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Living with the Ideals of Good Scientific Practice
Of Concerns, Care, and Response-abilities

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*This thesis is dedicated
to those who care*

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Abstract

Studying and governing research integrity have attracted growing interest. Triggered by cases of scientific misconduct and reports about questionable research practices, various means of controlling researchers through new guidelines, forms, or integrity courses have been introduced. These present good scientific practice as a clear rational choice to work along seemingly straightforward rules. However, such accounts fail to contextualize the mundane negotiations about good scientific practice in academic environments, which are characterized by conflicting valuations of what makes research good. This thesis challenges the assumed clarity of good practice and instead follows researchers' boundary work, questioning when and how research practices become matters of concern, for whom, and how these concerns can be addressed. Conceptualizing good practices not as an issue of choosing "the" right actions but as in need of situated care requires an understanding of responsibility that is not limited to accountability but acknowledges the complex responsibilities at stake.

This thesis is an article-based project. The first article follows the discourse about concerning research practices in the journals *Nature* and *Science* over the last four decades, showing that more institutional stakeholders have become responsible for managing good research. The second article presents the card-based engagement method "RESPONSE_ABILITY" as a tool for capacity-oriented research integrity training. The third article analyzes discussion groups with early-stage researchers, challenging deficit narratives that characterize early-stage researchers as merely in need of training and illustrating their complex understandings and care for good research, which they portray along four registers of valuing.

Bringing these observations together, I reflect on the visibilities and invisibilities of concerning and caring practices. I contend that integrity is not a stable personal quality but an ongoing achievement in practice and ponder the tensions in the social academic fabric and alienation of researchers and their institutions, as well as the differences between caring and controlling modes of responding to concerns. Concluding the thesis, I argue that attuning to concerns about good research practice in practice also contributes to strengthening trust in and within research. Instead of understanding research integrity as a stable prerequisite for public *trust*

in science, what matters is to shed light on what people do to make research a reliable source of knowledge and emphasize collective responses as the basis for *trust in research*.

Zusammenfassung

Die Integrität von Forschung steht in den letzten Jahren vermehrt im Zentrum von akademischen und gesellschaftlichen Debatten. Ausgelöst durch Fälle von wissenschaftlichem Fehlverhalten und Berichte über fragwürdige Forschungspraktiken wurden Kontrollmechanismen, Leitlinien, sowie spezielle Integritätskurse eingeführt. Konzeptuell wird gute wissenschaftliche Praxis in solchen Formaten als eindeutige und rationale Entscheidung dargestellt, bei der es scheinbar lediglich darum geht, klare Regeln zu befolgen. Solche Darstellungen verabsäumen es jedoch, die alltäglichen wissenschaftlichen Herausforderungen und Ausverhandlungsprozessen der konkreten Bedeutung von guter wissenschaftlicher Praxis tatsächlich in der Praxis zu kontextualisieren. Akademische Lebenswelten sind heutzutage gekennzeichnet durch widersprüchliche Bewertungen dessen, was „gute“ Forschung ausmacht. Diese Arbeit hinterfragt die vermeintliche Selbstverständlichkeit, Eindeutigkeit und Klarheit von guter Praxis. Dabei geht sie der alltäglichen „Grenzziehungsarbeit“ von Forschenden nach und hinterfragt wann und wie Forschungspraktiken als besorgniserregend eingestuft werden und wer für diese Sorge tragen muss. Das Verständnis von „guter Praxis“ beschränkt daher nicht nur auf die Auswahl der „richtigen“ Handlungen, sondern betrachtet die situierte Sorgfalt (engl. Care) in akademischen Praktiken. Dies erfordert auch ein komplexeres Verständnis von Verantwortung für gute Forschung, das sich nicht auf Rechenschaftspflicht beschränkt, sondern die komplexen, kollektiven Reaktionsmöglichkeiten (engl. Response-abilities) anerkennt.

Der empirische Korpus dieser Arbeit besteht aus drei wissenschaftlichen Publikationen. Der erste Artikel verfolgt den Diskurs über besorgniserregende Forschungspraktiken in den Zeitschriften *Nature* und *Science* über die letzten vier Jahrzehnte und zeigt auf wie zunehmend institutionelle Akteure für das Management guter Forschung verantwortlich gemacht wurden. Der zweite Artikel stellt die kartenbasierte Engagement-Methode „RESPONSE_ABILITY“ als Instrument für ein kompetenzorientiertes Training zur Forschungsintegrität vor. Der dritte Artikel analysiert Diskussionsgruppen mit Nachwuchsforschenden und veranschaulicht ihr komplexes Verständnis und ihre Sorge um gute Forschung, die sie anhand von vier Bewertungsregistern darstellen.

Abschließend reflektiert diese Arbeit die artikelübergreifenden Beobachtungen zur Beantwortung der Forschungsfragen. Dies umfasst eine Reflexion über die Sichtbarkeit und Unsichtbarkeit von besorgniserregenden und sorgsamem Praktiken und ein Plädoyer dafür, Integrität nicht als beständige persönliche Eigenschaft zu verstehen, sondern als kontinuierliche Errungenschaft. Diese kommt in den eigenen Handlungen, Beobachtungen über die Spannungen im sozialen akademischen Gefüge und die Entfremdung von Forschern und ihren Institutionen/Universitäten, sowie die Unterscheidung zwischen fürsorglichen und kontrollierenden Antworten auf bedenkliche Forschungspraktiken zum Ausdruck. Schlussfolgernd beschreibt diese Arbeit, dass das Verständnis von besorgniserregenden Forschungspraktiken in der Praxis auch dazu beiträgt, das Vertrauen in die Forschung und innerhalb der Forschung zu stärken. Anstelle von einem dogmatischen Verständnis von Integrität als stabiler Voraussetzung für das *Vertrauen in die Wissenschaft* auszugehen ist es wichtig zu beleuchten, was Forschende in ihren individuellen und kollektiven Handlungen tun, um Wissenschaft zu einer verlässlichen Wissensquelle zu machen, und damit die Grundlage für das *Vertrauen in die Forschung* zu charakterisieren.

Part I Introduction

Chapter 1 Preface

“I hereby *declare* to *follow* the regulations relating to good scientific *practice* and *confirm* that *I am aware* of the legal basis to them” (Universität-Wien, 2016b, p. 1, [emphasis added]), states form SL/W1, which every PhD student must sign when registering their thesis for public defense to the faculty. The form reminds aspiring scholars that “[i]n *addition* to the terminology, choice of methods, systems *and so on* peculiar to the discipline” (p. 1, [emphasis added]), also the legal regulations and university guidelines for good scientific practice must be observed. How these guidelines and regulations relate to research *practices* remains as opaque as the rules themselves. The form only points to the Austrian University Act and the statutes of the University of Vienna. Some of the referenced documents are buried in more than a decade of university bureaucracy, difficult to access, and the referenced paragraphs in the English form are not correct. However, this does not seem to bother anyone. *Declaring, following, confirming, and being aware* of the rules of good scientific practice does not appear to entail actually reading the documents. Still, thesis writers must know that they will be held accountable and sanctioned if they do not observe them.

Interestingly, the document describing the Regulations Relating to Good Scientific Practice (Universität-Wien, 2006b) is not directly referenced in the form that PhD students must sign. This document outlines the ideals of honest, fair, and diligent scientists, concrete demands for proper documentation, critical assessment, publication ethics, and categories of scientific misconduct. Most importantly, it acknowledges the university’s responsibility in taking care of its PhD and master’s students, not merely by teaching them methods, skills, and a responsible attitude towards their work and peers but also by acknowledging their “right to regular scientific supervision, consultation, and support”¹ (Universität-Wien, 2006b, p. 5). It

¹ „§ 3 NachwuchswissenschaftlerInnen (1) NachwuchswissenschaftlerInnen und Nachwuchswissenschaftler beginnen spätestens mit ihrer Magister-, Diplom- und/oder Doktorarbeit wissenschaftlich zu arbeiten. Die Universität vermittelt ihnen neben den methodischen Fertigkeiten eine ethische Grundhaltung für das wissenschaftliche Arbeiten, für den verantwortlichen Umgang mit Ergebnissen und für die Zusammenarbeit mit anderen WissenschaftlerInnen und Wissenschaftlern. (2) NachwuchswissenschaftlerInnen und

is one of the few instances in the relevant documents of the University of Vienna where good scientific practice is presented as an issue of more than rules—an issue that is embedded in specific academic environments and must be supported. The fact that the university does not tell students that good practice also requires good environments and that they are eligible for institutional care but merely reminds them of their accountability for any misconduct reflects the university's understanding of good practice and its relationship with its researchers.

Good scientific practice is framed as a clear, rational choice and a duty to work according to seemingly straightforward rules. There is little to no space in any of the university documents for detailing disciplinary differences or acknowledging efforts to translate imperatives into actual practice (Hangel & Schickore, 2017). Arguably, registering for faculty public defense might not be the time to acknowledge the many grey zones of good scientific practice (Fanelli, 2012). It is a moment when the university can remind aspiring researchers of the ideals that the academic community, which they want to become part of, strives to live by. It is a moment when the university performs its control and power to admit only students who confirm to living by certain standards to a PhD program. It is a time for reminding researchers of their societal mandate, articulated, for instance, in explicit laws, to produce good, reliable, and credible knowledge. At the very least, signing this form is a moment that the university can recall if a PhD student engages in questionable practices. The signature confirms the university's efforts to raise awareness of rules and testifies to an individual's readiness to be held accountable for scientific transgressions.

However, in the past decade, a more complex unease about scientific practices has surfaced that is not easily contained by bureaucratic means of form signing. Observations suggest that a large part of research results cannot be reproduced (Baker, 2016) and that a high percentage of articles are retracted (Steen, Casadevall, & Fang, 2013). These seem to be symptoms of a publication culture, in which researchers are incentivized to publish as much and as quickly as possible (Tijdkink et al., 2016). Traditional academic quality-control systems, such as peer review or the filtering out of faulty papers over time, seem to be overwhelmed

Nachwuchswissenschaftler haben Anspruch auf regelmäßige wissenschaftliche Betreuung, Beratung und Unterstützung.“ (German Original)

by the sheer, unmanageable amount of papers (Chu & Evans, 2021; Sarewitz, 2016). In addition to worrisome publishing dynamics, the dominance of logics of competition has contributed to a somewhat hostile and vigilant atmosphere, where researchers are hesitant to admit to or correct mistakes and help each other without specific gains (Müller, 2021; Shapin, 1995). These observations are particularly pressing because of fears that society might lose trust in science if these tensions become publicly known (Yarborough, 2021).

A science-policy movement under the euphemistic name of “research integrity” (Aubert Bonn & Pinxten, 2019; Davies & Lindvig, 2021) set out to study and police these concerns about good scientific practice. The amount of funding granted to study “what is wrong with science” not only reflects the pervasiveness of the unease that research integrity is supposed to mitigate but also participates in steering and shaping the concern that “something is wrong” (see also Peterson & Panofsky, 2023). Many articles on research integrity are drawn to a positivist and realist understanding of science that presents responses to concerns as neutral, logical, and apolitical interventions (Davies, 2019; Mody, Sibum, & Roberts, 2020).

In this thesis, I take a step back from the presumed clarity about what good scientific practice is to examine how researchers live with the ideals of and concerns about good scientific practice, in practice. In doing so, I understand researchers not as detached, rational individuals but consider the environments in which they live as shaping their perspectives and practices (Felt, 2009). How researchers make sense of and implement good scientific practice is molded not only by the institutional environments in which they work but also by the collectives of which they are part, situated epistemic challenges, the wider symbolic understandings of good, excellent, and socially robust research, and the spatial/material and temporal conditions in which they conduct their work. Therefore, I follow the intricate “boundary work” (Gieryn, 1983) of how lines are drawn and how concerns about good scientific practice are experienced and responded to in practice.

Turning to the mundane challenges and negotiations of good research practice in concrete environments also requires adopting a perspective that does not reduce it to a mere choice but acknowledges the care work involved in doing research well (Mol, 2008). Good research practice is not an issue of choosing “the” right actions but a continuous process and an ongoing commitment to researching “as well as possible” (Fisher & Tronto, 1990, p. 40). In

this thesis, I attend to care practices as a deeply political rendering of concerns about good scientific practice (Martin, Myers, & Viseu, 2015; Mody et al., 2020), which challenge a detachment of individuals' "response-abilities" (Haraway, 2012) from their environments.

My thesis is conceptualized as an article-based project, framed by a detailed introduction, a discussion, and a conclusion. After this introduction, the second chapter lays out the conceptual and contextual groundwork of my thesis. I first map out observations from the literature about how the basis for credible knowledge has evolved from a conceptualization locating it in special individuals (Shapin, 1994), particular methods (Popper, 1959 [1934]), or a "scientific ethos" (Merton, 1973 [1942]-b) towards more constructivist approaches that take the situated negotiations over reliable knowledge seriously. This shift to practices of reliable-knowledge production (Latour & Woolgar, 1986; Schatzki, Knorr Cetina, & Svon Savigny, 2001) offers no universalist perspective but is attuned to the "boundary work" (Gieryn, 1983, 1995) positioning and stabilizing knowledge as credible, reliable, and trustworthy.

In contemporary knowledge societies (Knorr Cetina, 1999), there is a strong demand for research to create "socially robust" (Gibbons, 1999, p. C81) knowledge. These demands have led to major changes in academic environments (Nowotny, Scott, & Gibbons, 2001). Audit logics (Power, 1997; Shore, 2008) and management practices (Deem & Brehony, 2005) have been central to this restructuring. They define particular visions of "good" or "excellent" science and steer researchers towards them (Sørensen & Traweek, 2022). Understanding these developments is not only important to contextualize the urge to define and manage good scientific practice but also turns our attention to how these changes shape how researchers can live and work in research. Speaking of researchers' "epistemic living spaces" (Felt, 2009) acknowledges the intertwining of the epistemic, spatial/material, temporal, symbolic, social, and emotional dimensions of research (Felt & Fochler, 2012). Nowadays, academic lives are characterized by high levels of competition (Fochler, Felt, & Müller, 2016), a patchy social fabric, and conflicting "chronopolitics" (Felt, 2017c, p. 53); in addition, demands to become mobile, global academic citizens (Balaban, 2018; Davies, 2020a) shape the capacity to produce "good" knowledge.

Evermore analysts are warning that the lives of researchers in contemporary academia are characterized by conflicting imperatives of good knowledge (Hackett, 2005a; Müller, 2021), which might pave the way for rushed, sloppy, or questionable behavior. A wide spectrum of concerns has been articulated, ranking from deliberate scientific misconduct to various degrees of careless conduct or social malpractice (Biagioli, Kenney, Martin, & Walsh, 2019; Horbach & Halffman, 2017). A growing number of scholars are studying these concerns under the banner of “research integrity” (Aubert Bonn & Pinxten, 2019). However, their perspectives and methodological approaches often rest on a realist and positivist understanding of science (Davies & Lindvig, 2021), inviting approaches that strengthen the grip on science by implementing various control measures (Aubert Bonn & Pinxten, 2019).

Concluding the second chapter, I describe how I conceptualize issues of good scientific practice not only as “matters of concern” (Latour, 2004) but also as “matters of care” (Puig de la Bellacasa, 2017). With this constructivist understanding, I want to challenge the apolitical framing of research integrity that seems so distant from researchers’ practices and instead give room to the complexity, situatedness, and the affective and relational dimensions of mundane research practices that are often overlooked (Mol, 2008). Highlighting these dimensions, I contest the universalist rhetoric of research integrity studies, which contributes to maintaining the status quo instead of imagining how research worlds could be different by considering the vulnerabilities that emerge in the debates.

Attuning to the concerns and care of research practices also requires reimagining responsibility, beyond ideas of control and accountability, as “response-abilities” (Barad, 2007; Haraway, 2008). In complex situations, where concerns and harm might not be straightforward, expressions of accountability are often insufficient to actually improve a situation (Peltola & Heikkilä, 2015; Petersmann, 2021). Understanding actors’ response-ability as enacted in and through practice, through care, casts a much wider focus on actors’ potential responses as well as the skills and capacities needed to respond (Moriggi, Soini, Franklin, & Roep, 2020; Schrader, 2010). Hence, response-ability is a political rendering of responsibility that does not uncritically accept what being response-able entails but rather acknowledges an ongoing need for mutual responsiveness and attentiveness (Barad, 2007; Haraway, 2008).

In chapter 3, I formulate the research question that guides my pursuit in this thesis. I ask **when and how research practices are conceptualized as matters of concern and how care and response-ability for these concerns are imagined and practiced**. This question is supported by three sub-questions about which concerns about research practice arise, who is imagined as responding to the concerns, and how matters of concern are responded to.

In the fourth chapter, I describe the materials and methods used for this thesis. The empirical basis of my research is comprised of materials gathered in the framework of the *Borderlands of Good Scientific Practice* project (Principal Investigator: Ulrike Felt). The project set out to characterize “how under changing conditions in research and innovation, issues regarding good scientific practice come up and how they are dealt with. In doing so, it focused on the specific institutional, epistemic, and local context, of Austrian universities, while looking at it through the lens of international debates” (Felt & Frantz, 2021, p. 5). It followed situated understandings of how researchers, policymakers, and scientific and societal discourses conceptualize and negotiate the boundaries of good scientific practice. For my thesis, I present an analysis of journal articles in *Nature* and *Science* about integrity debates since the 1980s, the development of the card-based engagement method RESEPNSE_ABILITY, and an analysis of focus group discussions with early-stage researchers. As I bring my reflections together with the analytical tools suggested by Clarke’s situational analysis (Clarke, Washburn, & Friese, 2022), I also describe the wider activities of the project, which sensitized my reflection.

The second part of the thesis comprises the empirical corpus of my work for three research articles. Each paper of my article-based thesis sheds light on the overall research aim from a different angle.

The first article, “*The shifting ‘self’ in discourses on the self-governing capacity of science*”, revisits four decades of debates on research integrity in *Science* and *Nature*. This article was co-authored with my supervisor and was submitted to *Social Studies of Science*. After addressing how concerns about good scientific practice have been discussed over the last decade, we show that an extension of worries was accompanied the increasing institutionalization of response mechanisms. Although the argument that science governs itself remains central, we observe a shift in who is part of this scientific “self” and how it is

supposed to ensure good research. Institutional actors take on an ever bigger role over time, transforming good scientific practice from a family-business to a multi-stakeholder managerial endeavor.

The second article, *“RESPONSE_ABILITY – A card-based engagement method to support researchers’ ability to address integrity issues”*, zooms in on one of the institutional spheres that have been strongly standardized in recent years, namely, the training of students and early-career researchers. This paper was published in *Science and Engineering Ethics*. In this paper, my supervisor and I challenge the assumption that knowledge of rules about good research is sufficient to respond to the manifold challenges and ambiguities that researchers encounter in everyday practice. Presenting the card-based engagement method RESPONSE_ABILITY, we highlight the importance of developing discursive skills for maneuvering the “borderlands of good scientific practice” (Felt, 2016). The appendix of the thesis contains supplementary material, including reflections, suggestions, and support for organizing and moderating RESPONSE_ABILITY discussion groups, as well as the four card sets and the discussion map.

In the third article, *“Good Research from Below – Of early-stage researchers’ registers of valuing, response-abilities, and care for good research”*, I analyze five discussion groups conducted with the RESPONSE_ABILITY method. This paper was submitted to *Minerva* and is currently under review. In this article, I challenge deficit narratives that characterize early-stage researchers as merely in need of training and illustrate the complex understandings and care of good research they portray along four “registers of valuing” (Heuts & Mol, 2013). Looking at the relationships between the four registers leads me to reflect on early-stage researchers’ response-abilities (Barad, 2007; Haraway, 2008) for good research. I argue that we must move away from conceptualizing integrity as a pre-existing unity of values and practices to understand it as an ongoing process of keeping partially conflicting values together when researchers navigate the borderlands of good scientific practice.

The third part of the thesis combines my observations and reflections throughout the realization of this thesis to answer the research questions. In chapter 5, I discuss four cross-cutting themes in the articles.

First, I reflect on the *visibilities and invisibilities* of concerns and care throughout the thesis. Situations where research practices become “matters of concern” (Latour, 2004) are uncomfortable. The very doings of research, which are usually well hidden in scientific facts and products (Latour, 1999), are put in the spotlight for everyone to see and judge. Throughout the thesis, I illustrate how institutional responses, mainly implementing forms, guidelines, courses, and investigation procedures, are central to claiming that scientific actors can manage responses to concerns themselves. Yet, the institutional practices meant to “raise awareness” run the risk of remaining mere tick-boxing exercises, obscuring the challenges that researchers face. The researchers we talked to pointed to the importance of care practices when conducting, analyzing, or reporting about their experiments as well as when living and working with other researchers. These are crucial for responding to irritations in their research and preventing them in the first place. This leads me to conceptualize *research integrity debates* as instances of “*unsettling*” (Murphy, 2015, p. 665) *care practices in research*, often pushed aside by neoliberal policies and reward structures (Lynch, 2010). Although ideas about rewarding academic practices of maintenance, repair, and care efforts are gaining prominence, it remains to be seen whether these contribute to more fundamental changes.

Second, I reflect on the role of *individuals of integrity* in responding to concerns about research practices. Traditionally, scientists and their moral integrity have been the basis of scientific credibility (Shapin, 1995). However, recent developments that aligned academia with societal goals introduced new values that restructure scientists’ “epistemic living spaces” (Felt, 2009). Concerns are raised that these logics have altered scientists’ values and behaviors, hampering the production of reliable knowledge. Yet, for the “imagined scientist” (Åm, Solbu, & Sørensen, 2020) invoked in these debates, there is little attention to the diversity of contexts, concrete situatedness, and expressions of these changes. Thus, disciplinary or generational differences are largely ignored. My work challenges the notion of a universal, ideal scientist by emphasizing specific career-stage challenges and concerns. Keeping abstract ideals of good science and scientists at the center of discussions of concerns has stabilized vulnerabilities and “hidden injuries” (Gill, 2010, p. 228) rather than improving conditions. The complex challenges that researchers face invite us to understand that *integrity is not a stable personal quality but an ongoing achievement in practice*.

Third, I reflect on the *concerning collectives* of research integrity debates, in a twofold manner. Various collectives express concerns about research practices, and many of these concerns focus on tensions and friction in the social fabric of research. Therefore, a recurring question throughout the articles is whether the scientific community is capable of ensuring the reliability of knowledge and what is needed for it to do so. In the first article, we showed that the “scientific ethos” (Merton, 1973 [1942]-b), as a set of shared values, no longer seems sufficient to prevent scientific misconduct and fraud. Gradually, the management of research integrity by institutional actors was meant to protect reliability. While more actors have become part of a “scientific self” that manages research, the participants in our focus group perceived a *distance and “alienation”* (Hall, 2018, p. 1) *from institutional actors*, who seem to have lost touch with the concerns of their scientists. Throughout the discussions groups a shared sense of disillusionment was tangible around the idea that logics of competition and individualism hamper the collective pursuit and incentivize questionable authorship practices, reviewer misconduct, or sheer neglect. Further, practices of “academic citizenship” (Macfarlane, 2005, 2006, 2007), such as peer review, mentoring, or support, are poorly rewarded despite their vital importance to good research. Competition logics as well as steep hierarchies limit *question-ability*, namely, who and what can be questioned and criticized during the research process and which vulnerabilities can be shared. This results in multiple *layers of invisibility*, where collaborators are unaware of the challenges faced, the errors made, or the decisions taken. In developing the RESPONSE-ABILITY discussion method, we sought to support early-stage researchers’ response-abilities to speak about concerns in their practice.

Fourth, I reflect on different modes of response to concerns about research practice: *responding with care* and *responding through control* (Mol, 2008). Responses of control are the ones most prominently articulated in research integrity literature, policy, and public discourses. The introduction of more rules and regulations, forms and guidelines, and integrity officers and offices assumes that it is clear what the problems are and where the lines between good and bad practice lie. Individuals merely need to be made aware of the limits and will rationally choose to behave well. Following this logic, the right choices can not only be demanded but also controlled and their transgression punished. Conversely, responses of care do not stop at the “integrity line” but are attentive to the entanglements

and complexities of the many different values and the many different good researches. These two modes of responding to concerns are partly conflicting, partly complementary, and too often disconnected from one another. In the final discussion chapter, I challenge the *push of care practices to the domestic scientific realm* and reflect on the “response-ability conditions” (Felt, 2017b, p. 54) necessary for institutional actors to care for research.

Concluding the thesis, I argue that attuning to concerns about good research practice in practice also contributes to strengthening trust in and within research. Research integrity discourses and institutional efforts tend to focus on abstract ideals of scientific practice, presenting efforts to describe and prescribe them via forms, guidelines, or courses as securing trust in science. Therefore, the basis for trust seems to be less the people or methods producing the knowledge than the institutions to which researchers belong (Gans-Combe, 2022). However, we cannot “integritize” concerns about scientific practice away by establishing more and more means of control: there will always be ambiguities and challenges in good scientific practice, as well as debates about where to draw the line. Instead of understanding research integrity as a stable prerequisite for public *trust in science*, what is needed is to shed light on what people do to make research a reliable source of knowledge and emphasize collective responses as the basis for *trust in research* (Oreskes, 2019). Conceptualizing trust not as passive acceptance of and reliance on knowledge but as an ongoing achievement in practices draws our attention to the capacities and conditions for responding to concerns about good scientific practice. In the long run, we have no choice but to “stay with the trouble” (Haraway, 2016, p. 2) and continuously adapting environments so that researchers can work in them “as well as possible” (Fisher & Tronto, 1990, p. 40).

Chapter 2 Contextual and Conceptual Framing

In the next pages, I will map out the strands of literature, lines of thought, and arguments on which this thesis builds and to which it aims to contribute. I present the sensitizing concepts that shape my theoretical perspective along with the disciplinary, historical, and social contexts and discourses that frame the research. This allows me to carve out my research niche while sharpening the analytical lenses and engaging in critical positioning work.

Credible, reliable, and trustworthy science

Why do we think science yields credible, reliable, or trustworthy knowledge? As blunt as it might seem, this question is at the very heart of my research and will surface in different forms throughout the thesis. Science and technology studies have a long history of reflecting on the practices and processes of research credibility (Shapin, 1994). Vital to many of their co-productive (Jasanoff, 2004) arguments is the notion that there is no such thing as an absolute, universal basis for the credibility of research and the knowledge it produces. Instead, it is the deeply situated outcome of a continuous process of co-evolution of the natural and social order, of science and society. Therefore, we must understand the question of what is good, reliable knowledge at any given moment as entangled with questions about who is doing research, in which social worlds knowledge emerges, and which corresponding politics is at play.

For many centuries, the main guarantee of credible knowledge was the personality and morality of the person producing it. The ideal of the antique philosophers acting out of a deep “love for truth” (Shapin, 1995, p. 394) and dedicating their lives to finding it prevailed for many centuries, merging with ideals of Christian intellectuality. Their honesty was seen as rooted in an active disengagement from worldly desires or material rewards to live lives guided by admiration for the godly creation of truth. With the rise of empiricism during the “scientific revolution” (Shapin, 1996) in the 17th century, a steady conceptual shift occurred towards inductive modes of knowledge production (Ladyman, 2002). This required the simultaneous construction of a social figure that could vouch for reliability (Shapin & Schaffer, 1985). Much like their philosophical predecessors, the veracity of the gentlemen was founded on their virtuosity. Gentlemen were speaking the truth as a matter of honor, and their social

status and financial independence put them above suspicion of tampering with results for their own benefit (Shapin, 1994). Both the philosopher and the gentleman were considered a special sort of people, whose personal integrity guaranteed the integrity of their knowledge (Shapin, 1995).

The epistemic virtues of scientists remained a core reason for deeming science reliable well into the 19th century, but their meaning increasingly shifted towards the virtue of minimizing the intervention and visibility of scientists in the process of knowledge production (Daston & Galison, 2007). Good scientific knowledge no longer drew its authority merely from the personality of its producer but rather from methods of inquiry (Ladyman, 2002; Shapin & Schaffer, 1985). Systemic observation and data collection made possible through technological inventions such as photography allowed an automatization of observations (Daston & Galison, 2007) that should ensure the objectivity of scientific knowledge. Ideas of pure objectivity were later criticized (Harding, 2015), but framing research as such made it possible to position it as a neutral, reliable source of knowledge in times of major societal changes (Jasanoff, 2004). This shift away from individuals towards methods must also be understood against the backdrop of an increasing institutionalization of research, with evermore people pursuing science as an occupation (Weber, 1919).

Over the course of the two world wars, science became more explicitly entangled with society and involved in nationalist warfare. Unease about the instrumentalization of Aryan science in Nazi Germany and Bolshevik science in the Soviet Union made the influence of societal circumstances difficult to neglect (Deichmann, 2020; Kremontsov, 2006). Yet, positivist perspectives that grounded the credibility of science purely in its methods failed to dispel this malaise (Popper, 1959 [1934]). Scholars began to reflect explicitly on the influence of individual convictions and values on the production of research. Most notably, Robert Merton's work (1973 [1942]-b) argued that the "frontal assault on the autonomy of science was required [...] [because it] has led to a clarification and reaffirmation of the ethos of modern science" (p. 268). His highly political writings in war times described the scientific ethos as an inner scientific moral regulatory force, which guaranteed not only the production of reliable knowledge but also science's necessary freedom from dictatorial regimes (see also Polanyi, 1962).

According to Merton (1973 [1942]-b), the scientific ethos, an “affectively toned complex of values and norms” (pp. 268–269), guides and regulates scientists’ path to producing “certified knowledge”(p. 270). His understanding of ethos represented a shift away from basing credibility on the moral superiority of scientists, who Merton considered to be “like other men” (p. 320), and on unique methods and instead put social norms at the center. Scientists would learn, during their socialization, “prescriptions, proscriptions, preferences, and permissions” (p. 269), that is, what is expected, allowed, and sanctioned if transgressed in the scientific community. His description of four central norms forming that ethos was less an attempt to codify them than to capture the dimensions along which the community judges, coerces, and sanctions behavior. He emphasized the collective pursuit and ownership of research (communalism), in which the impersonal character of knowledge would render the religion or nationality of a scientist irrelevant (universalism). He depicted a community where scientists do not act in self-interest but work, unbiased, towards finding results (disinterestedness) and highlighted the importance of rigorous policing and collective scrutiny of one’s work and that of others (organized skepticism).

Although Merton’s work was influential in legitimizing the study of the credibility of research as a social process, it was not spared criticism. In the 1970s, in particular, scholars challenged the rigid functionalist perspective of science and its emphasis on ethos as a social structure regulating knowledge (Sismondo, 2011). They questioned the extent to which norms could actually prevent scientists from inappropriate, deviant, or fraudulent actions (Zuckerman, 1984). They challenged the degree of institutionalization of these norms. In addition to counter-norms diametrically opposed to Merton’s, some situations required secrecy, particularism, self-interestedness, and organized dogmatism on the part of scientists for the production of good knowledge (Mitroff, 1974). Rather than attributing an actual normative force to the norms, scholars proposed to understand them as ideals for science (Mulkay, 1976). These cannot be reached perfectly in practice but describe a desirable direction and powerful tropes for demarcating science from non-science in situations where it is challenged (Gieryn, 1983, 1995). All of this points to a wider shift to conceptualizing the basis of credible knowledge as situated not in structure but in agency and action (Sismondo, 2011).

Science and technology studies (STS) are often described as arising from the critique of these hegemonic functionalist perspectives. In line with a rediscovery of the works of Ludwig Fleck

(1979 [1935]) and Thomas Kuhn (1962) in the 1960s and 1970s, questions concerning knowledge were increasingly approached as social and political ones, focusing on practices rather than stable structures (Pickering, 1992; Schatzki et al., 2001).

Early studies in this vein analyzed historical and ongoing scientific controversies (Bloor, 1976; Collins, 1981). These debates between scientists offered fruitful grounds to observe how knowledge claims come to be accepted as “true”. Controversies about the meaning and plausibility of discoveries (Collins & Pinch, 1993), the reliability of methods and approaches (Collins & Pinch, 1982; Shapin & Schaffer, 1985), or the harm and effects of innovations (Mulkay, 1994; Richards, 1991) were considered privileged analytical moments for understanding the social processes of stabilizing and challenging knowledge. The actors involved in these debates had to make their perspectives, reasons, and tacit assumptions about the issues explicit when positioning themselves (Jasanoff, 2019; Mukerji, 2007). Therefore, analysts believed that the “[s]olutions to the problem of knowledge are solutions to the problem of social order” (Shapin & Schaffer, 1985, pp. xl-xli).

Thomas Gieryn (1983, 1995) proposed to analyze the rhetorical strategies of actors in controversies, which allow them to draw boundaries between good, acceptable science and bad, unacceptable science. He showed how scientists deliberately include, reject, or defend research to protect their authority and the autonomy of research. Speaking of “boundary work” (ibid.) draws attention to the political, interested, and ideological efforts involved in claiming that something is or is not proper research. This deeply constructivist approach has a much bigger aim than analyzing single case studies, instead challenging essentialist claims about science: “[S]cience” is no single thing: its boundaries are drawn and redrawn [in] inflexible, historically changing and sometimes ambiguous ways” (Gieryn, 1983, p. 781).

Despite the flexibility of the boundaries of science, establishing which knowledge is accepted is not purely a social and rhetorical endeavor. Material affordances and non-human actors represent vital allies and tools in the negotiations (Callon, 1986). Anthropologists, who ventured into the natural habitats of scientists, namely, laboratories, from the 1980s onwards, drew attention to the material world and mundane doings of establishing and defending facts (Latour, 1994; Latour & Woolgar, 1986). They highlighted the collectiveness and heterogeneity of knowledge production in practice (Knorr Cetina, 1999). Hence, they also

argued that “[d]istinctions between ‘good’ and ‘bad’ science therefore must go beyond individual actions” (Mody et al., 2020, p. 379). Focusing on the socio-material assemblages of research painted a less heroic picture of science but showed the everyday practices of how researchers craft and struggle when creating, negotiating, and gaining credibility.

Nonetheless, claims about the mundanity of knowledge production and the social construction of science were ill received by scientists/realists, who felt threatened by the overly agnostic claims of social scientists studying science (Gieryn, 1999). What has become known as the “science wars” (Parsons, 2003; Ross, 1996) was a series of publications and conferences in the 1990s where scientists criticized the overly symmetrical approach of scholars studying science (Jasanoff, 2019). Considering the natural and the social as equally important to an analysis threatens to deprive the latter of all grounding in true, natural subjects. The efforts of early STS scholars were thus met with hostility and aggression, based on the belief that a focus on the practices of knowledge production would undermine science’s special status in society.

Overall, we can understand the science wars as arising at a time when the relationship between science and society was increasingly problematized. The tightening entanglement of these two spheres in contemporary knowledge societies (Knorr Cetina, 1999) was accompanied by a fear that society might lose trust in research. However, the intensification of science communication efforts aiming to secure societies’ support received much criticism from STS scholars (Hilgartner, 1990; Weingart, 1988). These efforts focused less on “taking [...] knowledge societies seriously” (Felt et al., 2007, p. 1) and fostering dialogue at eye level but more on dissemination activities with a deficit perspective on societies (Wynne, 1991; Ziman, 1991).

Although science communication efforts have pluralized over the last decades (Felt & Davies, 2020), a reluctance to fully open the “black boxes of scientific facts” (Latour, 1999, p. 23) to the public often remains. “Keeping society close but outside” (Felt & Fochler, 2012, p. 140) seems to be the motto. Hiding the messy processes, ambiguities, and controversies from the public eye and instead focusing on scientific facts is too comfortable (Felt & Fochler, 2013). Yet, societal trust is a far more complex relationship than reliance and belief in research outcomes (Porter, 1995; Wynne, 1996). Society is not passively waiting for scientific

accomplishments but has strengthened its grip on science in recent decades, demanding “socially robust” (Gibbons, 1999, p. C81) knowledge. These overall changes in how science and society relate to each other, ideas about which knowledge is important, and modes of governing and steering research have led to major changes in how academia is being imagined and constructed (Etzkowitz & Leydesdorff, 2000; Nowotny et al., 2001).

Brave new academic worlds

Over the last decades, myriad policy and governance interventions emphasizing science’s accountability to society have reshaped academic institutions to comply with this societal mandate (Irwin, 2008). Processes and tools for auditing academic practices and performances have skyrocketed in numbers (Power, 1994). The delivery of transparent reports about the activities of scientists has installed “rituals of verification” (Power, 1997) that should salvage the fading trust in public institutions, such as science, by making it judgeable from the outside (Shore & Wright, 2000). Nonetheless, these developments have been criticized for failing to create accountability by inviting a public discourse about the role and state of science in society and instead anchoring neoliberal ideas of governance and paving the way for a managerialization of academia (Shore, 2008; Strathern, 2000).

Universities, once hailed as self-governed beacons of enlightenment, have become entrepreneurial actors whose institutional habitus aligns with those of private companies (Clark, 2004; Hackett, 1990). University leadership was empowered to strategically position universities to cater to societal needs, such as the increasing demand to educate knowledge workers and fare well in the global competition of universities (Felt & Glanz, 2004; Krücken & Meier, 2006). The decrease in public funding and the shift towards more competitive money inflows have also come with the implementation of new management practices (Hornbostel, 2001; Lave, Mirowski, & Randalls, 2010). These should allow a more strategic positioning and steering to ensure an efficient and excellent conduct of research (Sørensen & Traweek, 2022).

Across these reorganizations and restructuring of universities, and academia more generally, two major assumptions about “good” research are ingrained in the newly implemented processes and practices. On the one hand, market logics of *competition* are seen to enhance performance. Universities are internationally compared in rankings and scoreboards (Espeland, Nelson, & Sauder, 2007; Weingart & Maasen, 2007), funding is distributed after

competitive processes, with research projects having become the most dominant form (Ylijoki, 2014), and there is immense competition between researchers for rare stable positions (Müller, 2012b; Sigl, 2012). On the other hand is the idea that an *independent and neutral assessment of quality* is possible. Diverse sets of metrics and indicators have been introduced, which assess quality throughout the research system along standardized categories (Burrows, 2012). Abstract numerical values, such as the journal impact factor, citation metrics, or the h-index, have replaced complex qualitative evaluations of peers as the assessment standards. Despite the convincing appearance of numbers, they are far from neutral renderings of quality (Porter, 1995). The global streamlining of numerical quality assessments has not only led to an isomorphism in the research landscape (Espeland et al., 2007) but also decontextualizes and depoliticizes (e)valuations of research (Hartley, Pearce, & Taylor, 2016).

Ethical, moral, and political assessments of research have been successfully pushed to confined spaces, somewhat outside of the research process. There is little discussion or public scrutiny of such issues; instead, specialized committees have been created to assess ethical questions related to research (Felt et al., 2007). However, the framing of ethical concerns in research as requiring detailed expert knowledge often leads researchers to consider themselves not responsible, reducing the researchers' interactions to mere routines (Åm, 2019a) and "bureaucracies of virtue" (Felt, 2017b, p. 49). Similar critiques have been leveled against wider governance initiatives such as the ELSI/ELSA or RRI programs, which should foster ethical, social, and legal reflections about researchers and stipulate social responsibility (Hilgartner, Prainsack, & Hurlbut, 2017; Stilgoe & Guston, 2017). However, it is often unclear how high imperatives should be included in academic practices. Dominant incentive structures rarely reward such initiatives, even appearing to conflict with them at times (Felt, Igelsböck, Schikowitz, & Völker, 2016; Sigl, Felt, & Fochler, 2020). Little attention is being paid to the conditions researchers would need in order to act according to these governance ideals (Åm, 2019b; Felt, 2017b; Viseu, 2015).

STS scholars have criticized the imaginations of academic work and how researchers are portrayed in policy directives (Åm et al., 2020). The idea that steering measures will result in linear change trajectories ignores the work needed to translate these imperatives into concrete action. Felt and Fochler (2010, 2012) coined the term "tacit governance" (p.298) to

attune to the complex, and by no means unambiguous, unfolding of macro-level changes to micro-level practices. They point to the “fault lines and ruptures in academic life arising from the clash of different, sometimes uncoordinated governance logics with the practices, traditions, ideals and experiences existing in the respective academic fields and institutions, which also open new spaces for negotiation and possibilities”² (Felt & Fochler, 2010, p. 298, translated by the author). They argue that governance measures frame research but are not decisive in terms of their concrete effects on (re)shaping researchers’ “epistemic living spaces” (Felt, 2009).

The space that researchers inhabit in contemporary academia consists of a multi-layered assemblage of values, discourses, and relationships in their specific material, spatial, and temporal environments (Felt & Fochler, 2012). The concept of “*epistemic living spaces*” (Felt, 2009) draws our attention to the entanglements of these different dimensions while keeping a clear focus on researchers as the agents of knowledge production (Fochler et al., 2016). In a co-productive vein, it avoids rigid distinctions between micro and macro practices or structures and agency (Felt, Sigl, & Wöhrer, 2010; Jasanoff, 2004) and instead studies the complex ways in which power is exercised on scientists. Hence, it joins a line of critique that challenges the individualization of responsibility and the internalization of audit practices as “neoliberal governmentality” (Foucault, 1991; see also Pyysiäinen, Halpin, & Guilfoyle, 2017) strategies and emphasizes the “intertwinedness of the personal, the institutional, the epistemic, the symbolic and the political” (Felt, 2009, p. 19). While every researcher creates and shapes their personal epistemic living space, there are wider developments that characterize many of them.

Academic careers have fundamentally changed over the last decades. With few stable research positions in the post-doc phase, researchers must become entrepreneurial actors (Shapin, 2008) who have to push their performance and visibility (Fochler & de Rijcke, 2017) to succeed in these artificial bottleneck dynamics (Müller, 2012b). Scoring high on evaluation metrics and accumulating various tokens of quality has become a predominant concern

² Original text in German: „Vielmehr entstehen Verwerfungen und Bruchstellen im akademischen Leben durch das Aufeinandertreffen unterschiedlicher, teils unkoordinierter Governance-Logiken mit den in den jeweiligen wissenschaftlichen Feldern und Institutionen existierenden Praxen, Traditionen, Idealen und Erfahrungen, die auch neue Verhandlungs- und Möglichkeitsräume eröffnen.“

(Fochler, 2016; Fochler et al., 2016). Although the introduction of such metrics was initially hailed as confronting nepotism and instating merit-based hiring by fostering “excellence,” they have led to a narrowing down of evaluative registers (Fochler et al., 2016; Müller, 2012b; Stöckelová, 2012). What counts to make a career in science is numerous publications in highly ranked journals (Felt & Ulmer, 2022; Müller, 2012a), acquiring large sums of third-party funding through research projects (Ylijoki, 2015), successful cooperation with high-performing institutions, and international mobility (Cantwell, 2011; Kim, 2017). Studies report that this normative pressure has tacitly altered the self-perception of researchers, who come to understand themselves mainly based on these academic metrics (Burrows, 2012).

The high pressure to perform well as an individual has also altered the *social fabric of science*. While modes of collaboration have proliferated (Hackett, 2005b; Vermeulen, Parker, & Penders, 2013), extending beyond academia to industry or even societal actors (Schikowitz, 2017), we still observe a “latent individualization” (Müller, 2014, p. 337). Collaboration, within and beyond the lab, becomes a highly strategic endeavor (Felt et al., 2010). With the closest intellectual colleagues also being the fiercest competitors, practices of support are expected to bring academic revenue (Müller, 2012b). The bias of reward systems towards productive activities, such as publishing articles, over reproductive and community-oriented tasks devalues practices of “academic citizenship” (Macfarlane, 2007) and makes the many care practices pivotal to a smooth functioning of the academic system largely invisible (Friese, 2013; Pinel, Prainsack, & McKevitt, 2020) .

These developments are also altering the smallest units of collective academic life, *research groups*. Although there are field-specific differences (Felt et al., 2010), analysts report tensions between older, traditional imaginations of a research group and new corporate logics (Hackett, 2005a). Principal investigators, who are highly skilled and qualified researchers, are drawn out of the labs by a myriad of organizational, bureaucratic, and political duties, transforming them into “managers” of their research units (Casati & Genet, 2014; Davies & Horst, 2015). As a result, the members of their groups find themselves in hybrid positions, such as student-employees, where the aims of these roles might conflict (Müller, 2014). Moreover, groups are instable collective on time, with most members only staying in the same place for a limited period.

Academic mobility is fostered to incentivize scientists to be well connected and become global academic citizens (Balaban, 2018; Davies, 2020a; Kim, 2017; Latour, 2008). They should be allied with many—preferably successful (Schönbauer, 2019)—departments but not reside anywhere too long before securing a stable position (Børing, Flanagan, Gagliardi, Kaloudis, & Karakasidou, 2015; Davies, 2020b). In Austria, this norm is legally inscribed as non-tenured staff must leave the institution after a maximum of 8 years (Felt, Fochler, Müller, & Nowotny, 2017). This results in the tacit exclusion of academics whose private lives and care duties do not allow such uncertainty (Ackers, 2008; Cantwell, 2011; Leemann, 2010). These developments thus contribute to alienating researchers from research institutions (Hall, 2018). As “[a]cademics are no longer treated as constitutive members of the university but as its employees, an individualized proletarian workforce” (Shore, 2008, p. 289), institutions are less likely to become important frames of reference guiding researchers’ actions.

Hence, the changing temporalities of academia are not innocent re-orderings but are tied to deeper “chronopolitics” (Felt, 2017c, p. 53). In addition to the changing rhythms of employment and research work (Ylijoki, 2015), the constant feeling of acceleration (Rosa, 2013) affects how knowledge is produced. Researchers feel that they are expected to deliver more in a shorter amount of time (Fochler et al., 2016), a phenomenon often referred to as “publication pressure” or “publish or perish” (e.g., Sigl et al., 2020). Time is commodified, seen as a resource, and increasingly imagined as “project time” (Ylijoki, 2015, p. 94) that can be accounted for, even though this does not necessarily match the “process time” (p.95) needed for research to be conducted. Academic “timescapes” (Adam, 1998) are becoming fragmented, that is, the landscapes of times do not align well or even conflict (Ylijoki & Mäntylä, 2003). This is also tangible in the need to anticipate the outcomes of research before even conducting it. Researchers must present convincing promises about the benefits their research might bring in the future (Felt et al., 2007) without being able to anticipate their own medium-term academic futures (Adam & Groves, 2007; Felt, 2015).

All of this makes it difficult for novice researchers to develop a sense of belonging and stability when crafting and furnishing their epistemic living spaces (Schönbauer, 2018). Studies report a sense of disappointment in the mismatch between scientists’ expectations of academic careers and their actual experiences (Felt & Fochler, 2013). The environments in which they are socialized are characterized by high degrees of uncertainty and anxiety, which tacitly

govern how they make sense of academic work (Sigl, 2016). Socialization into research seems less focused on an intimate, caring transfer of academic values and norms and instead conceptualizes early-stage researchers as a cheap labor force. Speaking of PhD and master's students as the "next generation of scientists" (e.g., Campbell, 2003, p. 897) is thus partly misleading because it overlooks the fact that most will not have a career in academia (Nicholls, Henry, & Dennis, 2021) as well as the "epistemic importance" (Wylie, 2021, p. 145) that early-stage researchers already have in early stages (Wylie, 2021). They are not only the biggest academic group by numbers but are also vital to the time-intensive, messy manual labor of gathering and analyzing data (Delamont & Atkinson, 2001).

Although research depends on the affective labor involved in these processes (Frieze, 2013; Pinel et al., 2020), the emotional involvement of researchers in research receives little attention (Bell & Sinclair, 2014). When it does, the focus is on emotions that align well with productive, neoliberal, and entrepreneurial logics, such as a passion for science (Schönbauer, 2021; Weber, 1946). What has been much less discussed is how imperatives of dedication are subjectivized (Pyhältö, Peltonen, Anttila, Frick, & de Jager, 2023; Sigl, 2012, 2019) and result in "hidden injuries" (Gill, 2010, p. 228). Analysts have been warning for decades of "a deep, affective, somatic crisis [that] threatens to overwhelm us" (Burrows, 2012, p. 355). Scientists report being stressed, burned out, exhausted, and anxious and cracking under the immense pressure (Gill, 2010; Sparkes, 2007). Surveys suggest widespread struggles with mental health problems among researchers, with early-stage researchers being particularly affected (Levecque, Anseel, De Beuckelaer, Van der Heyden, & Gisle, 2017; Metcalfe, Wilson, & Levecque, 2018). Increasingly, voices are raised that question the influence of researchers' well-being on their capacity to produce knowledge (Creaton, 2021; Wellcome-Trust, 2020).

All of this paints a picture of epistemic living spaces as being under increased tension (Hackett, 2005a). The shelves of the STS library at my department are full of PhD theses concerned about the state of academic affairs and how the changes over the last decades have not only altered researchers' lives but also affected the knowledge they produce (Müller, 2012b; Schikowitz, 2017; Schönbauer, 2018; Sigl, 2012). In the next pages, I map out the discourses and observations showing that strained conditions contribute to situations where research and its practices become a "matter of concern" (Latour, 2004).

The good, the bad, and the ugly research

In light of the profound changes academia has undergone, analysts and observers raise critical questions about how the transformation of reward systems, careers, research groups, and institutional belonging has influenced knowledge production (Felt, 2009; Schönbauer, 2018; Sigl, 2012). Journals, policy discourses, and commentary websites about the state of academic affairs display a shared unease and discomfort about what research is published and how (Beall, 2012; Jackson, Walter, Daly, & Cleary, 2014), whether the mechanisms for quality control are sufficient (Didier & Guaspere-Cartron, 2018; Ferguson, Marcus, & Oransky, 2014; Woodgett, 2012), and which social fault lines become visible (Edwards & Roy, 2017; Hackett, 2005a).

Studies report a growing skepticism and vigilance of researchers towards published literature (Neufeld, Hinze, & Hornbostel, 2014; Shapin, 1995). At a time when scientific papers have become a proxy for academic excellence and are decisive for research careers (Sigl et al., 2020), worrisome publication practices seem to be commonplace. Often, only results that fit a hypothesis are presented, and control groups are neglected for the sake of producing a publishable argument (Fanelli, Costas, & Ioannidis, 2017). The tendency to gather more data than necessary and selectively report only the significant results has led the p-value, a statistical test for the significance of results, *ad absurdum* (Raj, Patil, Sarode, & Salameh, 2018). Consequently, it is unsurprising that large parts of the published literature are not (easily) reproducible (Baker, 2016; Peterson & Panofsky, 2021). Attempts to explain the difficulties also point to the reduced reporting of methodological details, either because there is too little dedicated space in publications or, deliberately, to keep competitive advantages (Stewart et al., 2021; Stodden et al., 2016). Thus, the production of large quantities of papers to prevail in academic competition (Fochler et al., 2016) is believed to cause the involuntary side effect of people trying to play the system (Biagioli et al., 2019). This has also contributed to the rise of numerous questionable, “predatory” publishing outlets, where authors simply pay to be published (Memon, 2018).

What makes these concerns pressing is that they show the limits of traditional academic quality-assurance systems (Benedictus, Miedema, & Ferguson, 2016; Wager, Singhvi, & Kleinert, 2015). In most fields, reading everything that is being published is becoming

impossible, and ideals of organized skepticism (Merton, 1973 [1942]-b) and the automatic self-correction of research (Peterson & Panofsky, 2021; Stroebe, Postmes, & Spears, 2012) are weak as a result. Although some argue that the rising numbers of corrections and retractions prove that the system is functioning (Fanelli, 2013), others see them as alarming signs to fundamentally rethink academic publication processes (Montgomery & Oliver, 2017). Additionally, peer review, a long cherished but little rewarded (Aczel, Szaszi, & Holcombe, 2021) corner-stone of academic quality control, cannot deliver control beyond a probability check, at best spotting mistakes and irregularities (Dadkhah, Kahani, & Borchardt, 2018; Mervis, 2014). On the contrary, it has also been accused of enabling biased and abusive reviews under the veil of anonymity (Radun, 2023). Articles report reviewers stealing ideas, deliberately prolonging the review process to publish their articles first, or artificially increasing their own citation index (Csizsar, 2016; Mervis, 2014; Pinholster, 2016).

In response to these observations, new formats of quality control have emerged. Algorithmic forms of control increasingly support the detection of problematic research: plagiarism detectors (Luke & Kearins, 2012), image manipulation software (Pearson, 2005), or statistics checkers help editors to filter questionable publications before they are published. “[N]ew watchdogs” (Didier & Guaspare-Cartron, 2018, p. 165) have also appeared. Blogs such as *Retraction Watch*³ report about retractions and investigate cases of scientific misconduct (Oransky, 2020). The online journal club *Pubpeer*⁴ facilitates post-publication peer review (Townsend, 2013) and also offers a browser plugin that alerts researchers if any article has been discussed (Barbour & Stell, 2020). Criticizing papers after they are published and making these discussions visible extends review processes beyond the publication and distributes responsibility beyond single editors and peer reviewers (da Silva, Al-Khatib, & Dobranszki, 2017; Townsend, 2013). These developments are in line with wider efforts to make research practices more transparent and remedy concerns by opening methodologies, codes, and results to others’ scrutiny (Mirowski, 2018). Pre-print servers, such as ARXIVE, not only allow researchers to claim the priority of discoveries independently of editorial processes but also provide spaces for lively debates on results and claims (Reyes-Galindo, 2016). Further, the

³ <https://retractionwatch.com/>

⁴ <https://pubpeer.com/>

possibility to pre-register studies should ensure that scientists only report on what they set out to study and not coincidental findings (Simmons, Nelson, & Simonsohn, 2021).

Besides the unease about publication processes and the challenges of traditional quality-assurance measures, the explicit and tacit social changes in research generate concerns. Living in a research world where the closest peers are also the fiercest competitors and collaboration is a highly strategic decision creates numerous issues (Edwards & Roy, 2017; Fochler et al., 2016). In addition to abuses of power by peer reviewers (Haffar, Bazerbach, & Murad, 2019), co-authorship has come under scrutiny. Disputes arose about unearned positions on papers, and responsibilities for a publication are not easy to pin down (Felt & Ulmer, 2022). As new partners and funders from the private sector become more important, concerns arise about potential conflicts of interest or implicit biases (Krimsky, 2013).

The interest in mental health issues has led to the publication of concerning statistics, bringing researchers' living conditions under scrutiny (Creaton, 2021; Gill, 2010). This is especially true for early-stage researchers, who have become a more essential working force in academia. They find themselves in dependency structures, in which the line between work and exploitation is blurred as they perform unpaid overtime work and face undue pressure (Levecque et al., 2017; Valeix, Moss, & Morris, 2021). These controversies are highly sensitive issues, deeply embedded in the fabric of personal relationships, which makes them not only invisible but also difficult to judge from the outside.

The most sensational array of concerns by far are cases of scientific misconduct and fraud, which have gained much attention within and beyond the scientific community (Kjaergaard, 2011; Montgomery & Oliver, 2017). In particular, high-profile fraud cases in which researchers fabricated, falsified, or plagiarized results for their own gain are closely followed (Park, Jeon, & Logan, 2009). Reports about the rising star of physics, Jan Hendrick-Schön (Felt, 2005), stem-cell guru Hwang Woo Suk (Park, 2020), or, more recently, the accomplished psychologist Diederick Stapel (Markowitz & Hancock, 2014) are tremendously bad news for a system that relies on the honesty and trustworthiness of its practitioners (Penders, 2018). Although these instances are comparatively rare (George, 2016), they are often used by analysts to showcase the flaws of contemporary academia and insist on the need to study the integrity of research.

Under the umbrella term of “*research integrity*”, analysts and policymakers have gathered over the last decades to study the somewhat elusive set of concerns about the production, dissemination, and assessment of research (Forsberg et al., 2018; Labib et al., 2021; Mejlgaard et al., 2020; Sorensen et al., 2021; van Hoof et al., 2023). More articles are being published, theses written, journals created,⁵ and world conferences for research integrity organized (Dejo-Vasquez, Lescano, & Perez-Carreno, 2021) that analyze the different threats to good scientific practice. The sheer amount of funding that scholars have attracted, on national and international levels,⁶ to study “what is wrong with science” both testifies to the depth of the unease that research integrity is supposed to address and participates in steering and shaping the concern that “something is wrong” (see also Peterson & Panofsky, 2023).

While entire research fields dedicate their epistemic efforts to studying the making and unmaking of valuations and emphasizing the situated complexities of “good” research, (Dussauge, Helgesson, & Lee, 2015; Helgesson & Muniesa, 2013), research integrity scholars are astonishingly univocal in their responses, describing good research as research that is not bad. The idea that all “goods” align without conflict results in a situation where labels of “*good research*”, focusing on researchers’ concrete practices, “*good scientific practice*”, indicating a range of expected behaviors, “*good science*” as an overarching category including the contribution of science to society, and “*research integrity*”, as a specific disciplinary and political rendering, are used interchangeably.

Questions of good scientific practice and scientific misconduct have always accompanied research in some way (Roberts, 2020b). However, they began to be publicly discussed in the 1980s and 1990s. These decades were characterized by a shifting relationship between science and society and increasingly pervasive audit logics (Power, 1994). Trust was no longer granted to professional societies as such, with transparency and accountability becoming the means to earn it (Power, 1997). This is evident in research integrity studies, which place their

⁵ For instance: <https://researchintegrityjournal.biomedcentral.com/>

⁶ Among others: <https://rri.univie.ac.at/en/research/research-projects/completed-research-projects/borderlands-of-good-scientific-practice/>; <https://embassy.science>; <https://eneri.eu/>; <http://entireconsortium.eu/>; <http://h2020integrity.eu/>; <https://path2integrity.eu/>; <https://printeger.eu/>.

origin as a field in the study of publicly discussed misconduct cases (Resnik, 2003; Steneck, 1999), legitimizing their pursuit as a contribution to safeguarding scientific trust (Ampollini & Bucchi, 2020; Yarborough, 2021).

To make sure that scientists “deserve” (Yarborough, 2021, p. 456) societal trust, an emphasis has been put on finding the “correct” definition of wrongdoing to police it accordingly (Hermerén, 2014; Steneck, 2006). The boundary work of establishing definitions of misconduct (Gieryn, 1983), when scientists and scientific societies challenged the propositions of national committees in the 1980s and 1990s (Aldhous, 1991), has been largely forgotten. Definitions are presented as ahistorical depictions of good and bad practices (Roberts, Sibum, & Mody, 2020). Falsification, fabrication, and plagiarism (FFP) have become conventionalized as the three mortal scientific sins undermining the truthfulness of and trust in research (Kuroki, 2018). These misdeeds, which are condemned by most social groups as some form of stealing and lying (Zuckerman, 1984), have been complemented by a range of “questionable research practices” (e.g., Kaiser, Drivdal, Hjellbrekke, Ingierd, & Rekdal, 2022; Ravn & Sorensen, 2021). Withholding of information, p-hacking, guest or ghost authorship, exaggerating claims, power abuse, gaming of academic indicators, biased reviews, and self-plagiarism are among the practices on extensive lists that describe what characterizes researchers and research of integrity (Biagioli et al., 2019; Fanelli, 2012; Ravn & Sorensen, 2021).

While the urge to cluster the hybrid, messy observations of problematic behavior into stable categories comes naturally to the modern mind (Latour, 1993; Law, 1994), attempts to bring and keep order are far from neutral endeavors (Bowker & Star, 2000). Research integrity scholars and policymakers often orient their work along realist, positivist understandings of science (Davies & Lindvig, 2021). Not only are these perspectives more philosophically compatible with the natural sciences than other types of science (de Rijcke & Penders, 2018), but they also support an (international) standardization and homogenization of institutional responses (Resnik, 2009). Over the last decades, research integrity has become professionalized, epitomized, for instance, by the introduction of new roles in universities, such as “research integrity officers” (e.g., Kalichman, 2020). Peers are no longer the main judges of academic reliability and credibility when it is questioned as standardized assessments of good and bad practices become widespread.

Universities have become major arenas for implementing governance tools and rules (Bouter, 2020; Mejlgaard et al., 2020; Sorensen et al., 2021). Guidelines have long been a prominent way to signal an institutional commitment to safeguarding the integrity of research (Frankel, 1989; Montgomery & Oliver, 2009). They present universal norms and/or values (Horbach & Halffman, 2017) about good research and outline the concrete processes for investigating and sanctioning transgressions. Institutionalization at universities focuses on outright misconduct because these cases are particularly uncomfortable when they attract public attention (Frantz, 2018). Therefore, university guidelines represent a crucial element in the reputation management of universities and have become obligatory institutional accessories (Wessels, Visagie, & Van Heerden, 2015).

Moreover, guidelines outline the concrete procedures and committees responsible for investigating accusations of scientific misconduct. These institutional bodies should ensure a proper and fair investigation, mediate between conflicting parties, and issue sanctions if necessary (Universität-Wien, 2008). This kind of institutional space must be implemented to protect whistleblowers and accused scientists alike in often messy and emotionally distressing situations (Bouter & Hendrix, 2017; Hermerén, 2014; Olesen, Amin, Mahadi, & Ibrahim, 2019). Counteracting suspicions of biased investigations, many countries also founded national bodies advising universities on matters of research integrity (e.g., the Austrian Agency for Research Integrity⁷) and offer independent assessments when a university's integrity is called into question.

Institutional responsibility is further expressed in efforts to oblige particularly young researchers and students in particular to take part in integrity training and courses about the responsible conduct of research (Phillips, Nestor, Beach, & Heitman, 2018; Sarauw, Degn, & Ørberg, 2019; Sefcik, Striepe, & Yorke, 2020). The logic that is repeatedly uttered is that teaching students about the rules early on prevents misconduct (Olesen, Amin, & Mahadi, 2018). Hence, it is the responsibility of universities to ensure that scientific values and norms are known to the novice scientists they train, which implies that these are not sufficiently conveyed in socialization processes but need to be formalized. The pedagogies of such courses have, however, been criticized for leaving little room for discussion and reflection and

⁷<https://oeawi.at/>

instead iterating stable ideas of rules without giving guidance on how to live up to them in everyday life (Hangel & Schickore, 2017; Hyytinen & Löfström, 2017; Phillips et al., 2018).

Institutions' interactions with their researchers are described as highly formalized. They follow a rational choice model of action, where researchers must merely be made aware of the scientific rules and will act accordingly. Yet, studies that interviewed researchers contest this idea, showing that researchers do not regard institutional regulations as reference frames or even read them (Davies, 2019; Schuurbiers, Osseweijer, & Kinderlerer, 2009). With new methods, there is always the danger that even well-intended efforts will be reduced to mere "bureaucracies of virtue" (Felt, 2017b, p. 49) that stabilize the logics of accountability and control instead of opening the way for more complex understandings of value and responsibility. Therefore, the vast array of institutional governance tools has been criticized as "individualization of [...] responsibilities" (Valkenburg, Dix, Tjldink, & de Rijcke, 2021, p. 9) or "responsibilization" of individuals (Amsler & Shore, 2017, p. 123). This criticism does not downplay individuals' duty to do their research as well as possible but challenges the assumption that introducing rules, guidelines, courses, or committees for research integrity is sufficient, deflecting deeper reflections about more systemic, cultural, and environmental changes (Davies, 2019; Valkenburg, Dix, Tjldink, & de Rijcke, 2020).

The focus on individual accountability and control also has epistemic roots in how concerns about good scientific practice have been studied (Aubert Bonn & Pinxten, 2019). Scholars studying scientific misconduct and questionable practices often work with retrospective case studies (DuBois et al., 2013; Park et al., 2009). This has stabilized the idea that wrongdoing is clear and judgable from the outside, focusing the issue on what can be done to prevent it and who is to be blamed. The disciplinary background of many research integrity scholars in criminology, psychology, and philosophy may have reinforced a pathological perspective on scientists. Additionally, a new discipline/socio-scientific movement has developed around meta-science, whose scholars try to quantify problems by analyzing big data on articles, retractions, and citations (Peterson & Panofsky, 2023). This approach is not only criticized for the assumptions it makes about research practices in order to make them countable but has also contributed to the framing of research integrity as a crisis (Peterson & Panofsky, 2023). Invoking a crisis narrative shapes the debate as requiring an immediate response (Müller, 2021). There is little room for questioning whether observations actually point to a crisis

(Peterson & Panofsky, 2021) and whether assumptions about good science might apply to all disciplinary backgrounds. Some practices that may nominally count as questionable practices may be legitimate in specific situations (Sacco, Brown, & Bruton, 2018).

Researchers and their perspectives on transgressions of good practice remained invisible for a long time in research integrity studies. The focus on studying the “*integrity of research*” (Mody et al., 2020, p. 373) to demonstrate the reliability of science as an institution to the public has sidelined the question of “*integrity in research*” (p.373). The processes whereby scientific collectives continuously assess quality, draw boundaries, and situate good scientific practice in their working environments, independent of any integrity policies, have been left out. Scholars who put researchers and their experiences at the center report a mismatch between rigid understandings of good/bad practices and researchers’ everyday lives (Davies, 2019). Reports show that researchers are largely unaware of the research integrity policy discourse or institutional measures and sometimes even struggle to implement abstract imperatives in their practices (Aubert Bonn & Pinxten, 2021; Hangel & Schickore, 2017). In studies that allow them a degree of freedom to transcend pre-defined categorizations of good and bad practices and are not morally overcharged, they highlight their concerns about how some forms of misbehavior have become “normal” (De Vries, Anderson, & Martinson, 2006, p. 43).

While researchers acknowledge their own responsibility to be more diligent and careful in their processes (Sigl et al., 2020), they portray a more complex understanding of responsibility for good research. They call for an “ethics of a system” (Davies, 2019, p. 1235) and, hence, resist the idea of separating research integrity debates from wider practices of doing research in academic cultures characterized by high tension and friction. They are worried about how the research conditions in which they live, where academic careers are characterized by uncertainty (Sigl, 2016), logics of competition change how they relate to their peers (Edwards & Roy, 2017), and incentive systems reward practices that hinder their ability to do good research (Aubert Bonn & Pinxten, 2021), have fundamentally altered knowledge production negatively.

The research integrity literature and policy world are also slowly engaging in reflections on the relationships between research environments, atmospheres, and cultures and how they

frame and constitute researchers' capacity to produce good research (Edwards & Roy, 2017; Ploder et al., 2023). A growing number of stakeholders, such as journals, funding agencies, and scientific societies, are actively included in the debates about good scientific practice, participating in conferences and being interviewed and invited to focus groups (Haven, Pasman, Widdershoven, Bouter, & Tjldink, 2020; Tomic, Buljan, & Marusic, 2022). Although all groups seem to agree that academic systems are not perfect and might enable imperfect behavior, none of the actors feel responsible for initiating fundamental change (Davies & Lindvig, 2021). Even if notions such as "integrity culture" appear more frequently in research integrity literature, suggesting a more complex relationship between individuals and their institutions, they are little substantiated and tend to remain rhetorical or residual categories (Valkenburg et al., 2021). At this point in time, it is unclear whether research integrity might become a lever to change the troubling conditions of research, which have been criticized for decades. But even such well-intended efforts have so far failed to steer systematic changes, and there is a risk that they will once again be reduced to individual responsibilities (Valkenburg et al., 2020).

Matters of concern and care

In this thesis, I take the unease about how researchers produce, disseminate, evaluate, and collaborate in contemporary academic research seriously, without relying on rigid categories of misconduct and moralistic jargon (Peterson & Panofsky, 2023; Roberts et al., 2020). These debates suggest that it is clear what the problems are and how they must be tackled, but this has proven far more complex in practice (Davies, 2019; Hangel & Schickore, 2017). What is almost lost in these debates is why "we" perceive practices to be concerning in the first place. When do research practices become "matters of concern" (Latour, 2004, 2008)? For whom are they concerning, and are the different concerns related? In line with Latour's proposition to attune to the concerns at the heart of debates, I develop a critical perspective that does not rely merely on debunking simplistic and moralistic perspectives on research and researchers but assembles the many concerns in and around them.

However, attuning to matters of concern is more than a diplomatic attempt at criticizing research integrity debates without deconstructing them (Michael, 2017). Looking at the debates through a "matters of concern" (Latour, 2004) lens comes with the ontological

awareness that research integrity is not one single, universal thing but is enacted in multiple forms by different actors (Davies & Lindvig, 2021). But whose concerns are we talking about? Those of policymakers, researchers, students, specific disciplines, research integrity scholars, or even society? Whose concerns are the most visible? Which ones remain invisible in the debate? How do the different concerns align or not? I want to challenge the overly unifying “aesthetic” (Latour, 2008, p. 27) of research integrity debates, which suggests not only a consensus on what is concerning but also that all these concerns seamlessly align with each other. Presenting long lists of concerning practices implies that these are clearly distinguishable and hides the “value conflicts” (Helgesson & Bulow, 2021, p. 113) between them.

Behind the apparent clarity about what the problem is, concerns are in fact not stable over time but change along with their socio-epistemic environments (Mody et al., 2020; Roberts et al., 2020). Although words such as “plagiarism” have been around for a while, what we are concerned about or how we respond to this concern has radically changed with the advent of the internet (Satija & Martinez-Avila, 2019). Part of methodological advancement in science has always been boundary work about the concerns at its edges (Gieryn, 1995; Shapin & Schaffer, 1985). This makes historical comparisons particularly challenging because some practices that we might consider troubling today may have been judged differently at the time (Roberts, 2020a). Therefore, examining matters of concern requires looking beyond a single research practice to reflect on “the whole earth and heavens that have to be gathered to hold it firmly in place”, as Latour (2004, p. 246) poetically put it. Consequently, we cannot regard concerns about research practices as detached from wider concerns in contemporary academia, science–society relationships, or an overarching sense of global crisis. Even if research integrity debates have managed to carve out an arena for discussing concerns, seemingly separate from wider developments, these never occur in a vacuum but evolve with the research worlds they are part of.

Yet, a matter-of-concern lens provides only a meager analytical repertoire for criticizing the political and ethical dimensions of these vast assemblages of concerns. Extending my analytical lens to look not only at “matters of concern” (Latour, 2004) but also at “matters of care” (Puig de la Bellacasa, 2011, 2017) allows me to draw on a wide spectrum of feminist STS critiques and reflections (Lindén & Lydahl, 2021; Martin et al., 2015). Critiques do not stop at

specific concerns but shed light on the affective and relational work that researchers, policymakers, and analysts do to care for/about concerns regarding research practices (Tronto, 1993).

This entails challenging a purely rational understanding of good research, which reduces individuals to their rational choices to acting according to abstract ideals and rules (see Haven & van Woudenberg, 2021). Abstract norms offer little guidance in specific situations and only seem straightforward from a distance, hiding the many messy yet vital care practices that sustain research (Mol, 2008). Thinking about the ethical questions at the heart of integrity debates in line with an “ethics of care” (Gilligan, 1982; Tronto, 1998) draws attention to the *practices* of doing good, the feelings and relationships that matter to do good. It is not a sanitized perspective on practices that ignores the emotions involved in making research or being concerned about it (Friese, 2013; Mody et al., 2020; Pinel et al., 2020); instead, it considers them an integral part of living with the ideals of good scientific practice in practice.

Turning away from a rational choice logic of good research towards a situated understanding of good practice also implies refusing to clearly categorize and label the care practices involved in making research good (Martin et al., 2015). Although not uncontroversial, this is also a deliberate move to keep the questions and responses to concerns about good research an ongoing process (Mol, Moser, & Pols, 2010), not only because some care practices might be right in some situations and harmful in others (Müller, 2012b) but also to invite a reflexive stance that avoids reducing our perspective to a limited set of criteria for imagining and judging “good” research (Jerak-Zuiderent, 2018). Therefore, my aim is not to create new caring codes of conduct but to contribute to a story that challenges dominant narratives and looks beyond what is already being discussed (Petersmann, 2021).

In doing so, the goal is not a “return” to a perfect research world that some analysts nostalgically promote (Ylijoki, 2005). Paraphrasing an oft-cited definition of care, the best we can do is “to maintain, continue, and repair our ‘world’ so that we can [*research*] in it *as well as possible*” (Fisher & Tronto, 1990, p. 40, paraphrased and emphasis added by author)⁸. While the promise that research integrity initiatives may make it possible to control a vast set

⁸ Original quote: “to maintain, continue, and repair our ‘world’ so that we can live in it as well as possible” (Fisher & Tronto, 1990, p.40).

of concerns may be comforting, it ignores the fact that research will always be imperfect and full of ambiguities, challenges, and concerns (Mol, 2008). As researchers, we will continuously have to “attend to what should not have been possible” (López Gómez, Callen, Tirado, & Domènech, 2010, p. 82). Care studies in the medical realm highlight the tenacity and patience that care-full engagement requires, where we cannot make an illness disappear but have to live with it (Mol, 2008). If we are serious about engaging with the concerns about good scientific practice, we must continuously “stay with the trouble” (Haraway, 2016, p. 2) and re-evaluate and adapt how we take care of our research worlds.

This does not necessarily mean installing new forms of institutional care practices but rather “unsettling” (Murphy, 2015, p. 665) the many care practices already vital to knowledge production (Frieze, 2013; Pinel et al., 2020). Care practices and sensitive attachments are too often sidelined and hidden to make research look more legitimate (Harding, 2015). Care practices are generally poorly rewarded in contemporary academia, making an in-depth caring engagement a “luxury” (Müller, 2012b, p. 145) reserved for people with sufficient academic resources. Yet, many of the concerns outlined above are about issues of care. However, this often results in an accusatory stance blaming actors for not having cared enough. In contrast, what these concerns tell us about the vulnerabilities and “hidden injuries” (Gill, 2010, p. 228) of changing academia receives much less attention. Awareness can only slowly extend beyond the concrete concerning practices to reflect the influence of reward structures (Aubert Bonn, 2020) and “research integrity cultures” (e.g., Lerouge & Hol, 2020) or a “responsible research climate” (Haven, 2021, p. 17). Still, these accounts rarely manage to develop a critical perspective that challenges core (neoliberal) assumptions about research and their tendency to individualize problems. Studies even suggest that well-intended ideas of instilling a “culture of integrity” end up as additional demands and burdens for researchers (Valkenburg et al., 2021).

Approaching situations in which research practices become matters of concern also means highlighting the relationships and interdependence of actors in the scientific system (Barad, 2007; Haraway, 2008; Mol, 2008). Interventions are frequently directed at individual scientists, imagined as abstract, career-stage, and disciplinary independent entities (cf. Åm et al., 2020). This makes the power structures and vulnerabilities that shape researchers’ room for maneuver invisible. How does the embedding of researchers in specific socio-institutional

contexts influence their capacity to do “good” research? Which support or hindrances are there? It is important to extend the issues of care beyond the “domestic” realm of researchers and their laboratories and explicitly make the care practices of other actors visible (Tronto, 1998). This is not intended as an accusation of institutions not caring enough but an invitation to make a speculative commitment (Puig de la Bellacasa, 2017) and experiment (Mol et al., 2010) with what caring institutions could look like.

Response-ability

A different conceptualization of how to approach the concerns about research practices and attend to them with care also requires reimagining responsibility beyond ideas of control. Thinking of good scientific practice not only as accountability but following how responsibility is enacted by researchers enables an awareness of the many-faced “response-abilities” (Barad, 2007; Haraway, 2008) at stake. Others have pointed out that in complex situations, where the causalities of concern and harm might not be straightforward, characterizing responsibility as abstract expressions of accountability is insufficient for actually improving a situation (Peltola & Heikkilä, 2015; Petersmann, 2021). Speaking of response-ability as a caring responsibility (Moriggi et al., 2020) casts a much wider focus on the potential responses that all involved actors might give as well as the skills and capacities needed to respond in practice (Schrader, 2010). Therefore, response-ability is a political rendering of responsibility that does not uncritically accept what being response-able entails but rather acknowledges an ongoing need for mutual responsiveness and attentiveness (Barad, 2007; Haraway, 2008).

Response-ability argues for a situated understanding of responsibility not as abstract, universal moral duties but always looking at what people (can) do to respond. Responsibility is never “from nowhere and for everyone” (Jerak-Zuiderent, 2015, p. 412), even if policy documents might suggest so; instead, it is always “from somewhere and for someone” (p.412). This requires us to acknowledge the actual capacities that enable a response (Brown & Dilley, 2012; Peltola & Heikkilä, 2015). Early-stage researchers have capacities, capital, and skills that differ from those of more advanced researchers and are involved in specific parts of research processes (Delamont & Atkinson, 2001). Different disciplines necessitate different skill sets and operate in different socio-technical assemblages that shape what kinds of responses are necessary/possible (de Rijcke & Penders, 2018). Universities have vastly different national support and funding mechanisms, modes and temporalities for engaging

with their researchers and students, and means of intervention/limiting their researchers' freedom (Labib et al., 2021; Ščepanović, Labib, Buljan, Tjink, & Marušić, 2021). There are different legal frameworks enabling or preventing responses (González Fuster & Gutwirth, 2016). Journals might have different needs and means of checking results, correcting them, or offering room for reflection (Hesselmann, 2023).

Moreover, these abilities to respond are not independent of one another (Haraway, 2012). The responses of one actor may conflict with, support, mitigate, nourish, marginalize, or pre-dispose the response-abilities of others (Baan Hofman, 2023; Tronto, 1998). Additionally, we are not equally response-able. Looking at response-abilities entails embracing feminist questions about power and how it is enacted. However, a collective idea of responsibility does not mean that we can simply deflect responsibility onto others but demands constant attentiveness to how we can respond (Barad, 2007). This makes response-ability an ongoing, procedural responsibility that is not geared towards claiming control of a perfect world but towards an awareness of our constant need to be responsive to challenges and concerns (Mol, 2008).

It would seem easy to dismiss a situated, procedural understanding of responsibility as relativist, fearing that a nuanced perspective on good research might open the door to normalizing questionable behavior (e.g., Sarauw, 2021). On the contrary, I would argue that it comes with a deeper obligation to the contexts in which it is situated (Baan Hofman, 2023). Without taking actual abilities to respond seriously, we merely keep window-dressing the underlying pathologies (Ahmed, 2007; Viseu, 2015) or burying the concerns in bureaucracy (Felt, 2017b). Understanding responses as active and as practices (Schrader, 2010) also means acknowledging the temporal, financial, or social resources necessary for responding (Puig de la Bellacasa, 2015; Tronto, 1993). Integrity efforts often focus solely on raising "awareness" (e.g., Barrett, Funk, & Macrina, 2005; Zhang, Lin, Zhang, & Ye, 2021) and leave little room for what happens in actual situations. Which support and conditions does one need to be response-able (Felt, 2017b)? Do research integrity initiatives just add other, unpaid work that gives little importance to the concrete context? "Cui Bono?" (Star, 1991, p. 43).

Speaking of response-ability always involves an attunement to the limits of what is actually possible in a given situation (Mol, 2008). We must not turn away from them and merely

accept them but “acknowledge that some things do not work well, no matter how well intended they may be” (p.88). Mol suggest that this requires “an entirely different accountability practice. Not one in which everyone has to say how wonderful they are, but one in which people feel safe enough to examine what in their practices tends to go wrong and why” (p.88). This holds true not just for researchers, whose practices are under scrutiny, but also for all other actors involved. Therefore, response-ability draws attention to actors’ “willingness to respond” (Martin et al., 2015, p. 634). There might be good reasons for not responding, even when an answer appears obvious from the outside. For instance, whistleblowing, though often framed as a moral duty, may lead to major retaliation against the ones raising concerns (Stein, 2019).

But response-ability does not come with a clear prescription of what is expected; it is instead a curious, anticipatory engagement (Adam & Groves, 2011; Martin et al., 2015). It focuses not only on retrospectively clarifying who should have acted more responsibly but also on cultivating a sense of resilience (Peltola & Heikkilä, 2015). It involves a “speculative commitment” (Puig de la Bellacasa, 2011, p. 85) tinkering ,which may involve a degree of experimenting and (Mol et al., 2010) with which responses are possible and which ones should be. Can research integrity debates enable collective reflection and responsiveness, where we can slow down “to create a space for hesitation regarding what it means to say ‘good’” (Stengers, 2005, p. 995) research, “good” (scientific) practices, and “good” science?

Putting the *responses* to concerns at the center (Baan Hofman, 2023) allowed me to move beyond seemingly clear “top-down” and “bottom-up” ideas of responsibility for “good” research (e.g. Glerup, Davies, & Horst, 2017; Sigl et al., 2020). A distinction between “formal” and “everyday”, “caring” responsibility re-enforces not only the categorization of responses but also ideas about who can even respond and how. A constant critical assessment of what and how someone is responding moves away from pre-established ideas and makes room for nuances, making care visible in the most formalized enactments of responsibility and urging institutional actors to reflect on their response-ability. For instance, the highly formalized character of misconduct investigations not only signals credibility and legitimacy but also prevents arbitrary judgment, protecting accused scientists and those raising concerns in vulnerable moments. However, it is essential to never stop at formal responses and ensure

doing research as well as possible remains an ongoing collective commitment (Haraway, 2008).

Chapter 3 Research questions

In light of the increasing number of debates about good scientific practice, I am curious about what it means to live with the ideals of good scientific practice in practice. Hence, I do not approach good practice as a matter of choice, but I am interested in when and how research practices are conceptualized as matters of concern and how care and response-ability for these concerns are imagined and practiced. Therefore, my perspective is shaped by an understanding of researchers' actions as situated in their "epistemic living spaces" (Felt, 2009). How researchers make sense of and conduct good scientific practice is shaped by institutional environments, the collectives to which they belong, their symbolic understanding of good research, and the spatial/material and temporal conditions in which they do their work. Consequently, I follow the intricate "boundary work" (Gieryn, 1983) of how lines are drawn and how concerns about good scientific practice are experienced and responded to in practice.

My overall research question is supported by sub-questions that attune my perspective to particular dimensions.

Which *matters of concern* arise about research practices? Over decades of studies of transgressions of good scientific practice, a vast array of research methods, social irritations, and modes of communicating research have been scrutinized. How clear is the boundary between acceptable and unacceptable practices? Who is granted the authority to judge? Is good scientific practice merely the absence of bad practices? How does which practices are seen to be questionable change over time? How does the knowledge produced about concerning research practices influence practices of response-ability and care for good scientific practice?

Who is imagined as responding to matters of concern? How are individuals and collectives imagined to enact/imagine/practice response-ability for good research? Researchers are the producers of knowledge and are at the center of discussions about good practice. Their values, moralities, and perspectives on science are seen as essential in shaping good practice. But how is their capacity to act according to ideals of good practice framed in contemporary research environments, where their careers are increasingly unstable and uncertain? How do

they conceptualize their own room for maneuver? How do their specific environments shape their response-ability? Scientific communities but also the wider scientific system and stakeholders are all attributed responsibilities to safeguard good practice. Can we track how those “geographies of responsibility” (Akrich, 1992) developed over time? Which ideas of collective stewardship are articulated? This also entails turning critically to the role of research on good scientific practice: Who studies whom? How is expertise for good scientific practice imagined?

How are matters of concern responded to? Which ideas of governance are present in discussions about good scientific practice and their transgressions? How do these align and reflect values in contemporary academia? Which ideas of science underlie the modes of governance that we encounter? How can we imagine and collectively further caring modes of governance in contemporary academia?

Chapter 4 Material and Methods

“Method? What we’re dealing with here is not, of course, just method”

(Law, 2004, p. 10)

Chapters describing the material and methods of an epistemic endeavor are never purely a description of tools and sites. They are a testimony to how researchers conceptualize the worlds they study, what is worth looking at, how to look, what to see, and what not. These are moments for anchoring and situating the researcher’s actions and acknowledging limitations and partiality (Haraway, 2001). They justify the deeply political choice of performing the realities we study in one way rather than others (Law, 2004). In the following pages, I describe the framework and conduct of the research project “Borderlands of Good Scientific Practice” (Principal Investigator: Ulrike Felt) in which this thesis was embedded, which materials were produced and analyzed, and how the analyses take form in the present article-based thesis. To conclude the chapter, I reflect more explicitly on the politics and performativity of my research approach.

The “Borderlands of Good Scientific Practice” project

In the last decade, scientific misconduct seemed to be on everyone’s lips. International debates were busy digesting major scientific fraud scandals (Kjaergaard, 2011; Markowitz & Hancock, 2014). Austrian newspapers regularly reported on spectacular plagiarism cases (Frantz, 2018), and universities established mechanisms for preventing uncomfortable headlines through guidelines, integrity courses, and plagiarism detection software. At the national level, the Austrian Agency for Good Scientific Practice (ÖAWI) was founded. Internationally, a research field of research integrity was slowly taking its first steps, meeting in conferences and gathering around the same keywords (Aubert Bonn & Pinxten, 2019). Yet, researchers and their perspectives on scientific misconduct were surprisingly absent from these debates. The few studies that interviewed researchers suggested that scientific fraud was just the “tip of the iceberg” and that researchers perceived “normal misbehavior” (De Vries et al., 2006, p. 43) to be more widespread. In this context, reflections on *how transgressions of good scientific practice are actually negotiated, when such issues come to*

matter in researchers' everyday practice, and what relationships these concerns have with recent changes in valuing and ordering academia remained rare and insufficient.

The research project “Borderlands of Good Scientific Practice” (Principal Investigator: Ulrike Felt), in which this thesis was embedded, set out to study precisely this. It rejected a dichotomous understanding of “good” and “bad” scientific practice and put the negotiations, contestations, and “boundary work” (Gieryn, 1983) around which practices should count as misconduct and which should not be at the center. These negotiations about good and acceptable practices exceed pure laboratory spaces, also occurring in wider societal and scientific discourses as well as policy debates. Attuning to the many-faced entanglements of researchers' practices and the narratives, imaginations, and valuations of good science makes this an interesting case beyond individual wrongdoing. It tells a story about friction and tensions in contemporary academia. Hence, mapping out the borderlands of good scientific practice means cartographing how actors conceptualize transgressions of good practice and understand their embedding in specific academic worlds.

The project was funded by the Anniversary Fund of the Austrian National Bank and conducted between February 2017 and January 2021 (Felt, 2016). Institutionally, it was situated within the research platform “Responsible Research and Innovation in Academic Practice” at the University of Vienna. I supported Prof. Felt as a research assistant in the application process and wrote my master's thesis and the present PhD thesis within the framework of the project.



Materials

The project used a qualitative mixed-method research approach, producing and analyzing three sets of materials: scientific and societal discourses, institutional environments, and discussion workshops with researchers using a card-based engagement method. Each of them zoomed in on different arenas of the discussion to map out not only the variety of how different actors talk about transgressions of good scientific practice and what they regard as concerning but also how they come to terms with different understandings, imaginations, and enactments of responsibility. The present PhD thesis used a selection of materials produced

in the framework of the project, which I will describe in more detail below. I will also explain the materials that were not used for this thesis to contextualize and shape my observations.

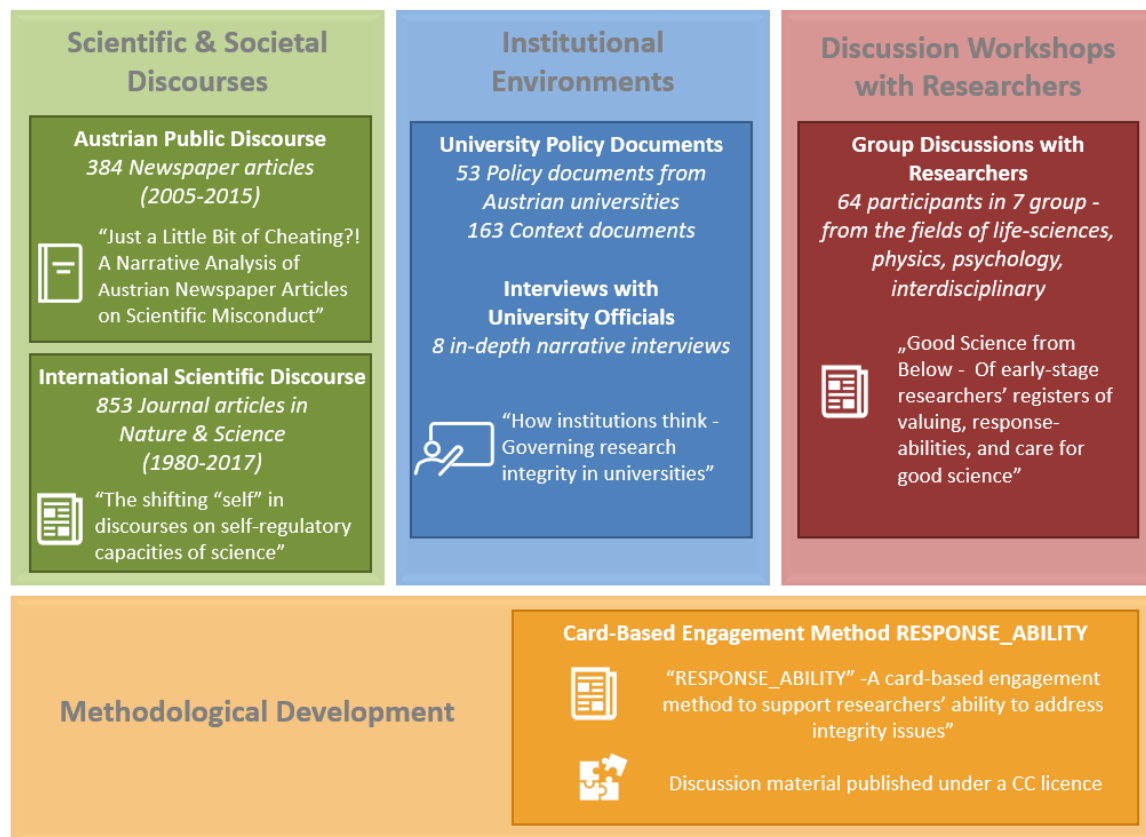


Figure 1. Representation of the sets of materials and output produced by the "Borderlands of Good Scientific Practice" research project, updated version from the project report (Felt & Frantz, 2021, p. 11)

Austrian media discourse

As a first discursive site, the project studied the Austrian news media discourse. Newspapers are an important arena for shaping the public understanding of scientific misconduct and establishing concerns about it as a public phenomenon. Hence, these are core spheres for negotiating moral orders and establishing a collective consciousness about integrity issues (Penkler, Felder, & Felt, 2015), on which researchers can draw for their own sense-making processes. In my master's thesis, I conducted a discourse analysis of 384 articles published in Austrian newspapers over the previous decade (2005–2017) (Frantz, 2018). For the present thesis, there are three observations that contextualize my PhD argument.

First, the public discourse frames scientific misconduct as a straightforward transgression of clear scientific norms. Hardly any negotiations or grey zones of good scientific practice are

made visible, the focus being on stories about plagiarism in student theses. Whether someone has copied parts of someone else's work is usually rather easy to determine. The lack of discussion of misconduct beyond these instances upholds an idealistic image of science, where good practice is easily determinable and protectable. Researchers' mundane struggles, more complex controversies, or the influence of pressures in academia that might invite improper behavior are less newsworthy and, hence, largely invisible.

Second, these dualistic depictions of scientific practice as either "good" or "bad" result in an equally dualistic depiction of morality in academia. There are good scientists and bad scientists, good students and bad students. The "rules" of scientific practice are seemingly clear to everyone, and those who transgress them do so deliberately and should be expelled from the academic community. Following this "bad apple" narrative (see Sovacool, 2008), science is imagined to be protected by removing the individuals who cheat, and potential systemic causes can be ignored (Felt, 2004). There is no room for deeper, potentially more uncomfortable systemic struggles about the state of contemporary academia in these public narratives. The systems of science are not questioned and the moral integrity of individuals takes center stage (Shapin, 1995).

Third, universities are not only seen as responsible but are also held publicly accountable and blamed if they do not police instances of scientific misconduct and put in place prevention mechanisms. They introduce guidelines for good scientific practice and emphasize the importance of teaching and controlling students through means of plagiarism software. Students thus become a core focus point of the discourse. Although it is undoubtedly important to convey expectations about proper academic conduct, the way these narratives are shaped paints a rather deficit picture of students, where knowledge about rules alone is the key to preventing transgressions. There is little reflection in these stories about wider questions related to studying, the living realities of students, and the latter's relationships with their changing environments.

International scientific discourse

The second discursive site that the project examined was the wider international scientific discourse on good scientific practice in the scientific journals *Nature* and *Science*. Both journals have a long tradition of publishing not only scientific papers but commentary on

science policies (Baldwin, 2015) and reflections on the relationships between science and society. Therefore, we conceptualized them as hybrid actors who talk with, for, and about the scientific community. Following the discourses in these internationally distinguished journals over the last four decades, we traced how narratives about transgressions of good practice changed.

The material corpus we used for our analyses was created using the journals' online archives with keyword search and snowballing techniques. Our search covered the period from the early 1980s, which was when transgressions of good scientific practices began to be publicly debated, until the time of our data collection in 2017. In total, 1,143 articles from *Nature* and 1,479 articles from *Science* were collected, which comprised different sorts of texts: editorials, opinion pieces, letters, comments, and research articles. For the analysis, we considered only texts that were at least half a page long and could elaborate a more complex storyline. The reduced sample of articles consisted of 425 articles from *Nature* and 428 articles from *Science*.

To analyze the articles, we used a narrative approach that allowed us to focus on how the journals make sense of integrity issues (Czarniawska, 2004). We were interested not only in what the articles addressed but also in the narrative work in which the authors engaged to create coherent stories and how these stories developed over time (Gubrium & Holstein, 2009). We identified actor groups, discursive moments, and matters of concern, as well as distinctive narrative strands. Five narrative strands were deemed essential for characterizing the changes over time and the differences between three discursive periods. Each period displayed a different mode of waving the narrative strands together, framing what is considered concerning, and imagining the regulation of scientific practices and responsibility and the influence of wider societal developments and research environments.

The analysis of this material is presented in Article A.

Institutional environments

In both the societal and scientific discourses, universities are ascribed a core responsibility to tackle scientific misconduct. They are depicted as “managing” the prevention and sanctioning of transgressions of good scientific practice. Given their powerful hybrid position as both employers and educators of current and future scientists, they are deemed able to leverage,

control, and steer the behaviors of their researchers and students. The main institutional responses focus on the introduction of guidelines for good scientific practice, including courses teaching them, which regulate the concrete procedures for investigating misconduct accusations. To understand how universities “think” about their responsibility for good scientific practice (Douglas, 1989), we followed the paths guidelines take throughout their universities.

The material corpus for this narrative analysis consisted of guidelines for good scientific practice from all 15 Austrian public universities. We sought to understand not only which visions of control and social order these put forward but also how the guidelines are “living” within universities (Asdal, 2015; Shankar, Hakken, & Østerlund, 2017). We collected older versions and English translations of these documents when available, resulting in a total of 53 guideline documents. These differ in denominations, length, and style, as well as how “hidden” or visible they are in universities’ online presence. The document analysis of these guidelines was refined through eight qualitative semi-structured interviews with institutional actors who are responsible for or involved in research integrity issues at their universities. We approached these interviews as spaces for reproducing and rehearsing institutional narratives about how universities consider their room for maneuver on research integrity questions (Gubrium & Holstein, 2009). To situate the positioning work of interviewees, we relied on a sensitizing engagement with the medial analysis to determine whether the universities had been in the public spotlight in the past for scientific misconduct allegations.

We presented an analysis of this material at the 2018 EASST Conference in Lancaster. Although no paper resulted from this, it yielded a handful of insights that are important for contextualizing my argument.

First, in analyzing universities’ guidelines for good practice and talking to actors who are involved in institutional governance for research integrity, we witnessed tensions between stories that describe the university as a caring collective that should steer and uphold scientific values and a heavy focus on universities establishing means of control and attributing accountability. The audience for these actions seems to be situated “outside” of the institution. For a university, having its researchers under control or attributing blame to them is also seen as preserving societal trust in scientific institutions.

Second, although guidelines undoubtedly have an important function in structuring investigations of scientific misconduct allegations, the meaning that those rules acquire in researchers' practices and struggles is limited. Guidelines rarely offer discipline-specific reflections and are sometimes not even available in English. Still, researchers and students must usually sign them. This performance of a "bureaucracy of virtue" (Felt, 2017b) conveys the idea that integrity issues have been dealt with, without fostering a deeper reflection. Instead, it rearticulates an idealized image of science with little thinking about how big ideals are expressed in institutional structures, deficit narratives that focus on knowing the "rules" of good practice and shifting responsibility to individuals.

Third, all of this portrays the relationship between researchers and their universities as a preliminary and formal one. Governance ideas that follow a logic of care (Groves, 2015; Puig de la Bellacasa, 2011), emphasize relational elements, acknowledge the fuzziness and tensions of contemporary academia, have a long-term vision, and focus on incentives and environments that enable compliance with high ideals rather than sanctions are often sidelined in favor of managerial logics. Therefore, we cannot understand the responsibility of universities without acknowledging the wider assemblages of responsibility in which they are embedded in contemporary academia, where they must perform well in international benchmarking that fosters homogenization and where only what can be ranked counts.

Spaces for exchange and collective reflection are practically nonexistent and are only opened reluctantly after accusations arise. Concluding our talk at the EASST Conference, we advocated for experimental modes of governing good scientific practice issues in universities. Rather than understanding guidelines of good practice as the end of intervention, they could be the start of an institutional discussion. University reflection processes could enable continuous checks and balances on the factors that foster the kind of research environments in which researchers can do their best work. Instead of understanding the university as divided between a management body and scientists, a collective reflection on how to maneuver pressures and tensions in contemporary academia can be promoted.

The RESPONSE_ABILITY card-based engagement method

In light of the strong focus on institutionalized contexts and their tendency to be rather standardized and formalized interventions rather than spaces for reflection and exchange, we

developed a card-based engagement method for opening up issues of good scientific practice to discussion (Felt, Fochler, & Sigl, 2018; Felt, Schumann, Schwarz, & Strassnig, 2014; Felt, Schwarz-Plaschg, & Schumann, 2017). It was developed in particular for teaching settings, in which students are often reduced to not knowing about the rules and there is little room for reflecting on how the challenges of contemporary academia shape their practices.

Issues of research integrity are often handled as taboo topics, which are uncomfortable to talk about. The card-based engagement method RESPONSE_ABILITY that we developed can lower the barriers preventing researchers from talking about transgressions of good scientific practice. The content of the cards builds on the analysis of societal, scientific, and institutional discourses and invites researchers to position themselves vis-à-vis the wider debates and reflect on how these come to matter in their everyday lives.

Compared to classical integrity trainings, which often portray a rather deficit idea of novice researchers, reducing training to abstract rules, this discussion format was designed to create reflective spaces and give a voice to researchers' experiences. Hence, "[t]he aim of this method is to create a space in which participants train the skills of reflecting on their own value ecologies, positioning oneself towards issues of integrity and shaping a sensibility for nuances when having to navigate the borderlands of good scientific practice" (Felt & Frantz, 2021, p. 15). It trains researchers' reflexive and critical attention to help them become response-able to irritations about research practices and maneuver the borderlands of good scientific practice.

The discussion method structures the debates into four phases, each guided by a particular set of cards with short inputs that invite researchers to reflect from different angles. In the first phase, researchers are asked to think about which values matter in and for their practices. The second phase centers on transgressions of good scientific practice. The third phase presents them with dilemma situations and asks them to position themselves vis-à-vis these. The fourth phase describes a set of conditions for research and enquires about which of those influence their capacity to do research 'well'.

A detailed description of the development and implementation of the card-based engagement method is presented in Article B. The Appendix of the thesis contains supplementary material,

including the four card sets as well as reflections, suggestions, and support for organizing and moderating RESPONSE_ABILITY discussion groups.

Discussion groups with researchers

The RESPONSE_ABILITY engagement method was used to conduct discussion groups with early-stage researchers, and we analyzed the transcripts of those discussion groups to understand how our participants make sense of good scientific practice in their everyday lives. Turning to early-stage researchers and giving them a more active voice in the discourse is deemed important because they are mainly talked about and rarely talked to. Given the vital function this actor group has in contemporary academia, making up a major part of the academic workforce, and the significant changes that were introduced to career trajectories and structures, it is crucial to understand how good scientific practice comes up and is dealt with on a daily basis.

We conducted seven discussion groups in various workshop and lecture settings. The participants came from the disciplines of life sciences, physics, and two interdisciplinary groups. They were all at an early stage of their academic careers, with most being PhD students, as well as some master's students or early postdocs. In total, 63 participants took part in the group discussions, in groups of between six and 13 participants. For article C, however, I limited the in-depth analysis to the groups comprised of life scientists and physicists because they were situated in the Austrian context, whereas the interdisciplinary ones were located in a German context. This also allowed me to reflect in more detail on disciplinary particularities.

All participants were informed of the purpose of recording, transcribing, and analyzing what was said and gave their written consent. We gave participants the option to participate without being quoted, which one participant opted for. These passages were marked in the transcripts to make sure that they would not be used as quotes. All participants were informed that they could revoke their consent at any moment, which was essential given the highly sensitive and, at times, emotional reflections they shared. We promised the participants anonymity, which entailed ensuring that their names were taken out of the transcripts. When using quotes, we made sure that the participants were not identifiable.

Nonetheless, research ethical reflections go beyond guaranteeing that their identities are protected; as concerns not doing any harm, the analysis also focused on how to create better worlds for these early-stage researchers and take their concerns and observations seriously. The feminist hinterland of my analysis draws explicit attention to the politics, tensions, and frictions in which early-stage researchers find themselves and considers that giving a strong voice to early-stage researchers an important contribution.

The analysis of this material is presented in Article C.

Article-based dissertation

This thesis is conceptualized as an article-based project, where the empirical context overlaps with that of the research project. The development of article-based dissertations is a relatively young phenomenon that arose hand in hand with shifts in academic publishing away from a focus on books towards an intensification of publications in article form (Le Pontois & Stéphane, 2024). Compared to monographs, the empirical interventions are more detailed, zooming in on one particular focus, and characterized by limited space and room for only one argument. However, they also give access to a wider audience and enable more visible contributions to existing discourses. This was particularly important to me given that critical voices on research integrity debates were rare when I started my research. The three articles that build the empirical corpus of this thesis are described below.

Article A: “The shifting ‘self’ in discourses on the self-governing capacity of science: Revisiting four decades of research integrity discussions in *Science* and *Nature*”

In this article, my supervisor and the project’s Principal Investigator, Ulrike Felt, and I trace how debates about good scientific practice developed over the last forty years in the journals *Science* and *Nature*. We show that while matters of concern about good practice multiply, the idea that science can govern “itself” remains the same. What changes is who is part of this “self” that governs science. Responsibility shifts from a pure focus on “the scientific family” towards a “multistakeholder managerial self”, where institutions take a much bigger role in governing academic practices.

Article B: “RESPONSE_ABILITY – A card-based engagement method to support researchers’ ability to address integrity issues”

The second article zooms in on one such managerial site, namely, the training of young researchers. Building on observations from our discourse analysis, where junior researchers are often portrayed through their lack of knowledge about good rules, we imagined this card-based method as an explicit intervention. It seeks to open up questions of good scientific practice from different angles and invites researchers to become response-able for the concerns they observe. Rather than proposing rule-following, this tool is intended to give researchers time to reflect on the borderlands of good scientific practice in their epistemic living spaces and how to maneuver them best.

Article C: “Good Science from Below – Of early-stage researchers’ registers of valuing, response-abilities, and care for good research”

The final article analyzes five discussion groups conducted using the RESPONSE_ABILITY discussion method. It positions early-stage researchers’ experiences and perspectives as a challenge to dominant research integrity discourses that look at good science from above, through a realist and positivist lens that seeks to abstractly govern research. Studying their valuing practices, we show that they paint a nuanced vision of good research along four “registers of valuing” (Heuts & Mol, 2013): experimentation, collaboration, “the system”, and feeling. The results challenge the dominant deficit narratives painting early-stage researchers as only in need of more knowledge about good practice or portraying moral insufficiencies. Attuning to a situated understanding of good research negotiated in concrete, mundane value constellations also invites us to reflect on early-stage researchers’ response-abilities for good research, characterizing integrity as the pursuit of aligning partly conflicting values in practice.

Drawing together heterogeneous observations

These three articles are not merely juxtaposed in this thesis but are instead approached as offering different perspectives on the bigger research question of *when and how academic practices are conceptualized as a “matter of concern” and how care and “response-ability” for these concerns are imagined and practiced*. In Part III of the thesis, I will discuss the insights and observations cutting across these articles and draw conclusions about what we can learn about science, its norms and values, and its relationship with society from this analysis.

To draw the heterogeneous sets of materials and observations of different discourses and arenas together into one coherent argument, I was inspired by Adele Clarke’s (2005)

situational analysis. Nevertheless, the analysis I present is not a traditional situational analysis that follows the concrete research processes Clarke suggests but mobilizes her sensitivities to take “the situation” as a site of analysis seriously as well as drawing maps to emphasize the relationality of different elements. It is in the broadest sense an attempt to implement a grounded theory approach “after the postmodern turn” (p.1.).

Clark suggests putting “the situation” at the center of its analysis. This takes the situatedness of our research (Haraway, 2001) seriously while also capturing the complexity of the issue at stake. As she writes, “a situation is not merely a moment in time, a narrow spatial or temporal unit or a brief encounter or event (or at least rarely so). Rather it usually involves many different kinds and categories of elements in a somewhat enduring arrangement of relations that has its own ecology” (Clarke et al., 2022, p. 18). For this thesis, I look at the increased attention to good scientific practice portrayed as a “matter of concern” (Latour, 2004), the rise of research integrity in research policy, and researchers’ reflections on it. What is it that is actually negotiated here? How does this relate to the institutionalization of good practice? How does it shape practices? Each article in the empirical corpus of this thesis zooms in on one particular arena.

A central aspect of situational analysis is drawing different kinds of maps that make the relationships in the situation visible and enable an understanding of the embedding and contextualization of issues without reducing perspectives to clear causalities. Instead, the point is to understand what the situation is about. Each type of map performs a different kind of analytical work that allows us to comprehend the elements, actors, and relationships but also the wider social worlds and discourses at stake. What is it that we are observing regarding the increased interest in talking about good scientific practice? What does it tell us about the state of science in society? The process of mapping is accompanied by intensive memo writing, where the researcher reflects on the analytical work and observations while drawing the maps and beyond. These memos are abductive in nature because they bring together the researchers’ knowledge about the studied situation and the observations and surprises of the research process. A reflexive engagement with the researcher’s position in the situation is also an essential part of writing memos.

The first kind of mapping suggested by situational analysis is *situational maps*. There are three kinds of situational maps. The *messy situational map* “lays out all the major human, nonhuman, discursive, historical, symbolic, cultural, political and other elements found in the research situation of concern as framed by those in it and by the researcher” (Clarke et al., 2022, p. 10). Allowing a wide spectrum of elements to be present in the same map prevents preliminary analytical closure and invites the researcher to open up the situation.



Figure 2. Messy Situational Map

Building on the messy situational map, researchers can engage in different kinds of ordering work of the messiness. To create an *ordered situational map*, they sort the vast complexity of elements into overarching categories to understand which (non)human elements, collective actors, implicated actants, discursive constructions of individuals or nonhuman actants, and political or symbolical, temporal, and spatial elements are at stake and how they are embedded in wider discourses and questions about the major debates.

Another mode of ordering and analytical work of the messy situational map is *relational maps*. These invite researchers to think through the different connections of one actor or element on the messy situational map. Each relational map focuses exclusively on one element; hence, many different relational maps are drawn that invite an analysis of

relationality. This exercise allows us to think about the different roles and relationships of different actors in this situation.

The second type of map that Clarke suggests is *social worlds/arenas maps*, which make the social, institutional, and organizational dimensions of the situation visible. They lay out all collective actors in the situation and the arenas in which they are involved. Clarke describes social worlds as “distinctive collective groups of varying sizes, each of which has ‘a life of its own’ [...]”. They can be quite small or even vast. Participants in social worlds generate shared perspectives that form the basis for individual and collective identities and the commitments of that world to collective action” (Clarke et al., 2022, p. 14). Making these collective actions and their interactions explicit and positioning them closer or further away from each other provides a better understanding of the relationships in the overall state of affairs in which the materials are embedded.

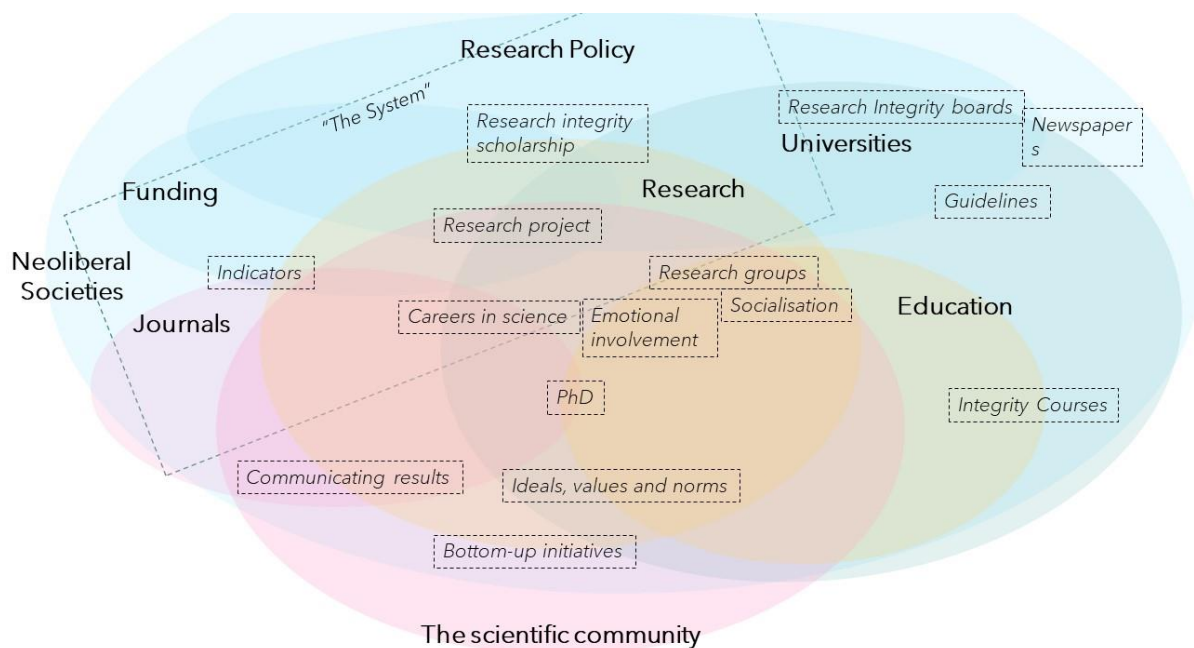


Figure 3. Social worlds/arenas map

Politics and performativity of methods

Concluding this chapter outlining the material and methods I used, I want to briefly reflect on the politics and performativity of methodology. Too often, scholars studying research concerns about good scientific practice operate based on realist and positivist understandings

of research, giving little thought to how their study approaches contribute to shaping reality (Davies, 2019; Roberts et al., 2020). Yet, “good research” is not abstractly out there, waiting for scholars to describe it; it matters how we conceptualize concerns, where we look, with whom we talk (or not), and which means of collecting data about the world we employ (Law, 2004). Concerns about research practices have predominantly been studied through quantitative approaches (Aubert Bonn & Pinxten, 2019) that assume clear, countable categories of issues and a degree of homogeneity among groups, such as disciplines or career stages. However, these assumptions hardly stand up to scrutiny through a more qualitative lens (Law, 2009).

This thesis does not ask “how many” but instead focuses on the “how”. Anchoring this thesis in a *qualitative social science* research project does not reflect a mere academic interest in improving our understanding of research practices, academic cultures, conceptualizations of responsibility, and contemporary academia but an awareness of the political dimensions of and responsibility for the kinds of knowledge we produce (Mody et al., 2020). How we look at the world shapes not only whether something is considered concerning or not but also invites actors to think from certain perspectives, potentially inspiring certain responses and not others (Jerak-Zuiderent, 2018; Peterson & Panofsky, 2023).

Hence, I want “to take responsibility for the role that we play in the world’s differential becoming” (Barad, 2007, p. 396). Although it is difficult to predict the direct impact of one’s work on discourses, on who takes up the things we think and present, I am trying to contribute to generating care in my doing (Puig de la Bellacasa, 2017). This connects to what Lindén and Lydahl (2021) have called the “dual engagement” (p.6) of both looking for care in the materials we study and reflecting on it in our own responses. How do we make care practices visible, and what “fables of response-ability” (Kenney, 2019, p. 1) can/do we want to tell? The knowledge we produce is not a neutral rendering of affairs but influences the worlds we study. This requires us to be considerate about our actions (Barad, 2007; Haraway, 2001; Law, 2004).

Many observations, particularly in the focus group discussions with early-stage researchers, were subject to an “uncomfortable closeness” (Müller, 2012b, p. 17) to my own realities of being an early-career researcher exposed to similar tensions as the participants. To

understand how my own experiences, frustrations, and concerns were articulated by peers in different fields, I engaged in extensive memo writing during the analysis. I made sure to share my analysis with more advanced researchers and people in stable positions to ensure that I remained critical of the things I saw.

Part II Articles

Article A: The shifting 'self' in discourses on the self-governing capacity of science

Revisiting four decades of research integrity discussions in Science and Nature

Abstract

The belief in science's inherent self-corrective nature has been challenged by growing concerns over research integrity violations, leading to heightened scrutiny of scientific processes. Examining 40 years of discussions in *Science* and *Nature*, this paper explores how debates on research integrity reflect important shifts in the very meaning of "scientific self" when speaking about the self-corrective capacity of science as well as evolving "geographies of responsibility" within the research system. These journals—key voices in science and policy discourse—offer a lens to explore these processes of gradual transformation. Using a narrative approach, we identify key themes and shifts in understanding who is accountable for ensuring research integrity—extending beyond individual researchers to include institutions, funding bodies, journals, and whistleblowers. The analysis highlights how the scientific community has progressively reassembled its self-image, adapting to complex systemic challenges while engaging diverse stakeholders. We argue that these narratives do not only chronicle transgressions but also reflect broader transformations in the research ecosystem, illuminating changing values and roles. By analyzing these shifts, we deepen our understanding of how research integrity concerns are intertwined with systemic changes, offering insights into what needs consideration when wanting to foster responsible research practices and build sustainable trust in science.

This article was co-authored with my supervisor handed in to the journal *Social Studies of Science*.

The shifting 'self' in discourses on the self-governing capacity of science

Revisiting four decades of research integrity discussions in Science and Nature

Introduction

“[R]eassurances that there is nothing to worry about - because the scientific process is **self-corrective**, and that mistakes, deliberate or accidental, will be found out sooner rather than later - are no longer enough”.
Nature, 13 November 1986⁹, 181

“Retractions are part of science, but misconduct isn’t [...]. Journals, funders and institutions that employ researchers all want to produce or disseminate rigorous scientific knowledge — and all can learn lessons from misconduct cases”.
Nature, 24 April 2024¹⁰, 689

In the realm of scientific inquiry, the comforting notion that the scientific process is inherently self-corrective and that errors—whether intentional or inadvertent—will inevitably come to light has been and, in part, still is a pervasive narrative. However, over the past decades, growing debates around violations of research integrity started to challenge “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, p. 1105). Sites where discussions on this phenomenon occur range from academic journals, professional associations, academic institutions, funding agencies, and science policy settings on national and supranational levels to mass media and websites such as Retraction Watch¹¹. We have witnessed national responses, leading to the creation of institutions caring for research integrity, journals either have their own publication ethics statements or are part of the Committee on Publication Ethics¹², the formulation of diverse, highly visible international Codes of Conduct¹³, the crafting of institutional guidelines of good conduct, but also the start

⁹ Joyce C (1986) Deception beyond measure. *Nature* 324(6093): 181.

¹⁰ Editorial (2024) Retractions are part of science, but misconduct isn’t, *Nature* 628(8009): 689.

¹¹ <https://retractionwatch.com/>

¹² <https://publicationethics.org/about/our-organisation>

¹³ <https://allea.org/code-of-conduct/>

of the World Conference on Research Integrity¹⁴ (the first of this series was held in Lisbon in 2007), co-organised by the European Science Foundation (ESF) and the US Office of Research Integrity (ORI). Together, all this can be taken as an indicator of the growing awareness that both principles and practices of research integrity need more attention. Yet, it remains unclear how to tackle the issue in practice (Felt, 2015).

The push for more open debates was driven by a range of concerns, including the growing perception of an increase in academic misconduct, the rising number of retracted papers (even though retraction itself is not viewed as inherently problematic), evident flaws in the peer review process, the undue influence exerted by those funding or conducting studies on their epistemic outcomes, and, more recently, the issues encapsulated by the term “reproducibility crisis”. Also, in the field of social science research, we now find a considerable body of studies around transgressions of good scientific practice that have delivered valuable insights into the dynamics at work in contemporary research. Besides a growing activity of researchers expressing personal experiences and perspectives in journal commentaries and blogs, we observe more structured analytical interests engaging in studying researchers’ perspectives (Olesen, Amin, & Zurina, 2018). We encounter studies investigating how contemporary academic incentive structures might tacitly foster unethical actions (Edwards & Roy, 2017), what is made (in)visible when misconduct cases are identified (Hesselmann & Reinhart, 2020), looking into research culture and practice (Valkenburg et al., 2021), questions of publication ethics (Jacob, 2019), the influence of public and private organizations on norms of research integrity (Montgomery & Oliver, 2009) and many more. These accounts highlight the diversity of practices that researchers consider, they point to the influence research environments have on the capacity to produce knowledge effectively (Felt, 2025) (Haven et al., 2020).

In this article, we do not aim to study specific forms of transgressions of research integrity or concrete cases of transgressions; instead, we step back and use debates on research integrity as a lens to explore the evolving ‘geographies of responsibility’—a concept adapted from Akrich (1992)—within the research system. To do so, we will use the key scientific journals, *Science* and *Nature*, as two platforms where these debates can be followed *in* their respective

¹⁴ <https://www.wcrif.org/>; so far, 8 conferences have been held involving a global community of researchers; the history is to be found on the website.

time and over several decades. *Nature* and *Science* are highly ranked multidisciplinary journals and have been a core stage for significant scientific insights since the 19th century (Ding, Ahlgren, Yang, & Yue, 2018). Both of them also have a long tradition reflecting on broader scientific developments as well as on science-policy and science-society relationships and shaping the idea of scientific publishing (Baldwin, 2015). Compared to using interviews to capture recollections of past ways of identifying and handling transgressions or engaging in questionnaire studies that allow us to gain insights into how researchers perceive the problems of research integrity, studying articles from the past 40 years in these two outlets enables us to understand how these issues were reflected upon *in* their respective time and it teaches us about the value-related transformations that occurred over this period.

Analysing articles discussing fraud, misconduct, reproducibility issues, or research integrity over a longer period of time allows us to trace how the understanding of responsibility for identifying, assessing, defining, regulating, correcting, or managing research integrity issues has changed. Specifically, we want to trace what we call **“the scientific self”** referenced in repeated claims of the capacity of scientific “self-correction” or “self-regulation.” Studying narratives from these two journals provides insights into constructing a self-image of science, which includes memories of the past and expresses intentions for future developments and how it was (re)assembled in ever new ways over time. For example, we can consider the Asilomar conference in 1975, organized by a segment of the scientific community, to discuss and reach a collective agreement on guidelines that delineate what should or should not be done with recombinant DNA technology. This is an example of a moment when “the authority of a scientific community to constitute itself, to predict possible futures, and to define responsibilities for them in the present” (Hurlbut, 2015, p. 126) became visible. Thus, what our analysis aims to provide is a perspective on when and how specific scientific selves are constituted over time to take responsibility in caring for research integrity

We will put narratives centre stage as they allow us to externalise and share our experiences (Czarniawska, 2004); they “organize our experience and our memory” (Bruner, 1991, p. 4) and find expression in the form of “stories, excuses, myths, reasons for doing and not doing, and so on” (ibid., 4). The two journals create narratives about transgressions of good practice, why they find them problematic, who is involved and who should act, how they conceptualise research and the institutional environment and, ultimately, how responsibility is or should be

distributed and assumed. Identifying dominant narrative strands addressing scientific misconduct and analysing their entanglement over time will allow us to identify different ‘models of the scientific self’ emerging in specific periods. As with every classification, the categories and the temporal periods we will identify ideal types and have in practice fuzzy boundaries. However, this periodisation will show how, over time, the scientific self gradually assembles and integrates more stakeholders besides researchers, such as funding agencies, scientific journals, universities, or offices for research integrity, but also whistleblowers. This indicates a clear shift in changing understandings of what it means to be responsible for and to behave responsibly in research. Identifying these shifts can help us better understand how concerns about research integrity are deeply intertwined with transformations in the overall research system, allowing for a deeper grasp of the changing choreographies of values and actors.

In what follows, we will first reflect on shifts in contemporary research systems. We will then argue how Tsing’s (2005) concept of frictions helps us to understand these moments of transgressions of good practice as productive as they allow us insights into the inner workings of the increasingly complex research systems. In the methodological section, we will discuss why *Science* and *Nature* are ideal spaces for our investigation, present our narrative approach and the data collected for analysis, and offer a first structural analysis identifying the key narrative strands. The findings then offer a detailed analysis of how scientific misconduct discussions have revealed a shift from insular, self-regulating scientific ideals to a broader, multi-stakeholder approach involving institutional actors and formalized oversight. While these changes have improved accountability and public trust, they also highlight the need to move beyond compliance-focused models towards fostering a collaborative, care-oriented culture of integrity that aligns ethical practice with the evolving complexities of science and society.

Capturing transformations in the research system

Throughout the period examined in this paper, the research system has undergone significant changes driven by various coexisting processes, often linked to broader socio-political and economic shifts, particularly neoliberalism. This has manifested in implementing new public management principles reshaping how research is organized, funded, and evaluated, with

profound implications for scientific inquiry, researchers, and research institutions. Simultaneously, there has been a growing call for a new social contract between science and society (e.g., Nowotny et al., 2001), rethinking knowledge production through concepts such as responsible research and innovation (Stilgoe & Guston, 2017). Let us briefly reflect on these two lines of transformation.

Adopting neoliberal ideals in research has varied in intensity and speed across different national contexts. Gradually, research has come to operate under market-like principles, prioritizing efficiency, competition, and measurable outcomes. This has led to a shift in the "orders of worth" (Stark, 2009) guiding research, along with new governance structures and performance-oriented priorities (Fochler et al., 2016), installing various forms of epistemic capitalism (Fochler, 2016). Public funding is increasingly tied to demonstrating societal impact, emphasising relevance and, often, commercial potential (Hessels, van Lente, & Smits, 2009).

Neoliberal pressures for accountability and excellence have driven the introduction of performance metrics that shape competition in the research system (Shore & Wright, 2015; Strathern, 2000) and created temporal pressures in many parts of academia. These metrics—focused on outputs like publications, citations, patents, and commercialization—valorise only quantifiable activities, sidelining other forms of scholarly work. This emphasis on efficiency and productivity has significant governance effects, influencing institutional practices and individual behaviours (Espeland et al., 2007). As a result, research is increasingly viewed as an economic and competitive endeavour rather than a purely intellectual or societal pursuit.

In parallel, there has been a rise in "projectification," with research funding typically allocated through competitive grants for specific projects with clear outcomes, timelines, and deliverables (Ylijoki, 2015). This trend makes long-term, exploratory research harder to fund, as researchers must continually apply for short-term grants, focusing on practical results within limited timeframes. This shift undermines career stability as reliance on short-term contracts grows. It also alters academic rhythms, with increased pressure to clarify the relationship between outputs and time invested (Felt, 2025; Garforth & Cervinková, 2009). These conditions raise concerns about the effects on early-career researchers and the potential for compromised academic standards (Krstic, 2015).

Amidst these changes, the intensification of accountability—captured by the notion of audit society (Strathern, 2000) —has brought an increased focus on control and planning, as science and technology are seen as central to shaping society. Gaining and maintaining public trust has become a critical issue. Researchers are expected to embrace the role of the academic entrepreneur, navigating the complex funding landscape while adapting to the logic of academic capitalism (Fochler, 2016; Shapin, 2008).

A closely entangled line of transformation concerns the evolving social contract between science and society, which defines the mutual responsibilities, roles, and expectations regarding the production and application of scientific knowledge (e.g., Nowotny et al., 2001). Science is increasingly seen as inseparable from societal needs, with growing demands for researchers to consider their work's social, ethical, and political implications. This shift is embodied in concepts like Responsible Research and Innovation (Owen, Macnaghten, & Stilgoe, 2012), which call for integrating ethical reflection, social engagement, and environmental sustainability into the research process. Researchers are now expected to ensure their work aligns with societal needs, anticipates potential harms, and involves stakeholders in shaping research agendas.

The new social contract also signals a shift in power dynamics within the research system. Traditionally, researchers and institutions held the dominant role in determining research priorities, with little input from the public. Today, there is a growing recognition that society—mediated through governments, funding bodies, and civil society—should have more influence in shaping scientific agendas. This shift is reflected in the increasing demands for accountability and a clearer demonstration of the societal relevance of research.

Frictions as our locus of analysis

Transgressions of good scientific practice are disruptive events that expose fault lines in an otherwise smooth-running system. Such moments provide valuable opportunities for STS researchers to study research cultures and practices (Valkenburg et al., 2021). Much like controversies, these moments make explicit the otherwise hidden assumptions about science's norms and values, revealing the processes and socio-material networks that typically remain black-boxed. These disruptions allow us to scrutinize the complex forces shaping scientific facts and artefacts. Thus, controversial debates in journals should not be

seen merely as informal assessments of science but as integral to the governance of research (Cambrosio & Limoges, 1991).

Such moments also serve as ideal spaces to observe the co-production of social and knowledge orders within research (Jasanoff, 2004). They offer a glimpse into how ideals of good scientific practice are shaped by the research systems they are embedded in, while simultaneously influencing the role of science in contemporary society. Transgressions, therefore, are not just disruptions of an ideal state of science but a lens through which we can better understand the development and positioning of science in contemporary societies. These breaches of good practice are particularly concerning because they not only threaten public trust in science (Ampollini & Bucci, 2020) but also disrupt the trust relations essential to the creation of scientific knowledge (Shapin, 1995; Shapin, 2008).

Our analysis draws on Anna Tsing's (2005) concept of "frictions," originally applied to different phenomena but useful to conceptualise scientific transgressions. Tsing views friction not as a problem but as an opportunity to explore the dynamics at play in any situation. In the context of research, frictions arise when individuals from diverse backgrounds—each with different goals—navigate complex and often unequal interactions in shared environments. These moments of friction, where epistemic, institutional, and social contexts intersect, are crucial for understanding the dynamics of knowledge production and academic life. Tsing's framework challenges the idea of frictionless progress, emphasizing how these encounters spark movements, reactions, and emotions that are key to understanding shifts in research cultures. This approach allows us to track the multiple concerns (Latour, 2004) that have emerged over time, revealing how the issues now subsumed under research integrity were gradually assembled. We cannot, therefore, speak of a single problem but of many context-specific frictions.

Frictions, then, are not mere conflicts but learning sites where power dynamics and cultural framings emerge, shaping how research is conducted and how academia functions. By reflecting on the scientific self shaped in these narratives, we can also draw on Goffman (1959) to highlight that identity and self-worth are always developed in relation to others in a community.. Through socialization, individuals learn the norms and values of the scientific culture they are part of. Thus, the question of who constitutes the community that decides

what is problematic in knowledge production—and how to respond to transgressions—becomes central to our analysis.

Methodological approach

Nature and Science as hybrid spaces

As scientific journals, *Nature* and *Science* are spaces where researchers discuss their scientific work and can thus be characterized as *speaking with* the scientific community. Their scientific audiences, however, are not limited to a single disciplinary background but encompass a global, multidisciplinary readership. STS research on *Nature* and *Science* as epistemic spheres has focused, for instance, on the power of these top journals to set epistemic standards about what counts as evidence and who can contribute to knowledge production (Bonneuil, Foyer, & Wynne, 2014), on how articles may represent the starting point for controversies about the contextualization of ethical engagement in knowledge production (Benjamin, 2016) or about the role of publications in such journals in negotiations of ownerships of knowledge (Swanson, 2007).

Nature and *Science* do not limit their actions to facilitating scholarly discourse, but also publish lengthy editorials, news sections, or letters (Ding et al., 2018) in which they also *reflect on the functioning* of the scientific community. There, they voice critique of structural imbalances in science and comment on science policies, global developments as well and science-society relationships. STS research drawing on this aspect illustrates, for example, the dominant position such prominent journals have for influencing the global perception of national research initiatives (Fukushima, 2016) or articles using quotes from old volumes as witnesses of a bygone scientific era to illustrate past worries and dynamics (Sapir, 2017). Kjaergaard's (2011) article comparing the coverage of the misconduct case around Hwang Woo-Suk in *Nature* and *Science* is another example. The author shows how the journals' positioning and narratives they take up relate to the journals' stakes in the case and broader geopolitical dynamics.

Furthermore, *Nature* and *Science* can also be understood as *speaking for* the scientific community in broader societal discourses. Their readerships are not limited to scientists (Krause, 2017); their inputs are also widely recognized in the policy realm. Here, STS researchers have, for instance, highlighted the close interaction of these two journals with

news-media (Caldwell, 2017; Shea, 2001). Besides, reflections from their editors expressing concerns about systemic challenges in science are used to illustrate worries about the scientific community (Fochler et al., 2016).

Their particular position of being not only long-term witnesses but also architects of the discourse at stake makes the journals an ideal space to study shifts and changes over time on why, for whom, where, when, and how research integrity should be a matter of concern to be cared for. In that sense, they are also an ideal space where we observe the co-productive relationship between science and society (Felt & Davies, 2020). Authors and editors appropriate prevailing discourses in specific ways or by “selective[ly] retailoring them to suit new needs” (Jasanoff, 2004, p. 41). Analysing the articles addressing issues of research integrity thus offers a window to understanding facets of co-production of research and wider research environments.

Data collected

The material corpus for our research consisted of articles from the period of 1980 to 2019. We chose 1980 as a starting point as around this moment a number of major cases of scientific misconduct were highly present and widely discussed in the scientific community and beyond. We ended in 2019 just before the Corona crisis came into the picture¹⁵. In a first step, we identified on the journals’ webpages a broad set of potentially relevant articles using the keywords ‘fraud’, ‘misconduct’, ‘dishonesty’, ‘falsification/falsify’, ‘plagiarism/plagiarise’ and ‘whistle-blower’. Furthermore, we also included linked articles and articles in special issues (e.g., on Reproducibility Crisis). Through this approach, we gathered 1192 articles from Nature and 1583 articles from Science, which consisted of many different types of texts: editorials, research articles, opinion pieces, letters, or comments. As we were interested in the ways these journals would make sense of the phenomenon and thus construct its narratives, our final corpus would only contain texts which were minimum about half a page long. In total, we analysed 447 articles from Nature and 451 from Science.

¹⁵ It would for sure be interesting to analyse the debates around the issues here during the Corona crisis, but this was not in the focus of this article.

Narratives and their choreographies

Our analysis of the articles followed a narrative approach (Czarniawska, 2004). Thus, we understand the narratives printed in the two journals as culturally anchored stories that aim at giving meaningful accounts of the issues at stake and reflect on potential interventions. Investigating these narratives thus allows us to understand how authors make sense of science as legitimate practice and culture. Moreover, it allows us to follow how they map out the “geographies of responsibilities” (Akrich, 1992; Sigl et al., 2020) at stake in the debates. Following such narratives over time, allows us to grasp when, where, why, and expressed by whom concerns are raised and who is called for solving the issue at stake. These narratives are, therefore, always diagnostic, telling us about the health of contemporary research systems (Penkler et al., 2015).

Narratives allow communities to share values and collectively make sense of practices. They can be understood as stabilising elements that help define and reproduce research cultures. Investigating narratives thus allows us to capture how certain collective imaginations become stabilised or get questioned and replaced. Thus, we will pay attention to the different forms in which we encounter narratives, which can range from “assessments, reconfigurations of past developments, future-oriented accounts voicing promises” (Felt, 2017b, p. 56) to the identification of “potential threats and moral reflections of what is good science and innovation and how a good researcher should be” (ibid., 56). Studying narratives can thus be understood as vital for “understand[ing] change beyond formal structural shifts” (ibid., 55) and allow us to engage with gradually changing understandings of the imaginary of the scientific self on different levels.

Narratives order developments in space and time. They are thus ideal for examining transformations of these developments and enabling us to inquire about the changing conceptualisations of the scientific self in relation to irritations about transgressions of good scientific practice. While the corpus of articles shows a broad range of matters of concern identified across time when it comes to the self-governing capacity of science, our analysis identified five narrative strands that were elaborated and mobilised throughout the period under investigation. These narrative strands change over time, grow in importance, or shift to the background and get entangled in ever-changing ways, sometimes forming discourse coalitions (Hajer, 2009) and sometimes creating tensions. These different strands are then

woven together in situated ways, making some narratives more central while others must align with them to form a whole. In our analysis, we will describe this bringing together of narrative strands as different narrative choreographies, i.e., as different entanglements of narrative strands, which communicate a specific form of situated coherence when it comes to capturing the situation of research integrity. These shifting choreographies then also point to the emergence of specific assemblages of the scientific self and their related responsibilities.

Our analysis identified five narrative strands, summarised in Table 1, that run through the full period covered by our study. They address the figure of the researcher and respective communities, cover epistemic self-regulation processes and practices that are in place at a specific moment in time, reflect on institutional actors that matter to the way research works, open debates on the often quite fundamental changes in the research environments and touch on the changing relations of science and society.

Narrative strand	Focus
Researchers and their community	Addresses the figure of the researcher and researchers' roles and status in the community and beyond; reflects norms, values, and understandings of duty that would/should guide research practices.
Epistemic self-regulation processes and practices	Engages with questions of how knowledge gets critically scrutinized, validated, and revised; discusses organised scepticism, and how good evidence/good data is defined and assessed.
Institutional actors	Draws attention to the different institutional actors and their roles in research, such as funding agencies, institutions where research is done (e.g., universities or industrial labs), journals or bodies watching over research integrity.
Research environment	Discusses the major changes in the ways research is organised and assessed, how careers are practiced, and how all this impacts research integrity culture.
Relation to wider society	Reflects on the place of science in society, on the trust relationships essential to science and how issues around research integrity could have negative impacts if not addressed accordingly.

Table 1. Five narrative strands

Findings: Major shifts in response to transgressions of good scientific practice

Based on analysing how these five narrative strands come together in complex narrative choreographies, we structure the period under investigation into three different phases, reflecting on the discursive frictions described and the potential responses that are debated. We acknowledge that such periodization is always difficult to establish, that the phases we describe overlap, and that the boundaries we draw are fuzzy. As we will show, all five narrative strands are co-present across the entire period, while their choreography and the role of each strand shifted considerably over time. Thus, we divided the four decades we analysed into **three main phases**: until the late 1980s, from late 1980s to early 2000s, after early 2000s. This periodization mainly aims to sensitize us to important shifts in the imagination of 'the scientific self'. The borders between them are fluid, and we often find the coexistence of the upcoming next phase while the current phase is gradually retreating.

Phase 1 (until the late 1980s) – Is scientific fraud a major problem for science? – Imagining a family-business that cares for correcting

Our analysis starts in the 1980s, a moment in time that seemed to witness an increasing number of reports concerning research practice, mainly in the form of stories on fabricated data and plagiarism. This early phase is of special interest because we can observe quite intense negotiations around the question of whether or not transgressions of good scientific practice are becoming more frequent and whether or not the scientific community has the capacity to address this problem internally. "The truth is", one article would argue, "that no one knows whether fraud is rare or not or whether it will inevitably be found out" (*Science*, 25 March 1983¹⁶: 1417).

Investigating the choreographies of transgression stories in the 1980s, the narrative strand gravitating around the role of the individual researcher and their community is at the core of articles, even though with considerable variations. Articles typically focused on (alleged) malpractice instances, highlighting individual scientists' actions and moral dispositions. Some, particularly in *Science*, read like detective stories, gradually revealing the "rotten apple" responsible for violating scientific norms. These accounts invited readers to follow the

¹⁶ Angell M (1983) Fraud in Science. *Science* 219(4591):1417-1418.

detectives' forensic work as they uncovered fraud, often presenting complex, messy situations involving the falsification of data to "obtain a result nearer to the expected figure", a "notebook of forged data", sloppy research practices, or a failure to respond to community criticism—issues that were either deliberately hidden or obscured by a strong bias to see things in a particular light (e.g., *Science*, 6 March 1981¹⁷: 1025).

Researchers who have violated accepted norms are often portrayed as individuals of questionable character, failing to adhere to the ethical principles central to research and engaging in self-interested or morally dubious behaviour. Transgressions are typically attributed to a single individual, with younger scholars disproportionately represented in such cases. Their failings are framed as a disregard for the ideal of science as a community bound by shared values. In this view, adherence to a common work ethos is positioned as fundamental to the smooth functioning of the scientific system, reflecting a Mertonian (1973[1942]) understanding of the scientific ethos. Researchers' lack of moral integrity was perceived as undermining the collective effort to produce reliable knowledge and eroding trust within the scientific community— "scientists cannot trust each other" (*Nature*, 22 January 1981¹⁸: 211).

During this period, the issue of trust is primarily framed in terms of the internal dynamics of the scientific community, with public trust in science not yet a central concern. Public awareness of scientific transgressions is largely dismissed as irrelevant. In this context, societal actors primarily appear as political figures, such as members of the U.S. Congress during the 1981 hearings on scientific fraud convened by Al Gore. However, these hearings did not lead to significant consequences.

While those who are identified as fraudsters fall into a clear-cut moral category, the figure of the whistle-blower, i.e., the person denouncing a situation of misconduct, is met with deep ambivalence, even though they frequently play an essential role in the "detective stories." Indeed, as outlined in the early 1980s, the then-recent cases of transgressions have shown that well beyond usual practices of control and replication, "other means have predominated" in the discovery of fraud. This included, for example, "detective work of young

¹⁷ Wade N (1981) A diversion of the quest for truth. *Science* 211 (4486):1022-1025.

¹⁸ (1981). Responsibility for trust in research. *Nature* 289:211-212.

lab assistants or young scientific rivals who have extra-experimental evidence of cheating, who have some independent reason for suspicion” (*Science*, 10 April 1981¹⁹: 140). However, while this is mentioned as an important part of self-correction, we encounter several cases where whistle-blowers face difficult situations, fearing they might lose their jobs, being suspected of acting out of personal interest or experiencing social exclusion. Thus, they were perceived as betraying the community and tarnishing its positive image by revealing 'family secrets' to those outside the fold.

Being part of the scientific 'family' comes with high expectations and the assumption that researchers act as members of a value community. Scientists who are found guilty of scientific fraud are, so the narrative, “as a matter of routine [expelled] from the scientific community” (*Nature*, 9 April 1981²⁰: 434). The judges of whether someone transgressed the boundaries of acceptable research practices are part of the direct research environment, thus the department or laboratory members where the research in question was conducted. They were supposed to act as agents to assure the quality of research. Thus, “the objective should be to make sure that laboratory communities remain as rigorous as they should be in their internal assessment of all their members” (*Nature*, 22 January 1981²¹: 212).

Scepticism, organized through reproducing and building on the results of other scientists as well as a critical engagement with peers, is deemed sufficient to detect and sort out wrong claims over time. The same holds true for both unavoidable “honest mistakes” as well as for deliberately misrepresented results. If an experiment “appears to have significance it will be repeated and retested in numerous ways” (*Science*, 24 April 1981²²: 421) is a frequent line of argumentation. Also, the peer-review process in journals is seen as an essential means to critically scrutinize results, even though the limitations are often pointed at. While we can trace the belief that fraud “will probably be exposed by the scientific process in the long run”, it is also admitted that “this is not necessarily true of all fraud and certainly does not apply to the short run” (*Nature*, 25 March 1983²³: 1417).

¹⁹ Broad W (1981) Fraud and the structure of science. *Science* 212 (4491):137-141.

²⁰ (1981) Who, not Congress, should police fraud? *Nature* 290 (5896):433-444.

²¹ (1981) Responsibility for trust in research. *Nature* 289:211-212.

²² Broad W (1981) Congress Told Fraud Issue “Exaggerated”. *Science* 212 (4493):421.

²³ Angell M (1983) Fraud in Science. *Science* 219(4591):1417-1418.

The assurances that science will correct itself by filtering out wrong claims and expelling individuals who do not follow the moral code enable the belief that transgressions do not significantly harm science. For example, in reports on the congressional hearing mentioned above, officials from the NIH explicitly “den[ied] that fraud is a significant problem overall” (*Science*, 24 April 1981²⁴: 421), stressing the need to be cautious about making quick judgments on whether something constitutes a serious transgression or not.

Placing scientists, their communities, and practices of epistemic self-correction centre stage for responding to transgressions also comes with a reluctance to attribute too important a role to institutions. Doubts are raised about whether institutions, such as universities or funding agencies, are sufficiently prepared to execute sanctions for scientific fraud formally. They were frequently described as reacting too hesitantly in the context of transgressions and tending to “look away,” and ignoring potentially problematic scientists. This is particularly true when researchers managed to become highly visible and thus somewhat achieved “immunity from scrutiny” (*Science*, 10 April 1981²⁵: 140). Universities are accused of wanting to protect their reputations and, hence, not thoroughly investigated accusations of scientific misconduct.

While institutional actors are seen as less significant for governing research practices than the scientific value collective, we can see the first instances when the changing research environment was described as a potential cause for rising transgressions. A number of articles, for instance, point to the “significant pressure to publish [...] data as fast as possible so as to obtain priority” (*Science*, 3 October 1980²⁶: 41) and secure grants and stable positions, which may temper researchers to cut corners. Yet, these initial observations suggesting that the issue might not be merely “a matter of rotten apples in the barrel” but rather something intrinsic to “the barrel itself” (*Nature*, 2 June 1983²⁷: 369) are frequently dismissed as mere rationalizations, diverting attention from the individual's failure to uphold the core values traditionally seen as guiding science (e.g., *Science*, 1 April 1983²⁸).

²⁴ Broad W (1981) Congress Told Fraud Issue “Exaggerated”. *Science* 212 (4493):421.

²⁵ Broad W (1981) Fraud and the structure of science. *Science* 212 (4491):137-141.

²⁶ Broad W (1980) Imbroglio at Yale (I): Emergence of a Fraud. *Science* 210 (4465):38-41.

²⁷ David P (1983) The system defends itself. *Nature* 303 (5916):369.

²⁸ Culliton B (1983) Coping with fraud: the Darsee Case. *Science* 220 (4592):31-35.



Figure 4. Choreography of the five narrative strands in phase 1 – The family-business model

Summarizing our analysis of the 1980s *Nature* and *Science* articles, science is described as able to govern itself, handling transgressions as a “family business”. Scientists desire minimal interference from societal or institutional actors in overseeing or regulating their practices. Responsibility for research is described as lying in the relationships among peers, colleagues, and supervisors, who were supposed to review the produced knowledge critically. Research is presented as a deeply cultural process, where scientists are expected to act according to core values. Governing scientific misconduct often boils down to expelling fraudsters who do not adhere to these ideals. Only those closely involved in the research process can judge and regulate the few cases where individual ‘rotten apples’ misbehaved and engaged in fraud. Mertonian ideals about science, picturing scientists as a community of values following implicit norms are prevalent and allow to cherish the idea of automatic self-correction of results as science advances. Institutional actors are not deemed necessary for this ‘purely scientific’ process among scientists.

Phase 2 (late 1980s to early 2000nds) - Scientific misconduct is a problem! – Including institutional actors in a scientific self that regulates

In the second phase, which largely spans the 1990s, debates about transgressions of good scientific practice are increasingly opened up for wider public debate. Several Congressional hearings were being held in the US to investigate the potential waste of taxpayers’ money, and newspapers increasingly reported accusations of scientific misconduct. Societal scrutiny of the questionable behavior of individual scientists was seen as unsettling, not only for its

potential to erode public trust in research but also due to a palpable fear of external societal oversight. Institutions were publicly warned that “fraud would eventually come out - it always does - and that newspaper accounts of a cover-up would do far more damage to the public trust than a clear statement about a single [person] [...] who thought he could bend the rules and get away with it” (*Nature*, 21 April 1994²⁹: 674). Indeed, society has started to speak back to science (Nowotny et al., 2001) in these years, and this discursive strand now occupies a more central position in the overall narrative choreography. The period when science operated as a largely unquestioned and successful enterprise and could keep its intricate processes hidden from public scrutiny seemed to come to an end.

The self-correction argument so strongly advocated for in the first period starts to lose its power. We regularly encounter now calls to “explicitly acknowledge that science’s self-correcting mechanisms are insufficient to guard against dishonest research” (*Science*, 1 May 1992³⁰: 604). The epistemic processes and practices of self-correction, filtering out wrong claims over time and expelling individuals – so the “in-the-end-good-science-wins” argument –, were described as important but too fragile in their nature and clearer articulations of formal control and oversight would be needed. Such formal procedures of investigation and the sanctioning of transgressions would, however, need considerable investments of time and resources, which only institutional actors were seen in the position to care for. This explains why institutional actors and their responsibilities moved to the centre stage of the debate.

Once diverse institutional actors are expected to take on responsibilities, we also find more explicit attempts to define scientific misconduct and establish rules and regulations, no longer assuming that tacit rules would suffice. However, these collective reflections go into rather different directions. Some show concerns that “public attention tends to focus on dramatic instances of misconduct - the occasional cases of fabrication, falsification, and plagiarism that all agree violate the ethical norms of science” (*Science*, 9 December 1994³¹: 1660). This might explain why high-level norms are made explicit in universities’ and funding agencies’ newly written codes of conduct—to assure societal actors that the issue of transgressions is taken

²⁹ (1994) How to lose confidence. *Nature* 368 (6473):674.

³⁰ Hamilton D (1992) A shaky consensus on misconduct. *Science* 256 (5057):604.

³¹ Alberts B and Shine K (1994) Scientists and the integrity of research. *Science* 266 (5191):1660.

seriously on an institutional level. However, we also find voices stressing that more attention is needed to “those behaviours that do not rise to the level of misconduct but nevertheless violate values held in common by the scientific community” (ibid.: 1600). Examples mentioned are the “allocation of credit” for contributions to research, “the treatment of research data” which often needs considerable time and care that remains largely invisible in reward systems, and “mentorship responsibilities” (ibid.: 1600). With opening up the debate to a much wider array of issues, there is also disagreement about whether or not we only see the tip of the iceberg of research transgressions. Indeed, the number of registered cases remains low compared to the total number of publications or cases reported in universities. Still, there are articles reporting on surveys finding a considerable number of researchers witnessing “serious breaches of research ethical guidelines” (*Nature*, 4 March 1999³²:14). Despite all the debates around definitions and reliable numbers of misconduct incidents, there is no longer any doubt that scientific misconduct is an issue that needs to be taken seriously.

It is thus beyond doubt that institutional actors are seen as having “a responsibility to articulate standards for ethical conduct and to see that they are put into practice” (*Science*, 18 April 1997³³:335). Concrete rules, investigative processes, and procedures for handling misconduct allegations thus become central elements in the discursive strand on institutions. We can also follow the introduction of offices for research integrity, which struggle in the first years to find their positions but gain legitimacy over the course of this phase. While it is clear that the very meaning of the scientific self has been extended by institutional actors, it still needs clarification of who has to investigate what, how, and when. This is for example addressed, when stating “academic institutions that receive their research funds [...] investigate allegations of misconduct in the first instance, and then [...] report their findings to the funding agency” (*Nature*, 4 March 1999³⁴:14). In parallel, institutions also consider how to ensure that novice researchers grow into science and are made aware of the newly implemented rules. Funding bodies, therefore make it obligatory that „institutions receiving

³² Abbott A (1999) Science comes to terms with the lessons of fraud. *Nature* 398(6722): 13-17.

³³ Gunsalus C (1997) Ethics: Sending Out the Message. *Science* 276(5311): 335

³⁴ Abbott A (1999) Science comes to terms with the lessons of fraud. *Nature* 398(6722): 13-17.

[...] grants had to provide instruction in research ethics to their young researchers“ (*Science*, 23 June 1995³⁵:1707).

However, these new social arrangements also raise other considerations. “The new procedures [for investigating scientific misconduct] are designed to ensure that cases of scientific misconduct are dealt with rapidly, and that both whistle-blowers and those innocently accused are protected “(*Nature*, 4 December 1997³⁶:430). Introducing such processes aims to ensure fair and accountable responses to accusations, addressing criticisms of arbitrariness in previous ad-hoc investigations. Yet, striking a balance between safeguarding all parties involved—the accuser and the accused—remains a significant open challenge. Reports continue to highlight ambivalence and outright hostility towards researchers who come forward with concerns about the improper behaviour of colleagues or supervisors. Whistle-blowers, often close colleagues or students, not only bear the emotional toll of initiating investigations but also play a pivotal role in the evolving landscape of research integrity within newly implemented university frameworks.

Another group of institutional actors that gains increasing prominence in the second phase is scientific journals. In the first phase, they present themselves more as commentators on events related to research integrity and as facilitators of scientific exchange without much intervention (beyond peer review). However, they now begin to explicitly reflect on potential roles, responsibilities, possibilities, and challenges. This repositioning is nicely captured in a statement in *Nature* (6 July 1989³⁷:3), underlining that journals are “an important layer of defence, detecting error (more easily than fraud) before it entered the scientific record, providing a forum for disagreement (journals without correspondence columns were urged to provide them), and ensuring that notice be given of research found fraudulent”. The heightened attention must be viewed in the context of persistent complaints that journals have been reluctant to address research misconduct issues, too slow to retract problematic papers, and hesitant to engage in inquiries concerning research integrity. In response, journal efforts during these years concentrated on enforcing clear guidelines, particularly regarding authorship criteria (e.g., *Nature*, 11 May 1989³⁸; *Science*, 18 April 1997³⁹) or peer review

³⁵ Taubes G (1995) Indiana: Wrong Answers – But No Right Ones. *Science* 268(5218):1707.

³⁶ Abbott A (1997) Germany tightens grip on misconduct. *Nature* 390(6659):430.

³⁷ Anderson A (1989) Scientific misconduct still an unknown. *Nature* 340 (6228):3.

³⁸ Palca J (1989) Disputed paper takes centre stage in Congress. *Nature* 339 (6220):83.

³⁹ Gunsalus C (1997) Ethics: Sending Out the Message. *Science* 276 (5311):335.

practices (*Science*, 22 December 1995⁴⁰: 1913). In subsequent years, these efforts expanded to include standards for permissible manipulations of digital images in published articles (*Science*, 21 January 1994⁴¹: 317)

In the initial phase, research environments were acknowledged as potential contributors to boundary transgressions, yet such systemic factors were simultaneously dismissed as unacceptable excuses for individual misconduct. Over time, however, the systemic dimensions and value ecologies (Felt, 2021) within which researchers operate have undergone such profound changes that articles in leading journals increasingly suggest causal links between these factors and violations of good scientific practice. References frequently highlight the intensifying competitiveness of the field, the relentless pressure on researchers to publish prolifically, and the fact that "promotions, appointments and the award of research grants [depend more than ever before] on people's publication records" (*Nature*, 26 May 1994⁴²: 262). This, in turn, leads researchers to "try to magnify their reputation by publishing more than they need (and have to say)" and it explains "people's eagerness to be co-authors of articles of whose content they are largely ignorant (and whose conclusions they are unable to defend), and [...] the inadequate and even misleading attributions of credit for earlier work now commonplace in the literature" (ibid.: 262).

⁴⁰ Marshall E (1995) Peer Review: Written and Unwritten Rules. *Science* 270 (5244):1913.

⁴¹ Anderson C (1994) Easy-to-alter digital images raise fears of tampering. *Science* 263 (5145):317.

⁴² (1994) What to do about scientific misconduct. *Nature* 369 (6478):261-262.

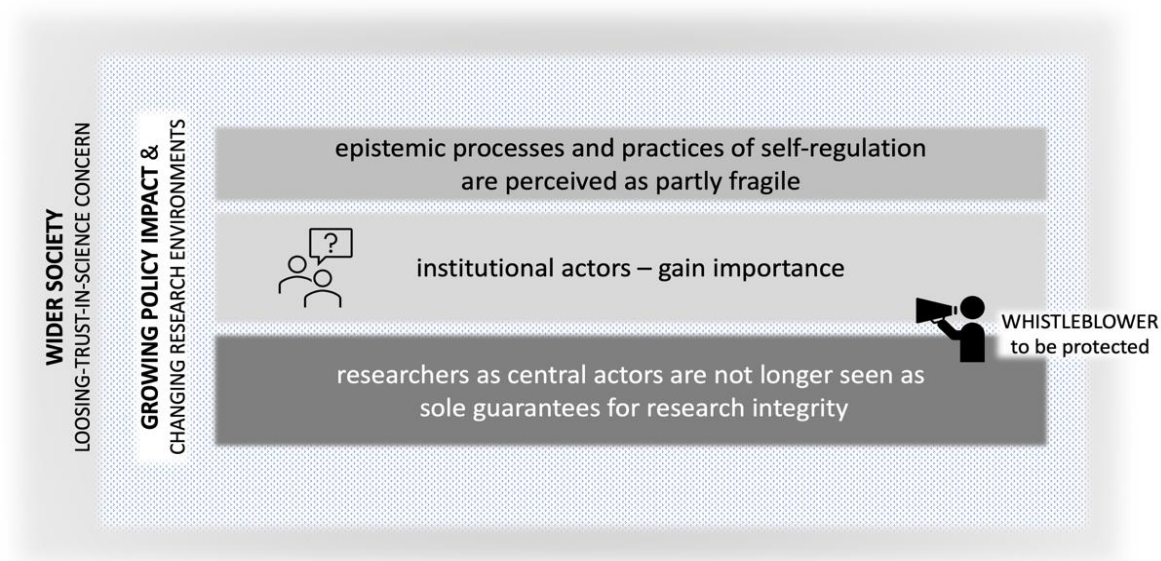


Figure 5. Choreography of the five narrative strands in phase 2 – An institutionally extended self model

In summary, the second phase reflects a broader understanding of scientific misconduct and a redefined conception of the scientific self, now seen as an institutionally extended entity. Institutional actors increasingly play a pivotal role in shaping scientific practice, complementing the traditional Mertonian ideal, which is gradually viewed as insufficient for addressing misconduct. The fragility of self-correcting epistemic processes underscores the need for broader systemic regulation. This evolution mirrors shifts in the research ecosystem and the deepening entanglement of science with society, redistributing responsibility for research integrity across diverse institutional actors. Consequently, practices for ensuring integrity are becoming more formalized, marking a shift from self-correction to structured self-regulation.

Phase 3 (from the early 2000s onwards) - Confronting research integrity – Governance by a multi-stakeholder self that manages science

The third phase began in the early 2000s, marked by prominent international fraud cases that cast doubt on the sufficiency of established institutional self-regulation in addressing integrity issues. What raised concern was the scale of transgressions committed by respected scientists such as materials scientist Jan Hendrik Schön and stem-cell researcher Hwang Woo-Suk. Numerous articles in leading journals conducted a quasi-autopsy of these cases, dissecting systemic failures and highlighting dysfunctions in research processes. These analyses exposed flaws and provoked substantial critiques of the research ecosystem's prevailing social and

institutional structures. Some articles depicted these fraud cases as “learning experience [that] will be a stepping stone for better execution and management of scientific research.” (*Nature*, 12 January 2006⁴³: 123)

Schön and Hwang's cases clearly exposed the publication system's fragility. *Nature* and *Science* came under particular pressure because they had published many papers that had to be retracted and feared for their reputation. In response, they ramped up regulatory efforts, building on previous initiatives by introducing stricter authorship and peer review guidelines. Notably, editorials took pride in the added review mechanisms, including using algorithmic tools to detect statistical errors, plagiarism, and image manipulation—marking a more proactive approach to preserving research integrity. “If you look at the number of mistakes we manage to correct before publication, I think it is worth it” said the responsible ‘image detective’ of *Nature* in an interview. She continues “It’s especially nice to get replies from authors who are really grateful when we spot errors. We are protecting the published record and their reputation” (*Nature*, 12 June 2015⁴⁴). While journals had positioned themselves earlier as facilitating communication among scientists with minimal interference, they increasingly adopted on a more active, managerial role, balancing oversight with support to uphold research integrity and guide researchers in maintaining standards.

One notable shift is the increased space journals provide for researchers to share perspectives through commentary pieces, letters, and reports on scientific misconduct, which are eagerly embraced by the scientific community. Beyond anecdotal accounts, researchers demonstrate a growing epistemic interest in studying misconduct, with articles reporting on interviews, discussion groups, and surveys that capture their perspectives and observations on breaches of good scientific practice (e.g., *Nature*, 10 July 2003⁴⁵). These studies highlight that the spectrum of matters of concern is for researchers much wider than the proclaimed focus on outright misconduct. Increasingly, we observe how scientists “put science under the microscope” (*Nature*, 28 January 2016⁴⁶:461) and discussions zoom in on potentially worrying mundane research practices, such as for instance the use of statistics, alterations in scientific illustration, the living conditions of animals, incoherent labelling of antibodies, unconscious

⁴³ Cyranoski D (2006) Verdict: Hwang's human stem cells were all fakes. *Nature* 439(7073): 122-123.

⁴⁴ Van Noorden R (2015) The image detective who roots out manuscript flaws. *Nature News* doi:10.1038/nature.2015.17749

⁴⁵ Abbott A and Graf P (2003) Survey reveals mixed feelings over scientific misconduct. *Nature* 424(6945): 117.

⁴⁶ Lewandowsky S and Bishop D (2016) Don't let transparency damage science. *Nature* 529(7587): 459-461.

biases, conflicts of interests, and the overall replicability of published results (e.g., *Nature*, 8 March 2001⁴⁷; *Nature*, 13 December 2012⁴⁸; *Science* 21 June 2013⁴⁹; *Science*, 17 January 2014⁵⁰; *Nature* 5 February 2015⁵¹; *Science*, 27 May 2016⁵²; *Nature*, 18 February 2016⁵³). This increased self-reflection, which is also portrayed as a form of epistemic self-regulation, contributes to a greater use of the term research integrity and we also see the range of practices considered concerning expanding.

Discussions of research integrity also start to intersect with growing concerns about how contemporary research environments—often in reference to the neoliberal transformation of research (Fochler et al., 2016)—impact the production of reliable knowledge. Competitiveness is increasingly portrayed as central to the research landscape and publications are framed as commodities through which individuals (and their institutions) compete in the global research system. However, these dynamics are often criticized for fostering conditions that may lead to transgressions, careless practices, or the erosion of trustworthy knowledge. The relentless pressure to publish, precarious career paths, limited time for meaningful mentorship, toxic lab cultures, high mobility, and other environmental factors are seen as creating vulnerabilities that encourage transgressions while leaving insufficient space to reflect on how research is done. Studies were reported to show that researchers “are more likely to behave unethically if they believe their managers are treating them unfairly” (*Nature* 18 January 2007⁵⁴: 242). This leads to a paradoxical situation: “many of the risk factors for misconduct also seem to be what makes for good science” (*Nature*, 18 January 2007⁵⁵: 243).

Furthermore, increased attention is given to science-society relationships which were seen as endangered through these developments: “Nothing will erode public trust more than a creeping awareness that scientists are unable to live up to the standards that they have set

⁴⁷ Richardson, M K and Keuck G (2001) A question of intent: when is a 'schematic' illustration a fraud? *Nature*, 410(6825): 144.

⁴⁸ Vaux D (2012) Research methods: Know when your numbers are significant. *Nature* 492(7428): 180-181.

⁴⁹ Godecharle S et al. (2013) Integrity Training: Conflicting Practices. *Science* 340(6139): 1403.

⁵⁰ McNutt M (2014) Reproducibility. *Science* 343(6168): 229.

⁵¹ Bradbury A and Plückthun A (2015) Standardize antibodies used in research. *Nature* 518(7537): 27-29.

⁵² McNutt M (2016) Implicit bias. *Science* 352(6289): 1035.

⁵³ Reardon S (2016) A mouse's house may ruin experiments. *Nature* 530(7590): 264.

⁵⁴ Giles J (2007) Breeding cheats. *Nature* 445(7125), 242-243

⁵⁵ Giles J (2007) Breeding cheats. *Nature* 445(7125), 242-243

for themselves” (*Nature*, 10 May 2012⁵⁶:149). Throughout the third phase, we repeatedly read about the importance of protecting the reliability of research to legitimize the role of science and ensure its contribution to society. Different to the second phase, when the fear of societal control was palpable, it is now about having a healthy relationship to society. In particular, the high-profile cases, which attract the attention of many journalists are seen as worrisome.

Faced with a broadening spectrum of concerns—including not only scientific fraud and misconduct but also more routine questionable practices—we observe the enforcement of a patchwork of responses. As noted in *Science* (26 June 2015⁵⁷: 1421), “ensuring that the integrity of science is protected is [seen as] the responsibility of many stakeholders.” Around each issue, actors assemble to negotiate their capacities and responsibilities in addressing problematic behavior. For long-standing concerns, institutional processes have often stabilized, sometimes becoming so entrenched they are treated as unquestionable golden standards. Countries lacking institutionalized mechanisms for investigating misconduct are frequently criticized, with their responses compared against these established norms. In contrast, responses to newly emerging concerns remain subject to negotiation. Yet, whether addressing old or new issues, most contemporary responses share common strategies: formalizing (e.g., international misconduct rules, guidelines for animal research, conflict of interest policies), standardizing (e.g., harmonizing global investigative procedures, standardizing laboratory techniques and data-sharing formats), and controlling (e.g., algorithmic checks for statistics and plagiarism, automated experimental protocols, video documentation of processes). Collectively, we describe these as managerial approaches to research integrity.

Efforts to manage research integrity are underscored by a strong emphasis on transparency. Advocating openness aligns well with managerial approaches of auditing and accountability. Making “data, samples, methods, and reagents” accessible (*Science*, 4 March 2016⁵⁸: 1024) then is seen as enhancing reliability—not only by enabling scrutiny but also by fostering a sense of responsibility among researchers. Universities, too, are urged to adopt transparency,

⁵⁶ Sarewitz D (2012) Beware the creeping cracks of bias. *Nature* 485(7397): 149.

⁵⁷ Alberts B (2015) Self-correction in science at work. *Science* 348(6242):1421.

⁵⁸ McNutt, M., et al. (2016). Liberating field science samples and data. *Science* 351(6277): 1024-1026.

especially in misconduct investigations. As *Nature* (26 May 2011⁵⁹: 420) notes, “Once an investigation is complete, the institution should be as transparent as it can about what happened. Especially when public funds are involved [...] the taxpayer has a right to know what happened when papers are retracted — even if the faculty member in question is eventually exonerated.”

In this context, the public arena is reframed: not merely as a potential threat to trust in science but as a space where transparency can help restore it. The rise of the internet and digital tools has revolutionized how data, critique, and ideas circulate. Initiatives like Open Access have increased visibility into research processes, while platforms such as PubPeer⁶⁰ and Retraction Watch ‘democratize’ critique, allowing broader participation in identifying errors or voicing concerns. These platforms also redefine whistleblowing as a systemic responsibility, with anonymity fostering a culture of accountability. This aligns with the evolving notion that “peer review continues long after a paper is published,” becoming part of the ongoing scientific record (*Nature*, 21 December 2011⁶¹:449). Connectivity is also celebrated for its practicality, with *Nature* (23 July 2015⁶²: 382) suggesting that researchers struggling to reproduce results could find help “just a phone call away.”

In this phase, researchers themselves are portrayed as key managerial actors. Innovators who create online infrastructures of sharing and exchange are highlighted as entrepreneurs shaping reliable practices. Additionally, the growing spectrum of concerns—extending into everyday research practices—places new responsibilities on researchers. They are expected to manage their work meticulously by providing data management plans (*Science*, 4 March 2016⁶³:1025), addressing biases (*Nature*, 8 October 2015⁶⁴: 163), and improving lab-management habits (*Nature*, 9 June 2016⁶⁵: 175). As central stakeholders, researchers are tasked with formalizing, standardizing, and controlling their own processes to ensure high-quality science.

⁵⁹ (2011). Copy and paste. *Nature* 473(7348): 419-420.

⁶⁰ <https://pubpeer.com/>

⁶¹ Marcus A and Oransky I (2011) The paper is not sacred. *Science* 480(2011):449-450.

⁶² (2015). It’s good to talk. *Nature* 523(7561): 382.

⁶³ McNutt M et al. (2016) Liberating field science samples and data. *Science* 351(6277): 1024-1026.

⁶⁴ (2015) Let’s think about cognitive bias. *Nature* 526(7572): 163.

⁶⁵ DuBois J et al. (2016) Misconduct: Lessons from researcher rehab. *Nature* 534(7606): 173-175.

However, this managerial turn has not gone without critique. Editorials and commentaries increasingly call for rethinking and reorganizing science, proposing alternatives that move beyond managerialism. These fragmented visions aim to address present challenges while fostering a forward-looking ethos. By the end of this phase, a shared narrative emerges, emphasizing the need for scientists to embrace responsibility and transparency, cultivating a collective ethos to guide the future of research.

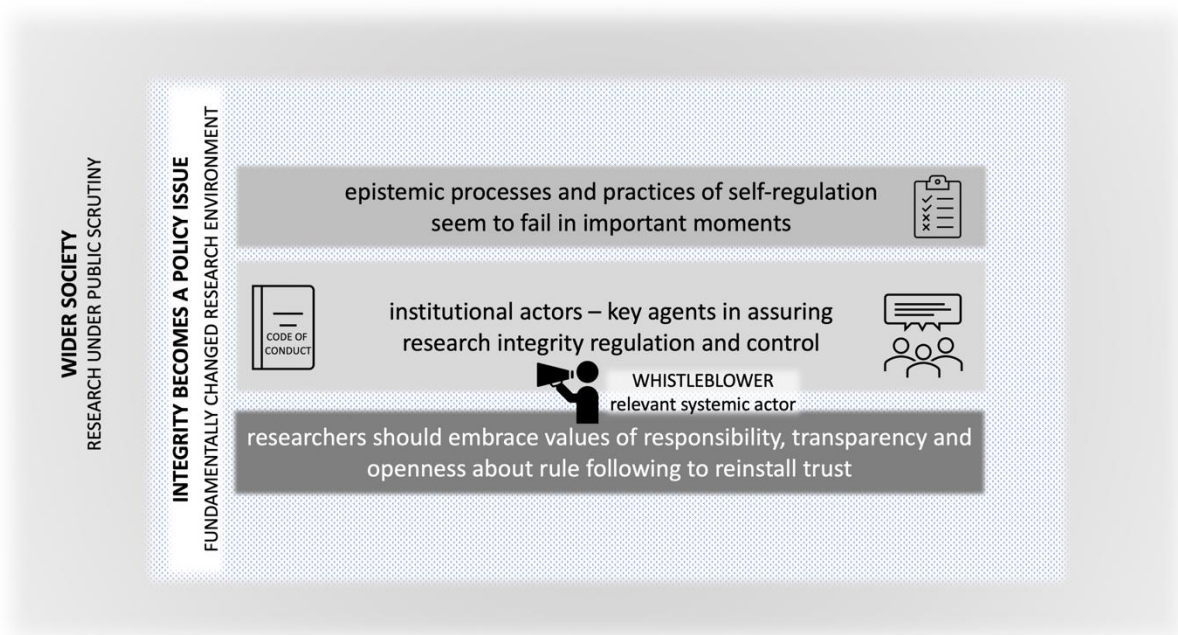


Figure 6. Choreography of the five narrative strands in phase 3 – A managerial multi-stakeholder-self model

In summary, the third phase is characterized by a model of the multi-stakeholder managerial self. Faced with the complex challenges to research integrity and the recognition that existing self-correction and regulation processes often fail at critical moments, new normative procedures for control are proposed. These include the introduction of standardization mechanisms alongside a redefinition and formalization of roles. However, stakeholders are not seen as acting in isolation; rather, they are understood to be deeply interconnected. Only networked approaches, where the responsibilities of each member of the scientific self are adapted to the specific situation, are considered viable.

Discussion and Conclusions

This article traces nearly four decades of discussions on scientific misconduct in *Nature* and *Science*. By questioning the myth of science's self-corrective capacity and examining how the concept of the scientific self has evolved over time, we gained valuable insights on two levels. On the one hand, we witnessed how closely entangled transformations in the research system and the handling of transgressions of good practice are and how this shapes the way distribution of responsibility is envisaged. On the other hand, we also saw the gradual shifts in the complex relationships between science and society and how this mattered in the way transgressions were being addressed.

Identifying five narrative strands across this 40-year period, we distinguished three phases. In phase 1 (until the late 1980s), the focus is on researchers and a relatively insular vision of the scientific community, closely aligned with the Mertonian ideal (Merton, 1973 [1942]-a). Researchers are expected to be guided by this ethos, with science's self-corrective capacity framed as an internal process akin to a *family business*. A sharp boundary is drawn between science and society and between the scientific community and institutional actors supporting science. The prevailing view is that only scientists can judge what constitutes adequate practice. A wider society only appears relatively marginally, mainly constructed as profiting from scientific insights and not needing to know what happens behind the scenes.

As the conditions for research and its relationship with society evolve, phase 2 (from late 1980s to early 2000s) witnessed the emergence of a broader *institutionally extended self model*, coopting institutional actors into the scientific community to address misconduct. This phase is marked by experimentation and uncertainty. We thus witness not only an expansion in the geography of responsibility involving more actors than before, but also the very definition of what counts as transgression has been considerably expanded, going well beyond classical fraud (Resnik, 2003). Public trust in science, more essential than ever before due to the prominent role science and technology play in the development of societies, is seen as in jeopardy. This does prompt institutional actors—particularly universities, funding agencies, and research integrity offices—to take on a more central role, and the scientific community can no longer refuse to extend their understanding of the scientific self. This

inclusion of institutional actors and their efforts to introduce new rules and processes are framed as a means to maintain science's ability to self-regulate.

By phase 3 (from early 2000s onwards), the role of institutional actors is firmly established, leading to more formalized control mechanisms. Indeed, as research integrity issues grow in complexity, a networked, multi-stakeholder approach is increasingly seen as necessary, with scientists, universities, funding agencies, journals, and research integrity offices all playing a role in safeguarding the trustworthiness of scientific knowledge. While involving these actors in ensuring research integrity is crucial, an overreliance on them risks transforming reflections on research integrity into a "bureaucracy of virtues" (Felt, 2017b), focused more on formal compliance than meaningful accountability. Furthermore, increasingly questions appear whether the very transformation of research is not also a potential source for fostering transgressions. Therefore, we would argue that the "boundary between healthy skepticism and manufactured doubt" is no longer a "simple matter of distinguishing between valid laboratory and publishing protocols on one side and political, economic, or personal interests on the other" (Roberts et al., 2020, p. 345). Research and the transformation of both science and society are deeply entangled with each other and therefore situated and careful answers have to be found to assure a culture of integrity. Indeed, also the *managerial, multi-stakeholder model* clearly shows its limitations, especially as contemporary research incentives encourage shortcuts and strain collaborative relationships. These developments are closely scrutinized, with growing concern over the erosion of public trust in science.

Across all three phases, also the role of whistleblowing evolves significantly. Initially marginalized and often viewed with disdain, whistleblowers gradually come to be recognized as figures deserving protection from attacks within the scientific community. By the end of the third phase, they have gained an integral role in upholding research integrity.

Through a longitudinal analysis of debates on research integrity, we see how misconduct issues offer a lens for understanding the co-production of social and knowledge orders within research. Our analysis highlights the value of studying "frictions", in the sense proposed by Anna Tsing (2005), i.e. as opportunities to examine the "grip of worldly encounters" (p.1) researchers have with the changing realities they have to navigate. By centring these frictions, we become attuned to the power dynamics at play across the three phases, recognizing how

much transgressions of good practice are shaping and being shaped by how research is transformed.

We also witnessed intense exercises of demarcation within science as well as between science and society (Gieryn, 1999) while at the same time observing how the self that should be the agent of self-governance expanded and changed. Gradually, different institutional players were integrated into the models of the scientific self that should ensure good scientific practice. This was due to two important transformations taking place during these 40 years. On one hand, we observed a clear shift in the dynamic but simultaneously fragile relationship between science and society. Science can no longer be narrated as a detached, objective pursuit but rather as an interactive and socially embedded practice that should increasingly contribute to identifying societal challenges and finding solutions. In a world marked by uncertainty and complexity, science is expected to be more responsive, inclusive, and transparent to gain trust in complex problem-solving tasks.

Yet, simultaneously, the research system transformed under a neoliberal logic. These changes have introduced a more market-like mentality, competitive behaviour, and ever-shorter time frames within which research must fit, causing a more fragmented approach to research and dense auditing structures. The pursuit of knowledge had to find an arrangement that is sometimes even subordinated to economic, political, and institutional imperatives. While these shifts have brought about efficiencies and focused attention on applying research to societal problems, they have also increased the readiness to transgress boundaries (Felt, 2025). This is well reflected in the fact that we move from the idea of correcting the few mistakes, to regulating good practice to a more managerial mode of addressing transgressions.

We had started this article with a recent quote from *Nature* (24 April 2024⁶⁶:689) stressing that “[r]etractions are part of science, but misconduct isn’t” and underlining that “journals, funders and institutions that employ researchers [...] all can learn lessons from misconduct cases”. This is much in line with a noticeable shift that can be witnessed in recent years; a shift towards emphasizing the importance of fostering a sense of belonging—not just to a community of practice, but to a broader community that shares common values and norms.

⁶⁶ Editorial (2024) Retractions are part of science, but misconduct isn’t, *Nature* 628(8009): 689.

This shift signals a growing commitment to collective stewardship of research integrity, with the aim of strengthening ethical practices in the future. While a strong managerial approach to research integrity still prevails, we are beginning to see the emergence of awareness regarding the limitations of this model. In response, there are early indications that more holistic, care-oriented approaches are being considered and, in some cases, implemented.

This trend is closely tied to a growing emphasis on cultivating a culture of integrity through more effective socialization processes. Integrity is increasingly seen not merely as a set of rules to be followed—rules which are often formalized and signed by newcomers—but as a dynamic, ongoing process that requires active collaboration and engagement among all actors within the research field. Developing a shared understanding of what constitutes quality research and how to address ethical violations calls for collective reflection and mutual responsibility. In this sense, the focus is shifting from compliance-based models to those that encourage a deeper, more sustained commitment to ethical practice, one that acknowledges the complexities of research and the importance of maintaining trust within both the scientific community and society at large.

Article B: RESPONSE_ABILITY - A card-based engagement method to support researchers' ability to address integrity issues

Abstract

Issues related to research integrity receive increasing attention in policy discourse and beyond with most universities having introduced by now courses addressing issues of good scientific practice. While communicating expectations and regulations related to good scientific practice is essential, criticism has been raised that integrity courses do not sufficiently address discipline and career-stage specific dimensions, and often do not open up spaces for in-depth engagement. In this article, we present the card-based engagement method RESPONSE_ABILITY, which aims at supporting researchers in developing their ability to respond to challenges of good scientific practice. The method acknowledges that what counts and what does not count as acceptable practice may not be as clear-cut as imagined and that research environments matter when it comes to integrity issues. Using four sets of cards as stimulus material, participants are invited to reflect individually and collectively about questions of research integrity from different perspectives. This approach is meant to train them to negotiate in which contexts certain practices can still be regarded as acceptable and where possible transgressions might begin. RESPONSE_ABILITY can be seen as fostering the creation of an integrity culture as it invites a more reflexive engagement with ideals and realities of good practice and opens a space to address underlying value conflicts researchers may be confronted with. Concluding the article, we call for caution that addressing issues of integrity meaningfully requires striking a delicate balance between raising researchers' awareness of individual responsibilities and creating institutional environments that allow them to be response-able.

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RESPONSE_ABILITY

A card-based engagement method to support researchers' ability to address integrity issues

Introduction

Over the last decade, the issue of research integrity has received increasing attention. National and international policy documents, extensive calls for immediate action to safeguard the trustworthiness of science, and the creation of special websites, such as *Retraction Watch*,⁶⁷ which report on and offer a forum for debate on recent retractions and the various transgressions against good scientific practice, are all witness to this shift in perception (Biagioli et al., 2019; Hiney, 2015). Research projects addressing integrity issues have been funded both nationally⁶⁸ and internationally⁶⁹ to identify, better understand and develop ways of responding to the challenges of contemporary research. Research institutions, particularly universities, have started to reconsider parts of their research governance, which has often run alongside managerialist logics, creating top-down formalization and increased control over research practices (Mejlgaard et al., 2020).

By now, most universities have not only formulated more explicit integrity guidelines, they have also introduced (obligatory) courses to address issues of good scientific practice (Abdi, Pizzolato, Nemery, & Dierickx, 2021). However, these trainings are often guided by an 'awareness-leads-to-avoidance' logic, which links scientific misconduct to an information deficit on the side of researchers. While communicating expectations and regulations related to good scientific practice is important, criticism has been raised that integrity courses do not sufficiently address discipline and career-stage specific dimensions, and that online teaching with little face to face interaction is not offering sufficient practical experiences with courses frequently designed around forms of learning that are too passive to be effective (Phillips et al., 2018; Sefcik et al., 2020). Analysts also underline the importance to embed this addressing of integrity issues into the overall socialization of novice researchers, which would require

⁶⁷ <https://retractionwatch.com/>

⁶⁸ e.g., "Borderlands of Good Scientific Practice," <https://rri.univie.ac.at/en/research/research-projects/completed-research-projects/borderlands-of-good-scientific-practice/>

⁶⁹ e.g., <https://embassy.science>; <https://eneri.eu/>; <http://entireconsortium.eu/>; <http://h2020integrity.eu/>; <https://path2integrity.eu/>; <https://printeger.eu/>

commitments on many different levels (Hyytinen & Löfström, 2017; Mejlgaard et al., 2020; Orr, 2018; Todd et al., 2017).

Therefore, numerous analysts also call for moving beyond prescriptions and rules to make the concept of research integrity meaningful in researchers' work (e.g., Sarauw et al., 2019; Young, Miller, & Barnhardt, 2018). New approaches to integrity training are being presented⁷⁰ that acknowledge how challenges to good scientific practice need to be seen as entangled with developments in contemporary research environments (Pizzolato, Abdi, & Dierickx, 2020). For facilitators of integrity training, this means opening up matters of integrity towards more interactive engagement (e.g., Jagiello-Rusilowski, 2017; Lewis, 2020; Tokalić & Marušić, 2018) and centering their efforts on participants' concrete experiences and concerns. This could then avoid trainees developing a 'ticking-off the integrity-course-box mentality' (Phillips et al., 2018), where they perceive integrity courses more as a burden than as a chance to reflect on their work as researchers with a responsibility to their communities and societies at large. Acknowledging that the development of integrity skills is a complex *process*, which needs time and careful contextualization, is thus seen as an essential element in developing a robust research integrity culture (Barak & Green, 2020; Hiney, 2015; Sarauw et al., 2019).

Studies in recent years stress that transgressions of good scientific practice rarely present themselves as the black and white issues guidelines and rules may suggest them to be (Davies, 2019; Hangel & Schickore, 2017). More frequently, researchers express wider concerns about the discrepancies between ideal understandings of science and their lived experiences in contemporary academia (Buljan, Barać, & Marušić, 2018; Felt, 2009; Müller, 2021) and have to find ways to navigate what we call the "borderlands of good scientific practice" (Felt & Frantz, 2021). The concept of borderlands refers to the fact that on the one hand what counts as acceptable practice and what not is potentially not as clear-cut as imagined. On the other hand, in an ever-changing and often quite heterogenous research landscape, researchers need to negotiate (with themselves and others) in which situations certain practices can still be regarded as acceptable and where possible transgressions might begin. For example, whether or not a contribution to a paper merits a place on the list of authors or simply goes to the acknowledgement, which place among the authors is fairly reflecting the work or how

⁷⁰ For a collection of research integrity tools and resources, see: <https://embassy.science/wiki/Resources>

to respond to reviewers is frequently a matter of concern. Or it was seen as underdetermined what counts as an acceptable way of embellishing a visual representation and where transgressions of good practice start. Thus, a more nuanced understanding of integrity issues must also coincide with attention to the research environments and cultures researchers find themselves in (Aubert Bonn & Pinxten, 2021; Biagioli et al., 2019; Haven et al., 2020; Wellcome-Trust, 2020). Contemporary ways to organize and reward research such as the need to play the “indicator game” (Fochler & de Rijcke, 2017), persistent logics of hypercompetition (Fochler et al., 2016), growing temporal pressures (Felt, 2017a), and occupational insecurities (Sigl, 2016) are seen as some of the main factors that potentially ‘support’ transgressions against academic integrity (François, Coessens, Vinckier, & Van Bendegem, 2020; Metcalfe, Wheat, Munafò, & Parry, 2020).

Embedded in these debates, this article aims to contribute to the growing pool of reflexive integrity training tools by proposing a card-based engagement method we call “RESPONSE_ABILITY”. The development of the RESPONSE_ABILITY method derives and builds from our research as science and technology studies scholars who study how integrity issues become a matter of concern in researchers’ “epistemic living spaces” (Felt, 2009). The latter concept refers to the importance of the structures, contexts, rationales, actors, and value orders which mold, guide and delimit researchers’ potential actions. Therefore, we understand the ways in which ‘good’ knowledge is produced as inseparably intertwined with how researchers (can) live in science.

The article proceeds as follows. First, after a brief outlining of our understanding of the issue at stake and an embedding of our approach into social science methods using cards as stimulus material, we describe the development and validation protocol of the card-based method. This is then followed by a detailed description of the method’s choreography and the cards utilized during the activity, including our argument for why we propose this particular choreography and choice of cards. We then discuss the moderation and preparation needed to use the RESPONSE_ABILITY method for integrity training. Finally, we provide examples from the discussion dynamic this method facilitates to demonstrate the potential for this form of engagement to sensitize trainees to the multiplicity and contextuality of transgressions against good scientific practice while underlining the

importance of the participants' engagement with each other. The conclusion will then briefly review the potential of the method and point to some of its limitations.

Contextualizing the method

Before we describe the RESPONSE_ABILITY method in detail, it is important that we make explicit the conceptual considerations that are inscribed into it (Law, 2004). Integrity is understood by us not solely as a fixed set of rules and norms, but as a lived practice that is part of the "boundary work" (Gieryn, 1983) researchers engage in when doing research. Here, boundaries refer to the field-specific delimitation of what is a relevant question, accepted methodological approaches, publishable entities, or career-relevant achievements. Boundary work, of course, also includes the question of which research practices still count as acceptable, and which do not. As mentioned above, in our research, we develop the concept of borderlands of good scientific practice. With this spatial metaphor, we are acknowledging that researchers encounter fuzzy, situated, and sometimes shifting boundaries for what qualifies as good practice during their epistemic and social journeys through the ever-changing research landscape. As researchers continually push the frontiers of knowledge, they will necessarily encounter uncharted territories, where they must assess what constitutes legitimate scientific practice and what does not (De Vries et al., 2006). In addition, we should also be aware that with changing methodological possibilities, well-known practices can change.

Therefore, the aim of the RESPONSE_ABILITY engagement method is to train researchers' ability to respond to such challenges in their everyday practices and incentivize them to ask specific questions. Thus, we aim to support the cultivation of reflexive skills and sensitize researchers to both questions of value choices within research and to the structural boundary conditions they find themselves in. By talking about the *ability to respond*, we want to draw attention to the concrete actions researchers take when they are confronted with challenging situations and to acknowledge that a unique set of skills is required to verbalize concerns and act adequately within these situations (Felt, 2017b; Schrader, 2010). Moreover, we conceptualize the idea of *response-ability*, in line with feminist research, as a care practice describing the "willingness to respond" (Martin et al., 2015, p. 634) to matters of concern without necessarily prescribing what a response should look like. Therefore, by using this

engagement format, we invite researchers to individually and collectively reflect and experience what it means to navigate the borderlands of good scientific practice.

Using cards as stimulus material

The card-based engagement method RESPONSE_ABILITY is grounded in a history of social science research that uses cards as stimulus material. There is, however, no single tradition but rather a broad spectrum of experimental methodologies that use cards to open up, steer and structure discussions, most notably with focus groups and interviews. The functions of cards range from being mere discussion inputs to more elaborate choreographies in which participants sort, choose, position, or even create cards (Rowley, Jones, Vassiliou, & Hanna, 2012). Several of the new interactive integrity training methods use card-based inputs for stimulating discussions. Luger and colleagues (2015), for example, present a card game that is used to train the reflexive capacities and competencies of designers who deal with issues related to data protection. Tokalić and Marušić (2018) use a card game to facilitate discussions on ethics and integrity in peer review processes. Meanwhile, the “Dilemma Game”, developed at the University of Rotterdam (van Donzel, Dijkstra, & Wynstra, 2013), addresses research integrity by discussing specific dilemmas in research.

While when developing the card-based engagement method RESPONSE_ABILITY we have explored these engagement methods, in terms of concrete choreography and specific methodological considerations it primarily draws from the card-based discussion methods IMAGINE (Felt et al., 2014) and IMAGINE RRI⁷¹ (Felt et al., 2018). Both methods – the former when addressing matters of concern related to nanotechnologies with citizens, the latter for reflecting on the meaning of Responsible Research and Innovation (RRI) with researchers – take specific care to break complex issues down into “micro-moments” (ibid.: 207). Thus, both methods support addressing issues at stake in great depth and use the group setting as a resource to engage with each other.

We decided to develop a card-based method to open up debates about research integrity, as previous experiences (Felt et al., 2014) have shown the advantages of cards being present in the discussion. It allows us to move away from classical question-guided discussion groups

⁷¹ RRI is the abbreviation for “Responsible Research and Innovation.”

towards more self-reflexive engagements, which foreground participants' experiences (Mammen, Norton, Rhee, & Butz, 2016). Each participant can individually choose — out of a broad repertoire of cards — which issues they want to address and which not (Sutton, 2011); thus, they collectively remain in command of the direction the discussion takes. The material presence of information, statements, and short stories in the form of cards raises awareness of the breadth of potential issues and invites the participants to actively position themselves. The cards present a broad spectrum of information in a graspable manner, thereby supporting participants to talk about a topic even though they might not have experienced the described situations themselves (Bandaelli, 2010). Moreover, the cards allow us to address sensitive issues, which might otherwise be regarded as taboo topics and thus, not given adequate attention (Olesen, Amin, & Zurina, 2018). Finally, because topical input to the discussion comes through the cards, this also gives the moderator more space to focus on facilitating the discussion.

Developing and validating the RESPONSE_ABILITY method

The development and validation process of the RESPONSE_ABILITY method follows a clear protocol. We started with a careful pre-study of the issues at stake that need to be addressed through an extensive literature review on research integrity debates. We also made use of the insights from numerous previous discussion groups and interviews on work and life in contemporary academic research performed by one of the authors (e.g., Felt, 2009; Fochler et al., 2016). This was followed by deciding on the choreography, i.e., on the different steps through which issues at stake would be addressed (these are the stages in the discussion, generally 3-4 in total) and by developing a first set of cards. After testing these first card sets with members of our own research community and students, the card sets were refined, and the choreography was adapted. The card-set which we provided as supplementary material for this article went through several of these circles of assessment and refinement until we reached a point of saturation. This occurred as we found the most efficient choreography, number of phases, content, and number of cards needed to open up participant engagement and spark in-depth debate.

To validate the impact of RESPONSE_ABILITY, we asked participants to write short reflection papers after participating in our card-based sessions to better understand how they

experienced the engagement and what their takeaways were. This provided us with detailed insights into what the method achieved and where, as with any method in this domain, its limitations lie. It will, however, be key to consider disciplinary particularities and adapt the content of the cards as needed before conducting a discussion group in different contexts.⁷²

Choreography of engagement

RESPONSE_ABILITY aims to open up a space where (early-stage) researchers can individually and collectively reflect on how issues of integrity come to matter in their research lives. This space takes shape through a specific choreography that brings together a series of individual moments of reflection and selection/ordering, followed by phases in which the participants are encouraged to share their visions and negotiate individual and collective positions in a discussion with each other. To achieve open engagement with integrity issues, the discussion is structured into four phases, each of which has a set of cards that addresses a specific perspective related to research integrity.⁷³ The participants are thus invited to look at research integrity from different angles without predefining or restricting the direction that their reflections will take.

Each participant has a personal board that indicates the different phases in the form of topical fields where they place the cards that they choose at the beginning of each phase (see Figure 1). For every set of cards, the participants are first asked to individually rank the cards according to specific criteria or choose a specific number of cards that they are especially keen to discuss. After this moment of individual engagement, the participants are asked to present their choices or argue the outcome of their ordering to the group. This generally triggers a vivid discussion between the participants about their specific choices/orderings, how they relate to different work experiences, and much more. Going through all four phases requires a total of approximately five hours. The alternation between more active discussion phases and moments of introspection in which the participants read and silently choose new cards is a rhythm that allows the participants to truly engage with the questions that come up.

⁷² Additional thoughts about how to adapt the cards to different disciplinary needs can be found in the supplementary material.

⁷³ The card sets and discussion map are published under a creative commons license, which is accessible under the following link <http://phaidra.univie.ac.at/o:1177603>.

Types of Cards

RESPONSE_ABILITY uses four sets of cards which we present in the order of their appearance in the discussion. For each set, we describe the kind of work we are inviting the participants to do and point to the reflections that we aim to generate by using them.



Figure 7. Discussion map and four sets of cards

The engagement exercise starts with *value cards*, which cover a broad spectrum of (mostly) positively connotated features, competencies, or attitudes such as fairness, diligence, curiosity, skepticism, commitment, or productivity. Each card contains a short explanation to support participant reflection. We ask the participants to order the cards on a scale of those that are more central to those that are less central to their specific research environment. The participants are thus invited to carefully think about their value ecologies and the tensions between their visions /values, their identities, and what they think is expected from them institutionally within their labs/groups as well as through wider (policy) discourses. They are asked to make these reflections visible by *ranking the cards*. We deliberately decided to start reflections with more positive values to create a framing to

VALUE - 5
Commitment
Research requires extensive commitment and persistence in pursuing questions.

which they could relate when discussing transgressions. This approach is in line with more recent initiatives that focus on virtues and values (Marušić et al., 2019) instead of going straight into defining and discussing unwanted behavior. Participants are also free to identify additional values by noting them down on empty cards and including them in their ordering. This flexibility is important to give space to *their* personal values and show that the cards are, of course, only a non-exhaustive starting point (Sutton, 2011).

TRANSGRESSION - 5
Misrepresenting data
Inventing/falsifying data; rejecting data leading to inconvenient results; manipulating images or graphs (e.g. overly embellishing)

In the second phase, the participants are encouraged to engage with *transgression cards*. These cards point out different and quite widely referenced transgressions against good scientific practices, such as unjustified co-authorship, misrepresenting data, sabotage, and conflicts of interest. These cards represent a spectrum of problematic instances identified in the literature, policy debates, interviews with researchers, and media articles. Again, here we invite the participants to order the cards, this time from what they see as the most to the least relevant in their respective research environments. The term ‘relevant’ was chosen to invite participant reflection about how their specific way of doing research, and their questions and methodologies might allow for different and sometimes new forms of transgressions. During this phase, participants can, for example, think about transgressions that happen most frequently, those that they are most afraid of within their own practices, those that have been at the center of recent controversies in their fields/direct work environment, etc. We will learn about their choice as they argue their orderings. Once again, we offer participants the possibility to add cards for additional transgressions relevant to their work for this phase as well.

While some transgressions seem clearly identifiable, others are more complex to straightforwardly classify as misconduct or acceptable practice. Our approach allows open discussion about how to navigate such borderlands of good practice without moralizing behavior from the start. It also makes room for participants to challenge the cards; for instance, by coming up with situations where a practice that could be regarded as a transgression becomes acceptable. Thus, this approach facilitates interesting exchanges about what counts as good practice in different subfields of a discipline and which of the transgressions participants recognize as being/becoming a (potential) reality for them.

Going beyond ordering work, the third phase addresses concrete dilemma situations. Participants are expected to select one or two of the dilemmas that seem most relevant to them and imagine how they would act during such a situation. These *dilemma cards* contain short stories that describe, for instance, situations about how to react to trouble related to data gathering, errors in a paper already in the publication process, co-authorship disputes, or research biases. The inspiration for using dilemmas as stimulus material comes from the “Dilemma Game” developed by Erasmus University Rotterdam (van Donzel et al., 2013).

DILEMMA – 8
Review experience
Peer-review can be exhausting. You are already in the second round of the review process for a paper in a low-level journal. Even if you don't know officially who your reviewers are, you can guess their names because your field is rather small... and because of the articles they suggested you to refer to - mainly their own. They don't really match with what you are doing and you have a hard time incorporating them. What do you do?
A) I write to the editors and complain about the reviewers. B) I add as much as I can because otherwise I won't get my paper published. It's not worth complaining, regarding the low status of the journal. C) I write a message to the reviewers and tell them what they are doing is misconduct. D) Is there another option?

Each of our cards briefly outlines a complex situation (3-5 sentences), which points out the tensions that researchers might realistically encounter in research or publication processes. We then list a few potential reactions to support their positioning work. “Is there another option?” explicitly invites responses that go beyond the few mentioned. This phase opens up a reflection on the situatedness and multiplicity of assessments for the given dilemma and is designed to prompt a discussion and exchange about the different real-world experiences that some participants might have had when trying to respond to a dilemma of this kind.

RESEARCH CONDITIONS - 5
Pressure & Quality
“Everything must be productive in a sense. And I think that can have negative consequences for research. Because maybe the quality is compromised when people have the feeling they must publish, publish quickly. As a consequence, we can no longer talk about the limits of our research or about what did not work so well.”

In the fourth and last phase of discussions, the set of cards addresses the *research conditions* seen as key for research integrity. These issues were primarily extracted from the reviewed literature in addition to previous studies on contemporary research conditions by one of the authors (e.g., Felt, 2009). They also took inspiration from the “context cards” used in the IMAGINE RRI discussion groups (Felt et al., 2018). The cards mostly include statements made by researchers about the environments in which research happens and potentially shape how research is/can be practiced. Examples of the issues covered here include the diverse pressures that researchers experience, funding structures, competition, and mentorship. The participants are asked to choose two of the cards they believe are most relevant to them and share how these conditions play out in their research lives and how they might be relevant to research

integrity. This phase invites participants to develop a sensibility to how systemic tensions matter within specific research environments when it comes to navigating the borderlands of good scientific practice. While these topics have often already come up during the discussions in previous phases, they mostly did not then trigger in-depth reflection. This will happen in this last phase.

At the end of the research conditions phase, every participant receives blank *change cards* and is asked to make realistic suggestions of how they would change the conditions in which research is happening. The aim of this exercise is not only to invite researchers to deconstruct integrity issues but also to come up with their own constructive ideas. Core to training researchers' response-ability is the capacity not only to criticize frameworks in which research is happening but also to creatively rethink how (smaller) changes might be implemented to improve the epistemic living spaces they inhabit.

Moderating the discussions

The materiality and choreography of the RESPONSE_ABILITY engagement method outlined above structures the discussions into four phases, each focusing on one particular angle of how to reflect on integrity issues. As discussions about research integrity may touch on sensitive topics and open up vulnerabilities, well-prepared moderators are vital for a successful discussion. Below we address specific points touching on the role of the moderator and the preparation for the discussion and its facilitation.⁷⁴

The moderator

To assure a safe and open discussion environment, the moderator of the RESPONSE_ABILITY discussion groups should not stand in a direct hierarchical relationship with the participants. Moderators who are supervisors or researchers close to the group may hinder participants from expressing their perspectives freely. Discussion groups should thus, for instance, be led by lecturers of research integrity courses or social scientists/external researchers. Still, however, moderators should have a deeper understanding of the current dynamics of the scientific system and know the institutional environment and debates about research integrity (including regulatory aspects relevant to the addressed field) in order to understand

⁷⁴ There is extensive supplementary material for this article, which goes into detail about planning and moderating RESPONSE_ABILITY discussions. It also outlines considerations for organizing potential moderator training seminars.

the discussions and guide them in meaningful ways. While moderators should not position themselves as ‘integrity experts,’ they should still be aware of the implicit expert role that the participants will likely ascribe to them. For some moments, moderators will be confronted with questions about how things are to be done ‘right.’ Depending on what the participants are asking, the moderator can choose to either re-ask the question to the group or offer their own perspective. Thus, moderating RESPONSE_ABILITY discussions is a complex balancing act between giving the participants enough freedom to discuss and intensify debates on whichever aspects they deem worth discussing and continuing to guide the participants towards meaningful debates about matters of integrity.

Furthermore, moderating the RESPONSE_ABILITY group discussions requires a certain set of skills: Moderators need to be able to *guide* the discussion while giving enough space to the participants and support their *engagement*. This also includes using subtle positive reinforcements if someone is reluctant to speak up. Moderators should be *careful listeners* to capture not only what people are saying, but also how they are saying it. They are responsible for clearly communicating the choreography and *keeping track of the time*. This includes being attentive to when the participants need breaks and making sure that speaking time is distributed fairly. Moderators should also be able to *deal with unexpected turns* the discussion may take: some cards triggered participants to engage in debates that may not be solely centered on the classical integrity discourses at hand, but still, help to map out the challenges connected to it (e.g., the relation of science and society). It is then the moderators’ task to balance how much room to give to such discussions and decide when to bring the debates back to the initial issues at stake — for example, by starting to discuss the next card. Many of these moderation skills become tacit and embodied when people are experienced teachers and have experience in leading a discussion.

Preparing RESPONSE_ABILITY discussions

For organizing the discussions, it is vital to consider the group size and composition. The RESPONSE_ABILITY method is designed for smaller groups of ideally eight participants. This number allows enough time for the participants to express their individual views and for participant interaction and the negotiation of positions. In larger groups, there may be too little time for every participant to fully explain, discuss and explore their perspectives, while in groups that are too small — less than five people — it might be challenging to extract a

diversity of experiences. It might also be less advisable to compose groups where hierarchies might come to matter. It turned out to be very fruitful to bring together participants who are in similar career stages but are from different groups or even fields. This allows for learning through comparison and fosters deeper reflection while enabling “participatory justice” in the discussion group at the same time (Felt et al., 2018). With participants who have not yet done any research at all, it is challenging to talk about the meaning of research integrity in practice, thus more basic reflective exercises will probably be better suited for them.

Another important aspect for preparing the RESPONSE_ABILITY discussions is the card sets. The card-set that we provided in the supplementary material was developed for interdisciplinary groups and covers a wide range of issues on research integrity. However, when organizing discussion groups, it may be necessary for moderators to adjust the cards to specific disciplinary settings and the research realities of the participants in each group. The cards should always relate and point to real challenges and realistic scenarios that researchers might experience in their day-to-day practices.

Moreover, RESPONSE_ABILITY discussions may offer rich sets of empirical data for qualitative social science research. Analyzing these discussions may yield insights into how participants engage in a situated drawing of distinctions between acceptable and unacceptable practices and towards a more fine-grained understanding of value orders and imaginaries about ‘good’ science at work. Of course, if discussion groups should be recorded, it is necessary to gain permission from the participants beforehand.⁷⁵

Facilitating the discussion

To moderate the discussion moderators must familiarize themselves with the card sets and the method’s choreography to be able to explain the overall logic of RESPONSE_ABILITY. At the beginning of every phase, the moderator asks the participants to pick up a pile of cards and perform a specific initial task with them. Once every participant has ordered or chosen the cards (depending on the phase) and placed them on their personal board, the moderator opens the discussion and invites the participants to share their choices and rationales for

⁷⁵ Please find more detailed reflections for recording the discussions in the supplementary material.

choosing/ordering their cards. It is essential to give every participant the time and space to talk and to change the order of speaking in the different rounds.

The moderator should encourage the participants to discuss their choices and the reasoning behind them with each other and not enter a dialogue with a subset of participants. This can be achieved by inviting them to share observations regarding the comments of other group members. Here, however, the moderator should not overly intervene, but should rather signal curiosity about the participants' perspectives, as they themselves are the best to explain how they perceive their research environments and related challenges. Of course, this does not mean that the moderator should not intervene/challenge the participants if they try to justify clearly questionable behavior. In our experience, this has not surfaced as a major problem so far.

Facilitating the discussion also entails thinking about how to keep the discussion going. We suggest that moderators take notes during the discussions with interesting observations that can later be redressed back to the participants. One idea to keep the discussion going in this manner is to address the participants' card choices and which cards were not chosen — or ranked as less essential. This might make “absent presences” (Law, 2004), i.e., topics people implicitly prefer not to address, visible and steer further interesting discussions. Also, this might trigger exciting reflections in the group as participants compare how others made their choices, for instance, how they clustered cards rather than ranking them (Felt et al., 2014).

Illustrating discussion dynamics

How did participants make sense of the cards and what kinds of interactions did they trigger? We will answer this question by using vignettes clustered along the two main aims of the RESPONSE_ABILITY approach: (1) to train the ability to recognize and engage with situations related to integrity issues, and (2) to make sense of them, situate them in their specific research environments, and develop a position towards them.

The presented vignettes result from an in-depth grounded theory-inspired analysis (Clarke, 2005) of seven discussion groups with a total of 63 participants from the life sciences, physics, psychology, and one interdisciplinary group. The groups were conducted in the framework of our research project in various training/workshop settings for early-stage researchers. While

a content-centered analysis of the material will be published elsewhere, the vignettes are used here as tools to portray typical situations through rich description and “vivid accounts of practice” (Jacobsen, 2014, p. 41). Although the names in the stories are fictional, the quotations are taken directly from the transcripts of the discussion groups and were only slightly adapted to create a better reading flow. The participants all gave their permission to be recorded and to be quoted in publications in an anonymized manner.

Recognizing and engaging with the limits of good scientific practice

While analysts have pointed to the fact that mundane research troubles have started to become a growing concern for researchers (e.g., Davies, 2019; Hangel & Schickore, 2017), we also know that it is not always straightforward to recognize when practices cross ‘the line’ and are considered unacceptable. This is nicely illustrated in the following discussion of researchers in biology on (mis)representation of research data.

“I think this is a problem that is the most common but the least discussed in our field,” Miriam states as she explains why she ranked the transgression card ‘misrepresenting data’ first. She bemoans that there are so many things that researchers do not talk about when it comes to representing data. It is the “little differences” that worry her, the things that are difficult to be standardized and regulated. Her observations trigger a lively debate. Frida continues this line of thought, specifically considering statistical tests, and argues that it sometimes seems arbitrary which statistical test somebody uses. She thinks that people often do not know any better and simply take what works best for them. But she also points to the unlikelihood that her supervisor will critically scrutinize how she performs her analysis: “If you have a polished graph [...] and the data fit with what you would expect,” there is usually little discussion about how she did her statistics. Smiling, because Frida apparently describes a situation he recognizes, Alfonso pushes the argument further. A lack of systematic scrutiny is his major concern. He describes himself as trying to be overly cautious with regard to potential tricks that expectations and hypothesis might play on one’s own judgment. One may take “a little step into misrepresenting the data” if you are convinced by a theory. An uncomfortable silence spreads in the room. What to do with this sudden open admission of potential bias? Laura breaks the silence spinning Alfonso’s thoughts further by saying that this is not an individual problem but rather a more fundamental question of how science gets done. In times when scientists need to be good storytellers and create coherent, publishable, mind-blowing stories to survive in academia, it is natural, she argues, that you want to ‘find’ good results. “I mean people most of the time prepare their articles in such a way that they tell a story so that it gets published. And they don’t show the results that could hinder the article [from getting published].”

This vignette condenses a considerably long discussion regarding the nuances and variants of what potentially constitutes a misrepresentation, and how this is rooted in the different facets of the very environment participants find themselves in. We can observe that for the participants it is not clear-cut where and when ‘the problem’ starts, or how and by whom it should be addressed — how it could and should be handled. Is the source of the problem a lack of discussion or supervision during the research process? Is it a systemic dysfunction in the communication of findings? And, in the end, who should take responsibility for the actions taken? Their exchanges are, however, not limited to concrete practices of presenting results: they become discursively tied to larger structural and organizational features of contemporary research. By taking up different angles on the issues at stake throughout the discussion, participant narratives become increasingly more elaborate and complex as they settle on some converging visions while also keeping certain aspects undecided.

Pressure in science is a recurrent topic in these debates. This is clearly visible in the next vignette where we follow a group of early-stage psychologists and their discussions:

“Before we discuss the cards you selected in detail,” the moderator says, “I would ask you to guess which [research condition] cards were selected most frequently?” Several people answer, “Pressure and quality.” Some of the participants just point at that very card and nod as it is being raised. Throughout the debate so far, the feeling of being pressured in their work has repeatedly surfaced as have reflections on the threats these perceived pressures may have on the quality of the produced knowledge. Discussing this card, they collectively reflect on “how to get away from this model of publish, publish, publish, and rather focus more on quality... Elisa shares a brief anecdote of a discussion she followed between two professors. “One professor [...] said: “When we were young and doing our PhDs, we had much more time. We didn’t have so much pressure to publish [...] For junior researcher it’s so much harder today.” And the other professor who was even younger just said [...] “It will always be like that. The more you do, the better you are, the more you publish the better you are.” She strongly disagrees that doing good research is only about delivering large quantities of knowledge and expresses frustration about the pervasiveness of the capitalist understanding of the world. Paula agrees that her understandings of being a good scientist also do not align with how research is rewarded nowadays. She ties her frustration about the importance of papers to the temporal imaginations that come with them: “You have to do your PhD in three years, you have to publish three studies in three years, and you only get published when you have significant or positive results. I think this is the most hindering thing about doing good research because it really makes you work poorly to get published, but you don’t have the time to really think about the problems and discuss them, because you only have three years.”

Here, deep frustrations and partial disappointment surfaced, feelings which are often only expressed behind closed doors (Olesen, Amin, & Zurina, 2018). RESPONSE_ABILITY discussion groups, however, are apparently perceived by participants as a safe space to reflect on how their living conditions relate to integrity issues in more detail. When following these participant stories, it seems that growing into academia comes hand in hand with a de-mystification of science as a practice. In the vignette above, we observed how participants reflected on the alignment of evaluations with contemporary academic market logics, where the sheer accumulation of countable entities is rewarded. Participants concretely identify how this pressure manifests and why they think it may hamper them from doing good work. At other moments in the discussion, they share solutions to handle the emotional moments, they learn through comparing between different experiences, and, thus, they gradually express a much finer-grained vision of what exactly is at stake and how to potentially respond to these challenging situations. This feeling was clearly spelled out as an important insight gained from the participation when giving their feedback to us. Empowering participants to choose the issues they want to focus on and allowing them to trade experiences and potential solutions is thus generally perceived to encourage to take action and develop more proactive positions.

Positioning oneself towards issues of integrity

Understanding research integrity as a set of complex matters of concern that are situated in specific research environments means accepting the plurality of reactions necessary to deal with such matters. RESPONSE_ABILITY thus does not hand out readymade solutions to every situation where research integrity is challenged. Rather, we invite participants to position themselves, reflect, speak up and imagine change. We understand positioning work here as an act of participants consciously making their own, often tacit, understandings of good scientific practice and what it means to be a good scientist explicit. These understandings are then expressed, defended, negotiated, and potentially changed through the discussion. Below, we describe three different positioning moments, namely participants' reflections on which issues should be seen as matters of integrity, how to react to the misbehavior of other researchers, and their ideas about how to re-structure and re-think academia to better support research integrity.

We will start with a vignette from an interdisciplinary group where a participant describes the empty card he would like to add to the debate about values in research. Here, we not only illustrate how the participants negotiate the meaning of the new card but also how they engage in debates about which issues should be considered matters of integrity and which not.

“Is there anything you missed in our discussion about values in science?” asks the moderator once the participants have each described how they ranked the value cards on their board and the group has already collectively reflected on some of the similarities and differences in ordering rationales. Lorenz proposes a card about “Resilience. [...] I think that’s a little bit missing here. I see a lot of facets of the PhD in there, but this is a little bit missing in my opinion.” He goes on to argue that for him it is vital to be able to deal with setbacks and recover from challenges or errors. His suggestion is faced with criticism: “Is that really a value?”, Lucia asks. After all, she does not see it being valued — rather, it is required that individuals come up with a certain mental strength if they want to succeed, survive in science. For Lorenz, mental health and seeing a “person rather than just a scientist” deserves attention in this discussion on research integrity and he keeps on arguing for it. Alfonso agrees and sees the point Lorenz wants to make, but for him, the capacity to continue working despite the problem one encounters is captured by the value of commitment. Lorenz responds that “if you ramp up the commitment to one hundred, problems you have to deal with hit you harder. And if you go down with the commitment, you can deal with problems easier.” Not everyone agrees, but Lorenz continues to argue that it matters to think about the person doing the research and that none of the values on the cards are self-evident but depend on the person behind them. After an intense discussion about what it means that science is conducted by humans, Lorenz closes the debate by stating that his concern would probably have been satisfied by “adding two words on [the] fairness [card]: fair treatment of others *and yourself*.”

We thus see a concern raised that was not explicitly addressed through the cards: How does researcher well-being matter for research integrity? This vignette illustrates a moment where the participants negotiate which concerns are allowed to belong under the heading of integrity and which not. Thus, they engage in collective boundary and positioning work about where they — as human beings — and their mental health should be discursively situated. Moreover, this short encounter also allows us a glimpse into how the participants negotiate the meaning of the cards and actively challenge them during their positioning work.

A moment of active positioning work can also be observed when participants collectively reflect on how to react to the misbehavior of other researchers, specifically reviewers. In the following vignette, we encounter a group of early-stage physicists.

"It has happened to me before and it is something that pisses me off very much," Lena starts by talking about why she chose the dilemma card on reviewer misconduct. Telling someone to cite their own articles as a review comment is a transgression of good scientific practice for her if they clearly don't match the argument of the paper. While she cautions that sometimes reviewers suggest useful papers which she did not know, she is outspoken about pushing back against reviewer fraud in her response letter to the editor. "I would say that I didn't find that they were connected enough to the result of the paper to include them." She perceives the nodding of her colleagues as she looks around. "I also chose the same dilemma," Kavaan continues shyly, "I experienced this as well and I think it is common practice to agree with everything that the referees ask for, especially their easy suggestions." He describes his process of first revising their easy comments, such as correcting typos and justifying formulas, before he adds the suggested articles "without even actually reading the whole papers," Yet he is outspoken about just adding a limited number of papers. Xenia interrupts their discussion. She stresses that she does not know whether or not she would add the references. It would depend on the journal she would be aiming for. Her group recently wanted to publish in a high-impact journal. And they agreed to simply add a sentence to include the reviewers' paper. "I am pretty sure we wouldn't have done this, at least I wouldn't have done this if it was a different journal. [...] It is always a compromise." After being asked by the moderator whether others had also pondered over choosing this dilemma, Gregory takes the opportunity to talk about the problems that his group faced when one of their reviewers was a member of another school of thought. Once he ended describing the complex odyssey of compromising in order to get the paper published, Mia shared an anecdote, partly as advice to Gregory, partly to expand the review problem. "Sometimes acknowledgments are used to avoid certain reviewers, right? So, you just put people into the acknowledgments and then they will not get the paper to review." Everyone laughs before the discussion returns to more serious reflections on reviewers and power abuse.

The participants seem to agree that it is wrong for reviewers to demand the inclusion of references that are not useful for revising a paper. Yet, the degrees to which the participants would resist this demand differ considerably and open up a diversity of positions. They collectively ponder about power relations, dependencies, and how these affect their room to maneuver. The spectrum of positioning ranges from response letters with frustrated and emotional complaints to more pragmatic approaches, whereas having little resistance to reviewers' requests is seen as a way to achieve their own goals. In their discussions, they collectively acknowledge that due to the structures of contemporary academia they may find themselves in uncomfortable situations where it may not be evident which paths to take. Still, they work out a variety of context-specific reactions and exchange their experiences, always with a shared understanding that this should not happen, yet without a clear vision of who

could really change these behaviors perceived to be at the border of what can be seen as ethically acceptable.

Finally, we want to briefly zoom in on the last stage of the discussion and show how the participants from an interdisciplinary group express their ideas for how research could/should change to support the conduct of good scientific practice.

After an extensive round of discussing the research conditions, the participants are asked to come up with changes they want to see in science and write them on the empty change cards. The cards are quickly filled with catchy titles and long lists of changes. Everybody is then asked to present their suggestions. Some of them overlap, such as a general desire to have “more time to really think about what and why are we doing science, how we communicate with others and how we can be open to the ideas of others and the critique of others.” But some participants have more concrete suggestions, such as Anna’s idea to re-think letters of recommendations not only as hierarchically top-down but also as bottom-up: “If it’s about leadership positions, why not [ask for] references from people who have worked below you, who have worked in your team?” She goes on to describe how this could not only help to combat power abuse and make it more visible but also strengthen the value that supervising and leading a team has if it is acknowledged as something that can be accounted for. This idea that the incentive systems are misguiding is also taken up by Eva: “I think most of the problems that we’re dealing here right now could be solved by just having a different incentive structure. So right now, what we do is we reward only things that we can’t control, which is data and results, right? If you have nice results, then you can publish them in Nature and you get a nice position.” She goes on to argue that incentivizing good practices, such as sharing data, also publishing negative data ... would, in the long run, hurt science.

Listening to their whole-hearted pleas and concrete proposals for a better, fairer, and more sustainable science, we can observe that they truly enjoy this exercise. Finishing the discussion on a more positive note is a deliberate decision that should ensure that the participants leave the group without being overwhelmed after hours of talking about challenges and concerns within research. The participants should instead be reflecting on concrete changes they would see for creating viable “response-ability conditions” (Felt, 2017b, p. 54). Furthermore, talking about research conditions and how even smaller changes can have a great impact is meant to avoid a rigid individualization of responsibility and foster an understanding of the participant’s own agency as embedded within wider systems — thus also giving space to reflect on systemic responsibilities (Davies, 2019). Training early-stage researchers to reflect and eventually respond despite challenging conditions is important not only for training future researchers but for training them as response-able citizens who find

themselves in complex worlds, where they will often be asked to act despite complex circumstances.

Conclusion

In this article, we described the card-based engagement method, RESPONSE_ABILITY, which was developed to facilitate debates on how research integrity comes to matter in the works and lives of early-stage researchers. Guided through four different phases, the participants are invited to take up different perspectives on integrity issues, negotiate what doing good research means for them and how they might deal with transgressions against good scientific practice. Core to the development of this discussion method was the idea to contribute a training tool for the growing body of reflexive teaching materials (e.g., Jagiello-Rusilowski, 2017; Lewis, 2020; Tokalić & Marušić, 2018) that acknowledge the existence of what we call borderlands of good scientific practice. Therefore, RESPONSE_ABILITY is meant to be sensitive to the situatedness of integrity judgements and supporting researchers to develop context-sensitive responses to integrity issues. This capacity to reflect on and react to challenging situations, often under unideal conditions, i.e., to be response-able in situations that pose challenging questions, is what we aim to train with this method.

To evaluate the engagement method, we gathered detailed feedback, in written and oral form, which clearly shows that the participants specifically appreciated the situated, in-depth engagements that this method allows. They underlined the importance of the cards, which opened up issues they had sensed as problematic but did not find ways of addressing/naming them. They are also deeply fond of discovering the subtle differences and similarities that were brought to light by comparing the different experiences of participants. RESPONSE_ABILITY discussions allow participants to learn and experience that often there is not just one good way to solve a problem, but rather several different ones. Participants unanimously stress that they left the discussions with a much finer-grained understanding of the issues at stake, which will potentially allow them to better address the problematic situations they may encounter.

However, no single training tool can completely ensure that early-stage researchers enculture all the skills and knowledge needed to deal with issues of integrity (Sefcik et al., 2020). Methods such as RESPONSE_ABILITY discussions must rather be seen as supporting the

continuous process of growing into research in ways where the researcher's own knowledge production is geared towards creating good knowledge. The RESPONSE_ABILITY discussions belong to the methods that work better for early-career researchers who already have some experience in research and are thus already confronted with the complexities of the borderlands of good practice. They are meant to be performed in small groups with well-trained moderators who have a good basic knowledge of the field the participants work in but are not directly related to them – confidentiality is key. Creating safe spaces to individually and collectively reflect on the borderlands of good scientific practice and thus to map out the room for participant maneuvering is thus a valuably reflexive moment. Opening up issues that are often silenced for a nuanced debate in a competitive, accelerated academic world is essential for developing an integrity culture that is robust even under difficult conditions.

Taking early-stage researchers and their concerns seriously as actors who can and should reflect on challenges in research does, however, not mean that responsibility for research integrity is only up to them. Addressing issues of integrity meaningfully means striking a delicate balance between raising researchers' awareness of individual responsibilities and analyzing the "response-ability conditions" (Felt, 2017b, p. 54) of the institutional environments they are embedded in. Calls for a change of research frameworks and cultures to support researchers' integrity efforts are becoming louder in recent years (Valkenburg et al., 2021; Wellcome-Trust, 2020). But the conditions necessary to create thriving research ecosystems — conditions that support researchers' ability to act in line within the ideals of good scientific practice — are apparently not easily achievable. They instead require constant work.

Following the process of engagements allows us to witness how essential it is to think about where to locate questions of responsibility for research integrity. Indeed, while many measures to improve research integrity are focused on educating the next generation and teaching them the rules, during RESPONSE_ABILITY discussions participants convincingly argue that change needs to happen at both the individual and the structural levels — and in a well-aligned manner. Embracing the undoubtedly uncomfortable idea that transgressions against good scientific practice have always and will always accompany research, it seems imperative to prepare novice researchers to become critically thinking actors who can find a position for themselves in challenging and potentially uncertain situations —capable and

ready to adapt their perspectives and actions with the ongoing development of research. Yet, returning to the notion of an 'integrity culture' and building on the experiences gained from these engagement exercises leads us to also call for the creation of an environment in which research practices are addressed, shared, reconsidered, and carefully put in context on a regular basis.

Article C: Good Research from Below – Of early-stage researchers’ registers of valuing, response-abilities, and care for good research

Abstract

Evermore studies suggest that the working conditions and environments in contemporary academia subtly undermine the integrity of research. And yet, the group most affected by the changes in academia, early-stage researchers, are given little voice in the debates. They are talked about, mainly along two deficit narratives of lacking either knowledge or portraying moral insufficiencies, but rarely talked to. The common narratives about early-stage researchers fail to capture the complex tensions early-stage researchers find themselves in, being simultaneously learners and practitioners of research. Early-stage researchers are central for knowledge production, in many groups responsible for data gathering, analysis, and presentation, so practices that are under scrutiny in research integrity debates. This article aims to take them, their experiences, and concerns seriously, describing how they value and care for good research along four registers of valuing: *Experimenting*, *Collaborating*, *“The system”*, and *Feeling*. Attuning to a situated understanding of good research, negotiated in concrete, mundane value constellations, invites us also to reflect on early-stage researchers’ response-abilities for good research, characterizing integrity as an active accomplishment of aligning (potentially) conflicting valuations, and not a stable quality.

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Good Science from Below

Of early-stage researchers' registers of valuing, response-abilities, and care for good research

Introduction

In early 2023, the frustration and anger of almost 2000 early stage researchers⁷⁶ became tangible on the streets of Vienna as they marched through the city to protest the aggravation of already strained conditions for those in academic jobs in Austria (Miller, 2023). The amendment of the academic labor law limiting short-term contracts led to an outcry, reflecting an array of long-standing concerns and complaints about the conditions under which early stage researchers work (Anders, 2021), with many jobs precarious, uncertain, and hypercompetitive (Fochler et al., 2016; Müller & de Rijcke, 2017; Sigl, 2016). While there is an ongoing tendency to brush off such complaints by suggesting that the conditions in place are necessary to ensure academic excellence (Sørensen & Traweek, 2022), recent studies suggest that these strained working conditions have troubling implications for the integrity of research (Aubert Bonn & Pinxten, 2021). For example, researchers are reported to cut corners and hasten publication in the face of increased competition and ever higher-paced academic rhythms (Haven, Bouter, Smulders, & Tijdink, 2019). More generally, there seems too little time for maintenance and repair in an academic economy where exaggerated success stories have become commonplace (Penders, de Rijcke, & Holbrook, 2020).

While early stage researchers are frequently mentioned as the group most affected by the recent transformation of academia (Fochler et al., 2016), literature on research integrity tends to portray them according to a rather deficit-based logic: Either they are characterized by a knowledge deficit, which is supposedly curable by them being taught the rules of good scientific practice (Felt & Frantz, 2022), or a moral deficit is attributed to them, as a result of which they deliberately engage in questionable practices to gain a competitive advantage (Tang & Jia, 2021). Most work thus fails to capture the constant and complex tensions to

⁷⁶ I deliberately refrain from referring to them as early *career* researchers as most of them will not secure long-term careers in academia.

which early stage researchers find themselves subject. They are learners, acquiring skills, knowledge, and an academic habitus, yet already involved in and responsible for numerous experiments and analyses (Delamont & Atkinson, 2001; Sorgner, 2022). In times when a myriad of “good science” policies are emerging across the science policy landscape (Hilgartner et al., 2017; Meskus, Marelli, & D'Agostino, 2018; Sørensen & Traweek, 2022; van Hoof et al., 2023), it is crucial that we gain a better understanding of how “good research” and its fuzziness in everyday practice are negotiated and embodied in this early phase of be(com)ing a researcher. This is not because early stage researchers are “the next generation” (e.g., Ripley, Markowitz, Nichols-Casebolt, Williams, & Macrina, 2012) as most will not secure long-term careers in academia (Nicholls et al., 2021), but because they are vital for knowledge production taking place now (Wylie, 2021).

This article builds on group discussions conducted with early stage researchers in Austria about their experiences and concerns regarding good scientific practice. During the analysis of these discussions, it rapidly became clear that the participants did not refer to pre-established categories of good and bad practice but mainly employed four “registers of valuing” (Heuts & Mol, 2013) along which they made sense of good research and conceptualized potential concerns in their everyday lives: *Experimenting*, *Collaborating*, *“The System”*, and *Feeling*. In mapping out these four registers, I emphasize not only how they valued research and conceptualized their concerns but what they reported doing to make research “good” and how they cared for it (Dussauge et al., 2015; Heuts & Mol, 2013). I subsequently conclude this article by arguing that looking at good research “from below” (Harding, 2008, p. 1) in a twofold manner—through the eyes of researchers at the bottom of academic hierarchies, who are involved in epistemic groundwork, and understanding the valuation of good science as deriving not from top-down principles but from valuation along different practice-based registers—offers critical reflections on the “response-abilities” (Barad, 2007; Haraway, 2008) of early stage researchers. In this way, I illustrate how integrity is not a universal quality of individual scientists but an active accomplishment in practice, aligning the various valuations in their work.

Debates on integrity

While concerns about the state of contemporary research can be heard in many different fora and spaces (Didier & Guaspere-Cartron, 2018; Wagne, Le Foll, Frantz, & Lasser, 2024), the field of *research integrity* has been particularly successful in positioning itself as responding to the somewhat elusive set of concerns (Bouter, Tjldink, Axelsen, Martinson, & ter Riet, 2016; Dejo-Vasquez et al., 2021). Part of their success in doing so rests on a comprehensive and easily applicable definition of good science that spans all scientific disciplines and is based on the absence of scientific misconduct, fraud, and questionable research practices (Resnik, 2003; Shaw, 2019; Steneck, 2006). The vantage points for judging practices based on these definitions are usually situated in abstract ideals, norms, or values outside of the concrete research processes (Horbach & Halffman, 2017). This results in the presentation of good science as an issue of common sense, depriving debates on the topic of its situatedness, practical fuzziness, and political dimensions (Felt & Frantz, 2022; Mody et al., 2020; Peterson & Panofsky, 2023).

The framing of research integrity as a clearly definable set of practices fosters an idea of responsibility for good scientific practice as a matter of accountability, control, and liability (Montgomery & Oliver, 2009). As in previous attempts to regulate research ethics (Hilgartner et al., 2017), ever more tick-boxes are added to remind researchers of the basis of good science when they enter a university, publish their work, or apply for funding (Maghrouni, Mahian, & Wongwises, 2018; Ščepanović et al., 2021). These interventions do not open up a space for reflection and discussion but fulfill a symbolic function, allowing their originators to perform responsibility as an act of raising awareness (Ahmed, 2007; Felt & Frantz, 2022). More recent calls for “integrity indicators” (Macleod, 2021, p. 533) make particularly tangible the underlying assumption that scientists themselves are not viewed as the experts in good scientific practice but as individuals who must be guided toward appropriate behavior (Åm, 2019b; Davies, 2019).

These are attempts to weave what I would term a *regime of integrity* into existing institutional logics and structures (Hecht, 2009). The goal is thus for specific visions and ideologies of acceptable practice to become “institutionally stabilized to a point where they become an obligatory frame that individuals need to relate their (e)valuative practices to” (Müller & de

Rijcke, 2017, p. 159). Nonetheless, these efforts do not challenge existing academic regimes, their neoliberal ideologies, and their abstract visions of excellence (Sørensen & Traweek, 2022) but merely add integrity as a further dimension.

Despite its long tradition of studying how quality is imagined in research and how credibility is curated in and through academic practice (Gieryn, 1995; Latour & Woolgar, 1986; Shapin & Schaffer, 1985), at times even building on explicit case studies of scientific misconduct (Collins & Pinch, 1993; Felt, 2005), STS scholars have been reluctant to publish work attached to the keyword of research integrity. The hinterland of a field that focuses on identifying and policing good scientific practice appears too realist and positivist (Davies, 2019). STS articles commenting on and contributing to research integrity debates indeed highlight the historical and disciplinary heterogeneity and situatedness of good practice, challenging an overly universalist understanding of research (Penders et al., 2020; Pols, M'charek, Jerak-Zuiderent, & Brenninkmeijer, 2024; Roberts et al., 2020). As such, they criticize efforts to homogenize the vast sets of related concerns across all sciences (de Rijcke & Penders, 2018; Hesselmann, 2023), an endeavor that presents the risk of making the fuzziness of good practice in practice invisible (Felt & Frantz, 2022; Horbach, Breit, & Mamelund, 2019). Studies show the nuanced nature of the mundane challenges of living up to the ideals of good scientific practice in scientists' everyday working lives (Hangel & Schickore, 2017; Penders et al., 2020; Peterson & Panofsky, 2021), a picture poorly matched by the concerns expressed in official research integrity definitions (Davies, 2019).

Focusing on early stage researchers

In addition to the above, I am also challenging in this article the universalist understandings of the “imagined scientist” (Åm et al., 2020) present in research integrity literature and policy by highlighting career stage–specific perceptions and challenges, namely those of early stage researchers. These researchers are somehow an absent presence in debates on good research practices: They are frequently *talked about* (Pizzolato & Dierickx, 2021), mainly according to two deficit narratives, but rarely ever *talked to* (Krstic, 2015), which would allow them to challenge these narratives.

The first narrative concerns knowledge deficits. The integrity training of junior researchers has been hailed as a core intervention needed to shape young academic minds, which has

contributed substantially to the establishment of research integrity as a field (Resnik, 2003; Sarauw et al., 2019; Steneck, 1999). Besides implicitly suggesting that value education is no longer sufficiently covered by the experience of working in research groups (Hyytinen & Löfström, 2017), this development characterizes good research practices as a matter of knowledge. The idea is that people who are aware of the possibilities of misconduct and questionable practices will avoid them (Felt & Frantz, 2022). This underlying rational-choice logic (Haven & van Woudenberg, 2021) is further strengthened by the pedagogics of many integrity courses, which leave little room for disciplinary particularities or career stage-specific concerns, and by the fact that courses are commonly conducted as one-time, online-only events with little interaction (Phillips et al., 2018; Sefcik et al., 2020).

The second narrative centers on the idea that young researchers transgress the boundaries of good scientific practice to gain competitive advantages (Tang & Jia, 2021). While the narrative of the overly ambitious and morally flexible young researcher is not a new one (e.g., Macilwain, 1996), recent studies suggest that pressure to publish, unrealistic expectations and promises, intolerance of mistakes, and normalization of overwork are hampering early stage researchers' capacity to succeed (Aubert Bonn & Pinxten, 2021; Haven et al., 2020). These are, paradoxically, often the very elements that further academic careers. There is much less reflection on how early stage researchers can translate abstract imperatives of good research behaviors into practice (Hangel & Schickore, 2017; Hesjedal, Åm, Sørensen, & Strand, 2020). Talking about the relationship between good practice and individual and cultural or environmental factors nonetheless means striking a delicate balance to take the perceived pressures and tensions seriously, without reducing the discussion to the mere attribution of individual blame (Loveday, 2018; Valkenburg et al., 2020).

All of this calls for a better understanding of how early stage researchers experience and conceptualize good scientific practice (Krstic, 2015). This is important not because some of today's early stage researchers will remain in academia and become its future generation (Ripley et al., 2012), but because they are currently the largest group in the academic workforce.⁷⁷ Over the last decades, and particularly given the projectification of research

⁷⁷<https://unidata.gv.at/Pages/XLCubedReport.aspx?rep=%40usEbiMpk5U1Or8%2fgifFXGc8ttlpSrQOb93%2fy4Lllizwin%2fFI5dMXVMUV%2bV6GJebRudpxX5%2bE7SF3TBLYtIse0VSMBpvZp9TydbOMVGr%2b5zWRGXq0NbK8coJj4w5fkgFONwHAgpLqYufYI7hFdwMHuGAnjw6yYmpuoNUhO7bLJ7EKdfxeWnVnT7oosnOR4sMw%2bQpI5lIcJcLUNsoCelkQ%3d%3d&embedded=SharePoint&toolbar=true> (accessed 22.02.2023)

(Ylijoki, 2015), numbers of early stage researchers have risen substantially, granting this group ever greater importance for research processes (Delamont & Atkinson, 2001; Wylie, 2021). Nonetheless, there exists little reflection on how these shifts have fundamentally changed not only socialization but also wider knowledge production.

Valuing good research

Taking early stage researchers seriously and closely considering their perspectives on good scientific practice requires a theoretical approach that does not seek to fit their experiences into pre-established categories but grants space to the examination of how good research is enacted and negotiated, that is, valued, in their practices (Dussauge et al., 2015). With good research addressed with reference to the field of valuation studies (Kjellberg et al., 2013), the focus is not set on how ideals, virtues, or norms (should) determine researchers' actions but on how good research is made in practice. In studying, for instance, plagiarism (Widmalm, 2015), conflicts of interest (Sismondo, 2015), or replicability of research (Lee, 2015), the focus is applied to following how the values of good, acceptable science are negotiated, showing the work that goes into constructing, stabilizing, and coordinating the boundaries of legitimate practice as fuzzy and situated processes. Good research, therefore, "cannot be seen as an explanatory factor, but rather something that needs to be explored and explained" (Dussauge et al., 2015, p. 20). I also emphasize my focus on practice terminologically by speaking of good research rather than good science (Latour, 1998).

As I analyzed the transcripts of the group discussions on which this article builds, it quickly became apparent that independently of the participants' concrete disciplinary backgrounds or research focuses, there were four main reference points for valuing good practice. These were not merely different dimensions of valuing good research but functioned as shared reference points across the various differently situated experiences, expressed through a variety of practices, grammars, and concerns. I have conceptualized these as "registers of valuing" (Heuts & Mol, 2013) good research. Heuts and Mol presented this concept to emphasize the multiplicity and performativity of valuing using the illustrative example of the "good tomato". There is no universal dimension within which to characterize a tomato as good: Good qualities differ depending on the situation and purpose for which the tomato is

intended. None of the potential registers predefine “what is or isn’t good in relation to this relevance [but it] may differ from one situation to another” (p. 129).

The aim of mapping out the registers of valuing, therefore, is not to derive comprehensive lists of what is good or not in a given repertoire but rather to acknowledge the coexistence of different registers of valuing, reflect on their relationships, and pay attention to the effort required to endure the potential conflicts or synergies between them. The theoretical commitment to the situatedness of valuations, however, does not open the door to arbitrary assessments of good practice. It instead encourages us to remain close to the concrete constellations in which valuations emerge, acknowledging that the valuation performances of our participants, both in the discussion groups and beyond, are subject to complex relationships, social rules, and environments (Peetz, 2021; Waibel, Peetz, & Meier, 2021).

Attuning ourselves to the situatedness of good scientific practice in early stage researchers’ lives is a deeply political endeavor of seeking to understand good research “from below” (Harding, 2008, p. 1). Making these researchers’ often sidelined perspectives and experiences visible allows us to develop a critical angle from which to consider the vulnerabilities at the edges of the scientific system. Contrary to dominant narratives that frame early stage researchers using deficit narratives, I show how early stage researchers describe caring for their research (Lindén & Lydahl, 2021; Martin et al., 2015; Pinel et al., 2020; Puig de la Bellacasa, 2017). Turning to the situated, affective practices of involvement also requires rethinking researchers’ responsibility beyond the simple acts of blaming and shaming when boundaries are transgressed. We must, however, ask, what are these researchers even “response-able” (Barad, 2007; Haraway, 2008) for and to? In the conclusion to this article, I will highlight what we can learn about early stage researchers’ response-abilities by looking at the relationships between the four registers of valuing.

Materials and methods

Being committed to theoretical attention to valuation and care also invites us to consider how we can generate care in our own actions, not only for the people we work with but also for the kind of knowledge we produce about them (Jerak-Zuiderent, 2020; Lindén & Lydahl, 2021; Puig de la Bellacasa, 2017). Discussing “integrity issues” (Aubert Bonn & Pinxten, 2021, p. 6) can be uncomfortable, especially for early stage researchers, who are asked to unpack the

very details of their research actions and their ideals, as well as the struggles and irritations they encounter in their research processes, groups, and practices (Felt, 2016).

In the research project “Borderlands of good scientific practice”, (PI: Ulrike Felt) we developed a card-based discussion method (Felt & Frantz, 2022) that acknowledges the challenges of talking about research integrity issues as part of its methodological design. Each participant is given a set of cards and a discussion map on which to place them. The brief stories, quotes, and statements on the cards confront the participants, first individually and then as part of the discussion, with issues from the research integrity discourse and ask them to position themselves. The presence of the cards invites the participants to think through and discuss how integrity issues come to matter in their own research environments, without blaming or exposing them for raising topics. The card-based method follows a choreography that structures the discussion into four consecutive phases, each inviting the participants to consider integrity issues from a different perspective. In addition to discussing transgressions of good scientific practice, we also asked participants to reflect on how values mattered in their research, how they responded to dilemmas, and which research conditions were important for their ability to behave responsibly.

Group discussions have frequently been used in research integrity studies to broaden the available perspective on what constitutes good practice (De Vries et al., 2006; Hangel & Schickore, 2017) and how those elements are entangled with the environments in which researchers work (Anderson, Ronning, De Vries, & Martinson, 2007; Aubert Bonn & Pinxten, 2021). Inviting researchers not only to share their own perspectives but to set them in relation to those of others and to challenge and discuss experiences has provided rich empirical material (Kitzinger, 1994; Morgan, 2012). Moreover, group discussions can create a sense of empowerment, as the participants’ understandings and perspectives are allowed to take center stage (Felt et al., 2018).

Five⁷⁸ card-based discussion groups with early stage researchers, including master’s and PhD students as well as early-stage postdoctoral researchers, conducted within the framework of workshops and teaching contexts, build the basis for this article. The 39 participants came

⁷⁸ In total, seven discussion groups were conducted under the framework of the research project “Borderlands of Good Scientific Practice.” Two of these, however, were not analyzed for this article due to the overly heterogeneous disciplinary and institutional backgrounds of their participants.

from the disciplines of the life sciences and physics. Each group had between 6 and 11 participants and lasted between 3 and 5 hours. In total, 20 hours' worth of material was collected and transcribed for in-depth analysis. The transcripts were analyzed using an abductive approach, as proposed by Tavory and Timmermans (2014). Unlike inductive approaches, which promote the independent emergence of theories from the data, or deductive approaches, which ask researchers to analyze the material using predefined theoretical categories, abduction fosters a combined approach. My analytical process was thus shaped by a back-and-forth interaction between the empirical material and theoretical texts. The analytical work was characterized by thorough coding of the material, intensive memo-writing, and mapping, which was gradually refined over time.

Registers of valuing good research

As I analyzed how the participants in the group discussions characterized good research practices in their work, four main “registers of valuing” (Heuts & Mol, 2013) stood out as shared reference points across all of the groups: *Experimenting*, *Collaborating*, *“The System”*, and *Feeling*. Below, I describe how the participants talked about how they knew and evaluated whether they considered research good along each of the registers and what they did to make their research good.

Experimenting

The first register of valuing mobilized by the participants focused on their practices of experimenting. Participants described how doing good research was anchored in their manual and analytical labor: They bred, fed, and killed mice, flies, or yeast; built, repaired, and maintained machines, materials, or programs; and extracted data before integrating them into tables, graphs, or text. Such practices of experimentation are often also the focus of integrity debates outlining questionable research practices and acts of misconduct. Among our participants, however, concerns about good practice were not singled out as particular moments but as considerations embedded in the mundanity of messiness and ambiguities in experimental practice. With the mobilization of this first register, research was characterized not as a sterile, linear path to results but as a process where “often the analysis is not straightforward” (FG_5_1.1) or where, despite one’s best attempts, “you can never fit that perfectly” (FG_7_1.2) and must “sometimes work in the grey zone” (FG_6_1.1).

Advancing the boundaries of what is known about the world and thus often doing what no one has done before tends to resist a clear linearity where one simply proves an idea (Delamont & Atkinson, 2001). Participants described how they were confronted in their experiments by “ugly particles” (FG_7_1.2), “weird noise” (FG_7_1.2), and situations where it might ex-post be “really hard to differentiate between what’s important [and] what’s not” (FG_2_1.2). Such material vulnerabilities are not avoidable but must be cared for. Consequently, participants talked about their intimate engagement with the machinery, programs, calculations, chemicals, and animals entrusted to them. Navigating these mundane ambiguities requires not only an anchoring in disciplinary customs and paradigms (e.g., how to share raw data or modify images) and a grounding in the concrete affordances of the experiments at stake but an ongoing commitment to addressing the challenges. The issue for early stage researchers is less whether or when something has passed a threshold of misconduct or under which category of questionable practice a concern falls than a constant need for attention to ambiguities and pursuit of the closest possible outcome to a “good” result (FG_2_1.1).

In the participants’ accounts, doing an experiment well did not connote universal control over it but rather represented an ongoing process of taming its uncertainties. Even if researchers seek to do their best and conduct their research as carefully as possible, unintentional mistakes or biases “can happen really fast, so this is just a small mistake” (FG_2_1.2); alternatively, one might unconsciously take “a little step into misrepresenting data, because you have this theory” (FG_1_1.1). The inability to fully control all aspects of their research, not to mention the risk of their own imposition on their results, calls for constant attentiveness, as well as the scrutiny of peers.

Noticing and assessing irritations, however, is not straightforward. It requires curating skills and knowledge as to which elements are and should be concerning in a given situation. Some participants mentioned that experiments might not be well documented if they were quick and easy to redo (FG_7_1.3) or talked about the importance of being able to assess “whether the error is affecting the story that you are telling, or not” (FG_2_1.2). The participants did not have absolute standards of good or bad but rather emphasized the importance of judging behavior depending on the concrete context of their disciplines and lab environments. This contributed to an ongoing process where they must be attentive not only in their own

research but more broadly, as they might also play a corrective role in relation to work already published. One participant, for instance, described how they had identified irregularities in a paper that “probably were an artifact due to a defocused imaging system” (FG_5_1.1) and notified the authors. Nonetheless, the mundane taming of messiness and ambiguities often remains invisible, devalued, and displaced (Singleton, 2010).

Collaborating

The second register of valuing good research was characterized by participants as emerging in and through their lives with others. Calling this register *collaborating* does not, therefore, limit it to literal practices of working together with others but subsumes all kinds of formal and informal relationships with other researchers. Participants emphasized that what is or is not good research does not precede relationships but emerges within them. They further emphasized that good research is negotiated and practiced in constant entanglement with others. They cohabited with, cared for, and competed with peers; they learned from, were challenged by, and worked with mentors; they were simultaneously becoming members of research groups, universities, and the global academic community. Research was characterized in this second register as a deeply social process, where concerns about good practice and their mitigation were situated in collaboration.

The statement that “nobody can achieve something really on their own” (FG_6_1.1) offers a baseline across the groups in their descriptions of their constant engagement with other researchers. Sometimes this even reached the point where colleagues in a group “[knew] what everybody [was] doing continuously” (FG_2_1.1). The scrutiny of collaborators was not just seen as making misconduct unlikely but also as preventing errors and allowing collective mitigation of concerns. One participant described this by saying, “[I]f you’re working all alone in the lab [...] you’re more likely to make mistakes [and if] five different things are wrong at the same time you will have only two hands to fix them” (FG_7_1.4). Based on this second register, good research requires the care of many.

Participants’ understanding of collaboration, however, was not simply as an innocent, feel-good ecology (see Shrum, 2010). They were well aware of the dependencies and vulnerabilities that could arise in the collective search for knowledge. Their work relied “on somebody else being very diligent to write down exactly what he or she did before”

(FG_5_1.1) or somebody warning them if data might be compromised (FG_7_1.3). Research could be easily delayed, disturbed, or even destroyed by the sheer neglect of colleagues. Some participants experienced frustrating situations where somebody “left the freezer open and [...] all [their] cells were dead” (FG_1_1.1), another reported that someone took measuring devices (FG_7_1.2) without bringing them back, and another stated that somebody “[used] up some reagents [...] [and did] not order new ones” (FG_2_1.1). Doing good research can, therefore, never be reduced to caring for one’s own actions but always requires others to be responsive, at least sufficiently so to avoid doing any harm.

To be able to respond to what was happening around them, participants reported that they needed to feel they “[could] openly discuss things with colleagues without feeling anxious about being sanctioned” (FG_5_1.2). This ability to scrutinize the practices of others and be challenged themselves, a mutual question-ability, was seen as vital in caring about good research. Feeling safe to share personal vulnerabilities and those of their research required environments, infrastructures, and spaces that valued this type of exchange and openness in general. Lab meetings, for instance, could be situations where a participant “just present[ed] the really nice data” (FG_2_1.2) or situations where they “discuss[ed] openly with everyone that everyone knows [their] problem” (FG_1_1.2). Participants considered themselves active contributors to shaping safe exchange environments.

However, the idea that everything should, in theory, be “questioned irrespective of who is doing it” (FG_7_1.3) seems often to have been limited by steep hierarchies within research groups (see Aubert Bonn & Pinxten, 2021). Some participants preferred to confront their colleagues about irregularities “alone [...] not in the presence of [the] supervisor and everybody” (FG_1_1.2). Such an approach results in layers of (in)visibility within the group regarding who knows about which kinds of struggles and who is or is not challenged and criticized.

In terms of invisibilities and absences, participants across the groups also reported a shared sense of frustration that “the supervisor [was] always gone” (FG_1_1.3) and had too little time to be responsive to the mundane struggles of those under their supervision. As one participant put it: “[H]e’s very excited about showing up when we have something cool going on, but he doesn’t work in the lab anymore. So, this master–apprentice situation doesn’t

happen where you actually learn the stuff that is very hard to put in a book” (FG_7_1.4). Supervisors were described as busy securing funding and new collaborations, dealing with bureaucracy, or handling university politics. They acted rather as managers of their groups (see Davies & Horst, 2015), a task for which participants perceived them as insufficiently prepared: “[H]e has never taken a management course, he doesn’t know, he doesn’t understand power dynamics himself” (FG_7_1.2). Supervisors are also assessed by their scientific output rather than their management practices, rendering them highly dependent on the work of their employees (see Müller, 2021). These aspects form a potentially toxic combination that may result in friction on both sides and even culminate in dynamics that the participants perceived as an abuse of power.

The social dynamics within research groups were understood by participants as relating to dynamics in wider science. The dominance of competition as a guiding logic was repeatedly mentioned as introducing new vulnerabilities and limiting the “willingness to respond” (Martin et al., 2015) to others. As one participant noted, if there are winners and losers in the race for publishing most quickly in the highest-impact journals, “it can hurt, because at some point you [...] may want to harm other groups” (FG_6_1.1). As part of their socialization in the research context, participants reported learning about the “tacit geographies” (Felt & Stöckelová, 2009, p. 58) of the social fabric within their groups and beyond, discovering whom to trust, how to offer and deal with critique, and how to share data and results: in other words, when and in which contexts they were able to respond, speak up, or criticize without risking harm to themselves. Many reflections about valuing good research within this register were thus characterized as a simultaneous commitment to the collective pursuit and the participant’s own success, which was often accompanied by an inner conflict. As one participant described it, “[M]orally, I would say we should make it the standard that you always publish a code, but as a person who needs to publish in science, I don’t wanna publish my code” (FG_7_1.1).

“The System”

The third register of valuing situated the participants’ reflections and practices regarding good research within tensions inherent in what they called “the academic system”. They reflected on the influences of publication processes, funding structures, university politics, and career perspectives on how they valued and practiced good research, influences they often

subsumed under references to “the system” (see Felt & Ulmer, 2022). While research integrity scholars acknowledge the influences and paradoxes that arise in reward systems (Aubert Bonn & Pinxten, 2021), many narratives portray researchers as deliberately deciding against good research and for their own success. There is little space for the struggles and negotiations that early stage researchers experience as they grow and move into research worlds of conflicting valuations. Participants emphasized their need to acquire skills and knowledge about the system and develop nuanced criticisms to challenge and change it from within.

As they grow into academia, early stage researchers learn how important it is to tell success stories about their own research. They learn how to “choose a picture [with] a nice particle” and make sure that their stories are “flowery enough” (FG_1_1.1). Moreover, they get to know the clear temporal hierarchies of novelty, where only those who publish first receive credit. “[I]f someone else publishes before you”, achieving a scoop, “it’s very frustrating” (FG_7_1.1). The dominance of triumph stories, meanwhile, leads to a narrative imbalance where negative results, errors, and struggles are systematically made invisible. Participants reported, for instance, “not mentioning to people that along the line [they] also got these other weird results” (FG_7_1.2). Many reported a lack of available grammars and spaces for sharing ambiguities and found themselves reluctant to talk about their concerns. “I would consult a colleague because I really, because I, I wouldn’t know how to deal with it [...] it’s interesting that we were never taught that in [laughing] our scientific career” (FG_7_1.3).

Participants criticized the tendency to publish, fund, and tell stories about science so as to show only linearized success narratives as making science less robust from the inside. They described how they developed nuanced, situated critiques of the systems concerned and how the understanding they acquired changed their evaluations of published literature. As one participant put it, “I always see it like [an] advertisement—if you write a grant or something [...] everyone who is reading it knows [...] everyone is just taking the best out of your own work” (FG_1_1.1). More advanced early stage researchers, in particular, described how they had become vigilant about things said in public spheres, understanding them as performative acts. This did not mean that they no longer trusted published literature at all, but they were cautious and reflective about how to use it in their own work and might build different forms of verification before relying on it.

The critique they expressed, however, was not mere finger-pointing toward the actions of others but views derived from their own experiences with ambiguities, uncertainties, and pressures. Participants described how valuing good research was always negotiated given the complex tensions stemming from their being expected to perform well in academia. They thus found themselves perpetuating and maintaining reward structures where “the system is and the science is not benefiting from that” (FG_2_1.3). This feeling that the valuations of “the system” and “research” regarding good practice were out of touch with one another was founded on an observation that institutional actors, dominant in determining and reinforcing ideas of good research, were too far away from research itself. Participants complained that “people who decide how much you should publish don’t even know how difficult that is” (FG_2_1.3) and that to “rank people in percentage [of their] contribution [...] is impossible to do” (FG_2_1.1). All of this points to a feeling of alienation and distance between researchers and their institutions (Hall, 2018). In their most critical comments, participants complained that they felt alone and that that “young scientists really don’t get any support from the universities” (FG_2_1.3), but they mainly felt exploited.

Nevertheless, participants also reflected on “how we can kind of break the system” (FG_5_1.1). They emphasized that this could be achieved “by talking to each other and just deciding that it’s not worth it to us” (FG_5_1.1). They thus understood academic regimes not as rigid but as in some way open to change, since without having meaning in people’s lives, they lose their power. However, such a task was “not for a single PhD student to do it, but I seriously think, maybe being naïve, but I seriously think that if [...] a rather big group of full professors would pick up the [...] problem and just stand up [then things would change]” (FG_6.1.2). Systemic change, as this participant noted, requires those in positions of power to challenge the systems that made them successful. Participants’ own agency seems to have been limited to developing a critical spirit and contributing to efforts to challenge “the system” slowly, from below. They did so, for instance, through the use of infrastructures that disrupted heteronormativity of what they perceived to be academically valued. One participant hoped, for instance, that they would “get the possibility to drop supplementary material along with the raw data, and [thus show] also the ugly particles” (FG_7_1.2).

Feeling

The fourth register of valuing used by participants to make sense of good research practices highlighted the affective dimension and how emotions mattered in assessing and producing knowledge. Contrary to dominant research integrity narratives that depict good scientific practice as purely a product of rational decisions, participants described how much their feelings about their work, colleagues, or the wider system influenced their perspectives on and capacities for good research (cf. Brunet & Müller, 2023; Gilligan, 1982; Tronto, 1998). Integrity issues are far from sterile situations (see Roberts et al., 2020). Our participants described how embarrassment, anxiety, frustration, anger, and fear but also happiness, relief, passion, pride, and excitement shaped their assessments and critiques of research. In this register, research appears as a deeply human endeavor, not detached from people and their feelings but conducted by and through them.

Along these lines, participants gave room to the emotional labor involved in research (cf. Friese, 2013; Pinel et al., 2020). They saw research not just as thinking work and craftsmanship but as requiring the affective engagement of its practitioners. Being “moved” by their surroundings was important for noticing concerns and following up on them, as was the entanglement of assessments of critique with the individuals raising that critique. As one participant stated, “I’m afraid ignoring critique from colleagues is something I’m quite prone to if I don’t personally like the colleagues. [...] I would say that if I personally do not like someone [...] it takes a lot more that I take [...] their comments seriously than with other people that I get along [with] better” (FG_6_1.1). The “willingness to respond” (Martin et al., 2015, p. 634) is thus never solely a logical process but always also an emotional one.

The readiness to respond, however, was perceived to decline with increasing frustration and mental health difficulties over the course of an individual’s studies. Participants shared worrying self-assessments and reflections on their mental health situations. Some went as far as to claim that “everyone has problems inside. It cannot be that you go do research and you have no problem” (FG_1_1.3), an observation that is well supported by recent mental health statistics concerning early stage researchers (e.g., Levecque et al., 2017). According to one participant, the “major source of me feeling unhappy most of the time when doing my research is [...] [that] when I think about these values from my very internal view, what I value about doing science and how it’s actually going on [...] that fundamentally clashes, it’s really

detrimental” (FG_7_1.1). Across the groups, this assessment was repeatedly shared, and the view that “academia creates conditions that are very distant to what science, at least idealized, should be” (FG_7_1.1) was prevalent.

While participants also talked about positive feelings such as excitement and pride, these were mainly used as reference points to contextualize their past experiences on beginning research. Across the groups, a sense of betrayal and exploitation at the fact that working in science differed so considerably from what participants had expected it to be was tangible (see Felt & Fochler, 2013). Many participants had worked in labs during their studies, and they complained that the concrete elements of academic labor were deliberately not shown “to the masters and bachelor students because they want to drag them in” (FG_7_1.1). Participants were outspoken in explicitly warning future PhD students to allow them “to decide whether this is the life [they] want to lead or not, because I feel like most of us are kind of stumbling into this machine we don’t really know about and don’t understand” (FG_5_1.2).

Throughout participants’ descriptions of feeling unhappy in research, a major point of critique was the narrative entanglement of excellence and suffering. It seems, they observed, that you “have to suffer to have a career” (FG_2_1.3) and “rarely you will be asked: are you feeling okay? Are you overworked?” (FG_5_1.1). This is not success despite suffering but rather a complex merging of neoliberal ideas and older ideals regarding passionate scientists (see Schönbauer, 2021) that make it appear positive to push one’s “limits, physical limits, mental limits” (FG_6.1.2) for science. While participants were also eager to demonstrate their passion for science, they were severely critical of the expectation that they should work overtime to show their commitment. They described the “idea that if we’re in the lab 10 hours a day, we’re somehow more productive than if we were only there 6. And half the time that’s not true, and so many times you’re just pretending to do something while you just hate your life right now, and you’re not doing anything for the past 4 hours. But your PI has to see you and you’re cracking away” (FG_7_1.4). Indeed, according to participants, the “normalization of overwork” (Haven et al., 2020, p. 3017) is highly problematic because it “kills the internal drive” (FG_7_1.4).

Many participants reported that they "stopped thinking about [research] as passion and started thinking about it as a job" (FG_7_1.4). They complained that their frustration not only reduced their productivity but might also lead to explicitly harming science: When people "get frustrated or overworked [...] mistakes could happen more frequently" (FG_1_1.3). The narrative participants presented was not one of sloppiness but an explicit critique of contemporary working conditions as resulting in worse-quality research. Many participants described feeling "really, really, really under pressure and they lost the scientific drive, they don't want to work anymore in science, they just want to get rid of the paper and send it anywhere" (FG_2_1.3). To bring back the deficit narratives, participants argued that we should be less concerned about those early stage researchers who lack moral fiber and want to cheat or those who do not know any better, and more concerned about those who stop caring for research.

Early stage researchers' response-abilities for good research

The aim of this paper was to gain a better understanding of how early stage researchers experience and value good research in their practices. Analytically distinguishing between four "registers of valuing" (Heuts & Mol, 2013) good research has allowed us to see that these researchers not only display a complex understanding of good research but also feel responsible for it and care for it through their practices. Research integrity thus becomes not an abstract precondition for "good" research but an ongoing achievement of researchers in reconciling their (potentially) diverging valuations.

This perspective also invites us to think about early stage researchers' responsibilities as "response-abilities" (Barad, 2007; Haraway, 2008), that is, as gradually evolving, caring, deeply situated, practical enactments of responsibility (Baan Hofman, 2023; Petersmann, 2021; Schrader, 2010). This is a rather critical, political rendering of responsibility that does not orient itself according to existing categories but empirically follows the concerns to which early stage researchers are responding and the capacities they require to do so in their everyday practices (Mol, 2008; Peltola & Heikkilä, 2015). These become particularly visible when we examine how the participants described the relationship between the different registers.

In many accounts, participants described how the close entanglement of the first two registers, *Experimenting* and *Collaborating*, was key to developing the ability to respond to concerns, that is, to acquiring the skills, (tacit) knowledge, and socio-epistemic orientation needed for assessing and practicing good research. Learning to tame the messiness of research processes and maneuver through novel epistemic terrain was rarely described as a purely individual journey but frequently as being part of a constant collective becoming. Instances of care for good research were, for participants, located in the interplay of attuning themselves to vulnerabilities or irritations in their experiments and occupying research environments where they felt safe to raise concerns and seek support. However, the mundane practices of knowledge production they described often remain under the radar, as the specificities (see Felt & Ulmer, 2022) of research processes are excluded from public accounts (Delamont & Atkinson, 2001). If their “epistemic importance” (Wylie, 2021, p. 145) is systematically made invisible, it is easy to characterize early stage researchers through deficit narratives and neglect the protective and responsive role they play in the foundations of research.

What these two registers share is that both were repeatedly described as systematically sidelined by and positioned as fairly distant from the third register, *“The System”*. The strong tensions that participants experienced between these registers echo previous studies that point to a mismatch of values between academic reward systems and practices seen as making research robust (Aubert Bonn & Pinxten, 2021; Davies, 2019; Sigl et al., 2020). The responses participants deemed necessary for valuing good research along the first two registers were in conflict with or at least sidelined for the sake of this third register. The internalization of this tension was described as highly disillusioning and frustrating because participants perceived little agency on their own part to escape the dominance of *“The System”*. Even if some participants were enthusiastically contributing to reform movements, such as open science, they perceived their agency to respond to their and others’ concerns as being severely restricted by their expectations and experiences of what was rewarded in reality. In particular, they criticized how the power and dominance of this register incentivized a sense of “carelessness” (Lynch, 2010) in their own and others’ practices that threatens to corrupt research from within.

What is conspicuously absent from present integrity debates, but nonetheless pervasive in shaping researchers' response-abilities, is the fourth register of *Feeling*. This register stands out against the others, as it is tangible in all of the other regimes and fundamentally shapes participants' "willingness to respond" (Martin et al., 2015, p. 634). Questions of good research are all too often presented as sterile, purely rational issues (Roberts et al., 2020) despite the obvious importance of affective relationships in individuals' valuing practices (Brunet & Müller, 2023). Our observations in the discussion groups align with the worrying reports and statistics often seen regarding researchers' mental health (Levecque et al., 2017). These observations, described above, suggest that this is far from an individual problem (Loveday, 2018) and urge us to improve early stage researchers' working conditions, not only as an ethical duty to the people entrusted to us but also because it is essential for them to conduct good research. We can no longer continue to claim that strained working conditions will give us the best possible research.

Extending these observations to the wider discourse concerning research integrity, one can see that integrity interventions tend to be negotiated on the level of "The System" from which participants felt so distant. Integrity debates seem to refer to practices of experimentation and collaboration only in abstract terms and hardly ever to feelings. This also supports the observation that despite the investment of considerable resources in research integrity initiatives over the years (Aubert Bonn & Pinxten, 2019), these struggle to achieve meaning in researchers' lives (Davies, 2019; Hangel & Schickore, 2017). So far, research integrity discourses have not succeeded in becoming collective spaces to "reassess [how and] what we actually value" (Downey & Veitch, 2021, p. 283) in research. They thus fail to acknowledge that integrity is not a universal quality of researchers, but an achievement reached in and through practices of reconciling different and potentially conflicting valuations and negotiating their meaning in researchers' own practices.

Part III Discussion and Conclusion

This study set out to understand when, how, and for whom research practices become matters of concern and how care and response-ability for them are imagined and practiced. In each of the three articles that comprise the empirical corpus of my research, I zoomed in on different arenas and thought about the issues at stake from a different angle. Drawing these observations together, I will first discuss four cross-cutting points: how the in/visibilities of concerns and care shape response-abilities, the roles of individuals and collectives in responding to concerns, and tensions between controlling and caring responses to concerns. To conclude the thesis, I will argue that turning to the concerns about good research practice in practice also contributes to strengthening trust in and within research.

Chapter 5 Cross-cutting analysis

Across the empirical body of this thesis, four main observations stood out as responses to the main research question. Each of the following subsections sheds light on the articulation and intertwinement of concerns, care, and response-ability from a different angle, pointing to the matters of concern represented in the material, who is imagined as responding and caring for them, and what the responses looked like.

In/visibilities of concerns and care

Situations where research practices become matters of concern are uncomfortable. Suddenly, the very doings of research, which are usually well hidden when only facts are discussed, are put in the spotlight for everyone to see and judge (Latour, 1999). Throughout the thesis, we saw that institutional responses, guideline implementation, courses, and investigation procedures are central to claiming that scientific actors can manage responses to concerns themselves. Yet, the institutional practices meant to “raise awareness” run the risk of remaining mere tick-boxing exercises, obscuring the challenges researchers face. The researchers we talked to pointed out the importance of many-faced care practices in responding to irritations in their research and preventing them in the first place. This leads me to conceptualize research integrity debates as instances of “unsettling” (Murphy, 2015, p.

665) care practices in research, which are often pushed aside by neoliberal policies and reward structures (Lynch, 2010). Although we are witnessing the first attempts at positioning the efforts of maintenance, repair, and care more prominently in academic reward systems, it remains to be seen whether these will contribute to more fundamental changes.

In/visibilities of concerns

In the first article, we followed the onset of a public discourse on scientific misconduct and fraud. Single cases gained considerable media attention, putting concerning behavior by scientists in the spotlight (Frantz, 2018; Friedly, 1996; Liebes & Blum-Kulka, 2004). The “scientific family’s” attempts to argue that it is capable of detecting and dealing with misconduct in its own ranks were met with suspicions of (deliberate) blind spots (Broad, 1981; Broad, 1982; Luke & Kearins, 2012; Nature, 1981). These cases not only made for newsworthy stories, which were followed almost like criminal investigations (Marshall, 2006), but also challenged the basis for societal trust in research. The “scientific family”, its individuals, collectives, and values were deemed insufficient for preventing scientific misconduct and fraud given that they were too attached to and protected their colleagues from public scrutiny.

Throughout this first article, we traced the changes in subsequent years and showed how institutional actors became increasingly important as guarantors of societal trust in science. In parallel to wider shifts formalizing scientists’ accountability to society (Power, 1997; Shore & Wright, 2000), funding agencies, universities, and journals implemented various “rituals of verification” (Power, 1997), signaling that they take concerns about research practices seriously. At the center of this kind of institutional response are abstract definitions of good scientific practice. Most guidelines equate scientific misconduct with practices condemned in most societies, such as cheating (fabricating), lying (falsifying), or stealing (plagiarism) (Hermerén, 2014). In institutional documents, these definitions are presented as ahistorical truths, ignoring the “boundary work” (Gieryn, 1983) of the early years when the issue of which practices should classify as misconduct was debated (Aldhous, 1991; Culliton, 1994; Kaiser, 1996, 1997). Presenting definitions of scientific misconduct as “neutral” both deprives them of their deeply political implications (Mody et al., 2020; Peterson & Panofsky, 2023; Roberts et al., 2020) and frames which kinds of responses are deemed legitimate and necessary and which are not.

The authority acquired by establishing formal rules and regulations allowed institutions to carve out protected spaces for investigating accusations away from the public eye. Accusations of scientific misconduct are uncomfortable and potentially harmful to everyone involved. Balancing the need for transparent communication by showcasing that accusations are taken seriously while also protecting the scientists involved is central to the implementation of fair trials (Hesselmann & Reinhart, 2020). Hence, a necessary prerequisite for due process was to limit the scope of the people involved in assessing and investigating accusations and simultaneously crafting clear instructions about when and how verdicts are communicated to the public (Hallum & Hadley, 1990; Universität-Wien, 2006a).

Besides setting up processes for investigating scientific misconduct, universities also responded to rising concerns by introducing codes of conduct/guidelines and integrity courses for students (Atkinson, Nau, & Symons, 2016; Montgomery & Oliver, 2009). Both measures characterize concerns about good scientific practice as a matter of knowledge. People who know the limits of good scientific practice will avoid misconduct, and if they do transgress the boundaries, they do so willingly and can be punished (Atkinson et al., 2016; Mahmud & Bretag, 2014). This rational choice narrative of good scientific practice reduces institutional responsibility to one of “raising awareness”. Although it might be necessary to state the expectations and demands for good practice, the limited number of other actions says a lot about the room for maneuver universities perceive for their own actions. They can display their commitment and incentivize actions that presumably prevent misconduct or investigate cases once they arise. But hardly any attention is paid to the concrete research processes or the wider conditions in which research occurs.

While the public discourse emphasized misconduct and fraud, scientists reported a more nuanced set of concerns (Martinson, Anderson, Crain, & De Vries, 2006). Surveys, interviews, and focus groups with researchers shed light on a broad spectrum of “normal misbehavior” (De Vries et al., 2006, p. 43) and “questionable research practices” (e.g., Ravn & Sorensen, 2021, p. 1). Sloppy conduct, exaggerated results, poor quality checks, inaccurate documentation practices, or selective/biased reporting were deemed even more concerning than the rare instances of scientific misconduct (Biagioli et al., 2019). For some commentators, these observations confirmed that scientific misconduct and fraud were just the “tip of the iceberg” (e.g., Editorial, 1997, p. 743), a metaphor frequently used to justify

the need for further funding. In contrast, others emphasized the dire need to attune to researchers' concerns (Hangel & Schickore, 2017). The visibility of researchers' concerns called for responses that did not reduce the problem to a lack of knowledge—since they were well aware of concerns—and pointed to the influence of strained academic living conditions (Davies, 2019). Although awareness has become non-negligible, the question of how to respond collectively remains open (Valkenburg et al., 2020).

In the second article, we presented the card-based engagement method RESPONSE-ABILITY to propose integrity training materials that involve researchers in collective reflection about good research practices. RESPONSE-ABILITY invites researchers to adopt different perspectives and think about transgressions of good scientific practice from different angles, supporting their positioning in a challenging terrain and pondering how abstract ideas of good scientific practice matter in their own lives. Thus, we positioned the discussion method as an explicit critique, challenging the notion that early-stage researchers are sufficiently prepared to respond to challenges in their own and others' practices if integrity courses only teach them abstract rules (Phillips et al., 2018; Sefcik et al., 2020). In many situations, it is not easy to determine how and where to draw the line between still acceptable and no longer acceptable practices (Peels, de Ridder, Haven, & Bouter, 2019). This is especially true because some practices might be concerning for some disciplines, experiments, or research questions but not for others (de Rijcke & Penders, 2018). We emphasize this point to sensitize researchers to the "borderlands of good scientific practice" (Felt, 2016), that is, the continuously emerging and evolving grey zones of good scientific practice. If there is little room for reflecting on the situated challenges, particularly for early-stage researchers, interventions become perfunctory (Sarauw et al., 2019; Young et al., 2018).

In/visibilities of care

In the third article, I analyze the discussion group conducted with the RESPONSE-ABILITY method and showed the complexity of the "registers of valuing" (Heuts & Mol, 2013) used by early-stage researchers to make sense of and value good research. These categories were not abstract ideals but had to emerge from the participants' practices. The narratives consistently illustrated the importance of care practices—both their own and others'—to research. Thus, the participants described how crucial it is to be affectively attuned to the irritations and ambiguities of their experiments, data, and colleagues. They aimed to make research as good

as possible in their everyday practice despite the continuous ambiguities and imperfections that are part of research processes (cf. Friese, 2013; Mol, 2008; Pinel et al., 2020).

Therefore, our focus group participants echoed the long-standing feminist STS critique that care practices are not just nice, feel-good actions but vital for scientific knowledge production (Martin et al., 2015). This is especially the case for responding to situations where research practices become matters of concern. Often, the actions that mattered the most to our participants were those that noticed and cared for irritations even before practices reached the threshold for being considered “questionable” or concerning. Engagement with research, data collection, and analysis requires them to “attend to what should not have been possible” (López Gómez et al., 2010, p. 82), to the “ugly particles” and the things that do not make sense. Yet, the care work they described remains fairly invisible in the wider discourse about “good” research (see also Friese, 2013; Pinel et al., 2020).

What is much more vividly voiced is expectations about “who should have cared” once problems occur. Therefore, we can understand research integrity debates as a more profound “unsettling” (Murphy, 2015, p. 665) of vital care practices that have been pushed to the side in neoliberal academia (Lynch, 2010). The heavy focus on competition and individualism is believed to corrupt science from within. In response to research integrity issues, attempts at making care practices more visible and valued are increasing. Consequently, new journals publish replications or negative results, pre- and post-publication become considered a valuable contribution to scientific quality control, discussions arise about rewarding good supervision, the sharing of data for collective use is incentivized, attention is paid to mental health struggles, or more elusive efforts are made to create “integrity cultures” (e.g., Lerouge & Hol, 2020) by implementing a variety of institutional reward structures. However, it is difficult for care practices to become meaningful in wider integrity debates because they challenge dominant narratives and the value structures of competitive, excellent science. It remains to be seen how much of a lever these research integrity debates can become for enacting a long-standing critique of how research is rewarded, organized, and structured or whether these efforts merely introduce more checkboxes.

Individuals of integrity

Scientists and their integrity have always served as a foundation for claiming the credibility, reliability, and trustworthiness of research (Shapin, 1995; Shapin, 2008). In the first article, we saw how the role of scientists as producers and guardians of knowledge changed radically over the observed period. In the first years, scientists were described as the central figures protecting and correcting knowledge, being the only ones who could judge its value and problems. Scientists were imagined as living by an “ethos” (Merton, 1973 [1942]-b) of scientific norms that ensured the production of reliable knowledge. Only personalities of questionable character could act against this ethos, and they were expelled from the community if they did not respect the shared values. Yet, in light of the growing number of public cases of scientific misconduct or fraud and the expanding understanding of which practices were concerning, this ethos was both challenged on its efficacy and deemed an insufficient guarantee for protecting research.

Gradually, institutional quality measures, such as the investigations of misconduct, guidelines, and trainings described above, were introduced (Montgomery & Oliver, 2009; Steneck & Bulger, 2007). These were not part of an innocent “extension” and proliferation of responsibility to more actors responding to concerns; they came with a shift towards portraying researchers as part of the problem that must be managed. Rather than understanding scientists as response-able experts, the institutional practices that were put in place seemed to suggest that researchers have to be nudged towards good behavior (Labib et al., 2021).

The “imagined scientist” (Åm et al., 2020) of such research integrity endeavors seems to be a universal scientist free from disciplinary, institutional, and local attachments. References to career stages or position in the academic hierarchy are rare, even though they fundamentally shape researchers’ room for maneuver (Felt, 2009). The narratives often feature nostalgic undertones, longing for a time when scientists were not hindered by perverse incentive structures and could search for the truth disinterestedly (Roberts et al., 2020). However, these nostalgic narratives must be understood as a diagnostic of the current state of affairs (Ylijoki, 2005). How we organize, reward, and structure science is suspected of causing a decline in virtues, replaced by new demands to perform well in the competitive game of

excellence and innovative research (Aubert Bonn & Pinxten, 2021; Biagioli et al., 2019; Tomic et al., 2022). Keeping the description of researchers abstract and idealized contributes to maintaining the status quo because many of the challenges associated with living up to the ideals of good scientific practice become visible only when looking at the concrete environments in which researchers live.

In the early years of the analyzed debates in *Nature* and *Science*, challenging research conditions and toxic environments were seen as a poor excuse for individual failure (Culliton, 1983). Raising awareness of the moral duty of being a scientist of integrity and expelling those who failed to live up to these high ideals were the core responses to concerns. Only gradually, and in parallel to a broader critique of the changes in academia, an understanding arose that aligning values and practices is not straightforward. In the third article, I challenged the idea of research integrity as a stable quality and highlighted the work that goes into keeping different, partly conflicting “registers of valuing” (Heuts & Mol, 2013) good research together. Understanding integrity as an active accomplishment in practices draws attention to the work that researchers must do when navigating the multiple “value conflicts” (Helgesson & Bulow, 2021, p. 113) in contemporary academia. This understanding of integrity as an achievement in practice in specific environments was also central to the development of the RESPONSE_ABILITY training method. With science constantly advancing its methods and claims, we must train researchers to be reflexive and position themselves rather than merely telling them about abstract rules.

In presenting an analysis of the discussion group, I contested dominant narratives that describe early-stage researchers as lacking knowledge and being morally deficient. Instead, their valuations of research are complex, and they describe their various efforts to make science good and respond to concerns. As more and more work is being conducted by early-stage researchers and their numbers keep rising, they are acquiring a considerable “epistemic importance” (Wylie, 2021, p. 145) that often goes unnoticed. Yet, they are not only the largest group of scientists in numbers but also the one most affected by the changes in academia (Fochler et al., 2016). They are subjected to intense competition, insecurities, and precarious working contracts (Müller, 2012b; Schönbauer, 2018; Sigl, 2012). The discussion groups revealed widespread disillusionment about the kind of work academic labor is. This illustrates

tensions between our expectations of science and lived practices (Helgesson & Bulow, 2021) and was also considered a strain on researchers' mental health.

Therefore, our participants' accounts are in line with worrying reports about mental health problems among researchers (Levecque et al., 2017). These struggles are no longer hidden behind individualized shame but have become so noticeable that they increasingly require action (Valeix et al., 2021). Our focus group participants emphasized that these are not merely individual problems; they also lower their "willingness to respond" (Martin et al., 2015, p. 634) to concerns. Ceasing to care for their experiments and results may have tremendous effects on the knowledge they produce. We must stop pretending that full-blown neoliberal competitive work logics contributing to strained academic lives will provide the best research possible. The narrative entangling of excellence and suffering pushes affective dimensions to the extreme, where researchers see exceeding their own limits as necessary.

Overall, research integrity has the potential to challenge and change many long-standing issues. It offers a chance to "reassess what we actually value" (Downey & Veitch, 2021, p. 283) in research. However, taking researchers seriously without further "responsibilizing" (Amsler & Shore, 2017; Davies, 2019) them for systemic failures that require structural and collective responses (Valkenburg et al., 2020) is a difficult balancing act. Creating more responsible research cultures cannot be reduced to putting all responsibility on scientists, given that their response-ability depends on the conditions they find for responding.

Concerning collectives

A core concern present throughout the three articles is which values are/should be shared by the scientific community. In the early years of the analyzed debates in *Nature* and *Science*, non-codified scientific values—similar to what Merton (1973 [1942]-b) described as the "scientific ethos"—served as the foundation for producing reliable knowledge. The benevolent collective pursuit by disinterested individuals, which was subject to collective scrutiny, was seen as a satisfactory safeguard of scientific knowledge production. Cases of scientific misconduct challenged not only their efficacy but also whether their informal transmission was sufficient for inscribing them in (novice) mindsets. The expectation of scientific collaboration is prominently emphasized in research integrity courses and debates.

It invokes a somewhat idealized “moral economy” (Daston, 1995) of scientists who collaboratively strive for the best knowledge (Roberts et al., 2020).

However, these narratives neglect the tensions and friction in the social fabric—labeled by some a “crisis in collaboration” (Müller, 2021, p. 131)—that arose with the prominence of neoliberal academic worlds (Anderson et al., 2007). Our focus group participants described a shared sense of disillusionment regarding how pervasive logics of competition and individualism shape collectivities. The participants reported multiple instances of questionable authorship and review practices. The importance of succeeding in competition limits the moments when observations are shared with others and makes collaboration a highly strategic endeavor, where practices of “academic citizenship” (Macfarlane, 2007) such as peer review, mentoring, or support are expected but too little rewarded (Civitelli & Duffy, 2021; Müller, 2014), despite their vital importance for ensuring good research.

Problematic social practices and experiences of loneliness in the face of challenges were also reported by the focus groups (see also Hackett, 2005a). There were vast differences between the participants, especially regarding how comfortable they were with raising concerns in their research environments. Question-ability (i.e. who and what can be criticized) appears to be limited in research processes by steep hierarchies and the pressure to perform well in front of the supervisor. Relationships with supervisors no longer seem characterized by classical mentor–apprentice relationships. Instead, the participants described how principal investigators act mainly as managers of a group, spending too little time in labs engaging in the experimental practices that are often the targets of research integrity debates (Davies & Horst, 2015). This leads to a situation where supervisors, who depend on the output of those they supervise, are sometimes unaware of the challenges faced, errors made, or decisions taken during the production of knowledge. These layers of invisibility seem to be unintended side-effects of the overproduction of early-stage researchers and the lack of consideration given to the conditions needed to guide them through research adequately.

In presenting the RESPONSE_ABILITY discussion method, it was thus essential for us to develop a collective format that trains the participants to navigate and talk about their concerns in their own environments. Several participants told us afterward how comforting the exchange with peers was, as they tend to subjectify the problems they encounter (see

Sigl, 2019). In addition, creating safe spaces for collective exchange was important in the development and design of the discussion method. However, understanding one's room for maneuver also means acknowledging that there are limits and challenges to raising concerns, for instance, when "blowing the whistle" in more extreme cases.

In the first article, we showed how the figure of the whistleblower changed considerably over the observed period. Whistleblowers are no longer portrayed as marginalized, questionable figures, and sounding the alarm about colleagues has become a duty to the system (Rossiter, 1992; Stein, 2019). Despite the widespread implementation of institutional mechanisms, raising concerns is still far from trivial (Bouter & Hendrix, 2017; McIntosh et al., 2019). Moreover, the extension of concerns from scientific misconduct to wider sets of questionable practices also changed how close whistleblowers need to be to knowledge production. The focus is no longer only on catching colleagues with a smoking gun but also on flagging troubling observations in papers (Didier & Guaspere-Cartron, 2018). Hence, the rising number of corrections and retractions (Fanelli, 2013) does not result so much from the general increase in publications as from new forms of review that have been incentivized by the advent of the internet. Pre- and post-publication peer review, for instance, is gaining more traction in online forums such as *PubPeer* or *Retraction Watch* (da Silva et al., 2017; Didier & Guaspere-Cartron, 2018).

Over time, more actors have become involved in the "multi-stakeholder scientific self" that manages the protection of science. Thus, while the claim that science regulates "itself" was maintained, the constellation of actors forming this "self" and what they did changed over time. However, the inclusion of additional actors was not a neutral development. It shifted from collectives of equals (e.g. researchers and researchers) to collectives characterized by steeper power structures and dependencies (e.g. researchers and funding agencies).

Research integrity seems to have become just another jigsaw puzzle in the wider managerialization of research (Deem & Brehony, 2005), with most actions being implemented on the level of "the system" (see Felt & Ulmer, 2022). This is concerning given that the participants in our focus groups described feeling very distant from those layers. Hence, research integrity presents an interesting case for observing the "alienation" (Hall, 2018, p. 1) of individuals, their collectives, and scientific institutions. Institutional actors

appear to have lost touch with the concerns of their members. Universities were not seen by our participants as the central frame of reference, especially because they knew that their time at a given university was limited. Nonetheless, this is counterbalanced by the rather standardized implementation of institutional responses (Fanelli, 2012), which makes the specific university in which a researcher is working irrelevant.

What is interestingly absent from the debates is reflections on the role of scientists studying research integrity debates. Although they are part of the scientific community and subject to the tensions and frictions of academic worlds, they tend to position themselves as “neutral observers” who simply translate abstract ideals into behavioral prescriptions. It is almost as if a “gaze from nowhere” (Haraway, 2001, p. 173) granted more legitimacy and authority to their actions. In their work, criticism of the idealized images of science is significantly rarer than attempts at “reinstating” them in academia.

Responses between control and care

Finally, I want to reflect on two different modes of responding to concerns about good scientific practice. The first, responses of *control*, stress the distinction between good and bad practice and draw a clear line between “integrity issues” (Aubert Bonn & Pinxten, 2021, p. 6) and wider research; they highlight the individual’s duty to act according to a logic of rational choice. The second mode, responses of *care*, attunes to the complexity of research practices and does not single them out but understands them as situated challenges requiring collective responses and processes of adaptation to the challenges (Mol, 2008).

In the first article, we illustrated the shift from the “scientific family’s” caring responses to concerns to an ever greater dominance of controlling and managerial responses of an extended “scientific self”. Scientists attempted to resist the codification of rules of good scientific practice and argued that those would fail to capture the specificities of research processes. In their critical comments in *Nature* and *Science* articles, they highlighted the tacit nature of guidance and the importance of community values. These values should ensure that science collectively and continuously advances and automatically corrects faulty results over time. The “integrity in research” (Mody et al., 2020, p. 373) that they emphasized is characterized by responses of care acknowledging that science can never be completely free

of mistakes and challenges. Instead, they put the focus on the collective process of filtering out wrong claims so that correct ones prevail.

Yet, these efforts were deemed insufficient to assure the public of the “integrity of research” (Mody et al., 2020, p. 373) in light of growing public concern over scientific misconduct and fraud cases. Policing these and installing various means of control became central to the argument for the self-regulation of research through scientific institutions. However, the increasing importance of controlling responses to concerns pushed *care practices*, which were so crucial in the first years of the discourses, to the domestic scientific realm. The participants in the focus groups shared rich stories of how situated, immediate responses are essential to making and keeping science good, along the various “registers of valuing” (Heuts & Mol, 2013) they mobilized for making sense of good research. They did not present stable lists of good practices but rather described situations in which they responded to irritations with care and how they depended on others to do the same. Still, they experienced many situations where “carelessness” (Lynch, 2010, p. 54) was incentivized by “the system” because practices that maintain or repair research are poorly rewarded.

Unlike in the participants’ discussion, the responses of institutions and research integrity discourses are characterized by the idea of controlling researchers’ behavior. This presupposes clarity on which practices are considered problematic, expressed in long, standardized lists of abstract fraud, misconduct, and questionable practices (Hermerén, 2014). In addition, the notion that quality can be assessed externally also de-contextualizes and de-politicizes the evaluation of challenges (Hartley et al., 2016). When good practice is expressed in a series of clear rules, the rational choice would be to abide by them, and individuals can be held accountable for failing to do so. There is little room for the borderlands of good scientific practice in responses of control.

Responses of control do not challenge the status quo of the current academic system but instead aim to reinforce it from “within”. The perceived decay of a “scientific ethos” (Merton, 1973 [1942]-b) nostalgically recalled in many integrity papers, should be counterbalanced with integrity forms, guidelines, and courses that raise awareness of clear rules. This comes with the risk that well-intended efforts to cure research practice by explaining ideals will develop into a Derridaian (2003) “autoimmunity” dynamic, where the very practices meant

to immunize science might turn against the system. Mimicking the logic of evaluating “goodness” through abstracted “integrity indicators” (Macleod, 2021, p. 533) may solidify a system that is seen as hampering good scientific practice (van Houtum & van Uden, 2020). It re-affirms ideas of external assessment and control of goodness as abstracted from the space where good research is produced (Kreiner, 2022) and stabilizes logics of accountability, whereby responsibility for goodness is measured, controlled, and detached from the situated practices that enable care (Jerak-Zuiderent, 2015; Shore, 2008). Thus, research integrity risks becoming a tick-boxing exercise, where researchers might stop thinking beyond stable categories of “good” practice and consider themselves responsible for negotiating its concrete meaning in their practices.

There is a fine line between creating legitimate spaces for reflection, institutionalized attention, and support, and installing mere “bureaucracies of virtue” (Felt, 2017b, p. 49). To ensure that we do not “end up doing the document rather than doing the doing” (Ahmed, 2007, p. 590) of good science, we must make sure that policies are meaningful for the people they are meant to govern (Salwén, 2015). For our participants, institutional guidelines did not represent important points of reference (see Davies, 2019). If they came into contact with them, it was not in the research process but often at the beginning of their studies by signing a form or at the end of their studies by signing another form.

Further, integrity courses are too often abstract and perfunctory (Sarauw et al., 2019; Young et al., 2018). The RESPONSE_ABILITY engagement method gives space to researchers and their individual concerns and maps out how they are embedded in specific environments. In designing it, we put much thought into how to fill these institutionally stabilized spaces with meaning to generate care through our own doings (Lindén & Lydahl, 2021; Puig de la Bellacasa, 2011). Accordingly, our method does not focus on fixed rules but provides blank cards and explicitly asks people to fill them with meaning. In the discussions, we do not concentrate on distributing blame to individuals but invite them to position their practices in the wider fabric of scientific worlds. We even published the discussion method under a Creative Commons license, in a Microsoft Word format, inviting people to adapt it to their own needs. Even so, our article was severely criticized by one of our reviewers, who claimed that anything that does not focus on enforcing abstract rules might invite questionable practices (e.g., Sarauw, 2021). Therefore, I do not argue that care and control represent

“internal and external control systems” (Godecharle, Nemery, & Dierickx, 2014, pp. 86-87), where researchers care and institutions control; the clear distinction between responses of control and care is analytical rather than straightforward in practice.

To conclude this chapter, I suggest that we need to carve out more space for responses of care because research integrity requires an ongoing commitment. We need to make room for collectively adapting not only research integrity responses but also research environments, values, and systems. Research integrity has the potential to be a powerful lever for changing research conditions that have been criticized for a long time because the reliability of knowledge seems to be under threat. Hence, we must think about “response-ability conditions” (Felt, 2017b, p. 54) not only on an individual level but on an institutional one as well. What is the integrity of scientific institutions (Pols et al., 2024)? What room for maneuver and resources does institutional care necessitate? How can institutions experiment with and adopt new responses while being evaluated according to standardized criteria? Which processes must be developed, which services designed, and what room made for research? What is the moral responsibility of a university, journal, or funding agency? These questions will require a continuous dialogue, asking what each actor can do to make the research as good as possible.

Chapter 6 Conclusion

“I hereby *confirm* that I have *written* the doctoral thesis independently, that I have *not used* other sources or facilities than the ones mentioned, that I have *not used* unauthorized assistance [...]. Moreover, I *confirm* that I have *observed* the Statutory Order ‘Regarding Formal Requirements when Submitting Scientific Papers’” (Universität-Wien, 2016a, p. 1, [emphasis added]), states form SL/D6, which PhD students must sign when handing in their PhD theses. They are again required to confirm that they worked according to university regulations for good scientific practice. The signing of form SL/D6 to conclude one’s PhD research is usually the second official instance in which the university controls adherence to the rules of good scientific practice. During studies, the university shows little interest in and offers little support for addressing the challenges and mundane concerns of living up to and with the ideals of good scientific practice.

Throughout this thesis, I criticized the mismatch between the ideas about good scientific practice propagated by institutional bureaucracy or research integrity discourses, on the one hand, and the experiences of researchers, on the other hand. Rather than debating which ideals should guide research or how different “registers of valuing” (Heuts & Mol, 2013) good research relate to each other in practice, we observe a tendency to describe and prescribe them. Universities have a special role to play in this regard. Their position as stable hallmarks of control seems central to narratives about maintaining societal trust in research. When concerns about declining societal trust due to scientific misconduct are voiced (Yarborough, 2021), a list of rules, the presence of investigation committees, or plagiarism detection software are reflexively mentioned to assure the public that universities take concerns seriously (Frantz, 2018). The basis for trust appears to be less the people or methods producing the knowledge than the institutions to which the researchers belong (Gans-Combe, 2022). Yet, institutions seem to be reluctant to go beyond standardized bureaucratic integrity responses.

However, the uncomfortable truth is that we cannot “integritize” concerns about scientific practice away by establishing more and more means of control. There have always been and will always be ambiguities, errors, and challenges in good scientific practice as well as debates about where to draw the line (Roberts et al., 2020). We must turn to them, care for them,

and understand them in practice to cultivate collective response-abilities. To conclude this thesis, I argue that attuning to concerns about good research practice in practice has great potential to strengthen trust *in* and *within* research.

Rather than understanding research integrity and its bureaucracies as a stable pre-requisite for public *trust in science*, it is crucial to shed light on what people do to make research a reliable source of knowledge and emphasize collective responses as the basis for *trust in research* (Oreskes, 2019). Challenges, vulnerabilities, and ambiguities must be communicated as an inevitable part of research processes; they must be made visible, highlighting what is done to respond to them and care for research. This is crucial because the moments when research practices become public matters of concern are those when the inner workings of research become visible for outsiders to see. In addition, if we lack the vocabulary and grammar to make sense of questionable research practices, it is difficult to assess their gravity and impact. Trust in research is not passive acceptance and reliance on robust knowledge but an ongoing achievement through practices.

Although it is less discussed in research integrity debates, trust *within* research is worryingly at the heart of concerns. In hypercompetitive research environments, there is little room for and willingness to share vulnerabilities, challenges, and problems related to research practices (Aubert Bonn, 2020). Vigilance towards published research seems commonplace and weakens science from within (Shapin, 1995). If we attune to concerns about research practice in practice, the conditions and tensions that contribute to the rise of academic skepticism take center stage. Therefore, we must “stay with the trouble” (Haraway, 2016, p. 2), cultivate collective capacities to continuously address concerns, and adapt research worlds so that researchers can conduct research in them “as well as possible” (Fisher & Tronto, 1990, p. 40).

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Appendix



Supplementary Material

RESPONSE_ABILITY

A card-based engagement method to support researchers'

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RESPONSE_ABILITY

A card-based engagement method to support researchers' ability to address integrity issues

Outline of the supplementary material

This supplementary material to the article “**RESPONSE_ABILITY – A card-based engagement method to support researchers' ability to address integrity issues**” consists of two elements:

- a) It provides reflections, suggestions, and support for organizing and moderating discussion groups conducted with the RESPONSE_ABILITY engagement method; and
- b) you will find the four card-sets and the discussion map necessary for conducting the discussions. More detailed information about the development and aim of this discussion method are available in the open access full paper published in *Science and Engineering Ethics*.

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The RESPONSE_ABILITY engagement method

What to consider when *planning* RESPONSE_ABILITY discussion groups?

The RESPONSE_ABILITY engagement method was developed to offer researchers a space to reflect on issues related to research integrity, how they come up, and how they are dealt with in their own research (environments). In the following pages, we outline a set of considerations necessary when conducting RESPONSE_ABILITY groups. Carefully planning how to conduct the discussions is vital for creating an environment in which the participants feel comfortable to share their experiences, address challenging questions, and gain relevant insights.

Group Composition

We recommend keeping the number of participants relatively low, approximately between five and eight people per group. This group size ensures that all participants have enough time to express their perspectives and interact meaningfully with one another. To avoid a lay-expert divide between participants and to enable participatory justice, we suggest conducting discussions with people from a similar career stage and research experience. Having too large academic age difference in the group creates a danger of the more experienced participants playing a dominant role. While there is, of course, value in intergenerational learning, such constellations might also hinder open discussion dynamics and potentially close issues of integrity down instead of opening them up. Participants should at best have experience in conducting research. Thus, experienced master students, PhDs, or early post-docs will benefit most from the discussions. With participants who have not done any research at all, it is challenging to talk about the meaning of research integrity in practice, and their accounts often remain rather abstract.

Timing

The RESPONSE_ABILITY engagement format is meant to create a space for deeper reflections on how research integrity matters in their own research. This demands a temporal investment of approximately five hours. Each phase of the discussion lasts about 45 minutes to an hour. It is up to the moderator to decide the exact length of each session depending on the discussion dynamic. We advise to plan sufficient time for smaller breaks between the phases and one longer break. Participants should be informed beforehand about the time commitment and temporal structure of the discussion.

Adapting the cards according to disciplinary needs

The RESPONSE_ABILITY engagement method is an open, process-oriented method that needs careful adaptation to specific settings and research realities. Moderators should have in-depth knowledge on the discussions and challenges related to research integrity in a given discipline. Identifying the concrete debates, regulations, and major dilemmas in the fields where the participants are coming from is key, not only for the moderator to feel confident in the discussion, but also for eventually adapting the content of the cards. The cards should reflect real challenges and realistic scenarios researchers might experience in their day-to-day practice. In our discussion groups with life science researchers, for instance, we included a transgression card dealing with the “Ethics of Animal Research”. We exchanged this card for the discussions with physicists and psychologists with a card about “Tinkering with Results”, as this has been an issue in those fields. Moreover, we advise being attentive to disciplinary specificities, such as co-authorship practices, for example, in order to ensure that the stories on the dilemma cards are realistic situations for the participants. The RESPONSE_ABILITY engagement method can also be used for facilitating discussion groups with more

experienced researchers, such as PIs and post docs. However, the cards, in particular the dilemma cards, would have to be adapted accordingly.

Preparing the cards

In this supplementary material you find all four sets of cards as well as the discussion map. The discussion map should be printed in an A3 format to provide sufficient space for the cards.

Spatial Organization

To trigger communication within the group, we advise setting the tables in a formation so that the participants see each other. On the right, you see table formations that worked well in our discussions. In terms of space for the discussion groups, we suggest having one room per group to reduce background noise.



Recording the discussions for social science purposes

The RESPONSE_ABILITY discussions can also be used for social science research studying researchers' narratives and perspectives on research integrity, values in science, and research conditions. If that is the aim, recording the discussions offers rich material. For doing so, all participants must be asked for their consent, ideally in a written form, before beginning the discussions. It might happen that participants allow recording but do not want to be quoted in any published analysis. This option can only be offered if a detailed list is kept tracking the order in which people speak.

What to consider for moderating RESPONSE_ABILITY discussion groups?

The choreography and the cards act as structuring and facilitating tools. This is why there is, in principle, less direct moderator involvement compared to classical discussion groups. Nevertheless, a moderator is essential for the smooth conduct of a RESPONSE_ABILITY discussion. The primary role of the moderator is to explain the stages and guide the group through each of them. Moreover, it is essential to ensure a discussion climate where participants feel comfortable talking about their experiences and to moderate in case of conflictual situations.

The moderator

Discussions on research integrity may touch on sensitive issues, creating vulnerabilities and insecurities. Therefore, the moderator should ideally not stand in a direct hierarchical relationship with the participants. Thus, we strongly advise against PIs or supervisors conducting RESPONSE_ABILITY discussions with 'their' PhDs or post-docs. However, the moderator should be a person who is knowledgeable about research integrity discussions and contemporary ways to organize and reward research. In our experiences, also knowledge about concrete regulations and legal frameworks concerning research integrity is helpful to respond if questions or uncertainties come up in the discussion.

The choreography

Moderators should be familiar with the choreography and structure of the discussion. RESPONSE_ABILITY groups are structured into four consecutive phases, where each phase engages the participants to think from a different perspective how values, transgressions, dilemmas, and research conditions matter for research integrity. Each of the phases comes with a specific set of cards. The participants are provided each with a discussion map that visualizes the four stages of the discussion and four sets of cards (values, transgressions, dilemma, and research conditions).

Kicking off the Discussion

Each phase is kicked-off with the participants' individual engagement with the respective card set. For each phase the participants are asked to perform a different task – ordering or choosing. We advise to keep all card sets upside down in the beginning and only ask the participants to turn the card set that is specific to each phase. This avoids that participants start reading the different inputs and therefore focus less on the task they are asked to do.

The participants' individual tasks for each of the four phases are listed in the table below:

Phase	Participants' individual tasks
Value	Rank the value cards according to how central the described values are in your own research. Add empty value cards if you feel values/elements are missing from the discussion. The term 'central' can have different meaning and it is part of the exercise for the participants to come up with justifications/reflections of why specific values matter for themselves/in their own research. It is important to emphasize that they should think about their own research experiences and not 'science in general'. It might be, however, interesting to discuss with the participants later how they perceive differences between their own experiences and their ideal vision of science.
Transgression	Rank the transgression cards according to how relevant they are in your research environment. Add empty transgressions cards if you feel transgressions/elements are missing from the discussion. Again, participants are asked to rank the transgression cards according to the relevance they have for them and they are invited to reflect what 'relevance' means in this context. Participants might report about recent debates/cases in their disciplines/groups or about practical issues they are worried about. Also, the terminology of transgressions was deliberately chosen because it acknowledges that not all transgressions are clear-cut misconduct or fraud.
Dilemma	Pick two dilemma cards that address issues you want to discuss. Participants are invited to explain their choices and give reasons for them. Arguments can be very different. Some participants pick cards of situations similar to ones they experienced, others may choose situations they would like to discuss because they are afraid to be overwhelmed and unprepared if confronted with them.
Research Condition	Pick two research condition cards you feel are potentially influencing your capacities to respond to/deal with issues of integrity. Here the moderator can decide whether they want them to choose one card that supports their capacities to do 'good' research and one that might hinder it. But moderators can also leave the choice open to the participants. This would allow them to speak more broadly about systemic influences on their research.
Change Cards	Write down which changes you want to see in your research environment. Be ready to be surprised by the creativity of the participants' propositions of how they would like their research environment to change. In our experience their considerations range from rather small changes within their research groups to bigger ideas about how to re-think science evaluations or publishing. It is usually a good idea to ask the participants to come up with realistic, concrete (maybe even small) changes as this invites them to ground their imaginations in actual practices.

Turn taking

After the participants have individually ordered or chosen cards, the moderator opens the discussion. They do so, by asking the participants to present their card choices or rationales for ordering them on the board (depending on the phase). Then the group is invited to react, compare different choices, speak to contradictions, share experiences, etc. In our discussion groups, we either asked participants to present their card choices one after another and open the wider discussion up after all participants have done so (participant-by-participant) or we started the discussions of by going through each of the cards, asking why participants have (not) chosen them or where participants ranked the respective card (card-by-card). We also used diverse hybrid forms depending on the group dynamic.

Asking one participant after another has the advantage that everybody participates actively in the discussion from the beginning, which is particularly useful for the first phase. In our experience this reduces participation barriers for quieter participants and leads to a more inclusive discussion environment. However, this way to assign turn taking might take a little longer, as every participant should be able to tell their choices without feeling rushed. A discussion more focused on single cards allows deeper collective reflections on the discussed card. The moderator must manage the time here accordingly, so that all cards will be discussed after the planned time. This also allows to explicitly address cards that were not chosen.

Encourage discussion among participants

The moderator should encourage participants to discuss with all participants in the plenum and not get into a separate dialogue with a specific participant or with the moderator. Therefore, it may be helpful to actively invite participants explicitly to enter the debate, suggest a comparison between the different disciplinary/methodological approaches and challenges, point out observations of the discussion dynamics, etc.

Contrary to introductory methods for undergraduate students, which may focus more intensively on teaching clear-cut practices (e.g., teaching students to quote their sources properly to avoid plagiarism), in RESPONSE_ABILITY discussions the moderator is mainly a facilitator. While the moderator does not need to agree with all positions expressed in the discussion, it is however essential to ensure that questionable practices are not trivialized. In our experience, this critique usually comes automatically from other participants. In none of our groups, participants tried to justify clear-cut misconduct, but we witnessed borderline cases where it was essential to address a palpable unease of participants with a specific position voiced.

Keep the discussion going

To keep the discussion going, the moderator can pose open-ended questions and comments directly to individuals or to the group. At the end of the moderation guideline, we outlined some potential questions that we felt were helpful to steer the discussion. We suggest keeping brief notes during the discussion, if there is anything the moderator wants to come back to later. Furthermore, if, for example, a participant decides to make use of the cards in novel ways, e.g., rank the cards not linearly, but clusters them, or if someone insists on choosing more/less cards than they are asked to, it has proven interesting and relevant to hear their rationales behind it.

What to consider for organizing train the moderator seminars?

For moderators who are inexperienced with facilitating discussions and who need more knowledge about research integrity debates, it may be helpful to organize train the moderator seminars. Such seminars offer the possibility to try out, reflect on, and prepare for moderating RESPONSE_ABILITY discussions. Most important in these workshops would be to internalize the choreography and particularities of the discussion method. We suggest for train the moderator seminars to make sure that the future moderators try the discussion method out themselves as this provides a better feeling for the potential dynamics. Ideally the participants should engage in RESPONSE_ABILITY discussions themselves, take turns in being the moderators or participants and reflect their insights together with experienced moderators.

Furthermore, we also suggest future moderators reading the article about this method in *Science and Engineering Ethics*. It describes the background and development of RESPONSE_ABILITY in more detail as well as it illustrates some discussion dynamics.

Moderation Guideline

In the following, we present a moderation guideline that should give new moderators a feeling of how RESPONSE_ABILITY discussion groups can be facilitated. On the next pages, we spell out the introductions we used for facilitating the discussions, indicate when we had shorter or longer breaks and give ideas for follow up-questions. Preparing for the discussions, we suggest that moderators should modify the moderation guide according to the environments/situations in which they are conducting the discussion.

Introduction	Welcome to today's workshop. [...] Today we will discuss how you experience issues of research integrity, so what doing good science means in your research, but also which potential troubles and tensions you experience. Each of you has a discussion map and four card stacks in front of you – please do not flip them over yet. On the discussion map you can see, how the discussion will be organized along four successive steps. Each step has its own card stack: value cards, transgression cards, dilemma and research conditions cards. In each round, there will be a slightly different task. Each step will last about 45 minutes to an hour in which there will be moments when you read the cards and then discuss them. We will have enough breaks in-between. [Lunch break will be from...] Before we start, I want to strongly encourage you to talk to one another and not to me. Also, I want to ask you to be respectful with one another and make sure that everybody who wants to talk can actually talk. Disagreement should be solved by respectful discussion. <i>Any questions before we start?</i>
Value	We start with the value cards. In the first card stack, you find 9 cards that provide a repertoire of different forms of values that matter for conducting research or that describe valuable attributes of researchers. Before going into discussions about transgressions and dilemmas, it is good to reflect on the things we value when doing research. The cards are in a random order, the numbers on the top are just to know which card you are talking about when you refer to them. What I want you to do now is to read through the cards and rank them at the top of your map from the most central for your research to the least central for your research. As soon as all of you have made your choices, we will do a round, in which each of you can explain your logic of ordering and what your three most central and three least central cards are. I invite you also to come up with additional values that you can note down on an empty card and include them in your ordering. If you have anything to add or ask to your colleagues, do so after they are finished. Then we will open up a general discussion where you should discuss as a group. <i>Any questions before we start?</i> After the choices: Let's start here, with you. Could you please tell us how you ranked your cards? In particular, I would be interested to know which were your three most central and your three least central cards and why the cards ended up where they are on your board.

15 minutes break

Transgression

Let us start now with the transgression cards. We will talk in this phase about which transgressions of good scientific practice potentially matter in your research environment. The **terminology of 'transgressions'** is deliberately chosen, as it acknowledges that troubles in research are not always straight-forward misconduct or fraud. You might be concerned about less obvious, smaller transgressions of good scientific practice.

These cards are very similar to the value cards, not only in number, but also in what I want you to do with them. I would invite you to order the cards again on a scale. This time from most to least **'relevant'** and this can mean very different things, depending on your experiences. Maybe you had a case in your field or group? Maybe you are at a point in your research where you are struggling particularly with something? Was there anything discussed more intensively in your group? Are you worried about certain behaviors? So, feel free to think about what 'relevant' means to you.

Again, I actively invite you to also come up with additional transgressions that you can note down on an empty card and include them in your ordering.

Any questions before we start?

After choices: I would like to kick off the round a little bit differently. We will go through the cards chronologically and everybody is invited to say where they placed the card and why they did so. Let's start with another person for this round. Where did you place the card number 1 on your spectrum and why?

Longer break

Dilemma

Let's move to the next step in our discussion. Here we will use eight so-called **'dilemma' cards**. These are inspired by the Dilemma Game of the Erasmus University in Rotterdam. On these you find short dilemma stories, which you could realistically encounter in your research life. Every card has four answers, the last one is always open-ended. I want you to choose two dilemmas you are most eager to discuss and think about how you personally would react to it.

Any questions before we start?

After choices: I would now make a quick round, where everyone shares which cards they chose and why. And then we will collectively discuss the most frequently chosen dilemmas.

15 minutes break

Research Conditions	And now to our last step in the discussion, where we want to address the conditions under which research is done and what implications this might have for doing good science. You have addressed already some of these issues, but now we will explore them in more detail. On the eight research condition cards, you will find quotes from researchers – many of them original quotes, others paraphrased – that address the conditions under which research is happening nowadays. I would now ask you to choose two cards: One card that portrays a research condition that you think is necessary for being able to do good research and another that you think hinders it. <i>Any questions before we start?</i> After choices: Let us now start here. Please can you tell us about the cards you chose. Everybody who has chosen the same card or wants to say something about it is invited to join in. We will make a round to make sure all chosen cards are covered.
Change	We talked a lot about the conditions in which your research is happening, and it is always easy to complain. What I want you to do now at the end of this discussion round is to think about what you would like to change in your concrete research environment. How could research be done differently without losing quality? What would you change? Make sure to come with changes that are small enough to be realistic. Please write your ideas on the empty cards. <i>Any questions before we start?</i> After they finished writing their cards: Now I am already curious to hear about your suggestions for change. Would you be so nice and kick off this final round by telling us what you would want to change in research?

List of potential follow-up questions:

- Was there anything that surprised you about your colleagues' answers?
- Did I understand you right that ...? Can you maybe explain this further?
- I see that the card ... was not chosen/ was chosen most frequently.
Why do you think this is the case?
- Listening to your discussion, I feel that one of the most pressing issues for many of you is Is there anything you want to add to that discussion?
- How do you think your perspective on ... changed over the last years?
- I see ... is an issue you feel strongly about. Do you want to elaborate on it?
- Thinking back to our discussions in the other phase(s), I find it interesting to compare ...?
- If you would have had to add another card, which one would it be?

Before presenting the card sets that can be adapted and printed out, please find below a visualization of the arrangement of cards and discussion map.

VALUES

VALUE - 1

Curiosity

The quality of inquisitive thinking which means to be explorative, investigative and ready to learn is essential for researchers.

TRANSGRESSION - 1

Ownership of ideas

Unauthorized use and misrepresentation of authorship (plagiarism); appropriation of ideas of others

DILEMMA - 1

To share or not to share?

Your group has just published an innovative paper. After some weeks, you get a request for the source data of your publication from a member of a competing group. You know that they could use the data for their own research and eventually publish on them too. Still, you think that it would be right to allow others to check your results before building on them. Also, who would be best qualified to give feedback on them than a peer working on the same topic? What do you do?

A) I agree to share the data after I published the follow-up article that I am currently working on.
 B) I share my data immediately.
 C) I don't share my data. Their group wouldn't share them either.
 D) Is there another option?

RESEARCH CONDITIONS - 2

RESEARCH CONDITIONS - 1

Lab/Group Culture

"Every lab has a different culture of how they work as a group. Some labs have a lot of meetings, cooperations and are a great place to grow into research. In others, secrecy and pressure to perform and to spend more time in the lab are more valued. This changes your perception of what doing good research means."

How do VALUES matter in your research?
Order the cards from more central to less central

Which TRANSGRESSIONS of Good Scientific Practice potentially matter in your research environment?
Order the cards from more relevant to less relevant

How would you deal with DILEMMA situations?
Choose one of the provided options

Which CONDITIONS are important for your RESEARCH?
Choose one card

Which CONDITIONS are important for your RESEARCH?
Choose one card

VALUE - 1	VALUE - 2	VALUE - 3
Curiosity	Diligence	Objectivity
The quality of inquisitive thinking, which means to be explorative, investigative, and ready to learn is essential for researchers.	A careful and highly attentive conduct of research is important for preventing sloppy science and errors.	When producing and reporting findings intellectual honesty is a must.
VALUE - 4	VALUE - 5	VALUE - 6
Skepticism	Commitment	Fairness
Core to scientific practice is a critical examination of the results and claims of yourself and others.	Research requires extensive commitment and persistence in pursuing questions.	A fair treatment of others, in particular acknowledging their ideas and work, is important in science.
VALUE - 7	VALUE - 8	VALUE - 9
Creativity	Openness	Accountability
Research is an endeavor, where original and innovative approaches and ideas are central.	Research results must be openly discussed. Research protocols and data should be made accessible to others.	Scientists have to take responsibility for their actions, both towards other scientists but also towards society.

TRANSGRESSION - 1	TRANSGRESSION - 2	TRANSGRESSION - 3
Ownership of ideas	Co-authorship	Data
Unauthorized use and misrepresentation of authorship (plagiarism); appropriation of ideas of others	Unjustified scientific (co-)authorship; claiming co-authorship of others without asking them; neglecting co-responsibility	Not securing source data; lack of documentation of results and research steps
TRANSGRESSION - 4	TRANSGRESSION - 5	TRANSGRESSION - 6
Sabotage	Misrepresenting data	Power abuse
Hindering others in their research activity (e.g., intervention into experiments of others without their consent, not giving access to resources)	Inventing/falsifying data; rejecting data leading to inconvenient results; manipulating images or graphs (e.g., overly embellishing)	Supervisors using their position to exploit young researchers; abusing position as reviewer for one's own benefit
TRANSGRESSION - 7	TRANSGRESSION - 8	TRANSGRESSION - 9
Conflict of interest	Critique	Tinkering with Results
Changing research results/questions to make them more appealing for industry partners; not disclosing (potential) conflicts of interests	Ignoring feedback from colleagues; Lack of possibilities to raise concerns regarding the results of colleagues; not raising critique that could improve the work of others	Overstressing the own research results; Tinkering with statistics to make data look more significant; "Adapting" a model to better fit expected outcomes

VALUE	VALUE	VALUE

VALUE	VALUE	TRANSGRESSION

TRANSGRESSION	TRANSGRESSION	TRANSGRESSION

DILEMMA - 1

To share or not to share?

Your group has just published an innovative paper. After some weeks, you get a request for the source data of your publication from a member of a competing group. You know that they could use the data for their own research and eventually publish on them too. Still, you think that it would be right to allow others to check your results before building on them. Also, who would be best qualified to give feedback on them than a peer working on the same topic? What do you do?

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- C) I don't share my data. Their group wouldn't share them either.
- D) Is there another option?

DILEMMA - 2

Living with an error?

You finally managed to get your paper through an intense peer-review process. When reading your published article for the first time, you notice a small error in your statistical analysis. It is just a minor mistake, but you should have noticed it before. However, you are sure that the results still hold. The reviewers didn't notice it anyway. What do you do?

- A) I consult a more experienced colleague and ask what to do.
- B) Before I do anything, I make sure that my results hold and run the analysis with the correct statistical model.
- C) I am embarrassed. I don't want to add an erratum to my paper. I start writing another article using the correct statistics.
- D) Is there another option?

DILEMMA - 3

Acknowledgement & Competition

At a conference, you hear a fascinating talk from a colleague working in the same research area as you. After the talk, there is a highly relevant discussion about potential pathways for this research. It motivates you to try out a new perspective on your own material and you want to publish the results. You are happy when you find out that you would be the first publishing on it. Still, you are not sure how you should acknowledge the fundamental ideas you got at the conference. What do you do?

- A) I write a long acknowledgement thanking all the people of the discussion.
- B) Nobody acknowledges all comments made at a conference by colleagues.
- C) I offer one person who inspired me most co-authorship and send her the manuscript.
- D) Is there another option?

DILEMMA - 4

Data trouble

In a lab meeting, one of your postdoc colleagues presents results where he discarded some samples of the large data set that you both use. He claims to having noticed problems in the data gathering procedure for these data. It feels strange to you that he does so; it is clear that the full data set does not prove his hypothesis. You are unsure how you should proceed with your own analysis on the data sample and what to do about his claims. What do you do?

- A) I confront him with my thoughts right away, in the lab meeting. After all, this is the place for critique.
- B) You don't raise the concerns. He is a postdoc and should know what he is doing. You make sure to do your work as good as you can.
- C) You consult your supervisor.
- D) Is there another option?

DILEMMA - 5

Earning Co-authorship

You are writing a research paper together with another PhD and a postdoc. The writing was separated equally among the PhDs. The postdoc offered to integrate the different parts of the paper. The postdoc sends you an email that she had to do much more than she thought because your parts didn't match up well. She thinks it's fair to list her as a first author although you did the largest share of empirical work. You do not think it is fair, but you are also not sure what would be an adequate reaction. What do you do?

- A) I reply to her email that this is not what we all agreed on. I want to have a meeting and discuss it in person.
- B) I write to my PhD colleague. We should agree on a first author and confront her together.
- C) I write to my group leader and look for help. If he does not react, I would approach the commission for scientific integrity at our university.
- D) Is there another option?

DILEMMA - 6

Documenting research

After years of hard work, you are finally in an advanced stage of the peer-review process of an article. The reviewer requests further information on one step of your methodology. You don't remember exactly how you did it back then and the notes in your lab book are incomplete because you were in a hurry. You are convinced that this step doesn't influence the overall conclusion. Still, you don't want to admit to her that you simply don't know about it. What do you do?

- A) I tell her everything I remember about the procedure and don't mention that there are no notes about it.
- B) I tell her straightforwardly that I have no notes about it, but that I know it doesn't influence the conclusion.
- C) I consult my bench mate. He was present when I did large parts of the study.
- D) Is there another option?

DILEMMA - 7

Research bias

A former colleague founded a start-up company, furthering an idea she developed in her thesis. So far, they are not very successful. One of the postdocs in your group will start to work there. Since he knows about the new position he has slightly changed his research question and the results he recently presented look overly promising for what the start-up is aiming to do. They look almost too good to be true. You know that misrepresenting data wouldn't make sense for the start-up as they need solid results. Still, you suspect that he is too eager to find suitable results. What do you do?

- A) Nothing. As long as this is not a problem for the success of the start-up I see no need to intervene.
- B) I ask him about it in an informal conversation.
- C) I talk about it with colleagues and we think about a collective strategy.
- D) Is there another option?

DILEMMA - 8

Review experience

Peer-review can be exhausting. You are already in the second round of the review process for a paper in a low-level journal. Even if you don't know officially who your reviewers are, you can guess their names because your field is rather small... and because of the articles they suggested you refer to - mainly their own. They don't really match with what you are doing, and you have a hard time incorporating them. What do you do?

- A) I write to the editors and complain about the reviewers.
- B) I add as much as I can because otherwise I won't get my paper published. It's not worth complaining, regarding the low status of the journal.
- C) I write a message to the reviewers and tell them what they are doing is misconduct.
- D) Is there another option?

DILEMMA - 9

Unfavourable outlier

You are about to finish the experimental work of your research project. Very few data-points appear to be outliers. They don't match with your dominant interpretation of the other data and including them in your dataset may lead to not so conclusive results. It would probably be difficult to get it published in a good journal. You could not find a logical reason why the data-points are so far off, and you would feel better if you could just exclude them. What do you do?

- A) I adapt my statistical model to see whether the results make sense in a new light.
- B) Outliers are a normal part of research. I exclude them and report them in a sidenote.
- C) I consult my colleagues and try to find the reason for the outliers.
- E) Is there another option?

DILEMMA - 10

Honorary authorship

Your group is about to hand in a paper in a well-known journal. During the last year, you spent quite some time working on this experiment and you are very much looking forward to the article finally being off your desk. However, before sending the paper to the journal your PI suggests adding a further author to the paper for strategic reasons. What do you do?

- A) I respond by asking who this person is and on what basis they deserve co-authorship.
- B) I accept the sudden appearance of names on our authorship list given the strategic reasons. Everybody does it because alliances are vital in science.
- C) I complain about this last-minute co-authorship. I attach the University Guideline that explicitly forbids such practices.
- E) Is there another option?

RESEARCH CONDITIONS - 1

Lab/Group Culture

“Every lab has a different culture of how they work as a group. Some labs have a lot of meetings, co-operations and are a great place to grow into research. In others, secrecy, and pressure to perform and to spend more time in the lab are more valued. This changes your perception of what doing good research means.”

RESEARCH CONDITIONS - 2

Non-collegiality/Competition

„In academia, I sometimes saw that one researcher might have a solution to another’s problem but deliberately did not help. That upsets me incredibly because no one works for the collective endeavor, but everybody works for him- or herself. Because everybody seems to fear that someone else will publish their results five seconds before.”

RESEARCH CONDITIONS - 3

Selling Research

“I have the feeling, it is no longer scientists but external actors judging on what counts as good research. Funding agencies fund the research that tells the most promising stories. Journals publish the catchiest articles. Personally, I don’t agree with many of these decisions and it leads to overstating what is achieved.”

RESEARCH CONDITIONS - 4

Planning, planning, ...

“You really get used to thinking in a project frame: what can I do to achieve something within a time frame of three or four years? You need this to be able to continue your career. It would be nice to think more broadly about scientific stuff, but the way it is right now, we’re mostly planning our own future.”

RESEARCH CONDITIONS - 5

Pressure & Quality

“Everything must be productive in a sense. And I think that can have negative consequences for research. Because maybe the quality is compromised when people have the feeling they must publish, publish quickly. As a consequence, we can no longer talk about the limits of our research or about what did not work so well.”

RESEARCH CONDITIONS - 6

Importance of Mentorship

“On my way to becoming a good researcher, scientific mentors and supervisors are central to guide my intellectual development. Their feedback is important for the quality of my work. However, due to dependency relationships and hierarchies, I cannot critique them or raise questions about their methodologies.”

RESEARCH CONDITIONS – 7

Open Debate

“We have a lack of open debate about how the research system works. Should we simply assume that just because results are published in a highly ranked journal that they stem from better research? Why do journals take so long, in retracting articles if something went wrong? Why do more problematic things in science simply get silenced? ”

CHANGE

RESEARCH CONDITIONS - 8

Journals as Central Players

“The ‘currency’ with which we are paid is completely weird: it’s not about whether outcomes are scientifically important in your field. Only publications count! Journals are central players. They decide how research is presented and what gets communicated. Nowadays, mostly positive results get published and research that sounds very new.”

CHANGE



RESPONSE_ABILITY: A card-based engagement method to support researchers' ability to address integrity issues - This discussion format was developed by Ulrike Felt and Florentine Frantz in the research project "Borderlands of Good Scientific Practice" funded by the Anniversary Fund of the Austrian National Bank (OeNB) (Project Number: 17427)

