counts what can be counted (often described as being part of new public management logic). As a consequence, they focus much of their attention on producing as many publications as they can quite early in their career. This, together with the fact that only being first matters, leads to publishing results earlier and less checked than would be good.

The founder of the retraction watch web-site expressed this clearly by stating that the transgressions of good scientific practice "are just symptoms of a wider issue with the reward system of academic research: publications are the only way to accrue scientific merit, so they take on a sanctity that academics are reluctant to disrupt with corrections or retractions. If researchers could afford to view scientific output more as a continuous stream, rather than a punctuated series of publications, revisions would carry less of a stigma, he says." (cited in van Noorden 2011, 28)

The reward system thus has to be seen as a crucial element in the research integrity debate. Each act of valuing a researcher's achievements draws on moral, discursive and material infrastructures—the exact blend being decided in a situated manner (Kjellberg and al 2013). It is exactly this blend which might come to matter in the overall choice of which practice is still acceptable and which one is beyond the borderline.

(4) This leads seamlessly to the fourth aspect, **the publication system** (one such infrastructure), which has been changed by these trends, while simultaneously being an actor in driving change. A former editor-in-chief of the *Science* magazine together with co-authors argued that "the inflated value given to publishing in a small number of so-called 'high impact' journals has put pressure on authors to rush into print, cut corners, exaggerate their findings, and overstate the significance of their work" (Alberts et al. 2014, 5774). Indeed as the pressure to publish rises and the space in highly visible journals gets increasingly scarce, this does not only transform when, what and how people communicate their results, but also how publications are read and cited (which is the other side of the reward system). The visibility of any single publication is further reduced as more and more literature is available and a smaller percentage of articles and journals are actually cited (Evans 2008). This is closely connected to concerns raised with regard to what is being published and how this is framed. Studies have pointed

to the fact that under conditions of scarce space there is a strongly declining number of papers recording negative results (Fanelli 2011). They are seen as hardly publishable in highly ranked journals, which in turn might have consequences on the ways in which results are presented. Moreover, the importance to position science in society leads to the questions how scientists reconcile the caution "about their results with the demands of the media for headlines and the growing emphasis placed by funding agencies on the economic impact of research" (Jones 2008, 65). This might lead to an "economy of promise" which invites researchers to stretch their imagination beyond what their research can actually offer. This calls for a thorough reflection on how publication possibilities and venues also frame what can be published and in what ways research gets tacitly directed. Finally, the growth also needs reviewing, which becomes an increasing burden for researchers and points to the limits of the system – and to the fact that probably quite some sloppy research remains unseen.

These shifts, one could argue, call for an increase in auditable work and for researchers to become more of an "academic entrepreneur" (Garforth and Cervinková 2009) capable to navigate the complex funding and career landscape and to behave along the logic of academic capitalism. (Shapin 2008)

(5) Finally, this poses the question how young researchers can **grow into the scientific community** under these conditions. It is essential to consider these young researchers' perspectives as they are particularly strongly affected by the changes described above. We know from previous studies how important the phase of graduate studies is for the enculturation of newcomers into the disciplinary and institutional culture of knowledge production (Campbell 2003, Delamont and Atkinson 2001). It is through these socialization processes that young researchers learn how to produce knowledge, but also to distinguish good from bad research practices and to grasp the distribution of responsibilities in a given team, institution and field. Therefore it will be key to also understand the role of group leaders and how they care in "crafting the group" and how they see their responsibility in caring for the respect of GSP. (Davies and Horst 2015) A better understanding of the interplay of how research (outcome) is valued and how young researchers are introduced to the practices of producing knowledge in science is thus essential—"not least because those being socialized today will be shaping the cultures and practices of science in the decades to come". (Fochler, Felt, and Müller 2016, 177)

Both strands of discussions outlined so far have shown the complexity and breadth of the problem. Indeed studying the debates and tensions around cases where the transgression of acceptable practices are negotiated and blame is distributed, are ideal moments of learning about the basic functioning principles of research. In the midst of debates around these issues, participants often need to unpack how they think science works, should work, what regimes of valuation are at work and why they fail, how social relations in the lab matter, how diverse pressures are handled and many more—all topics which under "normal" circumstances are neither openly expressed nor debated in some detail. This is similar to the study of controversies which also allow insights into the functioning of knowledge production in all its facets (Sismondo 2010). Studying struggles over issues of research integrity is therefore a privileged moment where analysts get access to the functioning mechanisms within the research community and can productively use this to show—beyond any single case—where contemporary research systems have developed fault lines where the seeming productivity turns

against the system. However, while we have many observations from different parts of the system, using different sets of data and addressing different problems, it would be essential to engage in a more comprehensive study of how these different forces come together in the situated lives of researchers, in a specific environment. This will be the aim of the proposed project.

3. Aims of the research project, research question

Building on the above mentioned debates, this project aims at developing a situated understanding of how researchers, embedded in a specific locally configured academic environment, try to make sense of and negotiate the boundaries of good scientific practice in everyday situations. It follows a practice theoretical approach (Schatzki, Knorr Cetina, and Von Savigny 2001), which takes the ideal of good scientific practice not simply as given or as to be defined on a normative level, but as a continuous achievement in the concrete scientific practices in need of an explanation. Yet, we will also investigate institutional actors responsible for GSP issues and wider debates on the issue. Given the central role of research and innovation in contemporary societies it seems essential to be able to better understand how the notion of good practice is developed, handed over to the next generation and performed in the lab.

Engaging with researchers from different areas of the life sciences/biomedicine in a specific university context as well as with institutional actors (within universities and in funding agencies) responsible for dealing with issues of GSP the project will

- a) identify the spectrum of implicit and explicit understandings of good scientific practice, and how they situate the borderlands in which the navigate;
- b) reflect on how researchers narrate their everyday research activities and the boundary conditions under which they take place;
- c) address researchers concrete visions of how the prevailing governance structures within the respective institutional settings as well as a wider societal environment matters when it comes to GSP;
- d) look at how they unfold a "geography of responsibilities" with regard to GSP and where they locate the different actors and institutions;
- e) analyse their perceptions of the impact of such transgressions on research and on the place of science in society;
- f) investigate how researchers and policy makers handle situations where they feel that value orders are transgressed.

Overall it will be essential to understand what kind of logic of care, i.e. "what kinds of processes accompanying the generation and application of knowledge and innovations" (Felt, Barben, et al. 2013, 19), would need to be put in place in order to lower the risk for transgressions of good academic practice.

4. Methodological considerations: data production and analysis

The project will work with a **qualitative mixed-methods approach**, using documents (media reports, blogs, discussion papers), discussion workshops with scientists as well as a set of different kinds of interviews with researchers and policy makers as core material. It is furthermore situated in the constructivist tradition of social science research. Therefore we will mainly work with different forms of **sense-making narratives through which we aim to get access to how research practices and the values attached to them** are addressed by researchers, journalists, and policy makers. (Czarniawska 2004, Gubrium and Holstein 2009) Narratives, in particular in the interviews and the discussion groups we plan to perform, are meant to show the work the narrators need to make in order to produce a story that seems coherent for them. In that sense we always look at what our interviewees tell us, but simultaneously also at also how they tell it. In tracing storied experiences of researchers and policy actors we also hope to get at the constitutive discourses, environments, contexts, metanarratives, tropes, and many more that participate in narratively configuring researchers ways of configuring what good practice means for them.

As indicated in Table 1, two larger sets of data will be produced in the course of the first two years of the 3 year-project.

The first set of data (1-3)—representing the wider environment in which the local study will be embedded—will consist of three kinds:

- a collection of "context material", part of which has been done as a pre-research to writing this application on the current international debates. These are publications on good scientific practice and the transgressions in scientific journals such as *Science, Nature* and *PLoS ONE*, reports and blogs which will allow us to capture the international dimension of the debate in the respective academic and policy communities (past 10-15 years); further we will collect material from the international institutions dealing with good scientific practice;
- 2. media articles published in major Austrian journals in the last 10 years in order to capture the public discourse around academic transgressions in the respective country;
- 3. a collection of documents by Austrian universities and funding bodies as well as from the Austrian Agency for Research Integrity on how they define transgressions of good scientific practice and on the ways in which they deal with them.

These materials will be analysed using a grounded theory approach to identify major topics and concerns, elaborate on the diverse criteria used to identify the kinds of transgressions, identify what practices are seen as particular subject to transgressions, the sanctions which should (not) be applied and the moral narratives which surround these narratives.

Building on the preliminary analysis of these three bodies of data, we will identify **three fraud cases** which will be analysed in more detail (see set of **data 4**), identifying key moments in the process and complementing this with observations from the three sets of data. This analysis and documentation be the input for

- the planned case analysis workshops and
- the questionnaires for the interviews.

The second set of data (5-7)—core data for our analysis of how borders of good scientific practice are dealt with—will consist of 6 discussion workshops (approx. 3h each) with approx. 8 researchers participating in each of them. These workshops will use a card-facilitated discussion method (Felt, Schumann, et al. 2013) developed in a previous FWF project. The aim of this method is to create a space in which participants are encouraged to develop and negotiate individual and collective positions towards a specific issue at stake—in the case of this project the issue of GSP and how this can be achieved in contemporary research practices. The method uses different sets of cards which each open up a major perspective on the issue of concern. Within each set of cards different observations, positions, statements, concrete examples etc. are presented to the participants. They are invited to use them as trigger material to develop and express their views. The input in form of card sets will be prepared on the basis of the analysis of data 1-3 and tied to the selected cases of violation of GSP. The moderator therefore does not have to formulate detailed questions, which gives participants the room to express their concerns in a bottom-up manner. This methodology allows for a much more fine-grained positioning work of participants. As a starting narrative to each discussion workshop, we will feature one case study of a major transgression of GSP. This should ground the discussions in research reality, constructing a "virtual laboratory" to think through the different decisive moments when "things went wrong" and identify the potential forces at work. This will allow participants to indirectly speak about their own practices and experiences through the case as well as to the other informational elements presented in cards. As research integrity is often a taboo topic this method could lower the barriers for participants to enter the conversation.

With regard to group composition, participants will come from different research areas within the life sciences using different research methods in order to explore the variations within the wider community. It will be essential to not only tape the discussions, but to also take detailed ethnographic notes in order to capture the interactions between actors as well as the non-verbal communication.

We will further carry out approx. 20 in-depth narrative interviews with

- a view selected participants from the workshops in order to get a more in-depth understanding of individual positions and to explore what they would not articulate in the group but share in individual conversations with us
- a **number of groups leaders** in order to better understand how they see the problem of trust and the transgression of good academic practice in group work, what responsibility they see for them as well as to reflect how they (would) handle cases of transgression.

Following Holstein and Gubrium (2008) interviews are understood here as an interaction between interviewer and interviewee and as a rich site of producing narratives about social practices. This is essential to keep in mind when analysing them.

Finally, as a third set of data, we will perform **6-10 in-depth narrative interviews** with those institutional actors involved in dealing with cases of transgressions of good academic practices. While these interviews are in some way "experts interviews", i.e. conversations with persons who are repeatedly dealing in an institutionalized manner with transgressions of GSP, the project will perform and analyse them as a site of producing institutional narratives. Here it will be essential to also consider the institutional context from which these interviewees speak (Czarniawska 2004).

All interviews and discussion groups will be taped and transcribed. These data are highly sensitive as they touch on researchers self-understanding and their lives in research. Informed consent will be asked from all participants in order to clearly agree on the anonymized use of the interview material as well as how it will be stored and who gets access to the data and for what purposes.

In analysing the data we will follow a "constructionist" or "post-modern" interpretation of Grounded Theory as proposed by (Holstein and Gubrium 2008, Gubrium and Holstein 2009, Czarniawska 2004) and Charmaz (2006). Grounded Theory offers great potential for the proposed study as it allows investigating "how research participants construct their lives and worlds" Clarke (2005), and as it stresses the emergent properties of categories in the data. As we will be working with a diverse set of narratives we will thus also take inspiration with narrative analysis as put forth by (Charmaz 2008, 403). This means that we will be particularly attentive to the interplay in which what they tell and how they tell in configuring the narrative and to observe the resources mobilized (by they contested or embraced). This is essential for all steps of analysis throughout the project and, in particular Clarke's approach of working with maps, will allow us to bring together the diverse set of materials collected throughout the research. This will mean that besides going back and forth between identifying relevant materials and preliminary analysis we will follow the suggestions of Adele Clarke (2005, 86-109) to draw preliminary *messy maps* followed by *relational maps* in order to constitute a *situational map*.

	Data	Aim
1	Collect context material on the international debates around transgression of GSP, from major journals such as <i>Nature, Science, PLOS</i> <i>One</i> —these issues have been addressed numerous times by the respective editors—, from blogs like <i>Retraction watch</i> or <i>pubpeer</i> on transgression of good scientific practice in research.	Identify the main lines of international academic debates on transgression of good scientific practice; What is seen as problematic when researchers transgress good scientific practice? What factors are made responsible? What fears about the advancement of knowledge are expressed? What changes to system are judged necessary in order to minor the phenomenon? What are the key-values of science to be protected?
2	Media analysis (key print media in Austria) and websites of institutions Period: last decade In particular articles in the quality press will be identified and analysed;	Develop an understanding of how transgressions of good scientific scientific practice are framed in the public discourse; What kinds of transgressions are reported? How are researchers portrayed as well as the more systemic conditions of research? What understanding of science and research as a practice can be identified? What are the moral narratives developed?
3.	Document analysis of good scientific practice guidelines/rule; most academic institutions, but also funding bodies in Austria have produced such documents;	Explore how institutions governing research imagine their role in identifying and dealing with transgressions; How do they define transgressions? What are the processes of identification and dealing with fraud? When do they decide to intervene, and if so, how?
4.	3 case studies of major transgressions of GSP in the biosciences/biomedicine each showing different structural elements;	Reconstruct the main lines of the cases and prepare them for use in the DWs

Tal	ole	e 1	: (Overv	iew (on data	prod	luced	in	the	proj	ect	and	what	their:	anal	ysis	will	contri	bute	•
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5.	Discussion workshops (DW) 6 DWs will be organised each using one case of major transgressions of GSP as a triggering and guiding element; approx. 8 researcher will participate in each workshop, which will last approx. 3 hours.	Understand how researchers collectively identify key mechanisms at work in cases of major transgressions of GSP; How do they connect these cases to their everyday experiences in the lab? Where do they see moments when intervention should have happened? We will see how they navigate the borderlands of good practice and when, where and in which circumstances they draw lines of GSP.
6.	In-depth narrative interviews with selected researchers – approx. 20 interviews 1-1.5 hours each—with participants in the DWs and group leaders.	Reflect and deepen arguments from DW; learn more about the relation of individual narratives as compared to more collective story-lines developed in group discussions; get a better view on what GSP means for those leading research groups.
7.	In-depth narrative interviews with institutional actors from universities as well as national agency dealing with transgressions of good academic practice. approx. 6-10 interviews 1-1.5 hours each.	Investigate how institutional actors perceive the scope of the problem at stake; How do they handle cases? What room for manoeuvre do they perceive? What conditions do they identify as supporting transgressions of GSP? Identify where they see deficits in the current handling GSP transgressions.

5. Expected outcomes

Concretely the outlined project plans to contribute innovative results on several levels.

- (1) The project will develop the **concept of "borderland of good scientific practice"** and thus move away from a normative approach of working with fixed categories to more carefully understand the grey zones where negotiations take place.
- (2) It will bring together and confront the visions from different actors. Thus we will be able to better understand the tension between ideals of good practice and realities implemented in contemporary academia. We will also contribute to better understand the imagined and practices distributions of responsibility, i.e. the "geographies of responsibility".
- (3) Looking into narrative sense-making efforts by researchers and institutional actors will allow us to identify and better understand the more stable "narrative infrastructures" (Deuten and Rip 2000) about good practice that can emerge in institutional contexts over time and form an important resource when people think and speak about GSP and its transgression.
- (4) The breadth as well as the complementarities of the data produced and used in the project will allow to address questions on good scientific practice from rather different angles and thus produce a much more fine-grained and comprehensive analysis of the dynamics taking place around this notion.
- (5) Bringing together different actors involved in different moments of the knowledge generation process helps to go beyond the normative approach, and focus more on issues governance of good scientific practice. This will be done through identifying and analysing in particular the implicit and explicit contemporary models of knowledge generation which are at work in this domain.
- (6) Beyond the specific outcomes, through developing and experimenting with discussion workshops, the project is also meant to contribute to the further development of a more context-sensitive tool for allowing researchers to reflect on their practices and the worlds they live in. The method developed to discuss borderlands of good scientific practice can after the project be used in the teaching context to sensitize young scholars to the challenges in their everyday situations.

The project is planning 2-3 publications in international peer-reviewed journals, but also publications in venues in the field of the life sciences together with our life-science partners in the research platform. Furthermore we will organise feedback from the actors who have worked with us.

6. Work plan

The project is organised in 10 workpackages. A schematic representation of the research process is presented in Figure 5.

WP 1: Analysis of the wider GSP debates

- Mapping of the debates GSP in major journals such as Nature, Science, PLOS One-these issues have been addressed numerous times by the respective editors-, but also blogs like *Retraction watch* or *pubpeer* on transgression of good scientific practice in research
- Complementing the literature review
- Preliminary analysis ==> identify input for workshops and interviews

WP 2: Study of Austrian print media

- Collect the articles from Austrian print media dealing with GSP
- Austrian media analysis
- Development of key hypotheses for the design of the stakeholder interviews and the workshops

WP 3: Institutional documents for GSP

- Collect the documents which spell out the institutional concepts for good scientific practice from universities as well as from the Austrian research funds and the Austrian Agency for Research integrity
- Analyse the common argumentation and the imaginations of research practice in them
- Identify the sanctions
- Development of key hypotheses for the interviews and workshops .

WP 4: First preliminary cross-cutting analysis

- Drawing together the outcomes from the preliminary analysis performed in WP1-3 and identify the key-issues to be taken up in the next phase
- Identify three case studies which could serve as trigger material of the the workshops planned in WP 5.

WP 5: Card-facilitated discussion workshops (DWs)

- Document the three cases in detail
- Prepare the presentation material for the case analysis workshops
- Call for participants and organisation of DWs

(months 12-20)

(months 6-12)

(months 5-9)

(months 3-8)

(months 1-5)

- Carry out the 6 workshops
- Document the ethnographic observations and transcribe the workshop discussions
- Perform a first preliminary analysis

WP 6: Interviews with researchers

- Development of interview questionnaires based on the analysis in WP 4 and 5
- Selection of interviewees from the CAWs
- Selection of interviewees from group leaders
- Conducting of ~20 qualitative interviews
- Qualitative Analysis of the interviews

WP 7: Interviews with institutional actors

- Development of interview questionnaires based on the analysis in WP 4 and 5
- Selection of interviewees from universities and funding agencies
- Conducting of ~6-10 qualitative interviews
- Qualitative Analysis of the interviews

WP 8: Analysis across the DWs and interviews

- Situational analysis integrating in a first step the DWs and interviews
- Complementing the analysis with findings produced in WP 4.

WP 9: Feedback, Validation and Dissemination

- Drawing together the different analysis to create a wider picture of the situation
- Feedback and validation with the researchers involved through smaller workshops
- International conference which will be organised in collaboration with the platform "Responsible Research and Innovation in Academic Practice" (financed by the platform)

WP 10: Accompanying analysis and publication activities

- Parallel to the data generation we will analyze them continuously (following the grounded theory approach), identifying and documenting key-issues, drawing different maps (situational analysis)
- Writing of a draft of an overall report on the findings to be widely disseminated
- Preparing 3 publications both for the STS community and for the community of life scientists

(months 18-24)

(months 20-25)

(months 22-32)

(months 31-36)

(months 10-36)



Fig.5. Schematic outline of the project

7. Project team and cooperation partners

The project team will consist of the project leader Ulrike Felt, who will devote 20 % of her time to the project (in kind contribution to the project) and a researcher working 50% of her time during the first two years of the project and 60% during the last year. Furthermore a research assistant will be supporting the team 10h/week over the first 2 years. Ulrike Felt (see attached CV and list of publications) will lead the conceptual work in the project, be involved in all stages of planning, oversee the preparation of the cards for the workshops, actively participate in the field work as moderator of the workshops and carry out some of the interviews, oversee the coding and analysis process and take a lead role in the publication process. The researcher should hold an MA, have excellent knowledge of the field of Science and Technology Studies and a sustained interest in understanding the ways how contemporary research environments work. The person will be hired after funding of the project is assured.

As the project will be an integral part of the interdisciplinary Research Platform "*Responsible Research and Innovation in Academic Practice*" (Leader: Ulrike Felt) established at the University of Vienna in September 2015 (see http://rri.univie.ac.at). Furthermore the project will be connected to the Department of Science and Technology Studies (see http://sts.univie.ac.at). The project will thus profit from an excellent research infrastructure (platform and department) which is internationally well networked and has been successfully hosting and supporting numerous (interdisciplinary) research projects.

The proposed project will be able to further draw on the know-how and support of experienced researchers in key phases of the project: Ass.-Prof. Dr. Maximilian Fochler (for more information see: http://sts.univie.ac.at/en/people/maximilian-fochler/) and Dr. Lisa Sigl (for more information see: http://rri.univie.ac.at/en/people/lisa-sigl/). Both have an excellent background in Science and Technology Studies and have been doing research on the changing conditions of scientific knowledge production.

Furthermore the connection to the community of life scientists will be assured by two other members of the platform: Prof. Dr. Renée Schroeder doing research on RNA (deputy-head of the platform; http://www.mfpl.ac.at/groups/mfpl-group/group-info/schroeder.html) and Prof. Dr. Andreas Richter working in the field of ecosystem research (co-applicant of the research platform; see http://ter.csb.univie.ac.at/people/andreas-richter). Both will engage in feedback during key-phases of the data-interpretation, will help us in preparing and validating the input to the workshops and will support us in connecting with the community.

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