Ethics in action

Ethics in Action: Multi-Sited Engaged Ethnography on Valuation Work in Contemplative Science

Mareike Smolka

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Ethics in Action: Multi-Sited Engaged Ethnography on Valuation Work in Contemplative Science

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by

Mareike Helena Smolka

Supervisor:
Prof. Dr. Cyrus Mody
Co-supervisors:
Prof. Dr. med. Cornelius Borck, University Lübeck
Dr. Darian Meacham

Assessment Committee:
Prof. Dr. Harro Van Lente (chair)
Dr. Steven Flipse, Technical University Delft
Dr. Anna Harris
Prof. Dr. Sabine Maasen, University Hamburg

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List of acronyms and abbreviations

AD	Alzheimer's disease
CRC	Mind & Life Contemplative Research Conference
CSS	European Contemplative Science Symposium
EAB	External Advisory Board
ELSA	Ethical, Legal & Social Aspects
ELSI	Ethical, Legal & Social Impacts
ESRI	European Summer Research Institute
FAIR	Findable, Accessible, Interoperable, Reusable
FAIRI	Findable, Accessible, Interoperable, Reusable, Interpretable
ICM	International Conference on Mindfulness
LKCM	Loving-Kindness and Compassion Meditation
MBSR	Mindfulness-Based Stress Reduction
MLE	Mind & Life Europe
MM	Mindfulness Meditation
RCT	Randomised Controlled Trial
RR	Relaxation Response
RI	Responsible Innovation
RRI	Responsible Research and Innovation
R(R)I	Responsible Innovation & Responsible Research and Innovation
STS	Science and Technology Studies
SSH	Social Sciences and Humanities
SoVT	Socio-affective Video Task
STIR	Socio-Technical Integration Research
VRE	Video-Reflexive Ethnography

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Abstract

In recent years, the potential of contemplative practices like mindfulness meditation to alleviate modern ailments such as stress, chronic conditions and signs of old age has been studied with neuroscientific, psychological and clinical approaches. Researchers conducting such studies, sometimes called 'contemplative scientists,' have been featured in the media to provide scientific legitimacy for the benefits of meditation. While proponents of contemplative science present this kind of research as unambiguously benevolent and capable of remedying global crises, opponents find it ethically dubious. Some social scholars and Buddhist practitioners worry that a scientific framing of meditation strips it of its intellectual, affective and ethical roots in Buddhism and makes it amenable to use for unethical ends, for instance as a concentration training in the military or a productivity booster in business corporations. Instead of reasoning in the abstract about these potential normative effects of contemplative science (for good or ill) and projecting them into the future, this dissertation explores the ethicality of contemplative science by studying how values emerge in practice. The exploration is guided by the following research questions: How are values enacted in contemplative science practices? How does the contemplative science community valorise and justify its research as epistemologically rich and ethically benevolent? How are knowledge-making practices related to scientific norms of good research on meditation? How can engaged social science research critique contemplative science in a way that is generative of changes in thought and action?

To answer these questions, this dissertation draws on theoretical and methodological resources from the field of Science & Technology Studies as well as from interrelated discourses on Responsible Innovation and Responsible Research and Innovation. It combines multi-sited ethnography with engagement research guided by adaptations of the Socio-Technical Integration Research (STIR) method to study and critique practices of valuation in contemplative science. The main finding is that contemplative scientists mobilise different strategies and repertoires to enact values – they perform what is here named 'valuation work.' The concept of valuation work captures how scientists make seemingly incompatible values, forms of authority and systems of orientation merge, coexist or alternate in practice. Ethnographic research on the laboratory floor, during scientific meetings and at conferences highlights that deliberations on and practical attempts to resolve value conflicts are inextricably bound up with scientific socialisation processes and knowledge production. Such valuation work can become visible and modifiable in interdisciplinary collaboration and practitioner dialogues guided by the STIR decision protocol.

In examining and inflecting the processes through which scientists engage with the socio-ethical aspects of their work, this dissertation adds an empirical perspective on 'ethics in action' to public and academic debates on 'ethics in theory' in contemplative science. The analysis

reveals that contemplative science does not automatically have the normative effects which proponents and opponents anticipate. For example, by turning mindfulness meditation into an object of research it does not necessarily lose its ethical roots in Buddhism, neither does it automatically result in improved mental health and well-being in society. Rather, both Buddhist and modern framings of meditation can be traced, destabilised and modulated in scientific work through reflexive practices that are already embedded in contemplative science and those that are stimulated by social science engagement research. This finding indicates that scientists can account for the ways in which their research influences society and culture – the kinds of impacts which are usually assumed to fall outside the scope of their responsibilities. Hence, *Ethics in Action* is not only relevant for contemplative scientists, but also for other technoscientific practitioners, policy-makers and engaged social scholars because it suggests that joint efforts to open up reflexive spaces, where conventional approaches and convictions are made available for reconsideration and revision, can facilitate the social steering of technoscience.

Chapter 1

Combining laboratory ethnography with engagement research: studying and critiquing valuation work in contemplative science

1.1 Introduction

Would you like to feel happier and more relaxed? Are you looking for ways to boost your immune system and live a healthier life? Do you try to enhance your productivity and personal excellence? In recent years, mindfulness meditation – a practice of attending to the present moment in a non-judgemental, open-hearted way – has been advertised as an all-round self-help technique to fulfil such modern desires in newspaper and magazine articles (Chan 2013; Duretz 2020; Stöcker 2018; Pickert 2014). With celebrity endorsement from Richard Gere (Shaitly 2017), Katy Perry (Hartman 2017) and Oprah Winfrey (Cohan 2012), more than 30 million subscribers globally to the meditation app Headspace[1] and the sale of mindful toys like the "Breath With Me Barbie," mindfulness meditation has gone mainstream. Its popularity has even led it to being called a "movement" (Beemer 2020), for example in the title of a recently released documentary, *The Mindfulness Movement,* which profiles the growing number of people who believe that mindfulness is the key to living happier and healthier lives. A pervasive rhetoric in the documentary – like in any number of self-help books, blog posts and news articles on the topic (McKinty n.d.; Schulte 2015; Tenney and Gard 2016; Terrant 2017) – is that mindfulness can "rewire the brain." The documentary features a number of experts from the field of contemplative science, the neuroscientific, psychological and clinical study of contemplative practices, who report on the positive effects of meditation on the mind and brain.

Speaking to the cultural fascination with the neurosciences, studies using neuroimages of meditators have frequently been touted in the media as incontestable evidence that "meditation works" (Ireland 2014; Turner 2017; Schulte 2015; Walton 2015). The engagement between contemplative scientists, the mindfulness movement and the media gives every appearance of being a mutually beneficial exchange. Over the last two decades, the work of contemplative scientists has acquired *public legitimacy* because mindfulness has become a topic of proliferating interest. People generally deem mindfulness to be worthy of scientific investigation due to its purported benefits for health, well-being and productivity. Although scientists tend to be rather cautious in reporting about the outcomes of their research, studies indicating that meditation practice increases grey matter volume, downregulates amygdala activation or quiets the default mode network are generally considered as scientific legitimators for meditation's efficacy to improve memory, cure depression and reduce distraction. The mindfulness movement thus gains *scientific legitimacy* whenever meditation appears as a research object. Journalists and film-makers benefit from both science and mindfulness by placing themselves at the intersection. They adopt the role of facilitators for the legitimacy exchange between contemplative scientists and the wider public, attracting people to join the mindfulness movement.

1 https://www.headspace.com/join-us

Whereas the benefits of this exchange have motivated the publication of ever more reports on the purported benefits of meditation, critical voices have also become louder. Initially, critics from circles of Buddhist teachers and practitioners worried about the long-term implications of banalising the Buddhist path to awakening by reducing contemplative practices to patterns in neural firing (e.g., Magid 2014; Salzberg 2015). Such initial critiques have swiftly precipitated an avalanche of critical commentaries on different aspects of the mindfulness movement published in news magazines, blog posts as well as in academic journals and books (Walsh 2016). Many of the critiques have been collected in Ronald Purser's (2019) book *McMindfulness.* The book presents meditation research as a major contributor to the development of a "new capitalist spirituality," a form of individual stress relief that encourages meditation practitioners to accommodate themselves to the pressures, demands and precarity of a neoliberal social order. As the book circulated within and without the contemplative science community, meditation researchers, psychotherapists and mindfulness coaches published responses (Helderman 2021; Lee 2019; MacPherson and Rockman 2019). These responses stress that research on meditation is motivated by the aim to help people with chronic diseases and pain as well as to contribute to human flourishing and well-being. In answer to Purser, they claim that such research is not intended to feed into the corporate or capitalist appropriation of meditation, but rather seeks to provide scientific validation for medical treatment and lifestyle interventions.

These debates over the ethicality of a modernist, scientific framing of meditation have become fierce enough to be described as the "mindfulness wars" (Gleig 2019, 60). On the one 'side,' proponents of contemplative science include researchers approaching the study of meditation from different disciplinary perspectives (for an overview see Komjathy 2018, 20) and institutions supporting meditation research, such as the American Mind & Life Institute and its sister organisation Mind & Life Europe (MLE). MLE's mission statement presents contemplative science as unambiguously benevolent: "By providing a complete image of the mind and its potential to develop positive mental states, contemplative science not only makes science itself more humane but also ensures that its conclusions can contribute to human and societal flourishing."[2] Similarly, influential large-scale contemplative science projects (e.g., ReSource Project, Silver Santé Study) frame research on meditation as a step towards "solving current global problems."[3] The Silver Santé Study, for example, addresses the problem of an ageing population suffering from physical and mental health conditions. A branch of the study investigates whether mindfulness meditation can help seniors to "age well" in terms of health and quality of life.[4]

2 https://www.mindandlife-europe.org/about-us/mission/
3 https://taniasinger.de/the-resource-project/
4 https://silversantestudy.fr/

While proponents of contemplative science highlight its ethicality, opponents, on the other 'side,' criticise its ethical corruptness. Although meditation researchers themselves have participated in what the media termed the "mindfulness backlash" (North 2014), pointing at methodological weaknesses and epistemological limitations of mindfulness studies (Davidson and Kaszniak 2015; Vago et al. 2019; Van Dam et al. 2018), the opponents of contemplative science to which I refer here are social scientists, humanities scholars and Buddhist practitioners. Opponents have expressed ethical concerns about future applications and socio-cultural implications of meditation research. The aforementioned worries that science strips meditation of its Buddhist roots are connected to concerns about the loss of its ethical dimensions (Hyland 2015, 2016; Rosenbaum and Magid 2016; Wallis 2018). For Buddhist meditators, bringing awareness to every moment is motivated by a vocation of love and compassion that is beneficial to humans, animals, plants and the earth. This vocation disappears in scientific conceptualisations that frame mindfulness as a value-neutral technique. To make matters worse, collaborations between contemplative scientists and stakeholders from the military or large corporations have been accused of facilitating the application of meditation as a concentration training for ethically dubious ends (Kucinskas 2019; Purser 2014; Tresch 2013). Opponents whose views are in line with Purser's are also concerned about the social impacts of health-related meditation research. In studying meditation as a remedy against stress, burnout and similar conditions, such research fosters a social model that frames mental health as an individual problem whose solution lies in personal transformation rather than structural change (Caring-Lobel, 2016; Payne 2016; Purser and Loy 2013).

What proponents and opponents of contemplative science have in common is that they largely reason about the ethics of meditation research in the abstract. They share the assumption that scientific knowledge will automatically have future normative effects in society – either solving societal problems or exacerbating social injustices. They run the risk of overstating the social relevance of contemplative science in transforming subjectivity, behaviour and culture, unreflexively reiterating the promises of brain research to change our conception of what it means to be human (Littlefield and Johnson 2012; Pickersgill and Van Keulen 2011; Rose and Abi-Rached 2013). Yet, Van De Werff (2018) points out that "*how* such changes come about in particular practices remains unclear" (p. 18). By separating ethics from scientific activities and projecting normative effects of meditation research into the future, participants in the debate do not pay attention to ethical conundrums and values embedded in *present-day* scientific work. The neglect of scientific practices is potentially problematic both for proponents and opponents of contemplative science. If proponents emphasise the benevolence and pro-sociality of contemplative science without translating such values into action, they jeopardise the field's reputation and legitimacy. If opponents' critiques – at least those who seek to transform the conduct of contemplative science instead of calling it into question altogether – remain removed from actual research, they are unlikely to provoke such transformation.

In this dissertation, I eschew the rather theoretical debates between proponents and opponents of contemplative science by inquiring into practices of valuation as they occur on the laboratory floor, during scientific meetings, in workshops and at academic conferences. My research is guided by the overarching question: How are values enacted in contemplative science practices? The chapters of the dissertation address more specific sub-questions: How does the contemplative science community valorise and justify its research as epistemologically rich and ethically benevolent (chapter 2)? How are knowledge-making practices related to scientific norms of good research on meditation (chapter 3)? How can engaged social science research critique contemplative science in a way that is generative of changes in thought and action (chapters 4–6)? In answering these questions, I do not offer another take on the neoliberal critique of mindfulness and its research. Nor do I discuss the prospects of emerging research directions in contemplative science or broader fields like the neurosciences and consciousness studies. Instead, this dissertation sheds light on socio-ethical practices that scientists usually do not consider as "part of their work" (Flipse et al. 2013, 1154). While these practices often appear so trivial and unimportant for science that they are performed without greater notice (Shapin 1989; Wolters et al. 2020; cf. Lydahl 2017), the aim of this dissertation is to show that they are intertwined with and have effects on the production of scientific knowledge.

1.2 Relevance

The relevance of this dissertation is twofold, combining academic contributions to Science and Technology Studies (STS) with practical implications for science governance. Contemplative science has not received much attention in STS literature (for exceptions see Harrington 2008a; Tresch 2013; Wiles 2018), possibly because it is a small niche of research, sometimes considered as a marginal subfield of the neurosciences (Komjathy 2018). However, I find the relative absence of empirical research on contemplative science surprising since the field wrestles with several topics of interest for STS scholars: the relation between science and (Buddhist) religion, the role of science in social movements (here the mindfulness movement), and the entanglement of science and ethics. The first two topics have been covered in relation to contemplative science in religious studies and sociology (e.g., Kucinskas 2019; McMahan 2010; McMahan and Braun 2017; Wilson 2014). This dissertation, by contrast, builds on a long tradition of STS research on the "co-production" of science and ethics (Brodwin 2008; Jasanoff 2004 Pickersgill 2012; Sørensen 2012) to shed light on the values embedded in contemplative science practices.

Contemplative science is particularly interesting in this regard because it joins a Buddhist ethical system of orientation with a scientific ethos (Wallace 2007). While publications in the library of the Mind & Life Institute stress the theoretical compatibility of Buddhism and

science (e.g., Harrington and Zajonc 2003; Hasenkamp and White, 2017; Hayward and Varela 1992), ethnographic research at contemplative science conferences reveals frictions between them (Tresch 2013). Tresch observed how values intrinsic to 'successful scientists' (performing career-centred ambitions, accumulating honours, controlling resources, competing against others, etc.) were displayed during the events, but alienated attendees at the same time. They conflicted with values cultivated through contemplation, which were captured in phrases repeated at the conferences, for instance "let go," "gentle yourself" and "may all beings live with ease" (p. 59). Tresch found that such value conflicts stimulated recursive negotiations of norms, identities and boundaries within the contemplative science community. Inspired by his findings, this dissertation studies how values are enacted in contemplative science to gain deeper insights into the practical achievement of converging ethical systems that partly oppose each other. This research foregrounds situated ethical judgements involved in making contemplative science "do-able" (Fujimura 1987), which may contribute an alternative perspective to the above-mentioned debate about contemplative science's ethicality.

In addition, the dissertation is relevant for science governance because it seeks to critically engage with contemplative science practices with the aim to scrutinise the possibility of steering its "soft impacts." Swierstra and Te Molder (2012) introduced the distinction between "hard and soft impacts of technology" (p. 1052). They find that scientists and engineers usually acknowledge their responsibilities for avoiding hard impacts, which are quantifiable, uncontroversial instances of harm caused by a technology (e.g., pollution, destruction or killing), while feeling unable or unwilling to account for soft impacts. Soft impacts are difficult to value, quantify and explain causally because they affect cultural norms and can create societal transformations. Societal stakeholders, however, often expect scientists and engineers to take responsibility for soft impacts, for example the effects of Facebook on interpersonal relations, the ways in which robots shape the labour market and the amplification of social biases in the application of machine learning. How to assess and address such ethical implications of technology has become a widely discussed topic in STS literature on science governance (e.g., Gabriels 2018; Kiran et al. 2015; Swierstra 2015a).

While the language of soft and hard impacts has so far mainly been used in relation to technology, I consider it equally applicable to scientific research more broadly and contemplative science in particular. Soft impacts become increasingly relevant the more science addresses questions about human needs that are higher up in Maslow's hierarchy of needs (Swierstra 2015a). Modern societies in the West today are relatively affluent, concerned more with realising positive goals like happiness and self-development than satisfying basic needs, such as food, safety and physical integrity. This focus on positive goals is reflected in scientific research geared towards human flourishing, including research on the effects of mindfulness on well-being and productivity. As human flourishing is difficult to define and quantify, such research is more

likely to have soft than hard impacts. This dissertation studies contemplative science as a case of research with soft impacts. In debating the ethicality of contemplative science, proponents and opponents are less concerned about the infliction of harm (for an exception see discussions on adverse effects of meditation in Britton 2019; Lindahl et al. 2017; Schlosser et al. 2019; Vörös 2016), but rather disagree about the ways in which meditation research influences personhood, society and culture in the long run. The case study probes the potential of critically engaged STS approaches to identify and alter such soft impacts as a form of "reflexive governance" (Voß et al. 2006) of science.

1.3 Theoretical approaches and concepts

The concepts used here to theorise about values as practices as well as their potential inflection are *valuation work* and *critique*. My understanding of both concepts is rooted in practice theory. Practice theory is not a unified theory but encapsulates a complex landscape of concepts, theoretical elements and research strategies that have gained popularity in the humanities and social sciences since the late 20th century. Theoretical work on social practices can be found in Bourdieu (1977), Giddens (1979, 1984), Foucault (1985, 1988) and Schatzki (1996), to name some prominent examples. Empirical studies in the wake of Garfinkel (1967), Butler (1990) and Latour (1993) can be understood as following practice approaches. At first glance, the shared label of 'practice theory' appears not to be justified for such a diversity of authors. Yet, social scholars like Reckwitz (2002), Shove et al. (2012), Soler et al. (2014) and Bueger (2014) argue that these authors have created a family of approaches with a number of shared features. Drawing on their work, I list five shared features that are relevant for this dissertation (for a similar list see Willems 2021). First, practice theory selects practice as the unit of analysis. A practice is generally understood as "a routinized type of behaviour" (Reckwitz 2002, 249), a recuring activity that reproduces the subject matter under study. This definition of practice overlaps with the concepts of "performance" from gender studies (Butler 1990) and "enactment" from STS (Mol 2002). I emphasise their overlap by using all three concepts interchangeably to denote the coming-into-being of a slice of reality in practical activity.

The second to fifth features of practice theory enumerated here each come to the fore in their own empirical chapter (except for chapter 4 whose content differs from the other chapters and will be elaborated later on). The second feature is that practices are both material and discursive: they encompass "real-time doing and saying something in a specific place and time" (Nicolini 2012, 219). While STS analyses drawing on practice theory often foreground the active role of material objects, tools and technologies in many practices (Latour 2000; Pickering 1995; Preda 2005), chapter 2 of this dissertation focuses on the practical effects of historical narratives. Third, practices are social in character. This feature is particularly relevant for STS

scholarship to recognise that social activities are not separated from scientific work practices, but are inextricably linked with each other in the "manufacture of knowledge" (Knorr-Cetina 1981; Lynch 1985). In chapter 3, the social character of practices further implies that they are stable and recognisable across space and time because they are collectively shared. Fourth, practice studies in STS emphasise the role of the body and its "tacit knowledge" (Collins 2010) in scientific work practices (e.g., Garfinkel et al. 1981; Lynch et al. 1983). Chapter 5 pays specific attention to bodily experiences of affect, in particular disconcertment, informing knowledge production in interdisciplinary collaboration.

The fifth and last feature of practices – relevant for chapter 6 – is practice theory's conception of the relation between structure and agency. In turning towards the study of practices, social scholars have sidestepped the question whether people's actions are either primarily determined by individual agency, including their interests, motivations and intentions, or by the societal structures in which they are embedded. Practice theory posits a both-and relation between agency and structure by considering them as equally emerging from practices (Reckwitz 2002). Accordingly, in approaching values from the perspective of practice theory, I consider them as a product of both individual preferences, tastes and ideals, as well as wider societal discourses and infrastructures.

I.3.1 Valuation work

Practice theory and its intellectual forerunners James, Dewey and Mead in pragmatist philosophy (Buch and Elkjaer 2015) have inspired more recent STS approaches to valuation studies (Dussauge et al. 2015; Fochler et al. 2016; Heuts and Mol 2013) and to empirical ethics (Mol et al. 2010; Pols 2013, 2015), which together provide the theoretical foundation to develop the concept of valuation work. Valuation studies are concerned with "the changing processes through which value and values come out" (Kjelberg et al. 2013, 12). Drawing on this body of literature, I define values as something "good, proper, and desirable" (Dussauge et al. 2015, 7) that emerges in people's engagement with each other, objects, concepts, tools and their environments. Understanding values as practices means that they are not taken to be absolute or universal. Instead, they are conceived as relational, situated and context-dependent enactments of attributing value to something or assessing something as valuable. This conception is indebted to the pragmatist move from 'value' to 'valuation' (Dewey 1939). The suffix '-ation' denotes action, which opens up an avenue for empirical research on practices of valuation. Empirical research on values in science has shown that some practices of valuation persist over time and across contexts, transforming local practices, subjectivities and institutions, while being locally adapted at the same time (Felt and Fochler 2017: Fochler 2016a; Fochler et al. 2016; Sigl 2019). Whereas practices of valuation often refer quantitative measures like grading, ranking and economic assessments, this dissertation investigates social, cultural, political and other qualitative attributions of value.

Research on values as they come into being in practices is the programme of an empirical ethics. To define ethics, it is useful to distinguish it from morality although both terms are often used interchangeably. According to Swierstra (2015b), morality refers to the values and norms that impact people's thinking, feelings and action in everyday life. Swierstra argues that most of the time moral judgements are so self-evident that they are hardly noticed – they are implicit in practices. "It would be quite disturbing if you would first consider to kill an annoying colleague, only to then decide after ample reflection that (unfortunately) this would be immoral" (p. 4). Ethics, by contrast, refers to more systematic and explicit reflections and discussions on values, norms and considerations of the good life. Ethical reflections and discussions are concerned with how to make 'good' moral judgements. Empirical ethics approaches put forward by STS scholars like Mol et al. (2010) and Pols (2015) study moments when morality turns into ethics, that is when it stops being self-evident and becomes problematic in everyday life. This can happen when moral norms and values are violated, contested or incommensurable. Empirical ethics examines how people engage in ethical deliberations, make decisions about what is good to do in a given situation, and how they negotiate value conflicts.

To analyse the process through which people engage with and resolve value conflicts, I introduce the concept of *valuation work*. Valuation work refers to the processes of valuation, where values are enacted, articulated, ordered and negotiated. The concept is derived from the notion of "justification work" (Jagd 2011, 343) informed by pragmatic sociology, in particular Boltanski and Thévenot's (2006) book *On Justification*. Boltanski and Thévenot famously noted that sociologists commonly tried to somehow unmask their informants' hidden interests and agendas rather than studying how ordinary people justify their actions. Departing from this mainstream way of doing sociology, they identified multiple "orders of worth" or "common worlds" (p. 125) that people mobilise to inform, orient, valorise and justify their behaviour. Justification work captures the process of flexibly combining, integrating and alternating between different orders of worth to establish or preserve moral legitimacy. Similarly, valuation work refers to the strategies and repertoires that people draw on to valorise their actions. Strategies and repertoires are "ordering process[es]" (Mesman 2008, 9), which are not pre-defined, articulated plans, but emergent properties of the everyday organisation of work practices. What these processes consist in and how they are captured theoretically is elucidated in the empirical chapters of this dissertation.

In studying valuation work, this research expands STS research revealing the intertwinement of knowledge and ethical issues. Rather than judging how well scientists perform their work, STS scholars have sought to learn about scientific practices before the results were clear or solidified (Latour 1988; Latour and Woolgar 1987). They have shown that scientific controversies interfered in political discussions about normative issues (Shapin and Schaffer 1985) and that different scientific fields come with their own "epistemic cultures" (Knorr-Cetina 1999)

in which knowledge-making practices are guided by culture-specific convictions, norms and values. To bring ethics into the focus of analyses, later STS scholarship developed multiple concepts that more or less closely relate to valuation work, such as "ethical boundary work" (Wainwright et al. 2006), "value work" (Van De Werff 2018, 20) and "regimes of normativity" (Pickersgill 2012), to name but a few examples. While these concepts are descriptive of ethics in practice, valuation work is explicitly "re-scriptive" (Pols 2015, 82). A descriptive pragmatic sociology describes values in practices but does not dispute these. A re-scriptive analysis, by contrast, asks how such empirically derived normativities can be weighed and argued about. The concept of valuation work is not only a theoretical lens to describe and analyse negotiations of value conflicts in practice, but also seeks to question the processes and results of such negotiations. A re-scriptive analysis implies that valuation work as it occurs in particular settings does not need to be taken at face value, but can be critically interrogated. The results of such critical interrogation could stimulate reflections among those involved in particular practices of valuation on how these practices could be otherwise.

1.3.2 Critique

The re-scriptive dimension of valuation work links it to a particular understanding of the notion of *critique*. While chapter 4 focuses on the theoretical and methodological development of critique as collaborative research practice, I already introduce it here as a form of reflection that recognises underlying assumptions and values. Through this recognition, actors are enabled to challenge their assumptions, reconsider guiding values and change their actions accordingly. Keeping in mind that the concept of critique has a long, complex history and could even be considered as the dominant ethos of modern thought (Felski 2015), I do not argue that this definition of critique is in any way new or original. In fact, the definition of critique introduced in what follows is in one way or another reminiscent of conceptions of critique in modern and contemporary philosophy (De Boer and Sonderegger 2012), such as Kant's critical method, Marx's ideology critique and Frankfurt School critical theory (see chapter 4). This dissertation, however, is neither a philosophical meditation on nor a historical reconstruction of critique. Instead, it takes its starting point in the "engaged program[me]" of STS (Sismondo 2008, 13) to develop a sociological understanding of critique that productively informs collaborative research across socio-technical divides.

Generally speaking, the engaged programme considers the theoretical ambition to analyse social dynamics shaping practices in science and technology development as continuous with the aim to render these practices more socially responsive, sustainable, safe and effective. Whereas modest versions of engaged research analyse issues that are politically topical, stronger versions, such as action-oriented science studies (Zuiderent-Jerak and Jensen 2007), interactive social science (Caswill and Shove 2000) and making & doing projects (Downey and Zuiderent-Jerak 2021), involve active engagement in the fields under study to promote democratic reforms

of science and technology. The engaged programme thus captures the overlap between what Fuller (1993, 1997) coined the "High Church-Low Church" distinction of STS. Accordingly, "High Church STS" is an emerging academic field using approaches from the humanities and social sciences to study the natural sciences and technologies. "Low Church STS" is a social movement, historically promoted by science and engineering educators who have pursued 'activist' interests in shaping the social implications of science and technology. Both churches overlap in their "critical attitude toward the role of science and technology in society" (Fuller 1997, 181), but one could argue that the High Church concentrates on "critical analysis" while the Low Church is more invested in "critical participation" in science and engineering education (Downey and Zhang 2015, 332).

Critical analysis seeks to make visible sociotechnical complexities that dominant forms of knowledge, practices and images hide. The adjective 'dominant' refers to what has become taken for granted, true and real for situated arenas of people and things (Downey 2009). STS critiques that document sociotechnical contingency, negotiations, flexibility and context produce valuable insights for STS audiences by revealing complexity inside the "black box" (Latour 1988, 6) of scientific facts and technological artefacts. Yet, Downey (2021) observes that the finding of complexity becomes a kind of "social science black box" (p. 225) for outsiders of STS, including the scientists and engineers whose practices are subject to critical analysis. Guidance on how to make STS critique travel to empirical arenas is often lacking. One way to make STS critique travel is to extend critical analysis to critical participation, by which Downey means "developing, expressing, and attaching sociotechnical practices to engage and inflect a dominant knowledge form in science and technology without necessarily dismantling or wholly replacing it" (p. 223). It combines participation in a community of practice for the sake of STS knowledge production with a critical agenda: to increase the chance that such knowledge generates alternatives to hegemonic ways of seeing and engaging with science and technology in a mutual learning process. In this process, all participants involved, including the engaged scholar, are open to seeing their assumptions challenged in a collective process of reflection. Although Downey developed critical participation in the context of engineering education to better enable engineers and STS scholars to probe their expertise, identities and commitments (cf. York 2018), I recognise his understanding of critique in Responsible Innovation and Responsible Research and Innovation.

Responsible Innovation (RI) and Responsible Research and Innovation (RRI) are part of a broader set of discourses and actions, including but not limited to technology assessment (Rip and Robinson 2013), anticipatory governance (Barben et al. 2008), (post-)ELSI (Ethical, Legal & Social Impacts) and ELSA (Ethical, Legal & Social Aspects) programmes (Balmer et al. 2016b; Zwart et al. 2014) as well as applied ethics (Van Der Burg and Swierstra 2013). They seek to align scientific research and technology development with societal values, needs

and expectations (Owen and Pansera 2019). While RI is an intellectual movement with academic roots (Brundage and Guston 2019), RRI is a public policy discourse originating in the European Commission's Science in Society programme (Owen et al. 2012). As such, RRI instrumentally aims to advance and mainstream the action lines of that programme: ethics, governance, public engagement, science education, gender equality in research and open access to scientific results. These so-called "RRI keys" (Owen et al. 2021, 6) have been considered as an attempt to re-establish public trust in scientific institutions and warrant the acceptance of new technologies through co-creation and co-production of "science with and for society."[5]

Some academic commentators have dismissed the integration of RRI keys in science governance as reducing ethical deliberation, stakeholder participation and public engagement to post-hoc exercises in meeting performance indicators that became tethered to the keys (e.g., Egeland et al. 2019). A few prefer to use the label RI to distinguish themselves from the European policy discourse and align their efforts with STS engagement research, sharing with it a critical stance on the relations between science, technological innovation, politics and society (Owen and Pansera 2019). RI is a rather abstract ideal that advocates a deeper systemic transformation striving for science and technology development that is more anticipatory, reflexive, inclusive, deliberative and responsive (Stilgoe et al. 2013). As the meanings of and boundaries between RI and RRI have remained contested, I use the acronym R(R)I to refer to the community as a whole, acknowledging that they share several common threads (for an overview see Van Hove and Wickson 2017).

The common thread that is especially relevant for this dissertation and aligns Downey's concept of critical participation with R(R)I is "critical reflection" (p. 215). Although the notion of critique has been used inconsistently in relation to R(R)I (for a brief review see chapter 4), I follow Van Hove and Wickson in considering critical reflection as the core of many methods, techniques and tools that seek to put R(R)I into practice. Such practical approaches consider critical reflection on the underlying, oft-hidden assumptions and values in science and engineering practices as a means to change research and innovation systems. Although change is needed across various spheres and actors to bring about R(R)I, most of these approaches focus on the level of researchers, presupposing that they play a significant role in making technoscience more socially responsive. These approaches ask researchers, among others, to anticipate the future impacts of their work (Rip and Te Kulve 2008), to discuss their research and its risks with stakeholders, wider publics and legislators (Conley and York 2020), and to reflect on their practices so as to recognise possibilities for shifting science and technology trajectories in more socially responsive directions (Fisher et al. 2015).

5 https://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society

Especially the last family of approaches, and more specifically what Evans et al. (2021) call "critical collaboration," aligns with Downey's notion of critical participation. Evans et al. (2021) define critical collaboration as follows:

> Critical collaboration can help explicate concerns about the roles of science and technology . . . not only on the side of [technoscientific] practitioners who are encouraged to explicate and reflect on what they do and why, but also for social scientists who might reconsider and revise their (static) position and knowledge claims vis-à-vis practical contexts. (p. 205)

While collaboration refers to "collective experimentation" (ibid.) across disciplinary divides, the qualifier 'critical' adds reflexivity "holding a mirror up to one's own activities, commitments, and assumptions" (Stilgoe et al. 2013, 1571). This definition distinguishes critical collaboration from critique as 'value advocacy' (Shilton 2014; cf. Puig De La Bellacasa 2017) on behalf of those affected negatively by violence, discrimination and social injustices as they occur as a result of and within technoscientific work. Instead of advocating for the inclusion of specific values in technoscience, social scholars entering critical collaboration challenge hegemonic norms and dominant practices by asking probing questions so as to stimulate critical reflection on what is usually taken-for-granted. The aim is to transform practices for the better, with the criteria for 'better' defined collaboratively and remaining open to contestation and refinement. While this collaborative process resembles Downey's idea of critical participation (i.e., generating critical STS knowledge and letting it affect technoscientific practices in a mutual learning process), the objective of critical collaboration is more specific in the context of R(R)I projects. It aims at enhancing the responsiveness of technoscience to societal values through open-ended changes in valuation work as it is already taking place in science and technology development.

1.4 Methodology

In the process of critical collaboration, valuation work is intended to become re-scriptive: valuation work is made visible to "open up" (Stirling 2008) such practices to reflection and interrogation. The act of rendering valuation work more transparent to those who perform it is a form of intervention, for researchers have been shown to be often unaware of the values and ethical judgement embedded in their practices (Glerup et al. 2017; Lee et al. 2019). Intervention is what R(R)I researchers (e.g., Fisher et al. 2015; Fisher and Rip 2013) and engaged STS scholars more broadly (e.g., Downey and Dumit 1997; Zuiderent-Jerak 2016) consider as a defining feature of their methodology. The meaning of intervention has, however, been contested in the literature (Hess 2001). Zuiderent-Jerak (2015) writes that intervention can be seen as a "crude" notion (p. 21) because it presupposes an 'outside' position from which

the intervention is launched as a unidirectional action with predetermined strategic effects. The notion conceals that knowledge from within the complexity of local practices is needed to design and realise an intervention. To acquire such 'insider' knowledge, a social scholar is commonly situated within the practices in which she seeks to intervene, which means that her presence and actions always already influence these practices. This is the case because STS scholars have argued convincingly that any research endeavour ultimately changes the object of research, whether in the natural sciences (e.g., Latour 1988) or social sciences (e.g., Law 2004). Social science research, more specifically, gives rise to a "double hermeneutic" (Giddens 1984): the presence and intervention of the researcher in her research context alters both her own interpretations and the meaning-making of those who inhabit that context, generating unintended effects on practices, just as the intervention itself.

To capture the double hermeneutic, I use the vocabulary of critical participation and critical collaboration. Critical collaboration emphasises that changes in practices do not result from a pre-conceived intervention performed by an influential, if not "heroic" (Fortun 2001 cited in Hess 2001, 241) social scholar, but from an emergent collaborative learning process. This process is as much about the production of new STS knowledge on valuation work as it is about transforming technoscientific practices in a way that enhances their socio-ethical responsiveness. It is by manipulating practices that one can better understand them and open up their normativities (Hacking 1983; Zuiderent-Jerak 2015). Critical participation equally emphasises the relevance of openness to mutual learning across disciplinary divides, and further acknowledges that ethnographic methods like participant observation and interviews are part and parcel of critical engagement research (Smith 2021). In participating in the practices under study, ethnographers understand the content, culture and language from within a field site, which is a condition for complexifying, questioning and possibly transforming what is taken-for-granted locally. Along these lines, this research combines a focus on participation in multi-sited ethnography with a focus on collaboration guided by the method of Socio-Technical Integration Research.

1.4.1 Multi-sited ethnography

Multi-sited ethnography brings different sites into the same frame of an ethnographic study. Instead of fixing the object of study in a single field site, the ethnographer follows people, stories, metaphors or conflicts to construct the field site in the research process. By the time multi-sited ethnography was coined in print by Marcus (1995, 1998), it had already been practiced and discussed in the anthropology of globalisation (e.g., Appadurai 1995, 1996) and STS (e.g., Latour 1993; Mol and Law 1994). Hess (2001) observed a shift from first generation single-sited STS laboratory studies to second generation multi-sited ethnography in the 1990s. While the first generation was interested in scientific knowledge production per se, the second generation was more oriented towards social problems related to the environment, class, race

and sexuality. As the second generation studied the intersection between science and social movements, policy makers, wider publics and popular culture, it moved out of the laboratory to participate in multiple sites where these intersections could be traced. Such multi-sited ethnography differs from comparative laboratory studies (e.g., Knorr-Cetina 1999; Traweek 1988). While the latter presupposes that laboratories are distinct sites containing culturally significant wholes, multi-sited ethnography is ambivalent about relevant sites. As it assumes that spatially bounded cultural entities rarely exist, it is part of the research agenda to find out where things connected to the object under study might be going on (Hine 2007). Examples of such explorations are STS studies following water pumping devices (De Laet and Mol 2000), information and communication technologies (Hine 2008), matsutake mushrooms (Tsing 2015) and energy infrastructures (Silvast and Virtanen 2019).

Relevant for this dissertation is another reason for studying science at multiple sites that was raised by Keating et al. (1992). The authors recognise that single-sited laboratory ethnographies neglect some relevant structures to which scientists orient their work, notably the scientific field or discipline (cf. Latour 1983, 60). They seek to reconcile the emphasis on situated and contingent action in laboratory studies with the continuity of scientific questions, theories, methods and findings across time, space and institutions. For this purpose, they introduce the notion of a "disciplinary form" which is mutually constituted by the local "laboratory level" and the places where laboratory results are exchanged and transformed into 'facts,' which they call the "community level" (p. 314). The term "level" does not imply a hierarchy, but is simply used as a short form for a component of the disciplinary form. The disciplinary form is constantly reproduced in open-ended interactions and practices, while also having a regulatory function in terms of pruning intradisciplinary heterogeneity and defining what counts as 'good' science within a scientific community. To capture valuation work in contemplative science at the laboratory level and the community level and to trace the ways in which both levels mutually constrain each other, this research is carried out at multiple sites: contemplative science conferences and meetings (chapter 2), a meditation research project (chapter 3–5) and curated online workshops with contemplative scientists (chapter 6).

The selection of these sites results from a conscious construction of contemplative science as a field. To allow both the actors involved in contemplative science and the ethnographer to equally partake in this construction process, two methodological moves are performed. The first move acknowledges that the ethnographer needs to engage in processes of bounding and selection – processes that any ethnographer has to undergo to reduce the indeterminacy of field observations into a meaningful account. To avoid the impression that multi-sited ethnography is a holistic project that could capture a scientific field or any other object of study in its entirety, the inherent partiality of ethnographic research is made explicit and productive in the ethnographer's methodological choices (Candea 2009). In this dissertation,

the methodological choice is to select the Silver Santé Study as primary field site. I elaborate on my primary field site and the specific reasons that motivate its selection after presenting the second methodological move.

The second methodological move gives room to contemplative scientists to co-construct the 'field.' In line with methodological suggestions in multi-sited ethnography, I have discovered which other sites are relevant to study valuation work by "following the people" (Marcus 1995, 106; Latour 1988) and their recommendations. Antoine Lutz, the neuroscientist in charge of research related to meditation in the Silver Santé Study, recommended me to attend the European Summer Research Institute 2017, a contemplative science conference organised by MLE in which he participated himself. This is where I conducted my first conference ethnography and established valuable relationships with other contemplative scientists who gave me advice on further events to attend, included me in regional networks and seminars and later participated in my online workshops. I thus combine a focus on the Silver Santé Study as a primary field site with an openness to follow the actors to places where they are socialised into the values and norms of their community (ranging from international conferences to regional meetings) and where they are willing to reflect on these values in relation to their work practices (curated online workshops). In this way, I study and participate in valuation work as it is shaped by the disciplinary form of contemplative science and its local practices.

A rich site to learn more about valuation work in scientific practices is the Silver Santé Study, a meditation research project on the impact of mindfulness and compassion meditation in comparison to learning a foreign language on healthy ageing.[6] The project was selected as a primary site of inquiry because it has the following characteristics: First, the project is well-known in contemplative science circles, partly because prominent meditation researchers (Gaël Chételat, Antoine Lutz, Olga Klimecki and Thorsten Bahnhofer) and popular research subjects (Tibetan monk Matthieu Ricard and former Korean Buddhist nun Martine Batchelor) are involved. Second, it combines laboratory research on long-term meditators with a clinical trial on novices. Therefore, it allows for making comparisons and tracing connections between valuation work as it is performed respectively in these two research branches characterising contemplative science as a field (Komjathy 2018; Tresch 2013). Third, the study is longitudinal, officially running from 2016 to 2020, and large-scale, a European Horizon 2020 project involving partners in several countries.[7] The longitudinal nature of the study enables me to investigate how negotiations about value conflicts unfold over time and to study the practical effects of critical collaboration (September to December 2018) in a second period of fieldwork (October to December 2019).

6 https://silversantestudy.eu/
7 https://silversantestudy.eu/about/silver-sante-study-partners/

The scale of the Silver Santé Study is one of the reasons why research entails journeys to multiple sites, among others, the biomedical research institute Cyceron in Caen, France, the hospital and the faculty of medicine of the University of Caen, and the different places where annual European consortium meetings take place, including digital Zoom rooms. Travelling physically and virtually has helped me understand how science is today, "carried out between varyingly identified groups and institutions and individuals . . . not just in physically bounded laboratories but also in computer-mediated locations" (Hine 2007, 669). Visiting multiple sites also allows me to trace how valuation work varies across physical and virtual spaces where contemplative science is conducted and discussed.

1.4.2 Socio-Technical Integration Research

To study the possibility of inflecting valuation work in contemplative science, I use the Socio-Technical Integration Research (STIR) method. STIR is one of the approaches that Fisher et al. (2015) summarise as "collaborative socio-technical integration" (p. 39). These approaches share three characteristics: First, they bridge segregated forms of expertise, such as the divide between, on the one hand, the social sciences and humanities (SSH) and, on the other hand, the natural sciences and engineering. Second, they operate closely within expert practices, usually embedding an SSH scholar in technoscientific workflows. Third, they have the potential to transform technoscientific practices in how they engage societal contexts and value considerations. In sum, collaborative socio-technical integration is the intellectual and practical work of enhancing capacities of technoscientific practitioners to responsibly align science and technology development with their broader societal contexts.

Fisher et al. provide an exemplary map including Human Practices (Rabinow and Bennett 2009), STIR (Fisher 2007), The Toolbox Project (Eigenbrode et al. 2007), and Value Sensitive Design (Friedman et al. 2013) that helps identify whether an approach to collaborative socio-technical integration qualifies as "critical" (Fisher et al. 2015, 25). One of the map's dimensions is the extent to which an approach contributes to technoscientific practices by working within local problem framings or by challenging existing practices and commitments. Fisher et al. suggest that the more critical an approach is of the technoscientific practices it engages, the more it problematises or reforms their underlying assumptions and values. The authors classify STIR and Human Practices as such critical approaches. The Human Practices approach seeks to reform technoscientific practices by introducing alternative values, skills and voices to work towards specific normative ends. STIR, by contrast, does not aim at direct reconfiguration or reform. The primary aim of STIR is to understand the conditions under which technoscientific practitioners reflexively engage with socio-ethical contexts; the second aim to critically destabilise and transform this engagement is considered as a byproduct of the first (Fisher 2018). STIR assumes that studying reflexive capacities of scientists and engineers through collaborative dialogues can reframe their problems and broaden their socio-ethical

horizon so that they may eventually adjust their practices voluntarily (Schuurbiers 2011). The focus on critique through reflexivity in STIR is the reason why I consider it as a promising method to guide critical collaboration and to make valuation work re-scriptive. Valuation work is not assumed to be absent or missing from technoscience, but is rather considered to be latent in practices. STIR is about documenting and clarifying valuation work as it is already taking place and, in this way, reveals alternative connections between science and its socio-ethical contexts.

There are three more reason why I choose STIR as a method for critical collaboration. First, many methods developed in the literatures on R(R)I, technology assessment, anticipatory governance, (post-)ELSI or ELSA and applied ethics focus on specific events such as workshops, card-based discussion groups and walkshops (e.g., Macnaghten and Guivant 2011; Felt et al. 2018; Wickson et al. 2015) that encourage socio-ethical deliberations, often involving technoscientific experts, stakeholders and wider publics (Conley and York 2020). STIR, by contrast, allows for following valuation work within a community of researchers over time. It typically embeds an SSH scholar in a technoscientific space or project for an extended period of time to conduct ethnographic fieldwork informing regular STIR dialogues with scientists or engineers about their everyday work practices (Fisher 2007). Extended periods of ethnographic research with explicitly collaborative elements allow for understanding valuation work from within whilst participating in it.

Second, STIR combines fixedness with flexibility, being positioned midway on a spectrum of approaches that are structured – collaborations are organised across contexts in a relatively consistent way (e.g., The Toolbox Project, Value Sensitive Design) – and those that are rather unstructured – collaborative procedures vary dependent on venue, expert group and other local characteristics (e.g., Human Practices). STIR is based on a protocol structuring collaborations that is topically oriented and therefore locally adjusted (Fisher and Schuurbiers 2013). As the method is semi-structured, I could flexibly adapt it to different collaborative configurations: in one-on-one dialogues with Silver Santé researchers, in focus group settings with the Silver Santé research team at Cyceron in Caen and in curated online workshops with contemplative scientists from different institutions.

Third, although multiple studies shed light on the social, cultural and institutional obstacles to collaborative socio-technical integration, which often limit its impacts (e.g., Delgado and Åm 2018; Doubleday and Viseu 2010; Thoreau 2011; Viseu 2015), STIR has a relatively large positive evidence base. Prior studies have explored and positively evaluated the potential of STIR to contribute to voluntary changes in science, engineering, businesses and municipal energy supply initiatives. These changes concern research direction, experimental design, team work and interactions with other stakeholders, to name but a few examples (Conley 2014;

Fisher 2007; Fisher et al. 2010; Fisher and Schuurbiers 2013; Schuurbiers 2011; Flipse et al. 2013; Flipse et al. 2014; Lukovics and Fisher 2017; Flipse and Van De Loo 2018; Richter et al. 2017). Due to its wide-ranging applications and positive evaluations, STIR is likely to prove similarly advantageous in contemplative science.

In this dissertation, I do not use STIR as it was originally developed (Fisher 2007), but adapt it for the purposes of my research. I further reflect on the obstacles and limitations encountered in the research process to propose additional refinements of the method. While the methodological specifics of STIR and its adaptation are presented in chapter 4, self-critical reflections are included in the conclusive remarks. There is one critical aspect of my deployment of the method that is equally relevant for multi-sited ethnography and is therefore worth mentioning here: my positionality. Positionality refers to my role, attachments and commitments in relation to the sites and communities under study, which have shaped the collaborative process in STIR and the construction of the 'field' in multi-sited ethnography. Freeth and Vilsmaier (2020) specify positionality in terms of tensions that pull an engaged scholar in sometimes opposite directions and thus require different balancing acts. One is the dynamic shifting between being 'inside' and 'outside' of the community one engages, which I discuss at length in chapter 4 and 5. I elaborate here on another balancing act between impartiality and investment. In line with STS scholarship on "situated knowledges" (Haraway 1988), I consider personal investment and partiality as an inevitable consequence of being in a relationship. As positionality can never be interest-free, I do not strive towards objectivity and elimination of bias but actively deal with my attachments and commitments.

Although these attachments and commitments have changed over the course of my research, as discussed in the conclusive remarks of this dissertation, I brought two investments into fieldwork and collaboration from the outset. I started this research as an active meditation practitioner interested in multi-disciplinary research on contemplative practice. As most contemplative scientists tend to share this twofold interest with me, we have often connected on a spiritual plane. I sometimes seemed to resemble them so closely that I passed as one of them at contemplative science conferences. Moreover, I had completed a STIR training facilitated by Erik Fisher, the developer of the method, in summer 2018 and was keen on becoming a bona fide member of the community of STIR scholars. Although STIR was not designed to change practices, but to understand and assess the conditions under which such changes take place, I was inspired by the above-listed STIR studies that had documented practical effects. These studies sparked an 'activist' interest in changing ethics practices in the Silver Santé Study for the better to prove the usefulness of my chosen approach.

My triple identity as a meditator-activist-scholar provoked tensions. My scholarly colleagues warned me that I was vulnerable to "going native" twice – both in STIR's community of

practice and in contemplative science. They questioned my ability to perform ethnographic research and to critically reflect on STIR since I seemed to lack distance both from my object of study and from my research method. My collaborators in the Silver Santé Study, by contrast, saw me as a foreign early-career social scholar who lacked experience in clinical research and experimental methods. Therefore, I had the impression that they were in doubt about my potential to actually become useful for their work. This meant that I was pushed to justify my research both in my scholarly community 'back home' and in the field 'out there.' In justifying the value of my research, I was constantly performing valuation work myself. While an in-depth analysis of the valuation work embedded in my own research practices would be a methodographic project (Lippert and Mewes 2021) beyond the scope of this dissertation, it is important to keep in mind that it has shaped the knowledge presented here.

1.5 Overview of chapters

Although critical collaboration guided by STIR and multi-sited ethnography are partly intertwined (I conducted ethnographic fieldwork in the Silver Santé Study at the same time as I had regular STIR dialogues with some of its team members), the structure of the thesis separates ethnography from engagement. In the first part of the thesis, I present ethnographic research at contemplative science conferences and meetings (chapter 2) and in the Silver Santé Study (chapter 3). In the second part, I discuss the outcomes of STIR in the Silver Santé Study (chapter 5) and in curated online workshops with contemplative scientists (chapter 6). These two parts are connected through a 'hinge' (chapter 4), in which I use insights from ethnographic observations in the Silver Santé Study to develop a methodological adaptation of STIR whose deployment is analysed in the subsequent chapter. I briefly introduce each empirical chapter and summarise the content of the conclusive remarks (chapter 7).

In the second chapter, I study contemplative science as a case of (post-)modern reenchantment. STS research has indicated that scientific aspirations to render the world fully explicable coexist with oppositional pulls towards reenchantment: feelings of awe and wonder, searches for transcendental meaning or moral values and practices akin to magical sorcery. The case study on contemplative science reveals that history plays an important role in the reenchantment of brain research. Drawing on historical ethnography, the chapter analyses how the contemplative science community narrates and performs history at conferences, commemorative events and in published textual accounts to valorise this field of research as a project of reenchantment without destabilising its scientific legitimacy. First, the folk history of contemplative science is shown to endow the field with enchanting qualities by combining Weberian ideal types of charismatic and rational authority. Second, alternative histories of meditation research are reconstructed and their absence from the official narrative is explained in relation to the

charismatic-rational Janus face of contemplative science. Third, contemplative scientists are found to make recourse to history in mobilising regimes of valuation that help justify their work in light of socio-ethical critiques. The analysis contributes to scholarly work on valuation and justification practices by revealing that history functions as a repertoire to defend science against critics, attract novice researchers and build a research community around the allure of enchantment.

In the third chapter, I examine the intertwinement between practices of valuation and scientific research in the Silver Santé Study, which I approach as an example of lifestyle intervention randomised controlled trials (RCTs) on mindfulness and compassion meditation. Studying meditation in an RCT poses the challenge of standardising an intervention that relies on a mix of people, skills and activities. The chapter describes how, in meeting this challenge, Silver Santé researchers engaged in diverging knowledge-making practices. For this purpose, it draws on praxeography, an inquiry into practices that is akin to ethnography. To analyse normative dimensions of knowledge-making practices, the concept of 'epistemic goods' is introduced. Researchers juggled partly incoherent epistemic goods – internal validity, feasibility, assessing efficacy, attending to qualitative effects, objectivity, trained judgement – and resolved tensions between them. Strategies to resolve such tensions in the research process were: reinterpreting the study protocol, caring informally while playing by formal rules and adjusting the protocol of a study task. Analysing epistemic goods and strategies that make them coexist is not only relevant to understand how valuation work is performed in actual practices of meditation research; the analysis also problematises what counts as evidence in evidence-based medicine. Instead of evaluating knowledge by reference to a 'gold standard,' this chapter proposes that evidence claims should be placed in the context of their production to evaluate them on their own terms.

In the fourth chapter, I move from observation to engagement by providing a methodological account of the role of critique in interdisciplinary collaborations that seek to advance R(R)I, in particular collaborative socio-technical integration. While critique has so far remained unspecified in R(R)I communities, this chapter introduces 'generative critique' as a practice in-between adversarial 'armchair critique' and a 'lack of critical distance.' Drawing on participant observation in the Silver Santé Study, I show how different modes of critique shaped interactions between biomedical researchers and the study's External Advisory Board. Researchers made armchair critique generative of an alternative understanding of meditation as a relational practice rather than a private brain training, which contributed to a more socially responsive public representation of the study. Generative critique can remake seemingly stable objects in moments when taken-for-granted ways of seeing and knowing are unsettled. To facilitate the emergence of generative critique in collaborative socio-technical integration,

a modified version of STIR is developed by incorporating methodological tenets of Video-Reflexive Ethnography.

In the fifth chapter, I describe how, in putting this modified version of STIR into practice, I navigated my positionality as an engaged scholar. Engaged scholars stress that the potential of interdisciplinary collaboration to inflect the social shaping of technoscience is often constrained by their liminal position. SSH scholars tend to be positioned as either adversarial outsiders or co-opted insiders. In an attempt to steer these dynamics, I find that attending to affective disturbances – or disconcertment – can open up possibilities for productive engagements across disciplinary divides. Disconcertment is analysed as a resource for collaboration in a STIR study conducted with the Silver Santé research team. For this purpose, I develop a heuristic that weaves together 'disconcertment,' 'affective labour' and 'responsivity' to analyse the role of the body in interdisciplinary collaboration. The heuristic draws out how bodies do affective labour when generating responsivity between collaborators in moments of disconcertment. Responsive bodies can function as sensors, sources and processors of disconcerting experiences of difference. The analysis shows how attending to disconcertment stimulated methodological choices to recognise, amplify or minimise the difference between collaborators. Although such choices are situational, each one examined here generated responsivity. Responsivity supported collaborators in enacting generative critique that helped readjust the technical in terms of the social. This analysis contributes to STS scholarship on the role of affect in successes and failures of collaborative socio-technical integration.

In the sixth chapter, I expand the scope of STIR by moving from laboratory engagement to online workshops with contemplative scientists from different institutions. I present the results of a study conducted together with Erik Fisher on the relation between capacities for socio-technical integration in scientific work and activities to preserve hybrid role identities. In literature on science governance, reflexive participation in the social shaping of technoscience has been framed as a capacity of scientists to exercise greater agency within constraining structures. This capacity is supposed to be pronounced in scientists with hybrid role identities, such as contemplative scientists who merge scientific with contemplative selves. Based on these assumptions, our study invited contemplative scientists to reflect on impending decisions in practitioner dialogues guided by the STIR protocol and involved interviews about their experiences thereof. An analysis of our data through the midstream modulation framework suggests that STIR practitioner dialogues can support scientists in reflecting upon and changing practices in response to value conflicts. In identifying the conditions facilitating such changes as 'values levers,' we highlight the oft-unacknowledged relational practices in STIR dialogues, which enabled the scientists in our study to resist and cope with structural effects on their agency. In doing so, contemplative scientists cared for their hybrid role identities while participating reflexively in the social construction of research.

In the conclusive remarks, the results of the empirical chapters are brought together by drawing out how analytical insights of each chapter expand our understanding of valuation work and illuminate possibilities for its inflection through critical collaboration. Moreover, I offer methodological reflections on the ways in which my shifting positionality at different research sites has shaped the knowledge produced in this dissertation. I further discuss the limitations of STIR, turning my scholarly gaze reflexively back onto my own engagement practices. Finally, I summarise the practical implications of this research and reflect on ways in which engaged STS research and contemplative science could learn from each other.

1.6 Writing an article-based dissertation

This thesis is written as an article-based dissertation, following what resembles Dunleavy's (2003) "craft approach" (p. 3) to authoring a PhD and what in fiction has also been called "writing like a gardener" (Flood 2011). Broadly speaking, fiction writers either work like gardeners or like architects. An architect-writer produces detailed outlines, planning the entire book before starting to write it, like an architect designing a house on paper. The gardener, by contrast, plants a seed, kind of knowing what the seed is, but as the seed comes up, while being nourished, she does not know exactly what the seed will grow into. Writing my dissertation as a gardener implies that I worked inductively, plunging myself into fieldwork, taking fieldnotes and drafting texts with the vague idea that I was working on a thesis on ethics in contemplative science, but without knowing ahead of time what each article or chapter would look like. Instead, surprising observations in the field, additional funding for further engagement research, unexpected opportunities for co-authorship and challenging feedback from colleagues and supervisors were like water and nutrients that allowed my PhD thesis to grow into unforeseeable directions.

As gardening also involves pruning and wiring plants to bring them into particular shapes, some of the articles published over the course of my PhD research were cut and further cultivated to fit into the dissertation. While chapters 2 and 6 are still in midst of the journal review process, chapter 3 largely coincides with the published article (Smolka 2022), and chapters 4 and 5 are rewritten versions of publications. I rewrote a conceptual article on generative critique (Smolka 2020) to include ethnographic observations from the Silver Santé Study in chapter 4. The added empirical material illustrates the concept of generative critique, helps develop a methodological adaptation of STIR and links the paper explicitly to contemplative science. The published version of chapter 5 (Smolka et al. 2021) was co-authored with Erik Fisher and Alexandra Hausstein and is based on data from all authors. For the dissertation chapter, I replaced the data and analyses of Fisher's and Hausstein's STIR studies with vignettes written on the basis of my collaboration with Silver Santé researchers, but preserved the argumentative

structure of the published article. Furthermore, bits and pieces were cut out throughout the thesis to avoid repetitions and enhance overall coherence.

Writing like a gardener and working under the pressure of 'publish-or-perish' narratives (cf. Sigl et al. 2020) are reasons why the PhD thesis looks more like a flower bed than a single plant. I made use of opportunities to work on chapters that were not foreseen in my research plan and to bring multiple articles – including one that did not make it into the thesis (Smolka 2021) – through peer-review as swiftly as possible. Readers may also notice some diversity in writing styles. Each chapter was written for a different STS journal, some of which allow for more narrative writing (chapter 2, 3, 5), whereas others ask for rather technical language that speaks to R(R)I communities (chapter 4, 6). Although each chapter stands on its own and can be read as an individual paper, they are all connected through the overarching research question inquiring into practices of valuation in contemplative science. To emphasise this connection, I insert interludes between empirical chapters. In fiction writing, interludes are sometimes included after dramatic scenes or fast-paced action to create a space for reflection and expand the understanding of the story (Holleman 2016). Similarly, the interludes in this dissertation include additional thoughts on the empirical chapters and help understand its line of argument. They draw out how each chapter relates to the concept of valuation work, albeit it is nowhere explicitly mentioned, to excavate the theoretical root system linking the chapters to one another. This is how the thesis came to resemble a carefully arranged, interconnected flower bed with deliberate colour choices and recognisable patterns.

Chapter 2

The role of history in the reenchantment of brain research: a historical ethnography of contemplative science

2.1 Introduction

> On the way back from my first contemplative science conference, the European Summer Research Institute (ESRI) 2017 on the island Frauenchiemsee, I was in a pensive mood. After spending a week listening to academic talks and engaging in vibrant personal exchanges interspersed with regular periods of contemplative practice, the boat ride felt like transitioning back from an esoteric place into society, but in a new state of being. I wanted to become part of this community, which had instilled in me a sense of awe and wonder. The people at the conference seemed to be passionate, hardworking, ingenious researchers, while also coming across as profoundly spiritual, reflective and committed to making the world a more compassionate and peaceful place. At the same time, I was puzzled. Many of the scientists attending the conference were doing brain research, reducing meditative states and moral virtues to neural firing. How could they give off the impression that they were bestowing the world with greater meaning and transcendental significance while doing materialist neuroscience? (Vignette, ESRI 2017)

In the four ensuing years, I followed the contemplative science community to investigate this question. Contemplative science is an interdisciplinary field of research, which primarily utilises neuroscientific, psychological and clinical approaches to study the biochemical, psychophysiological, behavioural and subjective changes that occur in and as a result of contemplative practices. Although the field has received little attention in STS, a few scholars have offered interpretations for how the paradoxical blend of neuroscience, spirituality and ethics is achieved in practice at contemplative science conferences. Tresch (2013) analyses these conference-retreats as initiation rituals through which participants develop a contemplative-scientific identity and culture whose internal frictions require recursive negotiation of self-definitions, values and boundaries. Kucinskas (2019) finds that leading figures in contemplative science resolve such frictions by combining several forms of legitimacy, in particular charismatic and scientific authority. Harrington (2008a) highlights how the mix of visual symbols of the 'exotic East' and the 'modern West' – the Dalai Lama in electrodes, scientists in flowing monk robes – frames contemplative science as a "project in re-enchantment" (p. 3). The aesthetics transmit the sentiment that contemplative science is "something deeper, finer, and more daring" (p. 6) than just brain science, which creates space for human values and spiritual quests.

While I assume that identity formation, legitimacy building and visual symbols all contributed to my sense of awe at ESRI 2017, I realised later that it had yet another source: contemplative science's purported history. In 2021, numerous events were organised on the occasion of two anniversaries: the 20th of the passing of one of contemplative science's founding figures,

Francisco J. Varela, and the 30th of the publication of *The Embodied Mind* (Varela et al. 1991), a symbolic landmark in the emergence of the field. During these events, it dawned on me that the commemoration of contemplative science's history – the Dalai Lama disclosing details about his friendship with Varela, Varela's wife reiterating her husband's values and visions, and Jean-Philippe Lachaux, his former PhD student, remembering Varela's "magical powers" – had enchanted me. This insight made me wonder: How does the contemplative science community deploy history to valorise this field of research as a project of reenchantment? How do they narrate and perform history to transmit the impression that contemplative science reinvests the world with meaning without destabilising its scientific legitimacy?

Instead of creating a historical narrative based on archival sources, I study the "folk history" (Shanley forthcoming) that members of the contemplative science community construct to retell the evolution of the field at conferences, meetings, commemorative events and in published written accounts. The contemplative science community encompasses mainly researchers from the neurosciences, psychology and the clinical sciences who collaborate with smaller numbers of humanities scholars, social scientists and contemplative practitioners (Komjathy 2018, 20). An extensive body of literature in religious studies sheds light on Buddhist practitioners' interests and rhetoric surrounding their collaborative engagements with scientific researchers (e.g., Hermann 2011; Lopez 2008; McMahan 2009, 2010). I shift the analytical focus to Western scientists and scholars involved in contemplative science to investigate how they valorise this kind of research by making recourse to history.

This study contributes to STS literature on how scientists attribute value to objects, technologies and work-related activities to justify and legitimise their research (Anderson 2012; Mody et al. 2020; Morrison 2018). While this body of work has shown how a range of discursive repertoires function in valuation and justification practices, the strategic use of history for the legitimisation of science has so far remained understudied (for exceptions see Abir-Am 1985, 1992; Olazaran 1996). I expose how the folk history of contemplative science combines Weberian ideal types of charismatic and rational authority to endow the field with enchanting qualities while underpinning its scientific legitimacy. I then reconstruct alternative histories of meditation research based on secondary sources in the history of science and explain how their absence from the official historical narrative shapes the charismatic-rational Janus face of contemplative science. Finally, I elucidate how contemplative scientists have made appeals to the past when mobilising "regimes of valuation" (Fochler et al. 2016) – social responsibility, contemplative values in science, diversity and inclusivity – in response to recent critiques of their work's socio-ethical implications. By demonstrating how the past becomes a forceful repertoire to defend contemplative science against critics, to attract novice researchers and to build a contemplative science community, we gain a better understanding of how this kind

of research establishes its multivalent status as credible, worthwhile and inspirational in the present.

2.2 Literature review, analytical perspectives and methodology

This research builds on three bodies of literature: empirical STS research on (re)enchantment, analytical perspectives on valuation and justification work, and methodological approaches to historical ethnography. The literature review of STS research summarises empirical studies which show that the modern project of disenchantment has never been complete or uncontested; in fact, there have been numerous attempts within science to move in the opposite direction. One of these attempts is the blend of charismatic and rational authority in scientific personae and technologies. In the section on valuation and justification work, charismatic and rational authority are presented as repertoires through which the contemplative science community valorises and justifies its research. The section further explains how the deductive analysis is complemented with an inductive approach to identify additional repertoires that emerge from the empirical material. All these repertoires are historical, meaning they feature in or draw upon the narration and performance of contemplative science's history. Finally, methodological approaches to historical ethnography are introduced to specify how data was collected on the construction of contemplative science's history.

2.2.1 (Re)enchanted science and enchanting scientists: charismatic and rational authority

Working in the shadow of Max Weber, numerous scholars have emphasised the corrosive effects of scientific thinking on religious or spiritual systems of orientation (for an overview see Saler 2006). In his famous disenchantment thesis, Weber characterises modernity as a process of "intellectual rationalisation created by science and scientifically oriented technology" that obliterated "mysterious incalculable forces" (Weber [1918] 1958, 117). Since the 1990s, however, postmodern scholarship has recognised the tensions and oppositions constitutive of modernity (Bilgrami 2010; Latour 1993; Taylor 2011). With the rise of modern science, magical sorcery, spiritual beliefs and religious values did not disappear but fragmented into patches within a complex pattern of modern enchantment. In STS analyses of science and technology, different understandings of modern enchantment come to the fore: reenchanted science as a historical backlash in the *longue durée* of Western disenchantment; scientists' affective experience of enchantment; discourses and practices through which scientific personae, objects or knowledge gain enchanting qualities. To distinguish between these understandings throughout this chapter, I use the terms 'reenchantment,' 'enchantment,' and 'to enchant' respectively.

Historians of science and technology have conducted case studies of "reenchanted science" (Harrington 1996): the spread of occultism in Victorian science (Owen 2004; White 2014), the emergence of a German-speaking science of wholeness in the early decades of the 19th century (Harrington 1996; Treitel 2004), and a range of "groovy sciences" (Kaiser and McCray 2016) – cybernetics in Great Britain (Pickering 2010) and parapsychology in the United States (Kaiser 2011) – flourishing from the later 1960s to the early 1980s. Historical studies frame scientific and public interest in paranormal phenomena and altered states of consciousness as fringe reactions to religious doubts sparked by Enlightenment thinking, uncertainty in times of rapid socio-political changes and post-war alienation from the fatal sides of science, technology and bureaucratic society. Sociological research, by contrast, highlights that the affective experience of enchantment is part of normal science. Feelings of awe, astonishment and delight, usually reserved for spiritual experiences, accompany the intuitive grasp of how things work (Barbalet 2009; Ellis 2011) as well as engagement with poorly understood but potentially transformative technologies (Mosco 2005; Davies 2014). Lastly, discourse analyses demonstrate how scientists, engineers and the media bestow science and technology with magic to enchant other researchers, stakeholders and wider publics. For example, the mystery and awe-inspiring potential of nuclear technology (Anshelm 2010) and artificial intelligence (Ames 2018) have not only been invoked for the sake of marketing and press hype, but also to shield their creators from responsibility for the societal impacts of these seemingly unpredictable, superhuman technologies (Campolo and Crawford 2020).

STS scholars contributing to the last-mentioned body of literature have highlighted the link between Weber's concept of (dis)enchantment and his work on charisma (e.g., Ames 2019). For Weber, modernity is a conundrum because the disenchanting process of rationalisation is constantly threatened by the enchanting counterforce of charisma. While rational authority secures the stability of social order through bureaucracy and procedural rule-following, charismatic authority appeals to forces outside of formal structures. Charismatic leaders are considered "extraordinary and treated as endowed with supernatural, superhuman, or at least specifically exceptional powers" (Weber [1922] 1968, 242), which enable them to fill the void of spiritual meaning and ethical purpose in a disenchanted world. Charismatic leaders can enchant followers – which literally means "to put them under a spell" (Ladkin 2006, 167) – to either rebel against, reform or support the existing rational order in modern societies (Islam 2014).

STS studies have illuminated how technological objects, digital networks and scientific personae are portrayed as rational and charismatic at the same time (Ames 2019; Kucinskas 2019; Lee 2020; Tresch 2012). Their enchanting power of charisma no longer constitutes an alternative form of authority, but expands the social vision of technological fixes, the euphoric attachment to digital systems and the legitimacy of scientific expertise. Along these lines, I analyse enchantment

in contemplative science. I build on Kucinskas's (2019) observation that leading figures in the field attract other researchers and professionals by emanating the impression that one could become "wise and spiritually aware by being part of this contemplative community" (p. 145). She locates the enchanting force of these figures in their interdependent forms of legitimacy, in particular the combination of epistemic authority derived from scientific credentials and charismatic authority grounded in Buddhist moral leadership. Her analysis of the discourses and practices that foster legitimacy is reminiscent of STS studies of valuation and justification.

2.2.2 Repertoires of valuation and justification work: orders of worth and regimes of valuation

The study of how actors prove themselves legitimate is at the centre of valuation studies (Kjelberg et al. 2013), which are influenced by STS (Dussauge et al. 2015; Heuts and Mol 2013; Van De Werff, 2018) and pragmatism (Boltanski and Thévenot 2006; Dewey 1939). As actors justify their behaviour, they resort to values that have legitimacy in the community they address. These values, broadly defined as something "good, proper, and desirable" (Dussauge et al. 2015, 7), are treated not as absolute or universal, but as produced in and through practices of valuation. Albeit locally accomplished, practices of attributing value to something and/or assessing something as worthwhile are not arbitrary. In fact, scholars have shown that actors in specific contexts habitually appeal to recurring "orders of worth" (Boltanski and Thévenot 2006) to inform, orient, valorise and justify their actions.

The analytical perspectives deployed here rely on Reinecke et al. (2017) in approaching the orders of worth framework as containing Weberian ideal types of charismatic and rational authority. In the industrial order, scientific and technical experts appeal to the good of technical efficiency. They engage in practices of valuation based on quantification and classification to establish rational authority – the derivation of expert legitimacy from procedural rule-following. In the inspirational order, by contrast, charismatic authorities claim worth "through what they have that is most *original* and most *peculiar to them*, that is, through their own *genius*" (Boltanski and Thévenot 2006, 161). Empirical research informed by Boltanski and Thévenot illuminates how actors perform "justification work" (Jagd 2011, 343), the process of flexibly integrating and alternating between orders of worth to establish or repair moral and epistemic legitimacy (Mody et al. 2020; Morrison 2018; Patriotta et al. 2011; Sharon 2018; Yamaguchi and Suda 2010). Likewise, I examine how the combination of the industrial order of worth (rational authority) and inspirational order of worth (charismatic authority) valorises, justifies and legitimises contemplative science as a project of reenchantment.

Similar to STS researchers who found Boltanski and Thévenot's deductive scheme too rigid for their empirical research (Falkenberg 2021; Fochler 2016a; Fochler et al. 2016; Heuts and Mol 2013), I do not limit my analysis to pre-defined repertoires. Instead, I follow Fochler et al.

(2016) in identifying additional "regimes of valuation" inductively. Regimes of valuation "are comprised not only of institutional discourses, practices and material and digital infrastructures, but also of people living in, complying with and resisting these very regimes" (p. 180). Albeit open to change through acts of resistance and subversion, the regimes that researchers comply with in valuing and justifying their work (e.g., in terms of publications and citations) are relatively durable. I follow a grounded theory approach (Charmaz 2006) to analyse the dominant regimes which contemplative scientists invoke to shield their work against critique.

2.2.3 Historical ethnography: folk history and its omissions

This chapter applies "historical ethnography" (Abir-Am 1992) to investigate how orders of worth and regimes of valuation are mobilised in the ways in which the history of contemplative science is preserved and performed. Multiple methodological approaches to historical ethnography have been developed at the intersection of history, anthropology and ethnology. While most of them use ethnographic methods and perspectives to study the past (e.g., Fenske and Bendix 2007; Kornblum 2004; Vaughen 2004), this study traces "the uses to which people put history" (Frankel and Abir-Am 1992, 361). Scientists narrate and perform history at scientific anniversaries (Abir-Am 1992; Richmond 2006), conferences (Fisher 2017; Stephens and Dimond 2016), memorial volumes (Abir-Am 1982) and in other commemorative practices in science (Abir-Am and Elliot 1999). On these occasions, they generate and solidify a "myth of origin" (Abir-Am 1985), an "imagined past" (Wilson 2017) or a "folk history" (Shanley forthcoming). While myths and imagination invoke the impression that they distort reality (Badino 2017; Miller 2004), the concept of folk history acknowledges that the past is not an autonomous entity to be unearthed, but a way to give meaning to individuals and communities.

Shanley describes folk history as a simplified historical account, sometimes based on witnesses' experiences albeit not systematically verified. This account is generally accepted by the members of a specific community, who can use and adapt it for strategic purposes to subtly direct or justify (future) actions. Abir-Am (1982) further emphasises that "the real importance of collective public representations of science by scientists lies not so much in their content but in their systematic omissions" (p. 283). Folk histories and their omissions serve to generate disciplinary loyalties to specific technologies, theories or colleagues rather than others, to legitimise authority by obscuring the relation between "scientist-heroes" (p. 284) and female or student scientists and to offer moral guidance for scientific behaviour, identity formation and community building around a shared historical anchor.

To capture the folk history of contemplative science, I combine participant observation with document analysis. Ethnographies of conferences and scientific commemorations have shown that such ceremonies are an important site where "heroes" are celebrated, "myths" are codified and stories are shared to bind scientists together around a specific version of the

past (Abir-Am 1992; Egri 1992; Friese 2001; Henderson 2020; Mody 2012). Moreover, meeting ethnographies of scientific seminars and symposia have demonstrated that these events facilitate academic socialisation through which scientists come to recognise the values, beliefs and practices that a scientific community holds up to (Lomnitz 1983; Molyneux-Hodgson and Meyer 2009; Sandler and Thedvall 2017). Following these examples, I participated in contemplative science conferences, symposia and seminars from 2017 to 2021, including events commemorating Francisco Varela (Table 1). While previous anthropological and sociological studies of contemplative science conferences took place in the United States (Kucinskas 2019; Tresch 2013), most of the events I attended were located in Europe, where the field has been prospering since the early 2000s (Lutz et al. 2006). I triangulated my observations with contemplative scientists' published accounts of their field's history in documentaries, interviews, books, magazines and journal articles.

To reconstruct alternative histories of contemplative science that are omitted from its established narrative, I drew on scholarly literature by historians of science. As a full-fledged historiography of contemplative science has yet to be written, I focused on histories of adjacent fields like mind-body medicine (Harrington 2008b), biofeedback (Robbins 2000) and the neurosciences (Lysen 2020). A pitfall of this approach is the asymmetry between the analyst's trust in historical secondary sources and her scepticism vis-à-vis actors' memories and historical narratives shared at conferences, meetings, interviews and other published records. Yet, "such asymmetrical distribution [of trust] is indispensable to knowing anything at all" (Frankel and Abir-Am 1992, 358) since each explanation or interpretation depends on provisionally trusting a large body of 'facts' or 'understandings' inherited from past investigators. As each body of beliefs can be further deconstructed, I deem it the task of my historical ethnography to convince readers of the plausibility of alternative histories, rather than claiming them to be more trustworthy than the established folk history.

Table 1. Participation in contemplative science events for ethnographic research

Event	Year
European Summer Research Institute (ESRI)	2017, 2020, 2021
International Conference on Mindfulness (ICM)	2018, 2020
European Contemplative Science Symposium (CSS)	2019
Varela Symposium	2020
Mind & Life Contemplative Research Conference (CRC)	2020
National Symposium on Mindfulness	2020
European Mind & Life Retreat	2021
Mind-Brain-Mindfulness Seminars	2019–2021
Mind & Life Europe Friends webinars	2020–2021
Francisco & Friends Life webinars	2021
Ouroborus webinars	2021

2.3 Folk history of contemplative science

2.3.1 Francisco J. Varela: laboratory research on expert meditators

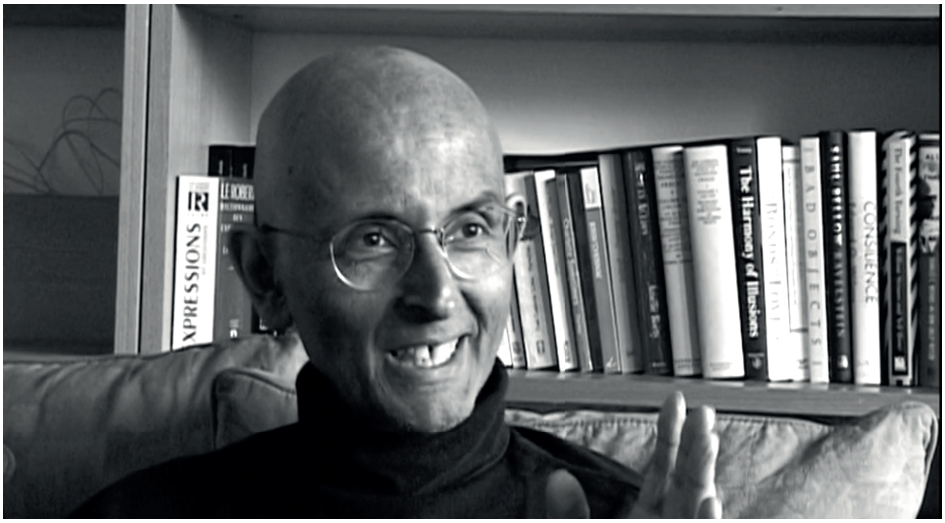

Figure 1. Francisco J. Varela in *Monte Grande – What is Life?*
Documentary produced by Reichle (2004).

> After sitting the entire day in a cross-legged position on a meditation cushion, I felt relieved to take a seat in the aula of the Frauenwörth Abbey for an award ceremony and documentary streaming. I was excited to find out who had received a Varela Grant named after the Chilean neuroscientist and contemplative practitioner Francisco J. Varela. The grants were awarded to young researchers who had promising ideas for furthering Varela's legacy: the examination of contemplative practices that combines first- and third person perspectives on the human mind and brain. As I had heard about Varela for the first time during the conference, I was curious about this 'visionary' – as he was frequently called by conference speakers and participants. Watching *Monte Grande,* a moving documentary about Varela's life and science, I was captivated by his vivid smile in scenes filmed during his illness and shortly before his death in 2001 (Figure 1). I also gained a first inkling of the history of contemplative science. (Vignette, ESRI 2017)

Varela's historical presence at ESRI provided conference participants with an ideal for their contemplative science identity. This identity was grounded in a shared value of openness to dialogue. In a CRC 2020 plenary panel on the origin of contemplative research, Varela's wife

Amy Cohen Varela recited his understanding of dialogue as a way to find underlying relations between different cultures, moral systems and knowledge traditions.

The first dialogue between the Dalai Lama and Western scientists in 1987 is often described as the birth of contemplative science and the Mind & Life Institute (Davidson and Harrington 2002; Harrington and Zajonc 2006; Hasenkamp and White 2017). The institute was founded by the Dalai Lama, Varela and the entrepreneur Adam Engele as a non-profit organisation. Today's vision of the institute is articulated in reference to its founding figures:

> When the Mind & Life Institute began over three decades ago, our founders envisioned a future where science and contemplative wisdom would come together to promote human flourishing . . . We're inspired not only by questions that drive scientific insight, but also by those that move people to greater compassion and action. (Mind & Life Institute 2020)

This double agenda combining epistemology and ethics is supposedly at the roots of the meetings between the Dalai Lama, Buddhist monks, scientists and other intellectuals.

While these meetings initially took place in a living room setting, they turned into increasingly publicised events disseminated through live streaming since 2003. Moreover, contemplative science conferences, known as Summer Research Institutes, have been held on an annual basis, typically at the Garrison Institute in New York since 2004, to build a community of contemplative scientists.[8] Four years later, the Mind & Life Institute split in two: the American organisation was separated from its European sister MLE. According to Antoine Lutz, MLE associate and former PhD student of Varela, one of the objectives of MLE's establishment was to ground contemplative science conferences and activities more firmly in Varela's original vision of dialogue (personal communication, November 8, 2019).

Varela's vision of dialogue was inspired by retreats he had attended in the 1970s at the Lindisfarne Association (Reichle 2004). Lindisfarne was a community first based in the state of New York and later Colorado, where people convened who were contemplative practitioners, intellectuals and those who combined both identities like Varela himself. When he joined the community as a scientist in residence in his early thirties, he was already a distinguished biologist with a PhD degree from Harvard. Besides Varela, by now leading figures in contemplative science, like psychologist Daniel Goleman, neuroscientists Richard Davidson and Clifford Saron, biologist Jon Kabat-Zinn and philosopher Evan Thompson, were among the mix. According to Thompson, their conversations at Lindisfarne were often circling around Varela's ideas to

8 https://www.mindandlife.org/events/summer-research-institute/

"revolutionise" science. Varela sought to expand neuroscience by including disciplined first-person investigations of experience cultivated through Buddhist contemplative practice to better understand how the brain works (Thompson 2004; Varela 1996).

Varela sought to further translate his interest into experimental research in the 1990s while he was setting up his laboratory at the University of Paris in France. After initial attempts to collaborate with Tibetan monks were thwarted by cross-cultural communicative difficulties (Houshmand et al. 2002), a study succeeded to produce remarkable results in the early 2000s. Lutz, Davidson and other scientists found that expert meditators with lifelong meditation experience produced a gamma brain activity while resting that was twenty-five times stronger than that of college students inexperienced in meditation (Lutz et al. 2004). To mark the study as a major breakthrough, an electroencephalogram of brain waves increasing in amplitude was printed on the cover page of Goleman and Davidson's (2017) popular science book *Altered Traits.* Davidson's by now most highly cited paper (Davidson et al. 2003), however, was published one year earlier with Jon Kabat-Zinn: the first randomised controlled clinical trial of mindfulness-based stress reduction.

2.3.2 Jon Kabat-Zinn: clinical trial research on mindfulness-based stress reduction

Figure 2. Jon Kabat-Zinn at ICM 2018
Photograph taken by Jason Gonzales at University of Amsterdam.

> I was surprised by the bustle in the entry hall of a university building in Amsterdam. People with conference badges huddled at bar tables, some were standing in line for coffee, ginger tea or cucumber water, and others were pinning their posters to panels. The urge to find my way through a crowded building to one of the seven parallel sessions reminded me that this was a scientific conference with a focus on clinical research and application, rather than a meditation retreat.
>
> On the second day, however, the conference got a contemplative flavour. Jon Kabat-Zinn was projected on a large screen (Figure 2) in a lecture hall where about 300 conference attendees had gathered to watch him over video live-stream. Although 74 years of age, he spoke clearly and forcefully when making appeals to the audience: to increase the rigour of mindfulness research, to bring mindfulness to society, to maintain a personal mindfulness practice and to pursue 'Buddhadharma' in all these activities. (Vignette, ICM 2018)

The subtle contradictions at the International Conference on Mindfulness (ICM) – coffee and cucumber water, hustle bustle and communal meditation, scientific rigour and quasi-religious preaching – reflect the interpretive flexibility that has permeated clinical research on meditation since its emergence.

The clinical branch of meditation research was instigated by Kabat-Zinn in the 1980s. After finishing his PhD in molecular biology at MIT, he had a "flash as to how meditation training could effectively be introduced into the mainstream of medicine" (Kabat-Zinn in Davidson et al. 2011) during a meditation retreat in 1979. Goleman and Davidson (2017) describe the episode as follows:

> On that retreat Jon had an insight, which he quickly wrote down on the back of an envelope . . . In his vision he realized that pain clinics are filled with people whose symptoms are excruciating and who can't escape the pain except through debilitating narcotics. He saw that the body scan and other mindfulness practices could help these patients uncouple the cognitive and emotional parts of their experience of pain from the pure sensation, a perceptual shift that can itself be a significant relief. (p. 84)

This was the birth of mindfulness-based stress reduction or MBSR. Shortly after, Kabat-Zinn opened a Stress Reduction Clinic at University of Massachusetts Medical School to introduce the programme to patients with chronic pain, illness or stress. In the classic documentary

Healing and the Mind (Wagner 1993), Kabat-Zinn is portrayed as an inspired and inspiring healthcare practitioner who conveys more to his patients than a simple technique.

Kabat-Zinn's success was not only of clinical but also of scientific nature. Historical sketches in scientific reviews of mindfulness often locate the origin of meditation research in the early 1980s coinciding with the development of MBSR as the dominant paradigm for clinical studies on meditation (e.g., Baer 2003; Loizzo 2014; Moulinet et al. 2018). Due to its standardised eight-week format, MBSR lends itself as a clinical intervention and has become the most widely tested meditation programme with more than 600 published studies in 2017 (Kabat-Zinn 2019). Such research was functional in implementing mindfulness-based programmes in hospitals. "If you want to be able integrate into medicine, you've got to be able to charge insurance companies for it," Kabat-Zinn (cited in Purser 2019, 66) stated at a conference on Buddhism in America in 1997 to explain his motivation for conducting randomised controlled clinical trials on MBSR.

Despite his ambition to bring meditation into evidence-based medicine, Kabat-Zinn has framed mindfulness as both scientific and spiritual. Although he had couched MBSR in secular language in *Full Catastrophe Living*, he published the book in 1990 with a preface by the prominent Zen teacher Thich Nhat Hanh. Four years later, he brought out his international bestseller *Wherever you go there you are* (1994), in which he makes the Buddhist roots of mindfulness explicit. Furthermore, he acknowledged in a magazine for Buddhist communities (Kabat-Zinn 1993) and later in outlets for academic audiences (Kabat-Zinn 2011) that there was no difference between 'Buddhadharma,' the teachings of the Buddha, and 'universal Dharma,' the lawful nature of the human mind and suffering captured in MBSR. With his ambiguous language – flexibly adapting to different audiences and making more room for allusions to Buddhism over time – Kabat-Zinn tried to find the "right vocabulary and the right framework . . . to reach many people at a heart level" (Kabat-Zinn in Davidson et al. 2011; see also Braun 2017). As meditation and Buddhism slowly lost their countercultural, New Age and mystic connotations, he became increasingly outspoken about the confluence of Buddhist dharma, medicine and science in meditation research.

2.3.3 Topoi of charismatic and rational authority

The folk history of contemplative science reconstructed in two branches – Varela's laboratory experiments on expert meditators and Kabat-Zinn's clinical trial research on mindfulness – touched upon *topoi* of authority. *Topoi* are commonplaces, relatively stable themes common to audiences and authors who deploy and adapt them according to occasion for rhetorical purposes (Walsh 2013). Some well-known *topoi* of charismatic authority – (1) extraordinary features of body and face, (2) exceptional manners of working and living, (3) visionary ideas and (4) moral guidance – are revisited above. Inspired by Walsh's (2013) and Hamilton's (2017)

analyses of charismatic scientists, I show that the purported persona of Varela and Kabat-Zinn express the convolution of these *topoi* of charisma with rational authority.

First, both scientists were captivating speakers whose power of mind appeared as elevated by the fragility of their bodies resulting from old age or imminent death (Shapin 1998). Second, both were not only long-term meditation practitioners, but also highly productive, influential scientists with degrees from and positions at prestigious universities. Their work and life were shaped by efforts to navigate their "hybrid role identity" (O'Kane et al. 2020) merging a contemplative with a scientific self. Third, their experience in meditation fuelled their original ideas: Varela's vision to revolutionise the cognitive sciences through a combination of first- and third-person approaches and Kabat-Zinn's inspiration to treat chronic conditions by separating the experience of pain from its cognitive-emotional overlays. Fourth, their research was entangled with the moral aspiration to alleviate suffering and promote human flourishing. Varela sought to create spaces for open dialogue in which opposing viewpoints, approaches to knowledge and political positions could find common ground. Kabat-Zinn aimed to disseminate mindfulness in society to improve health and well-being by generating evidence for the positive effects of meditation through clinical trials.

The blend of Kabat-Zinn's and Varela's scientific persona with *topoi* of charisma could be interpreted in light of Porter's (1995) understanding of expert authority. Porter proposes that expert communities endorse rational procedures as a source of authority whenever the legitimacy of expert consensus becomes vulnerable. Accordingly, rational authority underpinned by publications in respectable journals and scientific credentials has helped establish contemplative science as a legitimate field of research. Within the contemplative science community, however, foregrounding the mesmerising qualities of historical figures like Varela and Kabat-Zinn fosters social cohesion. Although the folk history spun around these figures is only one reason why researchers feel attracted to contemplative science among several others (e.g., epistemic and contemplative interests, the recent 'hype' around mindfulness and careerist ambitions), it helps interpret the Janus-faced nature of contemplative science. As charisma rallies 'insiders' while rationality persuades 'outsiders,' contemplative science looks into two directions at once, and is thus imbued with antinomies and tensions. In the following, I show how the rational-charismatic Janus face is inverted in the alternative histories of meditation research that are absent or explicitly demarcated from the official narrative of contemplative science.

2.4 Alternative histories of meditation research

2.4.1 The Greens' groovy biofeedback research

Although historical sections in scientific reviews of meditation research reference studies on contemplative practices in the 1960s and early 1970s in passing (e.g., Lutz et al. 2006; Loizzo 2014), this period does not feature prominently in the folk history of contemplative science. This is surprising since during that time first EEG-biofeedback experiments were conducted on meditating yogis. Biofeedback attracted public attention through reports in popular magazines and documentary films, and is today remembered in books and articles on the history of neurofeedback (Brenninkmeijer 2013).

At the centre of these historical accounts are Elmer Green, an applied physicist, and his wife Alyce, a trained psychologist. They were best known for their 1974 research expedition to India (ibid.). Equipped with a portable laboratory, they made physiological recordings of yogis controlling their heart rate, body temperature and brain activity. Their findings demonstrated that humans undergoing extensive training could attain volitional physiological control, which substantiated the biofeedback research they had been doing since 1964 at the Menninger Clinic in Kansas. They had tried to teach self-regulatory skills to ordinary people by monitoring physiological changes and feeding them back to volunteers for greater self-awareness (Parks et al. 2020).

The Greens' research was motivated by their long-term meditative practice. They discovered that whenever Elmer slipped into a meditative state, his EEG displayed in low-frequency theta brain waves. After conducting further research on theta, they claimed that it was associated with an enhanced state of well-being through the quieting of body, emotions and thought (Robbins 2000). Informed by their observation that every change in mental-emotional state was accompanied by a physiological change and vice versa, they envisioned "a science in which mind and matter were not forever separate" (Green and Green 1977, 13).

Their visionary science was intertwined with their socio-political convictions, which became evident in their work's emphasis on volition. Their understanding of volition referred to people's freedom to wilfully choose a mental-physiological state. According to Hartman (2016), the training of volition was of societal relevance for the Greens, since they considered it as a "vital response to a pervasive social dependence on top-down systems of governance" (p. 10). They believed that through the combination of biofeedback technology and meditative practices, ordinary people could learn to take responsibility for their own health and free themselves from a patronising political system.

This sketch of the Greens' work and life highlights that, similar to Varela and Kabat-Zinn, their scientific personae merged with charismatic features: their hybrid role identity combined meditative practice with scientific ambitions, they had non-mainstream ideas about the relation between mind and matter, and their research extended into political philosophy. Although their research in India was widely publicised through the documentary *Biofeedback: Yoga of the West* (Hartley and Hartley, 1975), which reproduced East-West clichés similar to those pervading meetings between the Dalai Lama and Varela, they are not remembered as early forerunners of contemplative science (for an exception see Edwards 2011). A reason may be that "biofeedback had a New Age whiff about it" (Robbins 2000, 6) and that the Greens associated their research with transpersonal psychology (Hartman 2016), sometimes considered as a New Age trend (Sutcliffe 2003). As such, the Greens' biofeedback research could be considered as part of the 1960s "groovy sciences" (Kaiser and McCray 2016) that had a countercultural air around them.

Contemplative scientists have downplayed their relations to the counterculture to gain scientific legitimacy for meditation. As mindfulness researchers like Kabat-Zinn have aimed to introduce meditation practice into established institutions, like hospitals, schools and governments, an association with countercultural revolutionary ideas could harm their cause (Kucinskas 2019). Therefore, Davidson, Goleman and Varela made careers in mainstream science before they came "out of the closet" (Davidson et al. 2011; Varela 2000) with their interest in Buddhism in the 1990s, when countercultural stereotypes slowly started to fade (Turner 2008). As contemplative science has constantly faced the risk of being identified with the New Age wing of the American counterculture, it has taken distance from its history in biofeedback research. In the case of the Greens, the charismatic-rational Janus face is not constitutive of contemplative science's reenchantment, but threatens its project with too much grooviness.

2.4.2 Benson's disenchanted relaxation response

Another biofeedback researcher who has not come to play a major role in the folk history of contemplative science is the cardiologist Prof. Herbert Benson. He has not been part of commemoration practices at contemplative science conferences and Goleman and Davidson (2017), in retelling the history of the field, mention him only briefly. His relative absence from the origin story of contemplative science in comparison to Kabat-Zinn and Varela is salient because their research careers appear alike.

Similar to Varela, Benson was keen on meeting the Dalai Lama. In 1979, eight years before the first Mind & Life Dialogue, the opportunity arose when the Dalai Lama came for a visit to Harvard. On that occasion, Benson told him about his interest in studying "g'Tum-mo" or "inner heat meditation" during which experienced Tibetan meditators upregulated their thermal production to burn defilements of improper thinking (Benson 1991, 42). Several months later, Benson received a letter from the Dalai Lama inviting him to study g'Tum-

mo practitioners near Dharamsala. Benson completed the research project with a *Nature* publication reporting that these practitioners had increased the temperature of their fingers and toes by 8.3 °C (Benson et al. 1982).

Benson's research on g'Tum-mo supported his clinical interest in studying the possibility that meditation, conditioning techniques and biofeedback could lead to striking changes in the body and treat stress-related illnesses. After training patients with hypertension to lower their blood pressure through biofeedback (Benson et al. 1971), he conducted research on young meditators. He observed that their blood pressure, metabolism, breathing rate and brain wave frequency rate decreased when they performed mantra meditation in comparison to a state of quiet repose (Wallace and Benson 1972). He interpreted the result as the systematic reversal of the stress-induced fight-or-flight response, which he eventually called Relaxation Response (RR) in a best-selling book (Benson 1975).

By the 1990s, the RR technique had been incorporated into modern medicine as a recommended therapy for hypertension, chronic pain, depression and other conditions (Benson 1991). Just like Kabat-Zinn, Benson had brought meditation into the clinic by authoring more than 190 scientific publications and by founding an Institute for Mind Body Medicine at the Massachusetts General Hospital (Benson 2019). Although both researchers are considered as having laid the foundation for meditation's proliferation in Western medicine (Horowitz 1999; Langer and Ngnoumen 2018), contemplative scientists are vocal about Kabat-Zinn's contributions but remain rather silent on Benson.

My interpretation of Benson's relative absence from the folk history of contemplative science is twofold: he lacks charismatic authority and curtailed his rational authority by making the 'wrong' allies. Benson has always presented the RR in strictly secular terms. To evoke it, one should sit quietly and relax the body, breathe slowly and repeat a word, sound or prayer, while disregarding other thoughts. As "it is not religion per se, it is what the person believes in" (Benson 1997), one could choose to repeat "*Ave Maria,*" "*Om,*" "Peace & Harmony" or any other phrase. Benson's descriptions do not only allude to the placebo effect, but also compare the RR to daily exercise (Benson 2019). In this way, he could maintain an allure of objectivity, although he had himself started practicing the RR technique to relieve age-related aches. In contrast to Varela and Kabat-Zinn, Benson does not display a contemplative-scientific hybrid role identity and his language has remained plainly secular over the years. His authority has been purely rational.

In the eyes of contemplative scientists, however, his rational authority may have looked damaged due to his research history. The study that helped Benson coin the RR was conducted with practitioners of Transcendental Meditation (TM). TM's spiritual leader, Maharishi

Mahesh Yogi, had advertised his mantra meditation as celebrities' favoured path to psychedelic bliss, with iconic images of the Beatles at his ashram (Wonfor and Smeaton, 1995), before searching for scientific legitimacy. Although TM produced what some call the "the first large wave of scientific studies on meditation's effects" (Farias and Wikholm 2015, 48) in the 1970s with hundreds of studies paving the way for a second wave on mindfulness thirty years later, contemplative scientists refuse such lineage. After TM had attracted negative attention for court cases, exaggerated claims and conflicts of interest, scientists tended to dismiss TM research as 'pseudoscience' (Tøllefsen 2014). To avoid such labelling of their own meditation research, contemplative scientists have "attempted to do this work in a way that's different than in the seventies with the TM people" (Davidson cited in Kucinskas 2019, 81). They carefully focused their research on empirical rather than metaphysical questions and made great efforts not to overgeneralise results. They also excluded any links to TM in contemplative science's history, like Benson's research on the RR.

2.5 History as a repertoire of justification work

Having demonstrated how history is constructed to perform, tell and write an origin story of contemplative science that bolsters its charismatic-rational authority, I now examine how scientists deploy the past strategically to fend off critical backlashes. Contemplative scientists have been criticised, among others, for claiming authority to speak about meditation despite methodological limitations of meditation studies (Van Dam et al. 2018), and for advancing the commodification and militarisation of meditative practices (Purser 2019). In the last decade, reporters, social scholars, Buddhist meditators and contemplative scientists alike have reacted with critical scrutiny to the exponential growth of peer-reviewed articles on mindfulness and the application of mindfulness practices in nearly every sector of society. In a recent special issue on mindfulness, contemplative scientists Bernstein et al. (2019) emphasise that "critical perspectives and questions have not fallen on deaf ears. Many scholars, scientists and practitioners have been and continue to grapple with these challenges" (p. vii). I analyse the repertoires that contemplative researchers have developed to respond to such challenges. The analysis identifies regimes of valuation – social responsibility, contemplative values in science, diversity and inclusivity – and directs attention to their historical nature. It reveals how they make references to Varela and Kabat-Zinn for the purpose of justification work, while, at the same time, reproducing contemplative science's enchanting qualities.

2.5.1 Social responsibility

An early, far-reaching socio-cultural critique of meditation's scientific framing in programmes like MBSR was put forward by the professor of business and Zen Buddhist teacher Ronald Purser. He published a blog post on *Huffington Post* (Purser and Loy 2013) that went viral

and fed into his book *McMindfulness* (2019). He warns that uncoupling mindfulness from its Buddhist roots could reduce the practice to an attention training amenable to ethically dubious ends, for example in the military or corporate business. He further invokes Žižek's (2001) critique of mindfulness as a Marxist opiate that smoothes the functioning of global capitalism by lowering employees' stress levels just enough that they are deflected from structural injustices. Contemplative scientists are accused of being complicit in the dissemination of corporate mindfulness by purporting to show that mindfulness enhances productivity at work.

Critiques like Purser's have given rise to expressions of commitment to social responsibility in contemplative science, which often invoke Kabat-Zinn's socio-ethical conception of mindfulness. A response to Purser's book issued by the Centre for Mindfulness Studies in Toronto points out that Kabat-Zinn "designed the 8-week MBSR program to help those with chronic illness and *pain*, not just stress . . . These contexts drove its rising popularity, not corporate or capitalist adoption" (MacPherson and Rockman 2019). It is further suggested that Purser fails to recognise the "real problem of mental illness" (ibid.) which obstructs people from advocating for corporate justice. Mindfulness is not an opiate, but instead enables people to take responsibility for social change. The moral vision of healing society through healing the self, famously encapsulated in Kabat-Zinn's (2005) description of meditation as a "radical act of sanity" (p. 8; see also Kabat-Zinn 2010, 2019), is the underlying thread of the response to Purser.

Kabat-Zinn's vision has been further reiterated in written responses to the McMindfulness critique (Repetti 2016; Willmott 2018), in interviews with contemplative researchers (Davidson 2020; Thompson 2020b) and at conferences. MLE conferences addressed the climate crisis, political conflicts and social injustices under themes, such as "Beyond Confines: Integrating Science, Consciousness and Society" (CSS 2019) and "Care for life: Enacting knowledge in an interdependent and uncertain world" (ESRI 2021). Calls to go beyond the confines of the individual and to recognise interdependencies are reminiscent of Kabat-Zinn's (2004) emphasis on the links between the self, society and the planet (p. 14). Keynote lectures were given by speakers with a background in party politics, activism and economics whose personal stories and political agendas grounded solutions to grand challenges in cultivating virtuous qualities through contemplative practice. Implicit and explicit allusions to Kabat-Zinn's socio-ethical conception of mindfulness are embedded in their justifications against McMindfulness critics.

2.5.2 Contemplative values in science

After the McMindfulness critique had been raised mainly by social scholars and Buddhist practitioners from without the contemplative science community, scientists held the proverbial mirror up to themselves. While Tresch's (2013) ethnographic study of the first American Mind & Life Summer Research Institutes indicates that a conflict between contemplative values

and scientific life has occupied contemplative scientists since the 2000s, I observed it gain momentum in the last three years in Europe. Former physicist Wolfgang Lukas, for example, had relentlessly tried for years to spread his proposal for a "mindful research culture" at annual ESRI events. He had not gained much attention until ESRI 2020 where his proposal sparked vibrant discussions (Lukas, 2020). In these discussions, Tania Singer, a prominent contemplative scientist who hit the headlines as the "The World's Top Empathy Researcher Revealed as a Bully" (Heaney 2018), was recurringly referred to. She appeared to embody the paradox of contemplative scientists who do not 'practice what they preach.'

Attempts to address this paradox have often framed the integration of contemplative values in science as a problem of individual integrity to which solutions can be found in contemplative science's history. For instance, MLE developed value cards intended for use during meetings, conferences and everyday work to reconnect to the "heritage and founding principles" of the institute.[9] Each card is decorated with an icon and a quote by Varela expressing the meaning of values like "take care" and "stimulate dialogue." Similar appeals to Varela for moral guidance were made at the MLE retreat 2021 which aimed to support contemplative scientists in giving space to their contemplative as well as professional practice. Retreat participants were suggested to read an interview with Varela (2000), in which he described his attempts to never lose sight of the purpose of his research, contemplating whether he was motivated by the pursuit of fame and glory or his wonderment about life and the intention to alleviate its inherent suffering. In support of such contemplations, scientists following Varela's legacy, like Lutz and Davidson, have encouraged meditation practice during workdays and have sent their teams to meditation retreats. The moral message derived from history seemed to be that 'practice what you preach' meant first and foremost 'contemplate your values on the cushion.'

2.5.3 Diversity and inclusivity

A critique raised both within and without the community marks the exclusive character of contemplative science. Sociologist Kucinskas (2019) notes: "For a movement inspired and motivated by democratic aspirations, progressive politics . . . and spiritual liberation for all, it is striking how the contemplative base was composed of such a privileged homogenous, group of people" (p. 193). In recognising that to pass as a 'contemplative scientist' one has to be both a high-achieving researcher and a dedicated meditation practitioner, participants in contemplative science events have become increasingly critical of the label. While some dislike that it excludes researchers who study contemplation but do not work in the 'hard sciences,' such as psychology, religious studies and anthropology (Komjathy 2018), others are sceptical of the qualifier 'contemplative.' In contemplative science's definition of contemplation, Thompson (2020a) recognises "Buddhist exceptionalism" (p. 1). He observed the development

9 https://www.mindandlife-europe.org/about-us/mle-values/

of an "in-group/ out-group structure" in the 2000s, which sidelined people who criticised the "special treatment" given to Buddhism (p. 12). Buddhist meditation has come to be considered as superior to other forms of contemplation in that it provides access to the fundamental nature of the mind, which puts it in a privileged position to work with the neurosciences.

Although Thompson had himself defended that view in *The Embodied Mind* (Varela et al. 1991), he wrote in the introduction of its revised edition:

> [W]hen I reread the book now, I cannot help but see it as limited by several shortcomings, ones that have become increasingly apparent to me over the years and that we need to leave behind in order to advance the vision and project of this book. (Thompson 2016, xxii)

Thompson has come to consider meditation, just as any other form of contemplation, as a ritual whose experience is as much shaped by social context as it reveals the inner domain. For him, the idea that Buddhist meditation is closer to direct experience than other forms of contemplation, which deeply informed Varela's thinking, is misguided. In taking distance from Varela, Thompson establishes himself as a reflexive participant in the past. His take on *The Embodied Mind*, rejecting some while confirming other parts, helps him stress the sustained relevance of the book's overarching vision: Varela's idea of inclusive, cross-cultural dialogue.

In reference to this conception of dialogue, diversity and inclusivity have been performed as central aspirations of contemplative science conferences. Conferences were organised under the themes "mindfulness teachings around the world" (ICM 2020) and "diversity and equality" (ICM 2021) with keynote speakers from countries in the Global South, including Colombia, Iran, Israel, South Africa, to name but a few. At ICM 2020, discussions on spiritual healing following Ubuntu philosophy, Muslim Ramadan and Jewish prayer emphasised their fundamental equality with mindfulness. One could consider such conference discussions as enactments of Varela's conception of dialogue, exposing relations across differences. The revival of the past in the turn to diversity and inclusivity performs justification work in response to critiques of Buddhist exceptionalism in contemplative science. At the same time, the appeal to Varela for moral guidance bestows contemplative science with deeper meaning, purpose and moral vocation.

2.6 Conclusion

The analysis above reveals that contemplative science could be understood as a case of reenchanted science. The case study advances the scholarship on modern enchantment by

moving from historiography (Castle 1995; Daston and Park 1998; Landy and Saler 2009) to historical ethnography. Through a combination of participant observation and document analysis, I examine how scientists and scholars involved in contemplative science narrate and perform their field's history as a project of reenchantment. Their folk history and its eluded alternatives are "partial connections" (Strathern 2005) that hold together seemingly incommensurable accounts of the world (De La Cadena and Blaser 2018; Ellis 2011; Verran 2001). Contemplative scientists make recourse to history to inspire enchantment through charismatic founding figures in a way that is compatible with those tenets of modernity usually seen as disenchanting the world, here rational authority.

The study further contributes to STS literature on charismatic scientists. In line with Weber's description of charismatic authority as a revolutionary force, charismatic scientists have been shown to dwell outside established institutions (Hamilton 2017) or to take on transitory leadership (MacKenzie and Elzen 1996). Other scholars find that charismatic authority thrives within modern scientific institutions (Lengwiler 2006; Thorpe and Shapin 2000). What both interpretations of charisma have in common is that they consider it to be contingent on normative uncertainty – either due to the absence of established procedures in revolutionary times or created by tightly structured organisations, in which situational, local courses of action are vouched for by someone. The case study on contemplative science, by contrast, highlights that charisma can function as a glue attaching individuals to a community of researchers. In conveying the impression that one could become as spiritually profound and academically successful as contemplative science's charismatic founders, the contemplative science community instils a powerful desire to belong. While I focus on the charisma of Varela and Kabat-Zinn because they feature most prominently in the folk history of contemplative science, future research could inquire into the role of other leading figures, for instance Davidson and Lutz, in strengthening communal ties and attracting novices to meditation research.

Furthermore, the reconstruction of folk history allows us to better understand how historical repertoires are mobilised to defend science against critics and to create moral obligations in the present. The analysis of regimes of valuation in response to socio-ethical critiques of contemplative science illuminates that appeals to past visions and moral ideals do not only perform reenchantment, but also justification work. Enacting allegiances to a particular version of the past creates obligations through the articulation of a moral indebtedness of 'descendants' to their 'ancestors.' Tracing these allegiances opens up contemplative scientists' regimes of valuation to scrutiny. For example, presenting Varela's soul-searching contemplations on the meditation cushion as a path to 'practice what you preach' may divert attention from structural violence in academia to individual responsibility. In foregrounding such examples, I intend to prompt socio-ethical reflexivity within contemplative science.

I also seek to promote reflexivity about contemplative science's present by shedding light on historical figures expelled from its official historical narrative. Attributing the omission of the Greens to their countercultural accent may help explain why relations between contemplative science and other sciences with a groovy past, such as research on psychedelics (McCray 2016), have remained rather obscure until today. In light of the "modern renaissance of psychedelic research" (Pollan 2018, 24), psychedelics are often talked about over dinner at contemplative science events, but only seldomly appear in scientific presentations and have neither made it into conference themes nor keynotes. Future research could further examine and interpret the hidden or refuted connections between contemplative science and research on psychedelics (Langlitz 2013), psychoanalysis (Harrington and Dunne 2015) and cybernetics (Pickering 2010). This sort of analysis could also be fruitful for other academic fields. A case in point is Shanley's (2021) alternative historiography of R(R)I communities, which highlights interlinkages with largely forgotten elements in the history of STS.

Finally, I suggest to not only investigate why certain alternative histories fall into oblivion, but also what renders the official narrative so powerful in building a contemplative science community. Whereas sceptics of Weber's disenchantment thesis wonder why it has been so compelling in the West (Saler 2006, 693), I propose to specify the question and ask: Why is the reenchantment narrative so powerful in areas like the brain sciences, where disenchantment seems to be realised most industriously? Although this question goes beyond the scope of this case study, I draw on Harrington (2008a) and McMahan (2010) in formulating a tentative hypothesis: reenchantment may be most vigorously sought after in epistemic cultures where science and technology drastically threaten to subvert what many of us hold dear: moral virtues, free will and experiences of transcendental significance. It might be easier to translate agency and experience into neural activation patterns if there is room left for inexplicable, mysterious aspects of our subjectivity.

INTERLUDE I

The sections inserted between the empirical chapters are referred to as 'interludes,' an expression used in entertainment contexts to denote an intervening period of time in theatre, dance or musical performance. Whereas intervals or intermissions refer to pauses or breaks between parts of a performance, when the audience meets for a drink at the bar of the opera house, interludes fill these breaks with bits of music or short dance acts. Although interludes sometimes serve the purpose of temporary amusement or diversion, they can also create transitions between parts of a performance, reminding the audience where the performance has come from and where it goes next. This is how I use them in the context of this dissertation: the interludes are supposed to help readers transit from one chapter to the next by sketching a map of the thesis and providing signposts. As the chapters zoom quite closely into theoretical frameworks and hopefully absorb readers into the empirical material, it might be difficult at times to relate all the details back to the overarching research questions and objectives. The interludes help explicate how all the bits and pieces are integrated in a larger whole. For this purpose, they sharpen theoretical concepts, include methodological reflections or add relevant empirical information. In this way, the interludes support readers in zooming out to understand each empirical chapter in the larger context of the thesis project and in relation to the following chapters.

The first interlude elucidates how some of the sites visited for this thesis project hang together and how they relate to contemplative science. As a multi-sited ethnographer, I visited different places where contemplative science is conducted, exchanged and communicated. The guiding question connecting the exploration of these sites is an inquiry into practices of valuation. Chapter 2 focused on the community level, examining how proponents of contemplative science – researchers studying meditation from different disciplinary perspectives and institutions supporting such investigations – valorised meditation research as a project of reenchantment. Proponents made recourse to historical repertoires to justify contemplative science as ethically benevolent in the face of socio-ethical critiques. They performed valuation work by combining charismatic and rational authority in the portrayal of contemplative science's founding figures. Valuation work further entailed the mobilisation of regimes of valuation which alluded to values embedded in contemplative science's official history: social responsibility, contemplative values in science, diversity and inclusivity. Historical narrations and performances achieved valuation work at the community level: at contemplative science conferences, meetings and other events where the past was commemorated, and in published accounts of the field's history. Chapter 3 introduces a shift from the past to the present and from the community to the laboratory level. It explores how knowledge-making practices on the laboratory floor are related to scientific norms of good research on meditation in a present-day research project: the Silver Santé Study.

Shedding light on the history of contemplative science in the second chapter helps contextualise the Silver Santé Study. The reconstruction of the folk history of contemplative science divides the field into two branches: experimental laboratory research associated with the work by Francisco J. Varela and clinical trial research initiated by Jon Kabat-Zinn. These two branches are, however, not strictly separated in research practice as the Silver Santé Study reveals. At first glance, the Silver Santé Study seems to belong to the second branch because it involves a randomised controlled clinical trial investigating the effects of a mindfulness and compassion meditation intervention on healthy ageing and well-being in elderly participants inexperienced in meditation. This classification is supported by Silver Santé researchers' historical contextualisation of the study. For example, in a review article on meditation and ageing, Moulinet et al. (2018) present Kabat-Zinn's development of the standardised MBSR programme and clinical trials on the impacts of MBSR first in patients and later in non-clinical populations as the origin of Western scientific, secular meditation research. Against this historical backdrop, the authors introduce the Silver Santé Study as a lifestyle intervention clinical trial, which contributes to the emerging body of biomedical studies on the effects of meditation on the ageing brain.

A second glance reveals that the Silver Santé Study also involves experimental laboratory research that appears to follow Varela's ambition to rethink scientific investigation through inspirations from meditative experience and Buddhist philosophy. Besides an interventional clinical trial,

the Silver Santé Study also includes an observational clinical trial with a group of long-term experienced meditators undergoing the same battery of study examinations as the novice meditators mentioned above. Chapter 3 shows that the contemplative first-person experience of so-called "expert meditators" fed into the refinement of scientific conceptualisations and measurement tools. Meditation was used to render the study of the brain more precise and culturally sensitive. The chapter thus reveals that two versions of meditation (meditation as a lifestyle intervention in clinical trial research and meditation as disciplined, first-person inquiry) are combined in the Silver Santé Study. It further highlights tensions between them by analysing how divergent knowledge-making practices (assessing the health benefits of meditation versus expanding our understanding of how the brain works through meditative explorations of experience) relate to seemingly contradictory values (objectivity versus trained judgement).

Despite this diversity in knowledge-making practices, chapter 3 frames the Silver Santé Study as a lifestyle intervention clinical trial and embeds its analysis in STS literature on the social dimensions of clinical trial research. A reason is that both clinical trials – the one with expert meditators and the one with novice meditators – investigate how meditation affects the ageing process. The Silver Santé Study is not a study on meditation per se, but on meditation in the context of healthy ageing. The aim is to study the potential of meditation to retain mental health and well-being at old age, for instance by reducing adverse factors (e.g., stress, depression, anxiety, sleep disturbances) as well as preserving brain structure and function from age-related decline and risk of Alzheimer's disease (AD). For a multimodal examination of well-being and health in older adults, experts in research on meditation, lifestyle, attention, cognition, well-being, emotion and biomarkers (neuroimaging, ageing and AD) are brought together in a European consortium. The expert group which hosted me for ethnographic fieldwork and engagement research was Gaël Chételat's team sponsored by Inserm, the French National Institute of Health and Medical Research. As Gaël Chételat is the scientific coordinator of the Silver Santé Study, her team took on most responsibilities for the study. The team initiated the study, has conducted the aforementioned clinical trials, coordinates collaborations in the consortium and includes experts in charge of data analysis related to biomarker and lifestyle research.

As Chételat's team members are experts in neuroimaging and neuropsychological research on AD, mental health and well-being in the ageing population, they study meditation in the context of ageing research, rather than contemplative science. This clinical framing of meditation in the Silver Santé Study also stems from the European Commission Horizon 2020 call on "promoting mental wellbeing in the ageing population"[10] in response to which

10 https://cordis.europa.eu/programme/id/H2020_PHC-22-2015

the study was designed. Accordingly, the study focuses more on mental health and well-being in ageing than on understanding the neurophysiological and mental processes of meditation. Meditation is studied as a lifestyle intervention, just like learning a foreign language, which is why it seems obvious that I present the study as an instance of a lifestyle intervention clinical trial in chapter 3.

Yet, I argue that the Silver Santé Study can also be considered as a bona fide example of contemplative science. Antoine Lutz, member of the Silver Santé European consortium and an internationally prominent contemplative scientist, recommended me to join the study as a laboratory ethnographer after I told him about my intention to investigate ethics practices in contemplative science. I had met him at contemplative science conferences, where I noticed that the Silver Santé Study was well-known in the contemplative science community and sometimes referred to as "cutting-edge meditation research." Gaël Chételat attended the European Summer Research Institute 2016 where she presented the study to the contemplative science community (Cohen Varela and Tideman 2016). Since the launch of the study, she has given ever more university lectures and conference presentations on meditation research. As the Silver Santé Study gains increasing popularity in the contemplative science community, Chételat receives a growing number of applications from students and early-career researchers who would like to join her team to investigate meditation.

As I observed some variability in how the Silver Santé Study was framed and perceived – both as a contemplative science project and as a lifestyle intervention clinical trial on healthy ageing – I also flexibly adapted the framing of the Silver Santé Study to the target audiences and objectives of my scholarly writing. The framing of the study in chapter 3 is partly indebted to the aims and scope of the journal *BioSocieties* where the chapter was published. *BioSocieties* is committed to the scholarly exploration of social, ethical and policy implications of developments in the life sciences and biomedicine. A relatively large body of literature published in the journal discusses frictions between standardisation in evidence-based medicine and personalisation of behavioural study interventions. Chapter 3 seeks to contribute to these discussions by analysing how clinical researchers negotiate seemingly incommensurable scientific norms of good clinical trial research to produce robust evidence.

Chapter 3

Making epistemic goods compatible: knowledge-making practices in a lifestyle intervention RCT on mindfulness and compassion meditation

3.1 Introduction

Clinical research is currently shaped by the convergence of two turns (Winther and Hillersdal 2020). On the one hand, a turn towards standardisation and objectivity has placed the randomised controlled clinical trial or, in short, RCT at the top of the knowledge hierarchy in evidence-based medicine (Knaapen 2014). On the other hand, a turn towards prevention has given rise to a growing number of studies on behavioural interventions that encourage healthy participants to adopt different lifestyles (Holman et al. 2018). These turns sit uncomfortably together because behavioural interventions are by default less likely to be tested and less likely to be proven effective in RCTs in comparison to pharmacological interventions (Lambert 2006). One of the reasons is that RCTs are designed to identify the efficacy of a specific intervention under highly standardised, controlled and monitored conditions that separate the intervention from external influences. Standardisation is particularly complicated in behavioural intervention trials, because these interventions rely on a mix of people, skills, devices, activities, processes and environments (Wells et al. 2012). Whether a behavioural intervention works, depends to a high degree on its adaptation to contexts of implementation (Cohn and Lynch 2017).

A solid body of literature in STS on interventions involving medical drugs or devices has shown that the successful completion of a trial – one that is actually able to recruit participants and gather outcome data – depends on the alignment of standardised protocols with already existing practices in local settings (Berg 1998; Hauskeller et al., 2019; Hogle 1995; Jonvallen 2005; Keating and Cambrosio 2007; Timmermans and Berg 2003; Webster et al. 2011; Will and Moreira 2010). Behavioural lifestyle interventions have received less attention, but a few studies reveal that socio-material contexts (e.g., care practices, social relations, study equipment, infrastructures) and study participants (e.g., motivation, meaning-making, affect) shape clinical trial research processes and results (Cohn and Lynch 2017; Jespersen et al. 2014; Rogers et al. 2005; Wolters et al. 2020). Accordingly, mixed-methods approaches have been developed to improve study designs and evaluations through qualitative research (Mannell and Davis 2019). Although there is a growing trend towards more flexible, adaptive and ecological designs (Bonell et al. 2012; Montgomery 2016; Ong et al. 2014), the classic RCT remains the dominant approach to investigate the efficacy of lifestyle interventions (Green and Kolar 2015; Holman et al. 2018).

I contribute to STS research on clinical trials by shedding light on the knowledge-making practices in a lifestyle intervention RCT. My research builds on previous studies in the fields of disease prevention and public health that analyse how clinical trial researchers carefully negotiate between seemingly contradictory scientific norms – methodological purity on the one hand and feasibility on the other – to create what they consider as robust evidence (Rod

et al. 2014; Will 2007; Winther and Hillersdal 2020). To expand on these analyses, I examine how knowledge-making practices in an RCT on mindfulness and compassion meditation are related to multiple scientific norms and how researchers engage with tensions between these practices. An RCT on meditation is a relevant case because meditation has become an increasingly popular and contested lifestyle intervention over the last two decades (Gotink et al. 2015; Van Dam et al. 2018). While some scientists and clinicians see RCT research as an opportunity to strengthen the therapeutic legitimacy of mindfulness (e.g., Kabat-Zinn 2011), others take the view that a rigid RCT design is too restricted to capture the processes underpinning the complex effects that meditation may have on the human body and mind (e.g., Lutz et al. 2015).

To study practices of doing good clinical trial research on meditation, I conducted praxiographic research from 2017 to 2020 in the Age-Well clinical trial, which is part of the Silver Santé Study. The Silver Santé Study, also known as Medit-Ageing among researchers, is a European Horizon 2020 project that combines two study protocols: SCD-Well and Age-Well (Figure 3). Age-Well is a three-armed RCT with 137 study participants conducted in the city of Caen in France. It compares the effects of an 18-month meditation intervention with a foreign language (English) training intervention – hereafter abbreviated to 'English intervention' – and a passive control group on mental health and well-being in older adults (Poisnel et al. 2018). Moreover, the trial includes a group of 30 long-term meditators who undergo the same battery of study examinations as the older adults. Comparing "novice" with "expert" meditators (Lutz et al. 2018, 759) helps to understand the mechanisms underlying meditation that are assessed with cognitive, behavioural, biological, neuroimaging and sleep examinations.

My case study seeks to answer the following research questions: How are knowledge-making practices enacted in the Age-Well trial of the Silver Santé Study? How are these practices related to scientific norms of good clinical research on meditation? Which strategies do Silver Santé researchers deploy to resolve tensions between different knowledge-making practices? To answer these questions, I introduce the concept of 'epistemic goods' by combining Pols's (2015) approach to empirical ethics with Daston and Galison's (2017) understanding of "epistemic virtues" (p. 39). In performing epistemic goods, research teams enact norms of doing good research. The verb 'to enact' highlights that what counts as good research is constituted in and through its practical accomplishment (Mol 2002). I identified multiple epistemic goods in the Age-Well clinical trial and traced contradictions between them: internal validity and feasibility, assessing efficacy and attending to qualitative effects, objectivity and trained judgement. Although these paired epistemic goods are not necessarily incompatible, tensions occurred between them in research practice and occasionally gave rise to debates within the Silver Santé team about how to resolve these tensions.

For this purpose, Silver Santé researchers deployed different strategies: reinterpreting the study protocol, caring informally while playing by formal rules and adjusting the procedure of a study task. A strategy does not imply a pre-defined plan to reach a certain goal under conditions of uncertainty, but is here analysed as situated "tinkering" (Berg 1998, 237) with standardised procedures inscribed in a clinical trial protocol. Informed by the sociology of standardisation (Timmermans and Epstein 2010), I study how the Age-Well trial became "do-able" (Fujimura 1987) in light of multiple epistemic goods partly pulling practices into opposite directions – towards and away from strict adherence to the trial protocol. Studying epistemic goods and strategies that make them coexist in a clinical trial is relevant to rethink what counts as robust knowledge and to adopt an empirical ethics approach in knowledge evaluation.

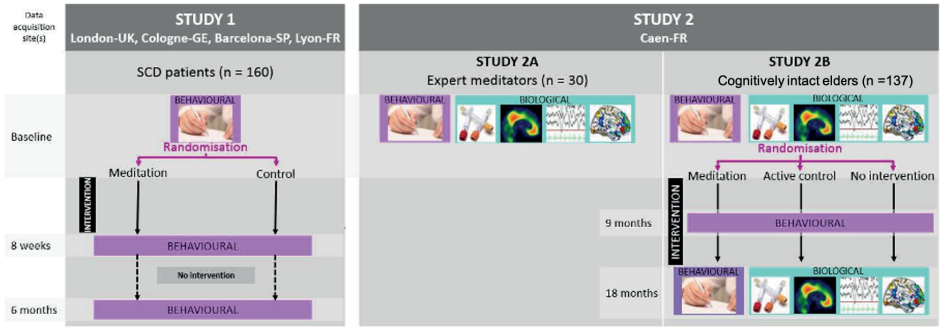

Figure 3. Study scheme of the Silver Santé Study

The Silver Santé Study combines two clinical trials: Study 1 SCD-Well, Study 2 Age-Well. Age-Well consists of two studies: Study 2A is an observational study with expert meditators, while Study 2B is an RCT with healthy elderly adults who participate in a meditation intervention, an English intervention or a passive control group. The scheme was adapted from public communication materials published on www.chetelat-lab.fr/silver-sante-study/.

3.2 Theoretical background

Empirical research on goods as practices is the programme of an empirical ethics (Mol et al. 2010; Pols 2013, 2015, 2018). Rather than reasoning about normativity in the abstract, empirical ethics studies how people attempt to accomplish something good with the help of devices, routines and concepts. What is good can be traced empirically in the activities that advance people's values, ideals or tastes. Studies have examined how ideals like dignity (Pols et al. 2018) and individualisation (Pols 2008) were enacted in multiple ways in healthcare practices.

Epistemic goods are practices of doing good research that enact scientific norms. The concept is informed by Daston and Galison's (2017) seminal work on *Objectivity.* The authors uncover how the norm of objectivity has infused practices of image-making for scientific atlases since the middle of the 19th century, thereby shaping how scientists view the world. To underline the

intricate relation between scientific norms, practices and knowledge, they call objectivity an epistemic virtue. Epistemic virtues "are norms that are internalised and enforced by appeal to ethical values, as well as to pragmatic efficacy in securing knowledge" (pp. 40–41). Daston and Galison reconceive epistemology as ethics by considering it as a repository of multiple versions of the good that are products of distinct historical circumstances, but have persisted over time in knowledge-making practices. Looking at practices throws frictions between these goods into relief – for example, precision and replicability can come at each other's expense – while acknowledging that what doing good research looks like is situated and context-dependent.

Instead of calling these practices virtues, which links their mastery to character and skills development for becoming a good scientist, I use the concept of epistemic goods to analyse their relational nature. In line with Pols's (2015) approach to empirical ethics, I understand practices as "the interrelational achievement of people, as well as the technologies and concepts they use" (p. 82). Within these relations, practices (of attempting) to do good appear in different forms. As people are assumed to be relational entities, different versions of the good cannot be attributed to independently acting subjects, but instead emerge within networks of heterogenous actors.

An empirical ethics approach also sheds light on the day-to-day labour and care practices that are necessary to do good research and produce sound knowledge (Swallow et al. 2020). It draws attention to private, embodied, emotional and messy aspects of science that are essential to its achievement but seem to conflict with epistemic goods like objectivity and precision (Friese 2013). STS researchers have invoked the concept of care to analyse a range of practices that remain invisible in the polished accounts of science (Latimer and Puig De La Bellacasa 2013; Puig De La Bellacasa 2011), such as the attentive and affective interactions with laboratory animals, study participants and databases (Lappé 2018; Pinel et al 2020; Wadman and Hoeyer 2014). But researchers tend to consider such care practices as sources of 'local variation' and 'noise' that disturb standardised clinical trial procedures (Fisher 2006; Hallowell et al. 2009). These disturbances must be weeded out in the research process or should be corrected in the analysis to conduct methodologically rigorous science (Danziger 1990). Strict adherence to the procedures specified in the clinical trial protocol is thought to minimise personal biases and enhance comparability between different intervention groups (Dehue 2002, 2010).

As established by research on clinical trials in the sociology of standardisation (Bowker and Star 1999; Lampland and Star 2009; Timmermans 2014; Timmermans and Epstein 2010), however, protocols are not as inflexible in practice as they appear on paper (Berg 1998; Jonvallen 2005; Keating and Cambrosio 2007; Will 2010). Although protocols contain detailed sequenced prescriptions of how to act in a given situation, there are a number of roles, tasks and assumptions that are not written out in a protocol but become visible once

it touches existing practices. Heterogenous practices are always already in place in hospitals or research institutes where clinical trials are carried out. These practices entail, among other things, scheduled activities of researchers and physicians for other projects; availability and accessibility of measuring devices, laboratory tests and examination rooms; and specific skills of research team members to perform study examinations. What a protocol prescribes must be aligned with the practices given in particular organisational contexts (Hauskeller et al. 2019; Timmermans and Berg 2003).

Berg (1998) shows that the practices defined, coordinated and ordered by a clinical trial protocol are inextricably linked with the practices involved in constructing the protocol. As he argues: "[A] protocol is not simply imposed on the diverse practices. Rather, the construction (and implementation) of a protocol is a process of ongoing, continuing *negotiations*" (p. 235). Only in retrospect, after a clinical trial has been completed, the protocol loses the traces of the "tinkering" (p. 237) that was necessary to make it work. Tinkering involves situated judgements, local knowledge and creativity in using a standard, so that local practices become standardised and "the standard is localised" (Knaapen 2014, 830), especially in view of unexpected events and particularities.

In the empirical analysis below, I identify different forms of tinkering as strategies that researchers use to enact diverging epistemic goods together. These strategies are oft-informal "ordering process[es]" (Mesman 2008, 9) that emerge in the everyday organisation of work practices. Tracing ordering processes is relevant to better understand clinical research because they define who and what should be included and excluded from knowledge production. By analysing strategies for tinkering with the study protocol, I highlight how (social) order is co-produced with knowledge-making practices (Jasanoff 2004).

3.3 Methods

For an inquiry into practices, this study used the methodology of "praxiography" (Mol 2002, 31), which is akin to ethnography but differs in focus and emphasis. While *graphy* refers to the common task of recording, describing and writing about a phenomenon, praxiography is not so much interested in *ethno* (culture) but in *praxis* (practice). Knowledge-making practices have been a focus of attention in STS laboratory studies that trace the large amount of calibration work and various standardisation practices required to (re-)produce a scientific finding across sites and transform it into a 'universally' valid fact (e.g., Collins 1992; Latour 1983; Latour and Woolgar 1987). As noted by Garforth (2012), the methodology of laboratory studies centres on "seeing close up, in context, and in the middle of the action" (p. 269). Yet, observation may be perceived as intrusive, and some practices resist being witnessed because of their solitary or

regulated nature (Garforth 2012; Star and Strauss 1999). STS researchers have therefore made use of alternative methods like interviews and document analysis to study (knowledge-making) practices (Beaulieu 2002, 2010).

My praxiographic research on the Silver Santé Study combined three means of data collection: participant observation, interviews and document analysis. I observed the Silver Santé team during two periods of fieldwork (Sep – Dec 2018, Oct – Dec 2019) and several short-term visits of the biomedical imaging platform Cyceron in Caen. I did observations of regular team meetings and study examinations (e.g., neuroimaging, behavioural and neuropsychological tests, polysomnography), as well as during public events for participant recruitment, science communication efforts and the annual two-day meeting of the European consortium. During fieldwork, I realised that social interaction, especially in conversations, helped me to learn more about practices, rather than simply being physically present. A reason is that a large part of scientific work was conducted silently behind computer screens, which is why it felt intrusive to shadow activities like data processing and analysis. Another reason is that I was not permitted to observe the study interventions because researchers were concerned that I could influence the dynamics in the English and meditation intervention groups. What is not accessible for observation, however, generates its own data (Garforth 2012). I learned that the epistemic good of objectivity, or codified rule-following to minimise external influences on experimental conditions, was enacted in the Age-Well trial by limiting access to the interventions.

Interviews allowed me to circumvent the problem of direct access by asking questions about an interviewee's involvement in the Silver Santé Study, the tasks that had to be fulfilled to keep the study running, and the specifics of work practices. I conducted 74 semi-structured interviews with diverse actors involved in the Silver Santé Study. The large number of interviews resulted from the praxiographic approach to data collection. Mol's (2002) praxiography draws on actor-network theory, which situates practices in a flat network of actors. A key tenet is that one should not assume *a priori* which actors are included in a network and which of them are more important than others. Therefore, I did not only interview the local research team at Cyceron, but recruited interviewees from wider circles around my primary field site whenever I noticed them to be involved in the practices I was exploring. Table 2 categorises actors into social groups whose interviews turned out to be relevant for the empirical analysis. I conducted interviews in French, English, and German, had them transcribed by research assistants who speak these languages in native fluency, and made English translations of French and German quotations that are used in the analysis below.

To prepare for interviews, I studied a range of documents to gain a better understanding of the Silver Santé Study: scientific articles, conference presentations, participant recruitment materials and news items. Scientific articles and perspective pieces on meditation research

more broadly helped me to become acquainted with this research field, making it possible for me to interpret practices in the Silver Santé Study in their wider context. Furthermore, the Age-Well clinical trial protocol was an important document to study practices. It provides detailed prescriptions of sequenced steps as to how to act in a given situation, criteria on whether and when the next step can be taken, as well as standards and classifications involved in recruitment, examinations and analysis. I got access to a confidential version of the protocol from 2018. For confidentiality reasons, I do not quote directly from the protocol; I only used it in the analysis process to triangulate information that I had gathered in interviews, participant observation and scientific publications.

Table 2. Social groups in the Age-Well clinical trial

Interviewees were recruited from all social groups.	
Research team in Caen	Principal investigator, scientific coordinator, senior researchers, project managers, postdoctoral and PhD researchers, research assistants and technicians, neuropsychologists, physicians, communication officer, administrator, English teachers, meditation instructors
Participants	Healthy elderly adults who participated in the English intervention, the meditation intervention, the passive control group or the group of expert meditators
Sponsor	Representatives of Inserm, the French National Institute of Health and Medical Research that assumes responsibility for the quality of scientific data and results, safety of participants, regulatory aspects and budget management
Methodologist	Independent experts supporting the sponsor and research team in data storage, research methodology and statistical analysis
European consortium	Researchers from European institutions (France, Belgium, Switzerland, London, Germany and Spain) involved in the data analysis, legal and administrative managers of the consortium, European communication officers

3.4 Empirical analysis of the Age-Well clinical trial

To process the empirical data, this study draws on abductive analysis (Timmermans and Tavory 2012). Abductive analysis refers to an inferential process of producing theoretical insights based on surprising research evidence. While Timmermans and Tavory identify an empirical finding as surprising against a background of theoretical literature, I recognised a finding as surprising or unusual in relation to other observations. Three events stood out from interview transcripts and fieldwork materials because they broke with the ordinary. While most breaks with regular patterns of ordinary practices were repaired relatively swiftly in the Age-Well trial, the events selected for analysis created enough of a disruption to force actors to carefully rethink and renegotiate ways of doing good research. Moreover, as suggested by Pols (2013), studying events sheds light on routine ways of doing good research because they "may teach us something about the *conditions* that allow particular dramas to emerge" (p. 22). In analysing

events, I examined how different ways of doing good research imbued day-to-day practices in Age-Well.

To gain an impression of everyday routines, extended periods of fieldwork and a substantial number of interviews were necessary. Only a part of the data corpus, however, helped me to describe the events selected for in-depth analysis. Limiting the amount of data presented here to a fraction of its corpus was a result of moving back and forth between empirical materials and theoretical literature. While I was searching for concepts that would help me interpret all the data, I was also looking for a definition of the research problem, which, without hiding anything, would make relevant only those data that fitted the concepts (cf. Katz 2011). In this way, the empirical focus on events and the analytical focus on tensions between epistemic goods co-emerged in the analysis process.

To avoid imposing theoretical concepts on the empirical material, I asked actors involved in the events for a written commentary on an earlier version of this chapter and presented preliminary analyses to the Age-Well research team in Caen and to the European consortium of the Silver Santé Study. I combined their feedback not only with my initial empirical findings but also with STS theory on scientific norms and knowledge production. Through this process, I reconstructed events, interpreted practices of doing clinical research as epistemic goods and analysed strategies to reconcile tensions between these practices. To further improve the validity of data analysis, I verified that the epistemic goods identified in relation to events could be applied across a multiplicity of scenes and actions captured in fieldnotes and interviews.

3.4.1 Reinterpreting the protocol in the English intervention: internal validity and feasibility

Event in the English intervention

In spring 2017, the first cohort o13f 43 healthy elderly adults started their participation in the three Age-Well study groups: English, meditation, or the passive control group. It is one of three cohorts in which 137 participants were recruited successively in the French city of Caen and its surroundings (Table 3). Participants in the English group followed a foreign language training programme to develop abilities in understanding, writing and speaking English. The language training programme was structurally matched to the meditation programme designed to cultivate mindfulness, kindness and compassion abilities. Apart from participating in weekly two-hour group sessions guided by experienced instructors, the English group and the meditation intervention group completed meditation and English exercises with a digital tablet at least 20 minutes every day at home, while also attending one day of intense group practice during the intervention.

Table 3. Schedule of the Age-Well clinical trial

	43 healthy elderly adults	**50 healthy elderly adults**	**44 healthy elderly adults**
Pre-selection questionnaire	Sep – end of Nov 2016	March – May 2017	March – Nov 2017
Individual interviews	Nov – Dec 2016	May – June 2017	Nov 2017 – Jan 2018
Selection visit: medical and neuropsychological examinations	Nov – Dec 2016	June – July 2017	Jan – Feb 2018
Study examinations at inclusion	Dec 2016 – Feb 2017	End of August – End of October 2017	Beginning of May 2018
Randomisation	Beginning of March 2017	Beginning of November 2017	Beginning of May 2018
Interventions *a) Meditation* *b) English* *c) Control*	March 2017 – Sep 2018	Nov 2017 – May 2019	May 2018 – Nov 2019
Study examinations after 18 months	Sep – Oct 2018	May – June 2019	Nov – Dec 2019

The schedule indicates the time periods allocated to the inclusion process, study examinations and interventions of the three cohorts of study participants in the Age-Well clinical trial. The table was created based on Poisnel et al. (2018) and on a presentation given during an Age-Well recruitment conference at the new faculty of medicine of the University of Caen in France, 25th of April 2017.

Soon after the start of the intervention, the English group realised that participants had different levels of prior knowledge in English. While some could hold conversations in English, others had barely any command of the language. After trying to follow the English intervention for about three months, two participants decided to quit their study participation. When interviewing one of the participants, she reported:

> We said: 'Stop! We quit.' I said: 'I quit. I cannot not keep up with this pace. This is not possible.' This was not the original rule . . . One could say that there were no exams and therefore no need to worry, but it is still dispiriting not to be able to follow [the English classes].

The "original rule" refers to the inclusion criteria of the study: age of 65+, retired for at least one year, living autonomously, availability for the study for 24 months, overall health without chronic or acute diseases, normal performance on cognitive tests, level of education of more than seven years, no preference for any of the three study groups, neither practice meditation regularly nor speak English fluently (Poisnel et al. 2018).

To verify if participants met the inclusion criterion 'not speaking English fluently,' they were asked whether they could hold a conversation in English and completed multiple choice comprehension exercises. The aim was to find participants with intermediate English competence to create a relatively homogenous group in which all participants would manage to cope with the same learning material. But the screening may have failed to filter out beginners

and advanced English speakers. Or participants with a high command of English may not have completed the screening test truthfully because of their eagerness to participate in the study. Another interpretation is that the intermediate level was stretched because it was difficult to recruit sufficient study participants who met all inclusion criteria.

Because the inclusion criterion left some leeway as to the exact meaning of 'not speaking English fluently' in practice, this may have eased the participant recruitment process. At the same time, this leeway led to a situation in which two participants intended to quit the study because they felt uncomfortable in not being able to keep up with the weekly English classes. In trying to deal with this situation, the research team was juggling with two epistemic goods: internal validity and feasibility.

Internal validity and feasibility

Internal validity is a cardinal epistemic good in clinical trial research. The RCT is considered as the "gold standard" for intervention studies to assess a causal relation between an intervention and its effect (Timmermans and Berg 2003). A well-executed RCT has high internal validity because it effectively rules out other explanations for the observed effect. To rule out alternative explanations, RCTs have a control group, participants are randomly allocated to study groups, they follow strict compliance criteria, and both researchers and participants are blinded to the nature of the intervention.

The lack of internal validity in studies with a meditation intervention has become a key concern for meditation researchers. In light of the recent public and scientific 'hype' of mindfulness meditation as a panacea for a range of mental and physical ailments, researchers have called for caution regarding the robustness of evidence (Davidson and Kaszniak 2015; Vago et al. 2019; Rosenkranz et al. 2019; Van Dam et al. 2018). In their critical evaluation of meditation studies, Davidson and Kaszniak (2015) state that studies on meditation have seldomly followed "double-blind placebo-controlled designs."

> This fact is partially responsible for the poor quality of clinical trials of meditation that have appeared in the scientific literature and is one important reason why recent meta-analyses of the clinical impact of meditation have reported so few rigorous studies that are judged to be methodologically sound. (p. 583)

To strengthen internal validity, the Silver Santé Study was designed in a "more rigorous" way (Klimecki et al. 2019, 223). The design of the English and the meditation intervention fulfils most of Davidson and Kaszniak's criteria for a "rigorous control condition" (p. 588). Participants were randomly assigned to the English group, the meditation group and the control group so that results could be generalised to a random sample rather than to people who feel drawn to

meditation or English. Moreover, the English intervention and the meditation intervention were structurally equivalent: the interventions were equal in length; they involved the same amount of group sessions and individual homework; and both the meditation instructors and the English teachers were comparably trained. This criterion was important to ensure that participants in both groups would be exposed to a similar amount of cognitive training. Similar levels of exposure in both study groups were necessary for a comparison of effect sizes regarding the changes in volume and cerebral blood flow in the anterior cingulate cortex and the insula – the main objective of the Age-Well RCT (Poisnel et al. 2018).

The pursuit of the hallmarks of internal validity in an RCT, however, creates frictions with another epistemic good: feasibility. Clinical trial feasibility generally refers to the possibility of completing a clinical trial at a particular site in terms of timelines, costs, and targets (Rajadhyaksha 2010). To ensure that a trial meets its research targets, an important aspect of feasibility is whether participants adhere to and engage with the intervention (Winther and Hilldersdal 2020). Meditation researchers Rosenkranz et al. (2019) comment as follows on this aspect of feasibility in their evaluation of mindfulness-based intervention research: "Choice is a strong predictor of adherence to and engagement with an intervention and effect sizes are typically higher when an intervention is individually initiated, rather than the consequence of random assignment" (p. 180). They point out that studies on meditation differ in some crucial respects from pharmaceutical trials for which the RCT design was championed. In pharmaceutical trials, one can be fairly confident that all participants in the treatment group receive the same dose of a drug. In behavioural interventions, the 'dose' depends on how an individual engages with the intervention. Therefore, they suggest to create study groups for whom an intervention is feasible. Studies must not necessarily aim to produce results that are generalisable to a random sample, but to individuals who would initiate an intervention such as a regular meditation practice or English language training.

The event in the English intervention highlights that internal validity was in tension with feasibility. The randomisation of Silver Santé participants neglected their social histories and the social dynamics that emerged in the study groups. It implies a model of social situations as a multitude of separate, identifiable elements with additive interconnections (Danziger 2000). In the English group, however, participants' histories (discomforting childhood memories of studying at school) and group dynamics (experience of pressure to perform in front of others) influenced their engagement with the intervention to the extent that two of them intended to leave the study. The reality of teaching English to elderly people differed from what was assumed in the design of an RCT, whose internal validity depends on the artificial nature of study groups.

Reinterpreting the study protocol

In light of the difficulties in the English group of the first participant cohort, one particular fieldwork observation during the annual European consortium meeting of the Silver Santé Study in 2019 proved a surprise. A Silver Santé researcher congratulated his colleagues who had been in charge of the Age-Well data collection for a "big achievement" since he had rarely seen a clinical trial without drop-out. This implies that the participants who intended to leave the trial ultimately decided to continue following the English intervention until the end. What had motivated these participants to remain in the study?

One of them told me what happened when she met the scientific coordinator of the Silver Santé project to announce that she and another participant would quit their study participation in summer 2017:

> [The scientific coordinator] proposed that we could stay in the study, keep the materials, meaning the tablet and the books, and do whatever we wanted, to not go to the [English] classes anymore . . . We accepted and this was great because we eventually played the game nevertheless. This means that we worked, but that we did so at our own pace. Every day we worked for half an hour, three quarters of an hour, or one hour, but at our pace, without the pressure of the group that was not at our level. I eventually progressed a lot.

The participant further emphasised that, from her point of view, she had engaged in a more effective and more comfortable way with the intervention without participating in the weekly English group sessions. She had spent more time practicing English on her own – completing English language exercises on a digital tablet and working with a language training book that was also used during the English group sessions – than the daily minimum of 20 minutes prescribed in the study protocol. Learning English had become feasible for her.

Making the English intervention feasible for participants was a matter of doing good research in the Age-Well clinical trial, which the scientific coordinator described as follows:

> It seemed important to adapt to the field and to the people in front of us rather than following the rules foolishly. For example, we made English groups and noticed that the English level, although we had tried to be fairly homogeneous, was still pretty heterogenous . . . this brings participants into very uncomfortable situations.

To create an intervention that was feasible – one that would hold in real life for people with social histories and for whom group dynamics matter – the research team reinterpreted

what it meant to participate in the intervention. Instead of "following the rules foolishly," reinterpreting the study protocol implied adjusting the way the protocol was imposed so that the participants who had struggled with the weekly English sessions could complete the trial in a way that was suitable for them.

At the same time, keeping these participants in the study boosted its internal validity. Because statistical significance of study results partly depends on the number of participants, drop-outs introduce uncertainty in evaluating the efficacy of an intervention (Wadmann and Hoeyer 2014). If participants leave the study this may suggest that the results are not based on a random sample, but on a sample including people who did not leave the study, possibly because of a common characteristic. Enhancing feasibility thus fostered internal validity through reinterpreting the study protocol.

3.4.2 Caring informally while playing by formal rules in the meditation intervention: assessing efficacy and attending to effects

Event in the meditation intervention

In summer 2018, towards the end of the intervention of the first Age-Well cohort, a participant wrote a letter to the Silver Santé team on behalf of the meditation group. He explained that the group was motivated to go on meditating together in spite of the imminent end of the intervention. They intended to proceed with regular meditation group sessions supported by the principal meditation instructor who had facilitated most of the intervention. He also asked if they could continue using a room in the faculty of medicine in Caen where the weekly group sessions of the meditation intervention had taken place. The letter led to negotiations within the Silver Santé team about what should be done in response to the participants' request.

On the one hand, researchers were reluctant to meet the request because they had recently amended the clinical trial protocol to include a third battery of study examinations 21 months after the end of the intervention (Figure 4). The scientific objective of this amendment was to validate whether the efficacy of the intervention would be maintained in the long run. The amended protocol specified that participants could proceed with practicing meditation or learning English on their own after the end of the intervention but not with the support of the Silver Santé team. Supporting participants in organising post-intervention meditation sessions would violate the protocol. Moreover, it would curtail the comparability between the 21-month follow-up study examinations of the English group and the meditation group. The reason is that no arrangements were made to prolong the English intervention beyond its official end because the English group had not put in such a request.

On the other hand, the research team acknowledged that meditation differed from learning English. While learning English was considered pre-eminently a cognitive training, meditation was also an affective training. Although both interventions were thought to give rise to affective group dynamics and might therefore affect participants' emotional well-being, meditation was assumed to have a specific effect on emotion regulation (Poisnel et al. 2018). A participant reported how meditation had helped him "channel" his emotions, so that he managed to stay calm in situations that used to make him angry. Meditation had "modified something within" which made him "live differently." As meditation had impacted how participants related to themselves and their lives, the principal meditation instructor stressed the importance of supporting the meditation group after the end of the intervention:

> Meditation is a process, it's not like learning about mathematics or a language, it's learning about yourself. It's transforming something inside you and when you are in the process, something organically grows . . . [A]fter 18 months they [the meditation group] want to continue to do something and we have to show them some tools or give them some information or support them.

Accordingly, meditation had different effects on study participants than the English intervention. Attending to these effects, however, seemed to be at odds with measuring the efficacy of the meditation intervention in the framework of the Age-Well RCT.

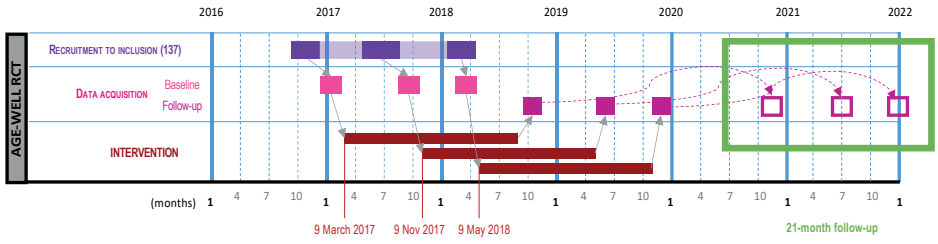

Figure 4. Study scheme of the Age-Well clinical trial with 21-month follow-up
The scheme visualises the periods of participant recruitment, data acquisition (baseline, follow-up after the 18-month intervention, and follow-up 21 month after baseline) and study interventions, which all started at different points in time in the three study cohorts. It is a modified version of a figure presented during an online European consortium meeting of the Silver Santé Study, 12th – 13th of October 2020.

Assessing efficacy and attending to effects

RCTs assess the efficacy of an intervention, or, in other words, whether it meets the expected outcome in the study sample under controlled conditions (Streiner 2002). They promise to prove the instantaneous efficacy of an ameliorative intervention unambiguously (Dehue 2002). For this reason, evidence derived from RCTs is the dominant type of knowledge used for the development of guidelines that inform clinical decision-making and help governments as well

as health insurers to allocate scarce resources (Wieringa et al. 2018). The growing number of RCTs which demonstrate the benefits of mindfulness-based interventions has been a major impetus to integrate mindfulness in medicine, healthcare, education and other institutions (Kabat-Zinn 2019; Stanley 2015; Wilson 2014). Along these lines, a Silver Santé researcher elucidated:

> The research we do in the Silver Santé Study, which is protocolled and a randomised controlled trial, has the advantage that it allows us to verify a hypothesis and to have legitimacy in comparison to pharmaceutical industries that will propose medicinal drugs. We can tell them: 'We realised a protocol that is as demanding as yours and we show positive results.'

Examination of the efficacy of meditation featured as an epistemic good in the Silver Santé Study that researchers were striving for by testing a hypothesis and adhering to a demanding study protocol. Doing good research meant producing results that could inform guideline development for the governance of healthcare.

The assessment of an intervention's efficacy is based on the assumption that the research hypothesis includes variables that are relevant for a particular study group and that one intervention works best for everyone (Dehue 2010). In this respect, however, one of the Silver Santé meditation instructors pointed out: "Meditation does not work for everybody all the time and at the same time." A meditation intervention has different effects on study participants depending on various factors, such as their world view, life circumstances, physical disposition and relationship to the meditation instructors. Meditation researchers Lutz et al. (2015) have cautioned against the negligence of context in clinical trials:

> [There] has been the need to frame mindfulness-based interventions in ways that are maximally compatible with clinical medicine and psychology, such that these practices are seen through the lens of current scientific thinking and are articulated in ways that can be readily communicated to potential patients, healthcare providers, and researchers. Although clearly crucial to basic and clinical research, this restricted perspective increases the risk of misrepresenting (or missing altogether) the active ingredients underlying the potentially transformative effects of these practices whose techniques emerge in a context broader than clinical medicine, psychology or neuroscience. (p. 633)

This critique of mindfulness-based clinical trial research underlines the significance of attention for the qualitative effects of meditation, instead of maintaining a narrow focus on efficacy (Farias and Wikholm 2015; Goleman and Davidson 2017).

Attending to an intervention's variable effects is not only a way to produce good knowledge (knowledge of which cognitive, affective and social processes might be altered throughout an intervention), but it may also give rise to a form of "care work" (Federici 2012, 368; Wadmann and Hoeyer 2014). Care work usually refers to the relational labour involved in holding communities together and generating conditions for "living as well as possible" (Puig De La Bellacasa 2017, 4). In acknowledging the affective effects of the meditation intervention on participants' well-being in the Age-Well RCT, the relevance of this kind of labour for doing good research came to the fore. The Silver Santé team wondered whether good research implied caring for participants after the end of the intervention – the phase in which researchers commonly "erase care" (Jespersen et al. 2014, 664) to direct their attention towards data analysis. Yet, performing extra care work to attend to the affective effects of meditation was in tension with assessing the intervention's efficacy. If the Silver Santé team had facilitated post-intervention meditation sessions, they would have biased the inquiry into efficacy in the 21-month follow-up examinations.

Caring informally while playing by formal rules

To take care of the affective effects of the meditation intervention without compromising the assessment of the intervention's efficacy, the Silver Santé team ultimately decided to play by the formal rules inscribed in the Age-Well protocol. Following a rule with fidelity does not contradict situational adjustments of its imposition; it also leaves room for courses of action not specified by the rule (Garfinkel 1967; Lynch 1993). Playing by formal rules meant that the meditation intervention of the first cohort of participants ended as planned in September 2018 (Table 3). The protocol prescribed that the weekly group sessions facilitated by Silver Santé meditation instructors should end after 18 months. It was not specified in the protocol, however, whether and in which way participants could continue meditating on their own.

The protocol left room for study participants to create an autonomous meditation group. Right after the end of the intervention, one participant managed to arrange a space, through the municipality of Caen, where the meditation group could meet on a biweekly basis for meditation sessions. This group invited the principal Silver Santé meditation instructor to attend a few sessions and teach members how to guide meditation practices for each other. The meditation instructor accepted this invitation in her personal capacity independent from the Silver Santé Study. By helping participants transition from a study group to a self-organised community of practice, she cared for participants' well-being after the end of the intervention while respecting the study protocol.

In this way, meditation was treated as an affective training whose effects were different from those of the English intervention and thus required the provision of "extra things" (Jespersen et al. 2014, 9) that were not included in the protocol. These extra things were part of an

informal trial economy existing side by side with its formal procedures (Daston 1995). Playing by formal rules ensured that the official procedures specified in the study protocol were followed. At the same time, the research team, especially the meditation instructor, engaged in informal care practices that the protocol did not address. Doing informal care work while following official procedures made different epistemic goods compatible. The affective effects of the meditation intervention were taken care of without jeopardising the assessment of the intervention's efficacy.

3.4.3 Adjusting the protocol for a study task with expert meditators: objectivity and trained judgement

Event in a study task with expert meditators

The Age-Well protocol combines a three-armed RCT with an observational study on expert meditators (Lutz et al. 2018). Researchers sought to recruit 30 healthy participants aged 65 years or older who clocked at least 10.000 hours of meditation including regular practice of some form of mindfulness and compassion in Vipassana, Dzogchen (Tibetan Buddhism) or Zen traditions to undergo a battery of study examinations on behavioural, neuroimaging, sleep and biological measures. The results of their examinations were supposed to be compared to those from participants of the Age-Well RCT. One aim of this cross-sectional study was to address a limitation of the RCT. Participants in the RCT learned two meditation practices over the course of the meditation intervention: mindfulness meditation (MM) and loving-kindness and compassion meditation (LKCM). As the RCT only assessed the combined effect of MM and LKCM, the observational study was supposed to help distinguish between the effects of MM and LKCM on brain functions, emotional reactivity and emotional regulation.

For this purpose, the battery of study examinations included an adapted version of the Socio-affective Video Task (SoVT) developed by Klimecki et al. (2013). The video task involved short silent video clips with high emotional content (human suffering in distressing situations) and low emotional content (people performing everyday activities). Novice meditators from the three-armed Age-Well RCT watched these videos while resting in the brain scanner. Expert meditators watched one set of videos in MM (relaxed openness to and awareness of any thought or feeling that arises) and another set in LKCM (generating feelings of loving kindness and compassion). Their brain activity was measured in response to the video clips. After the scanning session, participants partook in a debriefing in which they re-watched the videos and provided self-reports for the experience of each video in MM and LKCM. These self-reports involved ratings on a 0-to-10 scale of 1) empathy with the characters in the video, 2) positive emotions, and 3) negative emotions (Table 4: Standard SoVT debriefing).

Table 4. Standard and adjusted SoVT debriefing

Standard SoVT debriefing Three-armed Age-Well RCT with novice meditators	**Adjusted SoVT debriefing** Age-Well observational study with expert meditators
1) At which intensity did you feel the emotions of the characters? 2) Indicate the intensity of your positive emotions. 3) Indicate the intensity of your negative emotions.	1) At which intensity did you feel the emotions of the characters? 2) Indicate the intensity of your positive emotions. 3) Indicate the intensity of your negative emotions. 4) To which degree of openness were you available to experience the emotional content of the video? 5) To which degree of intensity were you upset and distressed while watching the emotional content of the video? 6) To which degree did you experience loving kindness and compassion towards the protagonists of the video?

The standard SoVT debriefing by Klimecki et al. (2013) was employed in the three-armed Age-Well RCT. The adjusted SoVT debriefing was developed by the Silver Santé team in response to expert meditators' feedback and was subsequently used in the Age-Well observational study.

I interviewed several expert meditators about their experience of the video task; one of them remembered it vividly:

> Expert meditator: The last session in the brain scanner was mind-blowing. This was my first experience of non-duality. Everything revealed itself to me although the videos shown were actually pretty sensory and, in part, pretty painful. Explicit suffering was depicted and, nevertheless, I had suddenly the feeling that it was not like that. Duality was completely dissolved.
>
> . . .
>
> Smolka: After your experience in the brain scanner, you talked to a researcher who asked you about positive and negative emotions. What did you answer?
>
> Expert meditator: I said that there was no positive or negative anymore.

The expert meditator's experience of non-duality escaped the protocol of the video task. She did not perceive a distinction between positive and negative emotions and, therefore, felt unable to rate her emotions in the debriefing. The protocol failed to standardise her subjective experience.

This case and similar incidences with other expert meditators gave rise to discussions among Silver Santé researchers about how to capture the subjective experience of the video task. One of the researchers suggested that expert meditators' trained judgement regarding their first-person experience of meditation could help improve the study task and data analysis. He considered long-term meditators as experts in observing and reporting their inner experience

of meditation, which is why he was interested in collaborating with them. Other Silver Santé researchers, however, insisted that performing rigorous clinical trial research required objectivity, that is, adherence to standardised procedures. Changing the study task in response to expert meditators' trained judgement in the midst of data collection would impair objectivity and could render SoVT data from Age-Well incomparable with SoVT data sets from other research groups.

Objectivity and trained judgement

The RCT has become the privileged form of knowledge production in biomedical research because it is deemed to produce claims about the efficacy of a drug or intervention on the basis of objective testing (Marks 1997). According to Cambrosio et al. (2006), the emergence of biomedicine in the 1950s has been accompanied by "regulatory objectivity," which ensures compatibility of measurements across laboratories and hospitals through norms and systems of collective production of evidence. Enacting regulatory objectivity in the Age-Well RCT meant weighing any change of the SoVT protocol against the loss of comparability of results with other studies that make use of this video task. The results of a single study have little meaning in isolation, but turn into solid evidence if compared with other findings. Regulatory objectivity seeks standards that allow for such comparisons and for cancelling out individual variation in subjective experiences. Its target is not so much the individual but a population of potential participants on whom a study task or an intervention could be used.

Regulatory objectivity incorporates elements of earlier forms of objectivity, in particular what historians of science call "mechanical objectivity" (Daston and Galison 2007, 18; Porter 1995, 4). Mechanical objectivity is synonymous with the exclusion of personal judgement through adherence to standardised methodological procedures. To understand why mechanical objectivity has become dominant not only in clinical research (Dehue 2001) but in the sciences and public life more broadly, Porter (1995) suggests to analyse the authority status of expert communities involved in knowledge production. Drawing on case studies of engineering, accountants and actuaries, and the rise of cost-benefit analysis, Porter argues that expert communities endorse mechanical objectivity whenever their authority becomes vulnerable. As long as their authority is considered legitimate by other scientists and the wider public, their knowledge claims rely on expert consensus. Accordingly, the rise of mechanical objectivity in clinical research is related to mistrust in subjectivity: scientific analyses could be biased by interests and clinical decision-making could be impaired by convictions (Dehue 1999).

Porter's explanation of the rise of mechanical objectivity in expert communities applies to meditation research. As mentioned in chapter 2, the first wave of meditation research in the 1970s was spurred by the TM movement, which sought to validate the benefits of its Transcendental Meditation technique with scientific evidence. Meditation researchers like

many of their colleagues in biomedicine, neuroscience and psychology consider TM research as "sloppy" (Farias and Wikholm 2015, 132; Harrington and Dunne 2015; Tøllefsen 2014). As of the early 2000s, second-wave meditation researchers have been trying to avoid such accusations by distancing themselves from spirituality, publishing in well-respected academic journals and carefully adhering to scientific standards, first and foremost the RCT (Kucinskas 2019).

Although objectivity is an important pursuit in meditation research, partly to consolidate the social basis of its authority, it is not coherent with another epistemic good that is at the heart of its scientific programme: "trained judgement." This concept was introduced by Daston and Galison (2007, 18) as an alternative practice of good science that relies on tacit expert knowledge (Collins 2010). While mechanical objectivity has banned both researchers' and participants' subjectivity (Danziger 1990), trained judgement makes knowledge claims based on subjective criteria. Bringing subjective experience back into science is a key objective of second-wave meditation researchers who aim to keep alive the scientific vision of Francisco Varela (see chapter 2). As one of their challenges is to conceptualise and operationalise meditation, they seek to collaborate with long-term meditators who have expertise in observing their inner experience and in reporting the activity of their minds (Wiles 2018). The mission of the Mind and Life Institute, one of the main drivers and sponsors of meditation research, is to foster "the dialogue between Western science and Buddhism" (Hasenkamp and White 2017, 7). Buddhist meditators participate in this dialogue as study participants and active scientific collaborators who help to refine research protocols and contribute to scientific analyses and publications (e.g., Singer 2017).

Still, ongoing collaboration with expert meditators in which researchers remain responsive to feedback and flexibly adapt their work throughout the research process challenge strict adherence to a protocol, thus interfering with objectivity in a clinical trial. As a Silver Santé researcher reflected on this interference in interactions with an expert meditator:

> Often there were situations – and I would totally agree with him there – where he, the [expert] meditator, would make a really fine point about the lack of definition in our task or in the way we present the test, but instead of really engaging in a collaborative investigation of where our conceptual frameworks might meet, we just say: 'Yeah, we get it, we understand, but could we just move on now?' And I agree. When I put my 'scientist head' on, I also just pushed him through.

As observed by the researcher, performing the scientific norm of objectivity did not allow him to be responsive to the expert meditator's trained judgement regarding distinctions between meditative states. Although attending to trained judgement could help to improve the task

design so as to better capture experts' experiences of meditation, it would blur the lines between subjectivity and objectivity (e.g., Dor-Ziderman et al. 2013; Lutz et al. 2002; Winter et al. 2020). As the striving for objectivity fused with the "taboo against subjectivity" (Wallace 2007, 67) have a long-lasting history in Western science, meditation researchers consider the incorporation of trained judgement of expert meditators in their work a radical departure from traditional scientific inquiry (Lutz and Thompson 2003; Varela et al. 1991).

Adjusting the study protocol

Silver Santé researchers brought objectivity and trained judgement together by adjusting the study protocol of the aforementioned video task (SoVT) in the observational study with expert meditators. The task is based on the assumption that study participants have an emotional response to videos with content of suffering that can be rated as positive and/or negative on a numerical scale (Engen and Singer 2015, 2016). Yet, this assumption did not hold for a number of expert meditators, as one of the Silver Santé researchers observed:

> One thing we realised, I think in the middle of the study, is that there are a couple of experts who have difficulties rating some of our scales in terms of valence [the extent to which an emotion is positive or negative] because they have more nuanced and complex ways to perceive things or images that do not fit our categories . . . Through mental training they have changed their worldview at such a level that it changed perception.

Some expert meditators commented on the videos that they experienced a lot of compassion without feeling any strong positive or negative emotions, especially when performing LKCM in the scanner. Nor did they perceive any distress in response to the suffering of the characters displayed in the videos. They might have changed the way they interpret and perceive suffering through long-term meditation practice (Dahl et al. 2015, 2016).

To find out whether expert meditators indeed perceive suffering in a way that escapes emotional valence, the Silver Santé team added three scale ratings to the SoVT debriefing (Table 4: Adjusted SoVT debriefing). Adjusting the SoVT protocol allowed them to investigate whether expert meditators experienced compassion (question 6) without strong positive/negative emotions (question 2 and 3) and/or distress (question 5), and whether these ratings were mediated by a particular interpretation of the video content (question 4). The protocol accommodated expert meditators' trained judgement in the research process, which opened up the possibility for new knowledge to emerge. While the protocol of the observational study with expert meditators was adjusted, the SoVT debriefing with novice meditators in the three-armed Age-Well RCT remained unchanged.

By limiting the adjustment of the study protocol to the observational study, researchers combined trained judgement with objectivity. They incorporated an emerging scientific insight into their work that resulted from trained judgement about how long-term meditation practice may change the experience of other people's suffering. At the same time, objectivity was warranted in the Age-Well RCT in which researchers and participants continued adhering to pre-defined procedures. The RCT is less flexible than the observational study because the former is supposed to provide conclusive results about the truth or falsity of a hypothesis, whereas the latter seeks to obtain novel biological and behavioural markers of meditation (Lutz et al. 2018). Despite its more flexible nature, researchers also paid attention to objectivity in the observational study. They developed a new standardised procedure for the SoVT debriefing that was followed in all ensuing study examinations with expert meditators. In this way, they collected objective data on how expert meditators in the state of rest, MM, or LKCM subjectively experienced the videos.

3.5 Discussion

The adoption of the RCT standard in research on lifestyle interventions means that researchers continuously engage in balancing a variety of epistemic goods. My analysis of these balancing acts in the Age-Well trial of the Silver Santé Study underlines that a lifestyle intervention RCT is a labour-intensive, careful and situated achievement, which often remains hidden behind a standardisation machinery. To make diverging epistemic goods compatible, Silver Santé researchers tinkered with the study protocol by drawing on different practical strategies. I have not presented an exhaustive list of all the strategies mobilised by researchers to enact epistemic goods together. Rather, I have discussed three events that foreground dramatic situations in which researchers needed to find ways to pacify tensions so as to keep their day-to-day research going. These events disrupted ordinary research practices so much that the disruptions, the strategies for repair and the epistemic goods at stake became apparent and analysable. The strategies that researchers deployed to respond to these events were not exceptional, but could be identified in multiple scenes where practices diverged from standardised procedures.

Adjusting the protocol, reinterpreting its procedures, and caring informally while playing by formal rules were some of the strategies that researchers took up on a regular basis to respond to more or less dramatic emergencies and surprises. What participation in the study interventions entailed was reinterpreted multiple times in both the English and the meditation intervention: at the occasion of participants' vacation requests, in cases of extended durations of illness, and when life took a toll on either participants or intervention instructors. There were also a few loopholes in the protocol which allowed researchers to engage in informal care practices while playing by formal rules. For instance, the protocol did not specify whether

participants could undergo psychotherapeutic treatment while being enrolled in the study. Meditation instructors could thus provide occasional psychological support for participants in times of trouble without breaching their professional task descriptions. In response to the emergence of new technologies and scientific advances, several official adjustments were made to the protocol, including the introduction of a new sleep monitoring device and an extra study task on memory consolidation.

When comparing these strategies, it becomes apparent that tinkering with the study protocol occurred formally and informally. Informal tinkering refers to the strategies that the Silver Santé team used to tinker with the imposition of the study protocol through reinterpreting its procedures and engaging in care practices that left written rules untouched. Formal tinkering, by contrast, means adjusting the official procedure inscribed in the protocol. Whereas care and social dynamics remain in the informal "back stage" of a clinical trial, tinkering is performed "front stage" (Goffman 1959, 115) if science is at stake. This means that responding flexibly to unexpected events in the research process is not necessarily "invisible work" (Wolters et al. 2020; see also Shapin 1989; Star and Strauss 1999). It becomes visible in the study protocol and related scientific publications if researchers recognise its relevance for epistemology.

The event in a study task with expert meditators put science at stake because it revealed that meditation as defined in the study protocol differed from meditation as experienced by expert meditators in the brain scanner. In consequence, Silver Santé researchers adjusted the protocol for expert meditators, so that it became redefined as a contemplative practice deserving further investigation because it could give rise to extraordinary states, such as the experience of non-duality. By leaving such states unexamined for participants in the Age-Well RCT, meditation was researched as a behavioural lifestyle intervention that could enhance cognition and emotional regulation. Through formal tinkering, Silver Santé researchers came to study different versions or "multiple objects" (Mol 2002, 5) of meditation. While this finding is not surprising for STS researchers who have long insisted that science is not simply representational, but generates new entities or modifies existing ones (Beaulieu 2001; Latour and Woolgar 1987; Law 2002; Pickering 1992), it could be relevant for the Silver Santé Study. After all, it calls into question whether the effects of meditation on brain function as captured in the Age-Well RCT versus those recorded in the observational study with expert meditators are actually comparable.

3.6 Conclusion

This chapter has explored the relevance of the concept of epistemic goods for STS literature on clinical trial research. Specifically, I have introduced 'epistemic goods' as a theoretical lens to capture knowledge-making practices and their normative dimensions. Prior social studies of

clinical trials scrutinised frictions between fidelity to the study protocol and adaptation to the local context of implementation (e.g., Cohn and Lynch 2017; Winther and Hillersdal 2020; Rod et al. 2014; Timmermans and Berg 2003; Timmermans 2010; Will 2007). By looking at these frictions through the lens of epistemic goods, it becomes visible that they emerge from the enactment and negotiation of multiple, partly incoherent norms of doing good research.

The contextual, situated accomplishment of scientific norms does not imply that they are arbitrary. Instead, their coexistence stems from larger historical developments: the turn towards cultural specificity in the international clinical trial industry (Brives et al. 2016; Rosemann 2019), the shift from generalisable to personalised knowledge in precision medicine (Au 2020) and in an emerging "precision science of meditation" (Schlosser et al. 2021, 21), as well as the revived recognition of expert judgement in biomedicine (Cambrosio et al. 2006). These developments have not led to radical transformations, but have allowed seemingly incoherent epistemic goods to be present together (cf. Daston and Galison 2007). The historical origin of epistemic goods and how they become internalised through socialisation processes are topics for further investigation that go beyond the scope of this chapter. What is important to recognise here is that the definition of good research emerges in the relational interactions between scientists, other members of a research team, study participants, trial protocols, scientific methods, technologies and concepts *in the process of knowledge production*. This insight has implications for the evaluation of scientific evidence in guideline development.

The concept of epistemic goods helps problematise the notion of evidence in evidence-based medicine and healthcare (cf. Knaapen 2013). Critics have pointed out that evidence-based medicine prioritises knowledge that appeals to internal validity, the assessment of efficacy and objectivity (Knaapen 2014; Lambert 2006; Wahlberg and McGoey 2007). As RCTs and their systematic reviews embody these epistemic goods, they constitute the "gold standard" (Timmermans and Berg 2003) of robust evidence production. Other kinds of knowledge and the epistemic goods enacted in their construction tend to be undervalued in guideline development (Wieringa et al. 2018; Zuiderent-Jerak 2012). Following up on these critiques, the concept of epistemic goods reveals that what counts as robust evidence cannot be tied to an *a priori* defined standard.

In line with Gomart and Hajer's (2003) reading of science study's philosophy of good experiments (in particular Stengers 1993), I argue that it is impossible to define universal criteria of robust evidence if we consider research settings as sites of emergence where "no one knows beforehand what are the essences, and therefore the vulnerabilities or the resistances of the entities [e.g., research participants] that pass through a setting" (Gomart and Hajer 2003, 39). Neither can one fix once and for all the essence of a good clinical study. This does not mean that there is no 'good' but that each study proposes a new definition of what good might

be. This definition is contingent on the interplay between the research methodology (e.g., case study, quasi-experimental research, RCT), study object (e.g., pharmacological product, technological device, behavioural intervention), research participants (e.g., college students, healthy elderly adults, patients) and situated knowledge-making practices (e.g., adhering to protocolled procedures, attending to effects, incorporating trained judgement). Therefore, evidence claims must be placed in the context of their production to be evaluated on their own terms.

For this purpose, I seek to introduce an empirical ethics approach (Pols 2015) to the evaluation of clinical trial research. In evaluating knowledge claims for the development of guidelines and policies, professionals have been shown to be reflexive about the narrow definition of evidence in evidence-based medicine and to pay attention to alternative (non-epistemic) considerations (Boswell 2017; Moreira 2005; Stewart and Smith 2015; Verkerk et al. 2006; Zuiderent-Jerak 2021). As observed by Lagerlöf et al. (2021), however, the tenets of evidence-based medicine prevail in the development process of national guidelines on lifestyle habits in Sweden. They further propose: "If considerations pertaining to public health and healthcare are to be integrated more firmly into the National Guidelines, methodological rigour needs to be complemented with a wider latitude for epistemological deliberation" (p. 16). I propose that an empirical ethics approach could widen the latitude for epistemological deliberation through empirically informed descriptions of locally configured knowledge-making practices and their normative dimensions.

An empirical ethics approach does not take local normativities to carry prescriptive force, but helps questioning what counts as good evidence by comparing the epistemic goods identified somewhere with those found elsewhere. Empirically described goods could further be compared with oft-tacit knowledge evaluation criteria in healthcare policy and guideline development processes so as to scrutinise and revise them. Along these lines, the results of this study suggest that the epistemological deliberation on internal validity, the assessment of efficacy, and objectivity in knowledge evaluation of RCTs could be widened by addressing whether a trial is feasible for participants, attends to effects and incorporates trained judgement. The epistemic goods identified here could play a role in the appraisal of knowledge for developing health promotion guidelines, disease prevention programmes and public health measures.

INTERLUDE II

The analysis in chapter 3 made apparent that valuation work is entangled with epistemological questions and concerns in the Silver Santé Study. The concept of epistemic goods was introduced to capture analytically how negotiation processes and balancing acts between different ways of doing good research were constitutive of knowledge-making practices. Foregrounding practices emphasised that one cannot reason about the ethicality of contemplative science in the abstract – in academic treatise or more popular fora for debate like blogs and news magazines where proponents and opponents of contemplative science wage the so-called "mindfulness wars." Neither can the participants in the mindfulness wars assume that scientific knowledge automatically has particular normative effects. Instead, normativity is always in the making on the laboratory floor where good research is both the process and outcome of merging, alternating between and trading off scientific norms against one another. In this process, what comes to be considered and enacted as good shapes the ways in which meditation is studied and known in contemplative science. In analysing valuation work, the relation between practices of ethics and epistemology was revealed to be dynamic and co-productive.

Chapter 3 further pointed out that in and through this dynamic relation between practices the ontology of meditation became multiplied. This observation is informed by practice theory, which assumes that how things *are* depends on what people *do* and what they say about what they do. Unravelling "ontology-in-practice" (Mol 2002, 143) is another theoretical agenda lurking in the analysis, which is expanded in chapter 4 and 5. Since the 1980s, STS scholars have insisted that objects come into being through their practical enactment (Mol 2002; Law 2002; Law and Lien 2013; Pickering 1992). Science does not simply represent objects, but generates new entities, or modifies existing ones (Latour 1988). For Mol (2002), this leads to the possibility that "ontology is multiple" (p. 166): different practices in specific situations simultaneously produce multiple ontologies, which afford different possibilities for further action. Chapter 3 indicated that valuation work in the Silver Santé Study produced multiple ontologies of its research object. Through the balancing act between objectivity and trained judgement, meditation became a contemplative practice in the observational study with expert meditators, while it remained a brain training in the lifestyle intervention protocol devised for novice meditators.

Yet, one may ask why it is worth emphasising multiple ontologies. Zuiderent-Jerak (2015) warns that, without asking this question, "'turning to ontology' becomes a strangely realist exercise in showing that 'X is really, really, ontologically multiple'" (p. 160). Reflecting on the relevance of foregrounding the multiplicity of meditation in contemplative science, I come to a twofold response to Zuiderent-Jerak's warning. On the one hand, I recognise a lurking desire within my own research attitude to go along with the "turn to ontology" in STS (Pickering 2017; Van Heur et al. 2012), making sure that my work would fit within the canon of the field. This desire, however, is dangerous, since it can skew participant observation. Chapter 5 describes my initial inability to recognise which ontology of meditation was relevant for Silver Santé researchers as a result of my active search for and overemphasis of moments in which alternatives to the hegemonic came to the fore. The urge to find multiple ontologies can remove STS analysis from the issues at hand in empirical arenas.

On the other hand, my efforts to detect multiplicity sprang from the impression that the presumed singularity of meditation in the Silver Santé Study had problematic consequences. Chapter 3 pointed out that the study design brought different versions of meditation into being. I interrogated whether the data collected from studying meditation as a cognitive-affective intervention in the lifestyles of novice meditators would be comparable with measures of brain activity in long-term expert meditators for whom meditation was a contemplative practice. I proposed that such interrogation could help refine the original data analysis plan of the Silver Santé Study.

In suggesting that ethnographic descriptions of multiple ontologies could inform contemplative science research, I do not mean to say that contemplative scientists lack awareness of such multiplicity. In fact, a recent meta-review of the field shows that there is no single definition of mindfulness in meditation research, which is why the authors ask scientists to examine whether their specified definition is consistent with their study design (Van Dam et al. 2018). Moreover, the insight that observer and observed are not stable independent entities but co-create one another in the process of observation is often reiterated in discussions at contemplative science events in reference to Francisco Varela's work (Varela et al. 1991; Varela 1996). According to Thompson (2020a), however, awareness of multiple ontologies has not yet trickled down to *scientific practices*. He notices that most neuroscientific research maps meditation onto particular brain areas or networks, presupposing that meditation is inside the brain, rather than involving the entire body in its environment. Studying meditation in this way neglects that it comes into being differently depending on the people, places and techniques involved. Ethnographic research on multiplicity could help introduce a shift in contemplative science from focusing mainly on the brain to examining how social and cultural practices, including those embedded in scientific experimentation, orchestrate the embodied skills of meditation.

With the hope to play such a productive role in contemplative science, I let go of any meta-reflexive pretence of detecting multiplicity where scientists supposedly saw singularity and engaged in collaborative work. Instead of using multiplicity for what is generally referred to as "studying up" in anthropology, that is to produce analytically removed knowledge about cultures of power like science, industry and bureaucracy (Nader 1969), I found the concept helpful for "studying sideways" (Hannerz 1998). Boyer's (2015) reading of Hannerz defines "studying sideways" as a collaborative enterprise in which shared concerns are a baseline for dialogues that help illuminate, scrutinise, rethink and advance the knowledge-making practices of both the ethnographer and her collaborators in the field. Chapter 4 and 5 elucidate how multiplicity turned from a shared concern, tickling my STS sensitivities and speaking to Silver Santé researchers' scientific interests, into an object of collaborative inquiry. Collaborative inquiry into multiplicity – not only ontological, but also epistemological and ethical – was motivated both by analytical and practical objectives. In drawing attention to multiplicity, contingency and alternatives in collaborative research, seemingly fixed and universal categories of what is real, true and good revealed themselves as local and malleable practices that could be transformed deliberately. To enable such transformations, the question posed itself: "how can knowledge about what *is* be helpful in deducing what *ought* to be done?" (Rehmann-Sutter et al. 2012, 436).

In answer to this question, chapter 4 introduces methodological resources from R(R)I. As outlined in the introduction of the dissertation, R(R)I discourses and practical approaches address the social steering of science and technology by locating it in the entire research and

development enterprise, in particular at the level of scientific practices. Some of the approaches advancing R(R)I aspirations in technoscientific spaces launch "attempts to intervene on the basis of a diagnosis of what is happening and how this could be modulated" (Fisher and Rip 2013, 173). Approaches like the STIR method, which is introduced and further developed in chapter 4, stimulate reflexivity about what *is* and elicit imaginations of how "it could be otherwise" (Woolgar and Lezaun 2013, 322). Challenging deeply held assumptions and relentless questioning of what is commonly accepted as normal draws attention to "failed, unseen, not-yet-real possibilities hinted at by ordering practices" (p. 323). In this way, STIR makes the articulation of knowledge-making practices, multiple ontologies and valuation work relevant for collaboratively defined practice improvement.

With its focus on methodology, chapter 4 does not qualify as an empirical chapter. Instead, it is a 'hinge' between the first and the second part of the dissertation, connecting observation rooted in STS theory and methodology to collaborative reconfiguration of valuation work informed by R(R)I approaches. In providing a practical tool for reconfiguring valuation work, the chapter contributes to debates between proponents and opponents of contemplative science. It indicates that critical discussions between contemplative scientists and socio-cultural critics must not remain in the realm of discourse. These discussions can change the status quo if they are attached to contemplative science practices through critical collaboration across disciplinary divides.

Chapter 4

Modes of critique in interdisciplinary engagement: armchair critique, lack of critical distance and generative critique

4.1 Introduction

In speaking to the integration of societal concerns and needs into research and technology development processes, R(R)I academic and policy discourses are often said to pursue a "critical" agenda. Practical efforts following this agenda are thought to promote "critical analysis" (De Jong et al. 2015, 71; Klaassen et al. 2017, 89) or "critical reflection" (Royakkers and Topolski 2014, 357) on technoscientific practices, assumptions and knowledge (Blok et al. 2017; Lubberink et al. 2017). Some consider these efforts as being full of potential "to provide an effective conduit for criticisms and the input of critical thinking and reflexivity into science and innovation" (Long and Blok 2017, 64). Others are doubtful about this potential, suggesting that R(R)I may serve as an immunisation against public critique of science and innovation, rather than as a critical interrogation of these practices (Borck 2018; Thoreau and Delvenne 2012; Pansera et al. 2020). As this brief review of the academic literature suggests, the relation between R(R)I and critique is contested and ambiguous.

Such ambiguity also underpins what Evans et al. (2021) call the "dilemma of engagement" (p. 204) in interdisciplinary collaborations between SSH scholars and technoscientific practitioners, which combine knowledge production about research and development processes with contributions to changes in how practitioners approach the socio-ethical dimensions of these processes (Fisher et al. 2015). SSH scholars often struggle with maintaining a 'critical' position while being immersed in a technoscientific environment (Balmer et al. 2015; Doubleday 2007; Doubleday and Viseu 2010; cf. Balmer and Bulpin 2013; Rabinow and Bennett 2012). On the one hand, they seek to maintain distance to protect their ability for critical analysis of technoscientific practices and to avoid being instrumentalised by their collaborators. Aircardi et al.'s (2018) reflections on their involvement in the Human Brain Project reveal that they were concerned about their work turning into ethics management. "It was important to be clear that we were not there to do the ethics for them" (p. 15), they state to counter associations of their role with service. On the other hand, R(R)I scholars acknowledge that a lack of proximity to their collaborators positions them in the role of an adverse observer whose critique is too detached to be relevant for the matters at hand. Viseu (2015) reports from her experience as an "in-house social scientist" (p. 643) at the Cornell NanoScale Facility that her contributions were often read as "critical, adversarial, or ungrateful" (p. 657). Referring to her expertise seemed to add "unnecessary and unwelcome complexity to nanotechnology" (p. 653).

Although reflexive accounts on the dynamics of positioning have been discussed in R(R)I scholarship (Balmer et al. 2015; Blok 2019; Calvert 2013), collaborative interdisciplinary research (Barry and Born 2013; Callard and Fitzgerald 2015; Phillips et al. 2013), anthropology (Berger 2015; Bieler et al. 2021b; Humphrey 2007) and the engaged programme of STS (Cole 2009; Hackett and Rhoten 2011; Mesman 2007; Zuiderent-Jerak 2015), there are

relatively few proposals that provide concrete guidance for navigating these dynamics. Freeth and Vilsmaier (2020) identify a methodological lacuna: "What we miss in much of the STS work as well as other ways of studying collaborative research . . . is an approach that does methodological justice to the complexity of the research situation being studied" (p. 61). This chapter introduces generative critique and its practical enactment through a modified version of the STIR method as a solution for the problem of taking a 'critical' position in the complex social dynamics that pervade interdisciplinary R(R)I collaborations.

Drawing on Fitzgerald and Callard's (2015) modes of engagement and Barry and Born's (2013) modes of interdisciplinarity, I first introduce different modes of critique – armchair critique, lack of critical distance and generative critique – to characterise different positions of SSH scholars in relation to their technoscientific collaborators. I further analyse these modes of critique in empirical material gathered through participant observation in the interdisciplinary External Advisory Board of the Silver Santé Study. The analysis highlights the dynamic nature of critique by drawing out how Silver Santé researchers engaged with armchair critique in a way that made this critique generative. In paving a middle path between overly detached critique and uncritical research assistance, generative critique unsettled taken-for-granted disciplinary assumptions, approaches to knowledge production and the dominant understanding of the research object in a way that stimulated change in thought and action. The Silver Santé team developed an alternative conception and framing of their research object that responded to societal concerns with socio-cultural impacts of meditation research.

Inspired by these empirical findings, I finally develop a methodological approach to enact generative critique in interdisciplinary R(R)I collaborations. The verb 'to enact' highlights that critique is not understood as a concept, but as a practice whose potential to transform thoughts, actions and objects could be bolstered with practical guidance. To provide such guidance, I modify STIR by drawing on methodological tenets of Video-Reflexive Ethnography, abbreviated as VRE. Both STIR (Fisher 2007) and VRE (Iedema et al. 2013) are characterised by a collaborative inquiry into practices, decisions and underlying attitudes of day-to-day work in research and technology development (STIR) and in healthcare (VRE). The methods are juxtaposed to make suggestions for how STIR could learn from VRE so as to better facilitate generative critique.

4.2 Modes of critique

With the growing interest in collaborative research in STS (Farías 2016), long-standing concerns about researchers' positioning in relation to the actors they study have flared up again (Jensen 2007; Nickelsen 2009; Leese et al. 2019; Price 2011; Zuiderent-Jerak 2015). I elaborate on the

problem of positioning by distilling three modes of critique from STS and R(R)I literature on interdisciplinary collaboration. I argue that armchair critique has characterised engagements between SSH scholars and neuroscientists, while concerns about a lack of critical distance have perturbed R(R)I researchers in synthetic biology. Finally, I elucidate how generative critique emerged in collaborations between anthropologists and health researchers. The examples from the literature were selected because they share features with the Silver Santé Study (i.e., socio-ethical concerns with neuroscientific assumptions, division of labour between social and biological research, diverging paradigmatic approaches to human health) and, therefore, helped me make sense of critique in my empirical material.

Moreover, these examples allowed me to configure modes of critique in a way that resembles the creation of Weberian ideal types: through an arrangement of discrete individual phenomena into categorical constructs. The purpose of the categorisation is to emphasise the ways in which modes of critique differ from one another and what the implications of these differences are, both for establishing rapport among collaborators and for the outcomes of collaborative projects. Due to the 'elevation' of these modes from concrete instances, they cannot be found as such in actual collaborative practices (Weber [1949] 2011). The nature of critique in actual collaboration is more convoluted, dynamic and fluid: different modes of critique collapse, coexist or dominate one another in one project (Balmer et al. 2015; Freeth and Vilsmaier 2020). After laying the conceptual groundwork, I illustrate the dynamic nature of critique with empirical material from interdisciplinary engagement in the Silver Santé Study.

4.2.1 Armchair critique

Armchair critique has been a common form of SSH engagement with the neurosciences (Fitzgerald and Callard 2015; Rose 2013). Fitzgerald and Callard (2015) present a range of critical authors who have published historical, social and cultural analyses that deflate neuroscientific trends or claims. As these authors seek dialogue with the neurosciences but aim for dissensus and opposition to change the status quo, their relation to existing forms of neuroscientific theory and practice may be described as "agonistic-antagonistic" (Barry and Born 2013, 12). This relation has been established in five collections and monographs of critical scholarship published between 2011 and 2013 (Choudhury and Slaby 2012; Littlefield and Johnson 2012; Pickersgill and Van Keulen 2011; Ortega and Vidal 2011; Rose and Abi-Rached 2013). In one of these collections, SSH scholars joined forces and explicitly concentrated their enterprise on the qualifier 'critical' (Choudhury and Slaby 2012).

The 'critical' in the name of the Critical Neuroscience initiative preserves "historical solidarity" (Slaby and Choudhury 2017, 362) with Frankfurt School critical theory. It shares with it a historico-political mission: to reveal the integrated system of leading assumptions, underlying normativities, material conditions and social implications of scientific inquiry into human

reality. By spelling out whose interests shape scientific research, critical theorists generate insights that allow them and others to render reality less unjust (Hartmann 2012). In a similar vein, promoters of Critical Neuroscience follow a dual strategy. On the one hand, they pursue "a multi-dimensional critical investigation of neuroscience-in-context" (Choudhury and Slaby 2012, 13) that reckons ideological influences, biases as well as hidden political and economic entanglements of neuroscientific assumptions. This agenda has been realised in studies that point to the seductive charm of brain images as direct representations of disease, difference and personhood (Raz 2012), the neurobiologisation of crime (Choudhury et al. 2009), and the burgeoning relations between national security industries and neuroscience research (Marks 2010). On the other hand, the Critical Neuroscience initiative calls for adopting "a hands-on approach that embeds and involves the critic within interdisciplinary research" (Choudhury and Slaby 2012, 13). The objective is to render critique meaningful and productive for neuroscientific research.

However, members of the initiative have shown hesitation to realise the proclaimed hands-on approach. Fitzgerald et al. (2014b) assert that they have resorted to armchair critique, instead of "linking critique with lab practice to influence the shape of future research in neuroscience" (Choudhury et al. 2009, 74). Most of the members of Critical Neuroscience have not engaged with neuroscientists in experimental research, possibly because their mission is to reposition experiments in their "context" (Slaby and Choudhury 2012, 35). This mission is based on the assumption that experimental knowledge would be 'better' if contextual, external influences braided through scientific facts were more visible and thus open to reform. The critical gesture of making context visible, however, does not directly translate into constructive and concrete proposals for how to rethink and redo neuroscientific experiments.

Since the Critical Neuroscience initiative dissolved because members moved on to other projects (Borck 2018), their critical successors have started to rethink the relation between the neurosciences and SSH (De Vos and Pluth 2016; Leefmann and Hildt 2017; Vidal and Ortega 2017). Several contributions to Leefmann and Hildt's collection discuss possible forms of "multidirectional" (p. xii) interactions. In this spirit, Rose (2013) suggests:

> To try and work on the assumption that they [natural scientists] are well-meaning individuals just the same as you are, rather than to start from a hermeneutics of suspicion about what they are doing, that they are only in for the money, for the influence, for the research papers and so on. They probably are in it for all those things as well, but no more than the social scientists. (Rose 2018, 118)

He encourages SSH scholars to "move beyond description, commentary, and critique" (p. 23) by becoming a lab-based collaborator.

4.2.2 Lack of critical distance

Calls for interdisciplinary collaboration are often accompanied by worries among SSH scholars about a lack of critical distance. A lack of critical distance can take two forms: "ebullience" (Fitzgerald and Callard 2015, 11) or "service-subordination" (Barry and Born 2013, 11). Ebullience refers to uncritical incorporation of scientific claims in scholarship in support of theoretical insights of cultural and social analyses. Fitzgerald and Callard (2015) mention the work by social theorist Massumi (1995) on the autonomy of affect as an example for a naïve understanding of scientific research. Similarly uncritical are scholars whose collaborations with natural scientists are characterised by a hierarchical division of labour. A social "service discipline" (Barry and Born 2013, 11) adopts a natural science definition of a problem and supports the development solutions within pre-determined parameters.

In their analysis of the role of R(R)I in synthetic biology, Calvert and Martin (2009) distinguish between social scholars who serve as "contributors" from those who are "collaborators" (p. 202). They describe collaborators as being engaged in "authentic interdisciplinary work . . . that does not just follow the scientific research, but interacts with it" (p. 203) to co-produce knowledge. Contributors, by contrast, are in a service-subordination mode of studying ethical implications and public reactions once synthetic biologists have done their work. Such R(R)I research does not reconfigure scientific and technological designs, but leaves a deterministic relation between a particular design and its social outcomes unchallenged.

Calvert (2013), for instance, reports that efforts to address social, ethical and philosophical issues in synthetic biology were often based on the assumption that society was separated from science, something to be engaged with in order to keep public resentment at bay. After giving a presentation at a synthetic biology conference in a panel called "Interacting with Society" (p. 184), she felt that she was legitimising the field. R(R)I scholars have been expected to legitimise synthetic biology by shielding innovations from public controversy in different ways: one is to help scientists choose between different applications based on an early prediction of which would cause controversy; another is to translate scientific results and technological developments to the public in a manner that renders them less contentious; and yet another is to contribute to public acceptance by serving as a symbol for ethical conduct in the scientific research enterprise (Balmer et al. 2015).

An even more pervasive form of science legitimisation that SSH contributors have fallen prey to is an implicit corroboration of the enormous promises of emerging science and technology. In the case of synthetic biology, Calvert and Martin (2009) observe that it is a "field in the making" (p. 201) whose current work is far from being suitable for application. Nevertheless, "there is a widespread conviction that it has important ethical, legal, and social implications" (p. 202). By discussing the implications of anticipated research trends, R(R)I scholars associate

themselves with the promoters of synthetic biology. They legitimise both monetary and scholarly investment in emerging research and technology development, while leaving existing technologies whose impacts are more clearly predictable unattended (De Saille 2015). Although immersion in technoscientific discourses and close proximity to related practices are generally desirable to foster mutual dialogue, Calvert and Martin point at the danger of uncritically embracing hegemonic framings, which may compromise social science research objectives.

4.2.3 Generative critique

Critique that is neither overly detached and agonistic nor overly attached and morphed into uncritical service could be possible in "integrative-synthetic" interdisciplinary collaboration (Barry and Born 2013, 11). Integration and synthesis imply that there are two distinct disciplines that merge into one (e.g., the fusion of biology and chemistry in biochemistry). Yet, the kinds of critical collaboration considered here maintain disciplinary differences across socio-technical boundaries while assuming that these boundaries are blurred. According to Fitzgerald and Callard (2015), there have always been crossings and entanglements between different disciplinary approaches – for example, attempts to bring biological and social phenomena under one roof in German holism (Harrington 1996) or the history of behaviour genetics unfolding in-between the natural and the social sciences (Panofsky 2015) – that can serve as anchor points for rethinking and remaking theories, methodologies and objects.

Fitzgerald and Callard consider experimental formats as suitable for such collaborative work. They draw on Rheinberger's ideal account of experiments as open processes that refuse preliminary decisions about outcomes, rather than as experimental apparatuses that make nature fit prior expectations (Sismondo 2010). Rheinberger (2011) proposes that experiments allow for "digression and transgressions of smaller research units below the level of disciplines, in which knowledge has not yet become labelled and classified, and in which new forms of knowledge can take shape" (p. 315). Fitzgerald and Callard (2015) refer to such open, ended experiments across socio-cultural-scientific divides as "experimental entanglements" (p. 16), which, according to Niewöhner (2016), provide the conditions for generative critique to emerge.

To elaborate on the notion of generative critique, Niewöhner draws a distinction between experimental entanglements and the study of experimental practices in laboratory ethnography. The latter focuses on 'critically' exposing underlying assumptions, interests and constructions of scientific experiments. As a number of STS scholars such as Lynch (Ziewitz and Lynch 2018), Stengers (2000) and Latour (2004) have pointed out, critical laboratory ethnographies often 'explain away' scientific practices by means of deconstruction. Generative critique, by contrast, is based on a mutual appreciation of methods, instruments, materials and objects in different epistemic cultures. It depends on what Niewöhner (2016) names "co-laboration," that

is "experimenting with different ways of seeing-and-being-in-the-world" (p. 19). An example is his co-laborative ethnography in a molecular biology laboratory where he together with biologists developed a research agenda for "localizing biology" (Niewöhner 2015): they tried to "situate the universal human body of biology" and "to materialize the constructed body of the social sciences" (p. 233). As shown in this example, co-laboration does not aim at producing shared outcomes, but opens up possibilities for generative critique that stimulates reflexivity and change within the participating disciplines.

Niewöhner's understanding of generative critique draws on Verran's (2001) *Science and an African Logic*. Verran introduces "generative critique" (p. 21) in order to move away from her initial conclusions about her fieldwork observations in Nigeria. From 1979 to 1986, Verran lived and worked in Ile-Ife where she taught and supervised science teachers in primary school education. Based on observations in Nigerian (Yoruba) classrooms, she initially concluded that logic and math were culturally relative and that an incommensurability separated 'Western' and 'other' knowledges. However, she was unable to finish her initial manuscript, for she felt that it "failed to deliver a useful critique" (p. 20). Instead of positioning herself as a removed observer who writes about communities in which Western knowledge had threatened other ways of knowing, she revised her manuscript so as to write for those she studied.

To develop a critique that is useful for a bilingual community struggling with tensions between Yoruba and Western math in everyday life, Verran paid continuous attention to what enabled and foreclosed the recognition of differences to the hegemonial. When colonial relations define which knowledge practices are legitimate, a generative critique points at how communities with a colonial past stay with differences by bringing the hegemonic and the non-hegemonic together. An example is teaching how to measure body height as an extension (Western math) and as a multiplicity (Yoruba math) at the same time. Verran (1999) observed that this kind of teaching involved making extension contingent on multiplicity by measuring students' height with a string from head to ground, winding the string several times around a 10-cm wide card, counting the number of windings, multiplying the number by ten and adding the surplus centimetres of string to the product. The example illustrates generative critique as a practice that enacts what might appear as a stable object (measuring body height) in different ways.

The opportunity to remake objects springs from creative ways to deal with tensions between different ways of seeing and approaching the world. To detect such tensions in everyday life that may allow for alternative ways of acting, Verran (2001) suggests paying attention to "disconcertment," a fairly common but often overlooked "fleeting experience" (p. 5). Experiences of disconcertment are visceral and thus personal, but, at the same time, they are "an expression of our solidified collective institutional habits" (Verran 2013, 145). They occur when encountering interruptions that do not fit one's line of reasoning and thus destabilise

familiar ways of categorising the world. Due to their disruptive qualities, disconcerting moments provide "a sure guide . . . in generating possibilities for new futures" and, thus, an opening "to do useful critique" (Verran 2001, 5).

Hillersdal et al. (2020) demonstrate how attending to disconcertment enabled generative critique in health research. The anthropologists pursued generative critique in an interdisciplinary research project on obesity and high levels of cholesterol in the blood. They report that "sensitivity to difference, as when sharing doubts with project colleagues about how to approach a research problem, is a promising starting point for pursuing a generative critique" (p. 3). Sensitivity for the experience of disconcertment helped Hillersdal and colleagues identify and work through moments in which the object under study was something else for collaborators from different disciplines. Generative critique is making connections between multiplicities of the same object, for instance, the biomedical understanding of pain as an intensity located in an individual body and the anthropological approach to pain as formed in relation to others. These connections gave rise to new questions, such as what and how to advise people on choosing pain-alleviating drugs. Such questions also destabilised routine practices, economic and strategic agendas, as well as expertise and evidence hierarchies. Critique of the status quo was generative of "other ways of 'seeing and doing' problems" (p. 3) because it was enacted in moments of co-laboration when problem-solving was unsettled and reconfigured by all parties.

Along these lines, Niewöhner (2016) states that generative critique puts into question how objects have come into being and how and why they remain stable. Such questions can arise when people are brought together who are usually situated differently in relation to an object and, therefore, see and enact the same object differently. When these people co-laborate, they can make connections between these "multiple objects" (Mol 2002, p. 5), remake objects in new ways and generate alternatives to what is hegemonic in their situated location (Kenney 2015). According to Niewöhner, anthropologists who enact generative critique neither lose their critical grip because of co-opting relations with scientific experts, nor do they drift off to an "epistemological meta-level" that is too abstract to be relevant for the experts' fields of research. Instead, they closely engage with and interrogate "the relevances and logics of these fields rather than starting from an outright negation of these aspects" (p. 13).

4.3. Critique in the Silver Santé Study

As the modes of critique sketched above appear as though they were monolithic constructs, I shed light on their dynamic and flexible nature in actual practices of interdisciplinary engagement. For this purpose, I draw on participant observation at a European consortium meeting of the Silver Santé Study, which I conducted as part of the praxeographic study

presented in chapter 3. Hence, the empirical material is not derived from a collaborative project which I initiated. While my collaboration with the Silver Santé team is presented in chapter 5, I focus here on an interdisciplinary engagement which I came across accidentally during fieldwork. I describe how the Silver Santé team dealt with armchair critique and a lack of critical distance in interdisciplinary engagement with the consortium's External Advisory Board (EAB). I further present how the Silver Santé team made armchair critique generative for the public communication of their research. In applying different modes of critique to my observations, I do not perform a rigorous analysis. Instead, I seek to concretise and refine ideal types of critique through empirical illustrations. Moreover, the empirical section feeds into subsequent methodological development. Inspired by the spontaneous emergence of generative critique in the Silver Santé Study, I develop a method for facilitating such critique in interdisciplinary R(R)I collaborations.

4.3.1 Armchair critique versus lack of critical distance

Following the Silver Santé Study for more than three years allowed me to attend its European consortium meetings in 2018 in Liège, 2019 in Berlin, and 2020 in an online environment. An important part of these meetings was the feedback session of the EAB. The EAB was an interdisciplinary group of independent experts selected by the Silver Santé team to participate in the two-day consortium meetings, review their work and provide comments regarding objectives, development, as well as exploitation and dissemination activities. According to one of the Silver Santé researchers, the function of the EAB was to offer a critique that would be constructive for the project. She elucidated: "It was pushing us to reflect on what we were doing. It was constructive." To fulfil this function, EAB members presented their observations during a feedback session that was a designated part of every consortium meeting and wrote a short report summarising their comments and recommendations.

The EAB was not a fixed entity, because the Silver Santé team had difficulties finding experts available to give advice to the team on a yearly, let alone more regular basis. Therefore, the EAB members varied from year to year. In 2019, it had three members: a sociologist working at an ethics department, a neuroscientist experienced in meditation research, and a neuropsychologist studying changes in the brain and cognition throughout the lifespan. After a long day of listening to a range of presentations on research (meditation, lifestyle, attention, emotion, cognition, biomarkers) and other activities of the Silver Santé Study (project management, communication, clinical trial sponsorship), they had an hour to provide feedback. They assembled behind the speaker's desk and shared their impressions one after another with the consortium. The sociologist was the first commentator who shared the following impressions:

> In everyday life – within the interpretive patterns of common man – meditation is mostly regarded as a practice of temporary but regular disengagement from

> the outside world, disconnection, deceleration, and self-centring. I have the impression that this is also the underlying paradigm in the Silver Santé Study. The goal of the research is to demonstrate that temporary but regular retreat from the world is good for cognitive well-being. However, this is only one possible model for cognitive well-being among others. Research on dementia suggests that social exchange and inclusion, rather than personal withdrawal, promotes cognitive well-being. It is important to be aware of the value judgements underpinning your research.

After the sociologist had finished his speech, a Silver Santé researcher jumped in and explained that mindfulness meditation was not about retreating from the world. Rather, it helped create a different relation to one's thoughts and emotions so as to remain engaged with happenings in the world without feeling overwhelmed.

Similarly, the meditation researcher who was part of the EAB disagreed with how the sociologist had portrayed the paradigm of the Silver Santé Study. He expressed his disagreement as follows:

> I do not think that the Silver Santé Study and its paradigm are disengaged. Quite the opposite, it is all about engagement with the world in a prosocial manner. This is at the heart of the contemplative traditions from which mindfulness and compassion meditation emerged. The team should further investigate the effects of the interventions on social behaviour. This may allow you to respond to questions about the social impact of your research. Depending on the results, you may find far-reaching effects of meditation training that go beyond individual health benefits.

Disagreement and mild indignation tainted initial responses to the sociologist. As I learned in subsequent conversations with Silver Santé researchers, they understood the sociologist's comment about disengagement to be not only related to mindfulness meditation, but also to their research practices. They suspected that such feedback could have stemmed from a lack of awareness of actual work practices in the study. Their everyday work involved a lot of social engagement with study participants, which an "outsider" inexperienced in clinical research might be unaware of.

In this snapshot from the EAB feedback session, the sociologist embodies the role of an armchair critic. He articulated normativities underlying the operationalisation of meditation as a brain training and lifestyle intervention, which turned cognitive well-being into a private rather than a social affair. Although his feedback related to the assumptions underpinning the design of the Silver Santé Study, researchers understood it as a critique of their research practices. To counter

the description of their research as "disengaged" and "disconnected," scientists pointed at the ongoing care work in relation to study participants that was necessary to make the clinical trial work (see chapter 3). The sociologist from the EAB was thus considered as somewhat removed from the Silver Santé Study because he did not know project from the inside of everyday scientific practice (i.e., he had not observed Silver Santé researchers on the laboratory floor). His critique was perceived as adversarial and evoked defensive responses among Silver Santé researchers.

The other EAB members could be considered as too close to the Silver Santé team to express a critique that would unsettle the study's assumptions and problem definitions. They were commenting on the project as scientific colleagues who were mainly concerned with epistemological questions and project management (reasons for the 0% attrition rate of the Age-Well trial, possibilities of data sharing for the replication of analyses, options to secure additional funding for the data analysis, etc.). While these comments were also considered as "critical" by some Silver Santé researchers because they provoked deep reflections on how their research trajectory could be adjusted, refined, and further advanced, the comments were not critical in the sense of armchair critique (i.e., probing underlying normativities and social implications of scientific investigations). While the collegial remarks, scientific questions and management concerns raised in the EAB feedback helped the Silver Santé team improve their project, they left disciplinary ways of seeing and approaching work practices and research objects undisturbed.

Even the quoted suggestion by the meditation researcher from the EAB regarding the conceivable social impact of the study was framed in epistemological terms: he proposed to study the effects of the interventions on prosocial behavior. Following patterns of "boundary work" (Gieryn 1983), he had reduced the social impact of the Silver Santé Study to a study measurement so as to keep social responsibility in the familiar narrow realm of the scientific. The sociologist, by contrast, raised questions about social impact in a wider sense: the values and conceptions of the good life that the study promoted in terms of the hypotheses it was testing.

4.3.2 Making critique generative

In the aftermath of the European consortium meeting 2019, I observed how the EAB feedback was taken up by Silver Santé researchers in a way that was generative of new engagements with the study's research object. Some Silver Santé team members discussed the sociologist's comment on the conception of meditation underpinning their research directly after the EAB feedback session:

> Meditation instructor*:* As he is trained in sociology and ethics, I am not surprised that he adopted the role of a critic who asked provocative questions.
>
> Scientific coordinator*:* These questions were useful. They made me realise that we need to explain what meditation is. Meditation is not about pausing thoughts and disengaging from the world.
>
> Senior researcher*:* It is indeed important to open the 'black box' of meditation.
>
> Meditation instructor: I could write a text that explains what we teach in the meditation intervention.
>
> Scientific coordinator: A text would be good, but we should also prepare a video for the public.

Two months later, the meditation instructor published a post entitled "What is meditation?" on the Silver Santé website and a video "Meditation explained" on the project's youtube channel. In the website post, meditation is described as "cultivating certain qualities that we already have . . . it's about helping us become calmer, clearer and more compassionate in daily life" (www.silversantéstudy.eu). Meditation is here not a private cognitive-affective training as it is defined in Silver Santé publications (Lutz et al. 2018; Marchant et al. 2018; Poisnel et al. 2018). Instead, meditation is presented as a practice that changes people's relationship to the world so that this relation gains in calmness, clarity and compassion. Accordingly, regular meditation practice develops a compassionate feeling of connection with other beings, which may animate activities to alleviate their suffering.

Comparing the brain-centric conception of meditation in scientific publications with the relational account of meditation in public communication could lead me to the interpretation that Silver Santé researchers adapted their rhetoric to different audiences (Brown and Michael 2001; Gilbert and Mulkay 1984). Their public communication could even be considered as a form of 'window dressing' because the positive image of meditation had recently been challenged in the news. Journalists had reported on scientific studies about negative side effects of meditation (Britton 2019; Lindahl et al. 2017; Schlosser et al. 2019) and headlines like "Should meditation be practiced at school to calm down children?" circulated together with critical opinion pieces on keeping employees quiet and compliant through meditation at the workplace (for French news see Gallagher 2018 and Pinto Gomes 2018; for English news see Foster 2016 and Little 2018). It was thus important for the Silver Santé team to stress that the study's meditation intervention was save and ethical. "There are very few negative effects associated with meditation as long as it's in light conditions . . . a weekly two-hour

mindfulness session every week should be fine for most [people]," the Silver Santé meditation instructor states in her website post about the nature of the meditation intervention. Moreover, her relational account of meditation underlines that some types of meditation explicitly "focus on being compassionate to oneself and to others," rather than producing a numb internal state that fosters docile endurance.

Instead of reducing different accounts of meditation to mere rhetoric, one could also consider them as different enactments of the same object (Mol 1999, 2002). A relational enactment of meditation emerged after the critique of the sociologist from the EAB had shaken up the common-place understanding of meditation as a brain training. The senior researcher quoted above referred to this ontology of meditation as a 'black box' since its multiplicity had been hidden within a unidimensional object. By pointing out that this object could promote a self-centred conception of the good life focused on individual benefits, cognitive performance and detachment from others, the sociologist's EAB feedback pushed the researchers to "open up" (Stirling 2008) what meditation was in the study. By acknowledging the normative interpretation of their research object, Silver Santé researchers gained impetus for its reconfiguration. They made armchair critique generative of meditation as a relational, engaged practice rather than an individual brain training.

In this way, they accounted for a potential "soft impact" (Swierstra and Te Molder 2012) of their research; soft impacts are problematic to evaluate, quantify and explain because they affect culture, morals or politics. The soft impact identified here could be considered as an instance of what Thompson (2017) calls the "modern mindfulness looping effect" (p. 49). Informed by Hacking's (1995) work on "looping effects," Thompson states that in conceptualising mindfulness as a brain training, scientists project it into the brain, making it real by virtue of its neuronal markers. The scientific concept – especially if promulgated by the media in statements like 'to be mindful you need to learn how to downregulate your amygdala in mindfulness training' – links back to how people think about themselves. Mindfulness comes to be conceived as a detached, individualised practice inside the mind, taken to be fundamentally the brain, which people need to learn to control to lead more fulfilled, peaceful lives. The Silver Santé team recognised the modern mindfulness looping effect at work in their research and took measures to counteract it. They changed their public communication about meditation, foregrounding the social and compassionate dimensions of the practice. In considering the wider socio-ethical horizon against which the Silver Santé Study was carried out, they made efforts to responsibly steer a potential soft impact of the project.

As armchair critique induced the Silver Santé team to take care of a soft impact of their research – the kind of impact that technoscientific practitioners usually consider to be outside of the scope of their responsibilities (Fisher and Miller 2009; Flipse et al. 2013) – it seems that

an adversarial voice speaking from a rather distant position can be productively disruptive of hegemonic, taken-for-granted objects, because it forcefully upsets entrenched ways of thinking. To safeguard this disruptive quality of critique, one of the members of the Critical Neuroscience initiative warns against being "overly cautious in bringing political [and ethical] concerns to the attention of natural scientists" (Jan Slaby, e-mail communication, October 8, 2017). Likewise, Rabinow and Bennett (2012) conclude from their collaboration with synthetic biologists that SSH researchers should practice "frank speech" (p. 179) that does not eschew confrontations. A critique that is watered down by careful modes of expression may not be as effective in perturbing procedures, assumptions and practices that usually remain unquestioned. Comparing different modes of interdisciplinarity, Barry and Born (2013) observe: "what is striking about the agonistic-antagonistic mode is that it can be associated with more radical shifts in knowledge practices, shifts that may be epistemic and/or ontological" (p. 13).

Yet, one could also argue that armchair critique only had an effect in the Silver Santé Study because researchers engaged in "affective labour" (Myers 2012, 177) to become responsive to armchair critique. Rather than reacting with reservation towards an adversarial description of their research paradigm as "self-centred" and "disengaged," they managed to deduce a new insight from it. As they care about the improvement of their research, scientists made efforts to affectively attune to alternative ways of viewing their work. One of the senior researchers explained: "As scientists we need to develop the capacity to be open to any kind of critique." Armchair critique became constructive because Silver Santé researchers had the affective capacity to turn it into generative critique.

Ethnographic studies on interdisciplinary collaborations demonstrate that the capacity for generative critique is not simply present in research teams. It needs to be acquired in ongoing interactions between collaborators (Callard and Fitzgerald 2015; Callard and Margulies 2014; Fitzgerald et al. 2014a; Littlefield et al. 2014). For example, Fitzgerald et al. (2014a) conclude from their collaborative project on truth-telling and deception that the interaction between SSH scholars and neuroscientists was characterised by "unspoken tension and lurking resentment" (p. 707). To make these interactions generative of experimental results, collaborators had to learn living and working with ambivalence and reserve. To provide guidance for collaborating through ambivalence, researchers have expressed the need to develop practices, tools or methods that could facilitate interactions across disciplinary divides (Fitzgerald et al. 2012; Freeth and Vilsmaier 2020; Griffin et al. 2013) in which generative critique emerges. Such methods should open up and guide collaborative reflection and learning without formalising interactions in rigid structures that constrain rather than enable generative critique. In the following section, I develop a practical proposal for the enactment of generative critique in interdisciplinary collaborations.

4.4 Generative critique in interdisciplinary R(R)I collaborations

Attempts to put critique into practice have been put forward in interdisciplinary collaborations seeking to advance R(R)I objectives. Many approaches guiding such collaborations do not provide sufficient guidance for social scholars to take a critical stance towards technoscientific practices that neither slips into agonism nor subordination (Aircardi et al. 2018; Åm and Sørensen 2015; Balmer et al. 2015; Calvert and Martin 2009; Doubleday and Viseu 2010; Nydal 2015; Rabinow and Bennett 2012; Thoreau 2011; Viseu 2015). Two engagement methods – STIR and VRE – are exceptional in that regard since they help maintain a critical position that is neither too far away nor too close to the practices under study. The 'critical' element in these methods could be broken down to careful scrutiny of expert practices, aiming to expose their underlying assumptions, rationales and stakes in order to uncover how and for what purposes they are shaped and enacted. Critique, however, is here not necessarily geared towards uncovering power dynamics – the kind of analysis that has at times been accused of favouring deconstructive forms of analysis and stopping short of offering productive alternatives. Instead, STIR and VRE introduce a reflexive element in technoscience that, in the vein of 'doing critique' and challenging established positions and knowledge, can help to problematise dominant patterns of behaviour. In endorsing such a pragmatic stance that is context-dependent and oriented towards action, STIR and VRE offer a concrete way of enacting generative critique. In what follows, I introduce both methods and elucidate how STIR could enhance its potential to enact generative critique in interdisciplinary R(R)I collaborations through modifications informed by VRE.

4.4.1 Introducing Socio-Technical Integration Research (STIR)

STIR was developed in response to the *21st Century Nanotechnology Research and Development Act of 2003* in the United States (Fisher 2019b). The Act required that "research on societal concerns" was "integrated with nanotechnology research and development" (United States Congress 2003, 117). To probe the capacities of nanotechnology researchers and engineers to integrate broader societal considerations into their work, Fisher (2007) developed a 12-week programme. He tested his programme in what became the first STIR pilot study in the Thermal and Nanotechnology Laboratory in Boulder, Colorado. For this purpose, Fisher immersed himself as an "embedded" scholar (Fisher and Mahajan 2010, 216) in the laboratory where he interacted with numerous researchers, conducted interviews, participant observation and archival research. Over the course of doing fieldwork, he noticed that researchers were often already integrating social and ethical concerns into their work without being aware of their own role in such a de facto integration. He discussed his insights with the researchers and assisted them in articulating further latent ethical reflections.

To facilitate this process, Fisher (2018) developed what he called the STIR "decision protocol" (p. 2). On the basis of the protocol, he engaged with researchers in a collaborative manner to map out their decision-making processes on a regular basis. They explored together how ethical and societal considerations were already or could be aligned with technical alternatives and how researchers could further cultivate or bring about this alignment in practice. As a result, researchers enhanced their capacities for integrating socio-ethical considerations with technical alternatives and started to perceive socio-technical integration as "an integral part of th[eir] work" (Fisher and Maricle 2014, 74). In addition, they voluntarily altered their decisions and practices concerning experimental setup, material choice and safety strategies (Fisher and Mahajan 2010).

The STIR pilot study realised a twofold agenda. On the one hand, it rendered research and innovation processes more akin to what would eventually be articulated as R(R)I by integrating societal and ethical considerations into these very processes and products. On the other hand, it resulted in knowledge production on whether such an integration was possible in the first place, how it unfolded over time and how it co-produced ethics, science and technology on the laboratory floor. Ensuing STIR studies produced similar results. They provoked changes in research direction, experimental design, team work and interactions with stakeholders, to name but a few examples, that integrated technoscientific alternatives with socio-ethical considerations, while generating knowledge about the conditions and processes of integration (Fisher 2007; Fisher and Schuurbiers 2013; Fisher et al. 2010; Flipse and Van De Loo 2018; Flipse et al. 2014; Lukovics and Fisher 2017; Richter et al. 2017; Schuurbiers 2011).

STIR serves as a practice for generative critique because it facilitates explorations of alternative ways of doing research in a collaborative learning process. By using participant observation as a resource for collaboration on issues of direct relevance to technoscientific practitioners, an embedded scholar avoids armchair critique. The collaborative nature of interactions helps circumvent a service-subordination mode of interdisciplinarity. Ethics cannot be relegated to an embedded scholar because what counts as 'ethical' and 'unethical' unfolds and may become altered over time in discussions about routine practices. Each semi-structured dialogue guided by the decision protocol starts with exploring an opportunity, challenge or problem that a technoscientific practitioner currently faces and that incites decision-making. A practitioner and an embedded scholar co-develop a problem definition, reflect together on considerations that matter for alternative courses of action and anticipate outcomes of a particular action selected from available alternatives (Fisher and Schuurbiers 2013).

Although the decision protocol structures interactions around four components (opportunity, considerations, alternatives, outcomes), it allows for flexibility in their order and application. In some studies, embedded scholars adhere closely to the STIR decision protocol (Flipse et al.

2014); in others they have altered or omitted components, choosing instead to adapt the STIR dialogue to their collaborators' concerns and needs (Flipse et al. 2013; Lukovics and Fisher 2017). STIR strikes a balance between structure and flexibility so that generative critique can emerge in the form of rethinking and remaking scientific and other opportunities, challenges, objects and practices.

The interaction between collaborators from different disciplinary backgrounds allows for connecting and combining different ways of seeing and approaching a problem, for raising different questions about it and for widening the horizon of considerations, values and anticipated effects that play into a decision-making process. While a technoscientific practitioner may alter problem definitions, objectives, considerations or practices on the basis of insights gained in a STIR dialogue, the embedded scholar may also modify her assumptions, questions and conclusions about the laboratory environment, routine work and its socio-ethical dimensions. Problem definitions, possible solutions and insights evolve and change over the course of a STIR study. Mutual learning among collaborators enables rethinking and remaking research and its object – in short, generative critique.

Despite the outlined potential of STIR to enact generative critique in interdisciplinary R(R)I collaborations, STIR could be further aligned with generative critique on three dimensions: the affective, collaborative and temporal dimensions of interdisciplinary research. First, for Verran (2001), a starting point in the pursuit of generative critique is cultivating an affective sensitivity for moments in which epistemic and metaphysical differences can be experienced. Moments of "disconcertment" (p. 5) emerge when tensions between different ways of making objects evoke immediate bodily responses, such as "the sort of laughter that grows from seeing a certainty disrupted" (Verran 1999, 141). Affect may direct attention to otherwise overlooked differences, for instance, when meeting other academic disciplines' ways of capturing a problem and defining a research object (Verran 2001). However, STIR has so far not made use of affect to broaden ethical considerations and enact generative critique. Although questions about the affective dimension of ethical considerations are part of the STIR decision protocol (Fisher 2018), published STIR studies have not addressed how affects figure into decision-making processes (see Conley 2014 for an exception).

Second, studies inspired by STIR have shown that the realisation of collaboration in interdisciplinary teams is challenging (e.g., Åm and Sørensen 2015; Thoreau 2011). Embedded scholars may find themselves outside of scientists' and engineers' learning and decision-making processes for various reasons, including practical, cultural and institutional barriers (Fisher 2019a). In light of asymmetric power relations and the possibility of "cultural subversion," in which "one party's language overwhelms that of the other" (Collins et al. 2007, 660), embedded scholars run the risk to be cast as "spokesperson[s] for 'ethics'" (Fisher and Mahajan

2010, 225). They may be expected to operate strictly as experts who evaluate courses of actions against ethical frameworks and give ethical advice. Such expectations may complicate a collaborative learning process.

Third, aligning expectations and establishing trust between collaborators so as to invest in an open-ended process without clear outcomes may require time. Whereas a STIR study is conducted within 12 weeks, Kenney (2015) describes "how Verran – through decades of thoughtful participation – attunes her modes of attention, analysis, and narration" (p. 750). Capabilities and conditions that allow for generative critique could be further nurtured over a longer period of time than the original STIR study design allows for. To enhance STIR's suitability as a practice for generative critique, VRE serves as a source of inspiration for modifications.

4.4.2 Learning from Video-Reflexive Ethnography (VRE)

VRE was developed roughly around the same time as STIR in the context of healthcare research, evaluation and improvement (Carroll and Iedema 2006; Iedema et al. 2006a; Iedema et al. 2006b). It was refined in the course of the HELiCS project which aimed at enabling clinicians to improve their communication practices in clinical handover, meaning transfers of responsibility and accountability between work shifts, departments and institutions (Iedema et al. 2009). Quality improvement of routine practices like clinical handover has become a pressing concern for policy makers and hospital staff alike. A reason is that constantly changing medical technologies, an increasing number of patients with multiple comorbidities, as well as the need to collaborate with a range of specialty groups and diverse skill sets has rendered contemporary heath care work increasingly complex and prone to failure (Carroll et al. 2008). Qualitative research methods have been recognised as suitable practices to study, question and reform the social and organisational complexity surrounding healthcare and hospital work (Bal and Mastboom 2007; Lambert and McKevitt 2002; Mays and Pope 2001).

VRE capitalises on methodological advances of using video in qualitative research by joining video-reflexivity with video-ethnography (Carroll and Iedema 2006). To combine the two approaches, clinical practitioners, including physicians and nurses, view video footage of their everyday work. While watching fragments of their recorded work practices, they may see aspects of their work that have become opaque in daily routine. In regular "video-reflexive sessions" (Carroll and Mesman 2018, 1145), clinical practitioners discuss these fragments. Some of them have taken part in selecting what is shown to the group. Discussing video material together creates new ways of seeing and thinking about daily routines (Mesman 2015). Clinical practitioners may become aware of their strengths and weaknesses and identify possibilities for improvement.

A VRE researcher, usually from SSH, facilitates this process not only by taking care of generating and selecting video material but also by moderating video-reflexive sessions. To complete these tasks, ethnographic fieldwork is required to develop familiarity with what is going on at a particular healthcare site, the socio-historical context of the filmed material and the institutional environment. Iedema and Carroll (2011) have coined the concept "clinalyst" as a shorthand version of "outsider-analyst-catalyst" (p. 176) to refer to a VRE researcher who produces insider knowledge by asking outsider questions. A clinalyst opens up clinical practices to clinical practitioners, who, in return, open up their practices to the clinalyst. In a collaborative learning process, both gain access to latent practices that practitioners usually do not pay attention to or take as given.

For example, Mesman (2015) used VRE to shed light on practices that ensure safety at a neonatal care ward. Assuming that safety requires more than high technology, protocols and training to avoid mistakes, Mesman focused on aspects of clinical work that go well and are safe. As these are hardly acknowledged or discussed by practitioners, Mesman used VRE to explicate practitioners' hidden competencies to understand the presence of safety in an environment marked by complex tasks and time rush. At the ward, infection prevention turned out to be one of the primary safety practices in dealing with the fragile patient population of newborn children. Infection control is among the practices that have been improved through VRE (Wyer et al. 2015; Gilbert et al. 2020). Other studies have shown that VRE contributed to the development of an ambulance-to-emergency department handover protocol (Iedema et al. 2012), greater commitment of nurses to palliative care (Collier et al. 2018), improved hand hygiene compliance (Gilbert et al. 2020) and the optimisation of interprofessional communication (Carroll et al. 2018).

VRE offers inspiration for refining STIR so as to align it further with generative critique with regard to the affective, collaborative and temporal dimensions of interdisciplinary research. Verran's (2001) proposal to pay attention to affectively charged "fleeting experiences" (p. 5) has been taken up in VRE. The role of affect has first been explored as part of a clinical team in which VRE "highlights and reveals relationships in their affective aspects" (Iedema et al. 2013, 38). Later work has extended the importance of affect to the VRE researcher (Collier 2013; Iedema and Carroll 2015; Wyer et al. 2017). A VRE researcher who works with "affect-as-method" (Carroll and Mesman 2018, 1148) develops sensitivity to affective dimensions of fieldwork and of video-reflexive sessions. She detects moments of tension at the field site, in video footage and in group discussions. Paying attention to the experience of "tacit or visceral impulses" (p. 1150) may help identify tension between, for instance, rigid safety protocols on the one hand, and the surprises and hectic of every day work on the other (Mesman and Hor 2018). The ability to "be moved" (Carroll and Mesman 2018, 1150) by what one encounters at a hospital may work as a driver for a VRE researcher and clinical practitioners to learn and

act so as to accommodate tension in clinical practice (Wyer et al. 2017). Along these lines, affect-as-method could help embedded scholars working with STIR to attend to and engage with the affective dimension of interdisciplinary research.

The methodological design of VRE could also serve as a model to modify STIR's collaborative dimension. Whereas STIR dialogues usually take place in a one-to-one interaction, VRE is based on a group process involving nurses and physicians. Sometimes even patients with their families join video-reflexive sessions facilitated by a VRE researcher (Wyer et al. 2015; Collier and Wyer 2016). In a group process, a range of concerns and viewpoints feed into collaborative learning across disciplines, sectors and hierarchies (Carroll et al. 2018). Clinical practitioners' authority and patients' ownership over healthcare have shown to be perturbed by opportunities, often created by the VRE researcher, "for new questions to be asked, and new answers to be given, by all involved" (Iedema and Carroll 2011, 183). The VRE researcher has been casted as a mediator between different interests and a facilitator of "reflexive space[s]" (ibid., 175). Her task is to set reflexive impulses and ensure the functioning of collective deliberation (Mesman et al. 2019). A VRE researcher avoids being treated as a moral decision guide by allowing clinical practitioners and patients to scrutinise her understandings and interpretations.

Similarly, embedded scholars could work with the STIR decision protocol to facilitate collective deliberation and unfold group decision-making in research teams. The decision protocol could either be used to reflect on an opportunity or problem that concerns all team members to various degrees, or an individual decision-making process could be discussed in the group. Using STIR in focus groups could help establish reflexive spaces where practices and positionings of team members are revisited and revised. This would allow research team members to recognise their colleagues' overlooked competencies and ethical reflections, learn from each other, critique each other in generative ways and interact with an embedded scholar as a process facilitator, rather than as an ethics expert.

According to Iedema and Carroll (2011), the role of a process facilitator who establishes and maintains reflexive spaces needs to be institutionalised. They consider a facilitator's long-term involvement as relevant for building capacities among clinical practitioners to deal with complex challenges of healthcare. Mesman (2015), for instance, has collaborated with a neonatal intensive care ward for more than 20 years. Over time, they built up a relationship of mutual trust and familiarity with each other's ambitions. Furthermore, her long-term involvement has deepened her understanding of clinical practitioners' verbal and bodily language, which she considers as crucial for interpreting their responses to VRE. She learned to sense when and where filming was (in)appropriate and developed an affective sensitivity for subtle, fleeting moments of tension that someone unfamiliar with the ward may have overlooked. While Mesman's long-term involvement at the ward is rather exceptional, other VRE studies lasted

between seven months and two years (Iedema et al. 2012; Collier et al. 2018) – a time frame that is considerably longer than a 12-week STIR study. By prolonging the duration of a STIR study, embedded SSH researchers could establish a rapport with their collaborators that is supportive of generative critique and trace the effects of this critique, also on the long term (Fisher et al. 2016).

4.5 Conclusion

Social scholars involved in interdisciplinary R(R)I collaborations seek to both study and contribute to the integration of socio-ethical aspects into technoscientific work practices. To pursue this double agenda, they must maintain critical distance so as to call these processes into question without operating on an epistemological meta-level that misses the issues at hand. This chapter introduces generative critique as a practice that allows them to walk the middle path between a lack of critical distance and armchair critique. Generative critique is a "curiosity about the genealogies and the performativities of theories, concepts and methods used to represent [an object]" (Niewöhner, 2016,13). It can emerge when attention is cultivated to the affective experience of disciplinary differences in researching an object.

Drawing on participant observation in the Silver Santé Study, I show how generative critique, armchair critique and a lack of critical distance characterised interactions between the Silver Santé research team and the study's EAB. The empirical analysis indicates that all modes of critique became productive for the study. EAB members who were involved in research on meditation and ageing themselves operated in close professional proximity to Silver Santé researchers. They could thus provide feedback that contributed to scientific advances and project management. The confrontational nature of sociological armchair critique gave impetus for new reflections among Silver Santé researchers regarding their research object. Researchers made armchair critique generative of a new version of this object that was an alternative to the hegemonic understanding of meditation as an individual brain training in health research. Meditation became a relational, compassionate practice in the public communication about the Silver Santé intervention. Scientists' affective capacity to remain open to confrontation allowed for generative critique to emerge.

Although generative critique is already present in work practices, this chapter seeks to provide practical guidance for establishing this mode of critique as a more solid feature of interdisciplinary R(R)I collaborations. STIR and VRE are introduced as engagement research practices that can enact generative critique. To foster STIR's potential to enact generative critique in interdisciplinary R(R)I collaboration, this chapter makes suggestions for adaptations of STIR by drawing on affective, collaborative and temporal dimensions of VRE. In this way,

the chapter makes a practical contribution to ongoing discussions in STS and R(R)I on the challenge of taking a critical stance in interdisciplinary collaborations that seek to both study and improve professional practices (Balmer et al. 2015; Calvert 2013; Freeth and Vilsmaier 2020; Zuiderent-Jerak 2015). The introduced adaptation of STIR promises to elicit alternative courses of action in professional practices that are productively disruptive of 'business as usual' by stimulating reflections on oft-overlooked competences, taken-for-granted activities and hegemonic objects. This promise will be put to test in the next chapter, which analyses the process and outcomes of using the here-adapted version of STIR in the Silver Santé Study.

Finally, this chapter enables mutual learning between R(R)I communities and the Silver Santé Study. In developing an R(R)I engagement method for the Silver Santé team, it offers them a tool to leverage generative critique in interdisciplinary collaboration. In return, R(R)I discourses are enriched by the empirical analysis of de facto generative critique in the Silver Santé Study, which helps clarify the notion of critique. In R(R)I discourses, critique is akin to "programmatic buzzwords" (Bensaude Vincent 2014) or "big words" (Bos et al. 2014): terms often used to convey a shared sense of importance, but vague enough to be linked to different agendas and concerns. The steering of communities with buzzwords, however, can have paradoxical effects because the vagueness of the buzzword allows for the simultaneous presence of multiple realisations of situated meanings with diverging normative commitments (Penkler 2020).

For example, in a discussion that took place in September 2019 in Leiden during the first event of a series of international symposia organised on the occasion of the launch of the *International Handbook on Responsible Innovation*, RI was described as "a new paradigm for innovation, that is both radically critical of and goes beyond previous (mainstream) paradigms of market innovation" (Von Schomberg et al. 2019). For more sociologically oriented researchers, the qualifier 'radically critical' may invoke immediate associations with twentieth-century ideology critique, that is a deconstruction of hegemonic narratives like mainstream paradigms of market innovation, to reveal their ideological and distorting character (Sankaran 2020). Others may rather think of Latour's (2004) diagnosis that ideology critique has "run out of steam" and his plea for reconceptualising critique as unravelling the politics involved in making objects and facts. These two conceptions of critique have diverging implications. Whereas ideology critique debunks and negates hegemonic narratives, Latour suggests to ask how the hegemonic has come into being and why it is reproduced—a blueprint for generative critique. Explicating what we mean when referring to critique in R(R)I is relevant because the framework addresses policymakers, scientists, engineers, other professionals and wider publics who may not be familiar with discussions on critique in STS. In pursuit of inclusivity and clarity, this chapter aims to resolve some ambiguity around the notion of critique.

INTERLUDE III

After the theoretical and methodological excursion in chapter 4, we now move to the empirical analysis of collaborative engagement. Chapter 4 developed a toolkit combining theory (generative critique) and method (modified version of STIR) to inflect valuation work in scientific research. Chapter 5 analyses how the toolkit was applied in interdisciplinary collaboration with the research group of the Silver Santé Study. To smoothen the transition between the chapters, this interlude elaborates on four common, interrelated themes: (1) R(R)I in the Silver Santé Study, (2) positionality in engagement research, (3) analysing affect and (4) co-laboration for STS theory development and interdisciplinary learning. I shed light on existing operationalisations and attributed meanings to R(R)I policy discourses in the Silver Santé Study to illuminate how researchers positioned me and my R(R)I project in relation to their study. As affect plays an important role in analysing how my positionality changed in our evolving collaborative relationship, I further elucidate how my understanding of affect was informed by contemplative science theory. In explaining how the analytical focus on affect emerged, I suggest that my interactions with contemplative science more generally and with Silver Santé researchers in particular could be considered as instances of what is named "co-laboration" in the STS research group led by Jörg Niewöhner.

(1) R(R)I in the Silver Santé Study: Chapter 4 and 5 are embedded in the corpus of R(R)I engagement literature which focuses on the efforts of SSH scholars to foster reflections on socio-ethical concerns in daily science and engineering practices. Such *in vivo* reflection exercises are often part of larger projects which respond to calls for responsibility in national funding programs (Koops et al. 2015) and international policy initiatives (De Saille 2015). Before launching reflection exercises, Glerup (2015) investigated how scientists and engineers responded to such calls to find out how an R(R)I intervention would be facilitated or inhibited by extant conceptions and practices of responsibility (see also Aparicio 2021; Ashworth et al. 2019; Carrier and Gartzlaff 2019; Lubberink et al. 2019). Similarly, my R(R)I engagement research with the Silver Santé team must be understood against the backdrop of already existing operationalisations and attributed meanings to respective policy discourses on responsibility within the team.

The Silver Santé Study was funded by the European Commission's Horizon 2020 framework programme, in which RRI was identified as a "cross-cutting issue." As such, RRI sought "to better align the [research and innovation] process and its outcome with the values, needs and expectations of society" throughout all Horizon 2020 objectives.[11] Accordingly, RRI was supposed to play a significant role in Horizon 2020 projects like the Silver Santé Study. Yet, I rarely noticed that the European Commission's conception of RRI was integrated in local discussions and practices of the Silver Santé Study. I gained the impression that Silver Santé researchers were not familiar with policy discourses on RRI. Moreover, it seemed as though the ethics component of RRI (one of the six RRI keys in Horizon 2020) was reduced to ethics management – making sure that all research would comply with relevant legal and ethical norms (Aircardi et al. 2018) – and advisory activities: ethical experts joined the annual European consortium meetings to provide feedback on ethical aspects of the study. My impressions concur with empirical research evidencing limited familiarity with and restricted practical uptake of RRI in science and engineering (Åm 2019; Glerup et al. 2017; Hartley et al. 2017; Kjølberg and Strand 2011; Leese et al. 2019). As it was not the subject of my dissertation to study the translation of RRI policies into practices, my observations may be incomplete. Nevertheless, I mention these observations here to point out that my dissertation research – which was independently designed, financed by an external scholarship from the German Academic Scholarship Foundation and institutionally affiliated to Maastricht University – did not conflict with any RRI activities that could have been embedded in the Silver Santé Study.

(2) Positionality in engagement research: The conceptional, financial and institutional independence of my work implied that Silver Santé researchers perceived me as a foreign social scholar primarily concerned with her own PhD project, rather than an active member of their

11 https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

team. Although our relation changed throughout our collaborative interactions, they initially positioned me as an outsider in relation to their project. A common dilemma in participatory research and interdisciplinary R(R)I collaborations is associated with the position of the SSH scholar vis-à-vis her research participants or collaborators. The SSH scholar navigates her position on a spectrum: she must come close enough to her collaborating partners to meaningfully contribute to their practices without losing the capacity to remove herself from their views and problem definitions, critically deconstructing the collaboratively generated insights against the backdrop of her own academic discipline. Based on a literature review, I named the two extremes of the spectrum "lack of critical distance" and "armchair critique" in chapter 4. The presentation of different modes of critique might have evoked the impression that "generative critique" was the 'happy medium' between these two positions, which SSH scholars could supposedly reach by following the STIR protocol. However, the empirical analysis in chapter 5 manifests that generative critique is not a fixed middle position but rather emerges through movement. As an SSH scholar in an interdisciplinary R(R)I collaboration, I could create favourable conditions for reflexive engagement with valuation work if I positioned myself responsively in relation to my collaborators –moving from an outsider to an insider position and back outside – depending on what *felt* appropriate in a given situation.

(3) Analysing affect: As disconcertment turned out to be an influential collaborative resource to navigate positionality in the STIR study with the Silver Santé team, the analytical focus of chapter 5 is placed on affect. I might have been particularly attentive to the affective substrates of our interactions because I had noticed a renewed interest in STS in studying emotions and affective entanglements in science, engineering and interdisciplinary collaborations. More importantly, the topic was also widely discussed in the contemplative science community, where embodied approaches to knowledge-making and meditation had long challenged the objectivist and brain-centric mainstream of meditation research (Valenzuela-Moguillansky et al. 2017, 2021; Varela et al. 1991). Contemplative scientists following the vision of Francisco J. Varela have sought to radically change the way in which scientific research is conducted, drawing on the researchers' bodily experiences of meditation to design experiments. The philosophical approaches that contemplative scientists use to make sense of "the feeling body" (Colombetti 2014) have also inspired my own thinking. Chapter 5 indicates that my understanding of 'embodied ethics' is informed by Colombetti's book. The concept is refined in chapter 6 by means of observations of the ways in which contemplative scientists approached their own embodied experience of values and value conflicts.

(4) Co-laboration for STS theory development and interdisciplinary learning: My analytical and empirical engagement with embodied ethics could be understood in terms of the German expression "Ethnographische Theorie Co-laborativ Fügen" (Bieler et al. 2021b). The STS research group at the Laboratory: Anthropology of Environment | Human Relations at

Humboldt University Berlin[12] developed an approach to ethnographic theory development that places the analytical process within 'the field' in interaction and communication with local research partners. In this process, concepts used in the field join concepts used in STS. Bieler, for example, took up the concept "ecosystem" widely used by actors in the start-up scene with whom he engaged in joint epistemic work to theorise about economic activities. In studying how actors reflexively deployed the concept to understand and talk about their own practices, he contributed to anthropological debates on contemporary economic practices. Similarly, I draw on philosophical approaches and experiential accounts that contemplative scientists use to theorise about bodily affects to contribute to STS discourses on the role of the body in interdisciplinary collaboration. I explain here how this analytical focus came into being to make clear why I extensively elaborate on the affective dimension of the STIR method while leaving other collaborative and temporal aspects – those discussed in chapter 4 as additional adaptations of STIR in reference to VRE – in the background.

Moreover, this interlude expands on the work by Niewöhner's STS laboratory group to emphasise that it was an important source of inspiration for my engaged research. Not only my empirically grounded and theoretically informed inquiries into affect are somewhat similar to Bieler et al.'s work; I also consider the nature of the STIR study with the Silver Santé team as what they call "co-laborative." Drawing on Niewöhner (2014, 2016), the scholars describe "co-laboration" as joint epistemic work across disciplinary divides, which does not aim at interdisciplinary outcomes, but disciplinary reflexivity. Rather than overcoming disciplinary differences to solve a shared problem, co-laborators are open to become "epistemologically irritated" (Bieler et al. 2021a, 89) by conceptualisations, problem definitions and world-making practices diverging from their own. Epistemological irritation appears to stand for an affective experience of disconcertment that emerges when seeing certainty unsettled. If such irritation or disconcertment stimulates reflexivity about norms structuring disciplinary perspectives, practices and ontologies, it can give rise to "generative critique" (p. 100). As mentioned in chapter 4, generative critique is a sort of productive engagement with multiplicity, a theoretical theme that is further explored in chapter 5. In interdisciplinary collaboration that is co-laborative, connections between multiple knowledge-making practices, conceptions of ethics,and ontologies of a research object can be drawn. Chapter 5 shows that these connections do not overcome difference, but give rise to alternative ways of thinking about and engaging with what is normal, dominant or taken-for-granted in an academic discipline.

12 https://www2.hu-berlin.de/sts/

Chapter 5

From affect to action: choices in attending to disconcertment in collaborative socio-technical integration

5.1 Introduction

SSH scholars following R(R)I science policy and funding calls for integrating the social sciences and humanities in technoscience (Fisher 2019b) have reported on successes and failures of their approaches to collaborative socio-technical integration (e.g., Lee et al. 2019; Ramos et al. 2018; Van Oudheusden et al. 2018). By way of reminder, Fisher et al. (2015) conceptualise this type of collaboration in terms of three characteristics: it works across established socio-technical divides, including disciplinary distinctions between SSH scholars and natural scientists or engineers; it situates the collaborating parties in proximity to one another for mutual learning; it contributes to technoscientific practices by stimulating change in how scientists and engineers engage societal contexts. Failures to put collaborative integration into practice have been attributed to the presence of prescriptive arrangements in which disciplinary boundaries and asymmetries structure interactions between SSH researchers and their technoscientific collaborators (e.g., Rabinow and Bennett 2012; Viseu 2015).

SSH researchers embedded in technoscientific environments highlight the "affective costs" (Viseu 2015, 5) of navigating their positionality between the role of a distant critic who is often perceived as an adversarial "naysayer" (Balmer et al. 2015, 18), and uncritical, submissive service that tends to transform attempts at collaboration into divisions of labour (Hackett and Rhoten 2011). Due to this liminal and precarious position as outsider/insider, most researchers remain silent on the affective disturbances of interdisciplinary collaborations (Balmer et al. 2018). Only a few have pointed at tensions that involve experiences of shame, insecurity and ambivalence (Jönsson and Rådström 2013; Fitzgerald et al. 2014a).

These unhappy affects have received increasing attention in feminist STS. Feminist thinkers emphasise their transformative potential to evoke changes in thought and action (Ahmed 2010; Murphy 2015). According to Puig De La Bellacasa (2012), anxiety, sorrow and grief "belong to an out-of-place sense of *inaccurateness*; that something does not match, does not hold together, that something could be different" (p. 212). In research collaborations, unsettling emotions have been described as "fruitful parts of collaborative processes and as guides to all that we do not know" (Jönsson and Rådström 2013, 140). They are presumed to unsettle stable objects, phenomena, logics, procedures and conceptions of the good within established paradigms because they crack open spaces for critical reflection on normalised practices.

In this chapter, I explore the transformative potential of affective disturbances in an interdisciplinary R(R)I collaboration. Drawing on Verran's (2001) work on science education in postcolonial Nigeria, I suggest that paying attention to "disconcertment" (p. 5) enables embedded SSH researchers to position themselves in-between adversarial armchair critique and co-opted, uncritical service. Through an empirical inquiry into the dynamics of positioning in

STIR (Fisher 2007), I study whether this in-betweenness allows for the enactment of generative critique. In other words, I examine the practical proposal developed in the last chapter: whether attending to affect in STIR helps enact a critique that is capable of "generating possibilities for new futures" (Verran 2001, 5) and opens up alternatives to what is hegemonic. Collaborators who are usually positioned differently in relation to a research object may be able to remake the object in alternative ways by drawing connections across differences (Hillersdal et al. 2020). In order to spot differences, Verran (2001) recommends attending to disconcertment, a bodily felt disruption that is experienced when our taken-for-granted assumptions are contradicted. Sensitivity to the disconcerting effects of differences may thus serve as a guide for openings to generative critique.

To examine this proposal, I ask: How is disconcertment experienced in an interdisciplinary R(R)I collaboration? Which choices can be made in attending to disconcertment? How do disconcerting affects relate to changes in collaborators' thoughts and actions? In answering these questions, I seek to contribute to STS literature that unpacks the mundane realities of collaborative socio-technical integration (Doubleday and Viseu 2010; Lee et al. 2019; Prainsack et al. 2010; Shilton 2012; Viseu 2015) and, more broadly, interdisciplinary collaboration (e.g., Balmer et al. 2016a; Callard and Fitzgerald 2015; Centellas et al. 2014; Klein and Marghetis 2017; Lyle 2017). I investigate the possibility that disconcertment may serve as a resource for engaging collaborative difficulties that stem from solidified disciplinary boundaries, epistemological and cultural differences and asymmetric funding provisions (Delgado and Åm 2018; Prainsack et al. 2010; Rabinow and Bennett 2012; Viseu 2015).

Furthermore, efforts to capture the fleeting nature of disconcertment contribute to the "affective turn" (Kerr and Garforth 2015, 3) in STS – a renewed interest in affective entanglements and embodied ways of knowing in science (Collins 2010; Fitzgerald 2013; Myers 2012; Pickersgill 2012) dating back to Max Weber, Ludwig Fleck and Robert Merton (Barbalet 2002; Parker and Hackett 2014). By characterising the nature and effects of disconcertment, I aim to advance ongoing discussions on the methodological and analytical relevance of affects in research and interdisciplinary collaboration (Boix Mansilla et al. 2015; Fitzgerald et al. 2014a; Griffin et al. 2013; Hillersdal et al. 2020; Parker and Hackett 2012).

For this purpose, I analyse disconcertment in a STIR study conducted with the Silver Santé research team at the biomedical imagining platform Cyceron in Caen, France. After presenting the study design and elaborating on disconcertment, I analyse vignettes from the STIR study by means of a heuristic. The heuristic is a provisional tool that enables me to think of disconcertment as a form of responsivity (Myers and Dumit 2011; Rosa 2016). Responsivity emerges among interdisciplinary collaborators who become increasingly sensitive to how researchers from other disciplines think, talk and behave. Sensing and responding to differences

may be disconcerting, but engaging with disconcertment becomes easier with practice, what is here referred to as "affective labor" (Myers 2012, 49). Collaborators practice "using their bodies as sensors, sources, and processors" (Poldner et al. 2019, 152) to see relations between differences, which facilitates more reflexive socio-technical integration. The examples of dealing with disconcertment through affective labour show different choices in tapping the body as sensor, source and processor that are not mutually exclusive and can appear in different sequences of interaction with the same collaborators. I illustrate how collaborators learn "to move with and be moved by" (Myers 2012, 177) other bodies in order to enable generative critique in STIR.

5.2 STIR in the Silver Santé Study

My collaboration with the Silver Santé team was designed as a two-phase STIR study (see chapter 4 for a summary of the STIR approach). In the first phase from September to December 2018, STIR dialogues took place on a biweekly basis with four members of the research team: two PhD students, a meditation instructor and an English language instructor. The STIR study started with a pre-interview in the first week and ended with a post-interview in the last week, which were semi-structured according to Flipse et al.'s (2014) interview guide. These interviews inquired into work routines and their socio-ethical aspects. The differences in answers given to the pre- and the post-interview provided insights into changes of awareness of social and ethical dimensions of work practices in the period of collaborative engagement. Fieldwork in the Silver Santé Study served as a resource for collaboration; it included participant observation, interviews and document analysis (see chapter 3 for a detailed account of data collection). In the second phase from October to December 2019, fieldwork was conducted to examine the effects of the first phase.

In addition, the Silver Santé team was invited to participate in two two-hour STIR focus groups. During the first focus group in December 2018, I facilitated a discussion on an ethical challenge that all research team members identified as relevant to their work practices. Following Fisher's (2018) methodological suggestions for deploying STIR in focus groups, the STIR decision protocol was used to map different viewpoints, concerns and suggestions for taking action in a collaborative process. In December 2019, I organised a second focus group that was inspired by Fisher and Mahajan's (2010) discussion of SSH scholarship in interdisciplinary seminar groups to build capacities for socio-technical integration among collaborators. In a similar vein, I presented SSH scholarship on mindfulness meditation research to stimulate reflections on the broader socio-ethical considerations and contexts of the kind of research conducted in the Silver Santé Study. The focus groups as well as the regular STIR dialogues were recorded

and transcribed by research participants who speak French with native proficiency. I translated quotes used in the empirical analysis presented here from French to English.

This chapter displays the results of the analysis of the empirical material through the lens of midstream modulation, a framework that helps capture the unfolding of learning and socio-material change over time (Fisher and Schuurbiers 2013). Midstream modulation relates the gradual alteration of technoscientific processes to scientists ongoing reflective interactions with their social contexts. Three analytical categories serve to capture this gradual alteration: "de facto modulation" (socio-ethical dimensions play an implicit role in technoscientific practices), "reflexive modulation" (heightened awareness of de facto modulation in real time), and "deliberate modulation" (changes in practice in response to reflexive modulation). Midstream modulation may pass sequentially from de facto, over reflexive, to deliberate modulation in a few moments or over the course of an entire STIR study (p. 100).

Published STIR studies have not extensively discussed the role of affect in collaborative socio-technical integration (see Conley 2014 for an exception). Embedded scholars are supposed to be alert to their collaborators' feelings (Fisher 2018), but their own implication in the affective fabric of socio-ethical reflection, technoscientific practice and collaborative actions has remained underexposed. Over the course of the STIR study with the Silver Santé team, I took fieldnotes on my affects and the manifestations of affects I observed among and in interactions with my collaborators. These fieldnotes and other empirical material fed into writing and analysing vignettes that illustrate how attending to affect, more specifically disconcertment, informed collaborative actions and deliberate modulations in the STIR study.

5.3 Disconcertment

Verran (2001) describes disconcertment as a visceral, fugitive experience that grows from "seeing certainty disrupted" (Verran 1999, 141) and that may open avenues for thinking and doing things differently. Verran says that certainty is disrupted when different metaphysics or epistemologies meet. This can occur in the encounter of different knowledge traditions: for instance, Nigerian versus English practices of counting (Verran 1999), the Western assumption of a single, ordered cosmos versus the acosmotic view of a totality of things without order in classical Chinese philosophy (Law and Lin 2010) and a biomedical understanding of muscle soreness as an individual, bodily experience versus an anthropological observation of how this experience forms in relation to others (Hillersdal et al. 2020). Detecting metaphysical or epistemological difference helps recognise what has so far been taken for granted; it also facilitates seeing and creating connections across these differences. This is what Verran (2011) describes as "doing difference together" (p. 422) and what has allowed Hillersdal et al. (2020)

to enact generative critique in interdisciplinary collaboration: they explore "how a problem may be examined in ways that destabilize politically strategic agendas, expertise, and evidence hierarchies" (p. 13) by attending to disconcertment.

Several scholars have made use of disconcertment as a bodily indicator for epistemological and metaphysical differences (Christie and Verran 2013; Jerak-Zuiderent 2013; Norrington and Nundhirribulla 2020; Law and Lin 2010; Williams 2020). Descriptions of how disconcertment feels and what indicates disconcertment in others vary. Some scholars who try to identify disconcertment in their interviewees pay attention to laughter (Jerak-Zuiderent 2013), others claim that "there wasn't much belly laughter . . . but there was certainly disconcertment" (Law and Lin 2010, 141). Christie and Verran (2013) take on the challenge to specify disconcertment in a special edition including nine "ethnographic stories of disconcertment." The editors invited contributors to write stories because "stories have a special ability to clarify . . . psychological and emotional states, their aesthetics and their entrenchedness as well as their searching for the new and the different" (p. 2). As emotions are notoriously difficult to record and classify, the contributors use storytelling as a creative way to give readers an impression of how disconcertment was experienced and what it can do.

Inspired by Christie and Verran's special edition, my research tries to capture empirically the experiences and bodily manifestations of disconcertment. Similar to colleagues who have written on disconcertment, I use the terms "affects," "emotions" and "feelings" interchangeably in relation to disconcertment while emphasising its embodied nature – "a sort of visceral laughter," a "chuckling" that afflicts bodies when different knowledge systems collide (Verran 1999, 140). In line with Verran and philosophers of emotions such as Colombetti (2014), I consider emotions, in particular disconcertment, as experiences with bodily symptoms. Emotions affect bodies in different ways and the affective quality of the experienced world changes accordingly (p. 123). Comparing and contrasting individual differences in bodily expressions of disconcertment with the intent of identifying patterns or recurrent variations would be a psychological project (cf. Tsai et al. 2002) that exceeds the scope of my analysis. Instead, I describe how disconcertment manifested itself in my body, interpret some affective expressions of my collaborators as disconcerting, and further draw out how our affective experiences gave rise to particular interactions. Building on the work by Hillersdal et al. (2020), I elucidate how disconcertment relates to action in interdisciplinary collaborations and how it can enrich data, analysis and research in these collaborations. For this purpose, I develop a heuristic that serves as a provisional tool for thinking about disconcertment. It is a plausible, contingent construction of how disconcertment relates to action.

5.4 Heuristic of disconcertment

My analysis of disconcertment approaches it as a potential form of responsivity. Responsivity characterises a particular embodied relationship that can show up in collaborations. In order for disconcertment to take such a productive form of responsivity, however, collaborators must perform the work of attention, sensitivity and cultivation –in other words, they must perform affective labour. If collaborators do affective labour, their bodies can function as sensors, sources and processors that can in turn facilitate responsive collaborations across disciplinary divides.

Myers and Dumit (2011) introduce responsivity as one among several concepts that have entered STS debates about agency distributed across bodies and materialities, such as "intra-action" (Barad 2007, 141), "ontological choreography" (Thompson 2005) and the "dance of agency" (Pickering 2012). They argue that responsivity speaks best to the affective quality of relations between bodies. This understanding of responsivity has been further developed in sociology. Rosa (2016) coins the term "resonance" to describe a meaningful relationship across people and other aspects of the world. He believes that humans seek and need resonance that connects people to other people, to their work, cherished objects or nature. For Rosa (2018), resonance depends on responsivity: "we feel truly touched or moved by someone or something we encounter" and "we reach out and touch the other side as well" (Schiermer and Rosa 2017, 3). This process is transformative. It constitutes the person who is reaching out while constituting the world as the person encounters it. Responsivity and transformation result in a resonant two-way relationship. Resonance is the "transformative appropriation of difference" (Rosa 2018). It resembles Verran's idea of finding ways in which different systems can "'go on together' that are respectful of differences between them" (Singleton 2012, 424). This presupposes responsivity – the ability "to move with and be moved by" other bodies (Myers 2012, 177). According to Myers, fostering the ability to engage in this double movement requires "affective labor" (p. 49).

Myers borrows the concept of affective labour from political theory (Hardt 1999) and from feminist literature on "care work" (Federici 2012, 368) and "emotion work" (Hochschild 1979). While the former often describes invisible labour that women have been doing for millennia in domestic spaces, the latter refers to low-waged workers such as stewardesses, waitresses and nurses whose work practices include regulating their emotional expressions. Studies on (post) colonialism and capitalist production shed light on coerced forms of care and emotion work performed by the poor, immigrant or racialised women for privileged others (Glenn 2012; Wilson 2004). The oft-gendered practice of "caring for" somebody that can be coerced or paid for must be distinguished from the affective relation of "caring about" that depends on love and passion (Puig De La Bellacasa 2017; Schrader 2015). Combining the practical and the affective dimension of care is essential for Myers's conceptualisation of affective labour. She shows that caring about molecules with affective, bodily attachment induces biologists to

make enormous efforts to care for their instruments, experiments and objects. Their affective labour gives them access to new forms of molecular life "that are perhaps less readily captured by capital" (Myers 2012, 51). Similarly, affective labour enables interdisciplinary collaborators to recognise alternative forms of taken-for-granted hegemonic objects by becoming responsive to one another.

To further specify how disconcertment can be approached as a form of responsivity, I suggest that responsive bodies can function as sensors, sources and processors. Poldner et al. (2019) studied these functions of bodies in constructing entrepreneurial selves over time. They introduce a tripartite framework to analyse embodied ethics. The body as a sensor helps detect ethical issues. Ethical issues are selected and refined by the body as a source through which an "assemblage of ethical fragments" (p. 162) is created. The body as a source defines the different fragments of ethical issues and puts them together as a bricolage in order to make sense of their relations and to turn them into an assemblage, that is, an organised aggregate whose components can be addressed individually. With the body as a source, the fashion entrepreneurs in the study by Poldner et al. "are not dealing with ethical issues as big issues, but they are dealing with very specific things that they pin down and use in their collections" (p. 165). The body as a processor puts these "very specific things," the "ethical fragments," together in a new way, and ends up transforming an entrepreneurial self. I draw on the framework by Poldner et al. to analyse how disconcerted bodies do affective labour in order to generate responsivity and facilitate interdisciplinary collaboration in STIR.

5.5 Empirical analysis

Trying to grasp affect analytically runs the risk of reducing what is sensed and felt to empty shells (Skoggard and Waterston 2015). Thus, the wording of the analytical categories sits uncomfortably with paying attention to the body and its affects. "Sensors" and "processors" remind of automatons instead of flesh. Nevertheless, I hope to provide readers with a sense of the affective situations I experienced. To avoid that my descriptions turn into navel-gazing and self-indulgence, I present my experiences in the form of vignettes written in block quotes that alternate with analytical sections. I do not treat these short literary sketches as 'raw data' to make sense of but as stories that are carefully crafted to illustrate how I see my STIR study retrospectively through analytical lenses.

Theoretical distanciation made me realise how disconcertment shaped my STIR study. Different reactions to moments of disconcertment illustrate different modes of becoming sensitive to the body as sensor, source and processor. I endorsed disconcertment and amplified difference to productively disrupt protocolled scientific procedures. Making efforts to reduce disconcertment

by minimising differences helped me and my collaborators draw connections between different conceptions of ethics and established the grounds for a responsive collaboration. Through the recognition of difference and its concomitant feeling of disconcertment, we acknowledged our diverging systems of orientation, which unsettled a seemingly stable research object.

5.5.1 Amplifying difference

Disconcertment turned out to be a pertinent feature of regular STIR exercises with PhD students and a resource for socio-technical integration with regards to a measurement task that relates to one of the Silver Santé Study's focal points: investigating the effects of meditation training on emotions (Poisnel et al. 2018). To help study how meditation in comparison to learning English influences emotional responses to the suffering of others, participants in the three-armed Age-Well RCT undergo the Socio-affective Video Task (SoVT adapted from Klimecki et al. 2013), which is described in more detail in chapter 3. To put it briefly, SoVT is a functional brain imaging task that involves silent video clips with either low emotional scenes showing every day activities or with high emotional content of suffering. Assisting the video task for the first time, I experienced a moment of disconcertment captured in this vignette:

> I joined a PhD student and a radiologist who administered the task in a room next door to the brain scanner in which the participant was lying. Three computer screens were blinking; two showed a range of images of the participant's brain and the other allowed us to follow the videos that were projected to the participant. After the PhD student had launched the task, I watched the videos attentively and realised that the furrow on my forehead was becoming steeper the longer I kept on watching. The videos with high emotional content portrayed people with disabilities, dark-skinned toddlers who were malnourished, women with headscarves crying in the ruins of a city and similar scenes filmed in African and Arab countries. I gained the impression that suffering was equated with the experience of disability and life in the Global South. As this portrayal of suffering made me feel unsettled, I bluntly pronounced my observation. The PhD student explained that these videos were selected from news and documentary material broadcasted during peak viewing hours. Moreover, the video task had been approved by an ethics committee, and it had been used in several other studies. Finally and more importantly, the majority of participants did not make any special remarks about the task.

This scene repeated itself several times whenever I assisted the video task over the course of the STIR study. In the pre-interviews, PhD students had also stressed that the most important ethical aspect of their work was "taking care of participants," making sure that they felt "accompanied" and "at ease." As scientists often have multiple demands placed upon

them, they commonly ensure that the norms and standards of their laboratory are followed (including care for participants) before reflecting upon every possible ethical aspect of their work (cf. Brosnan et al. 2013). Acting in accordance with their professional responsibilities toward study participants, the ethical aspects that the PhD student prioritised differed from what unsettled me. My disconcerted body led me to recognise de facto modulation in how researchers engaged in socio-ethical aspects of their work. I made this observation because I repeatedly confronted my collaborators with my unsettlement about the video task. By amplifying disconcerted situations and interactions, I used my body as a sensor to detect different disciplinary responsibilities in the biomedical and social sciences.

Sensing difference induced me to continue inquiring into the video task by bringing it up in STIR exercises and conversations with Silver Santé team members. My disconcerted body served as a source to continue discussing the task, patch different issues together and reflect on how these could be addressed. A recurring theme in these discussions was bias, which generally denotes a disproportionate weight in favour or against one thing, person or group compared with another. It is a major concern for researchers because it impedes them from measuring what they intend to measure. When I raised the narrow representation of suffering as disability and life in the Global South in conversations with scientists from the Silver Santé team, they acknowledged it could be a form of bias. They explained that a bias in the archived news and documentary material from which the video clips were selected may have generated a bias in the task. They further suggested that including additional video clips in the task that showed suffering in other contexts and degrees could counterbalance this bias.

This episode beginning with a confrontation and leading to an ongoing discussion of biases elicited a reflexive modulation: reflections on the presence of biases and how these could be counterbalanced. In the collaborative process, what was initially experienced bodily as an ethical concern was eventually transformed into an epistemological question and problem-solving quest. As the following vignette illustrates, this modulation, however, induced a new experience of disconcertment:

> I experienced apprehension because the socio-ethical aspects of technoscientific practice that I had intended to investigate seemed to dissolve into epistemological questions about how to design a study task. I was worried that this shift was moving my research participants away from the topical focus on ethics practices that was supposed to guide my research.

Only after the STIR study had ended, I could process my experience. Re-examining the transcripts of the post-interviews with PhD students, I noticed that both of them referred to a socio-ethical aspect of their work that they had not mentioned at the beginning of our regular

interactions following the STIR protocol. They said that ethics were in their data. If potential biases are not made explicit, "what we do here serves nothing," a PhD student said. Another PhD student summarised this as follows: "If we are conscious of the limits of our reference frames and of our methods, our results can contribute a stone to the building." Therefore, it was necessary to continuously ask: "Is this the best way to proceed? Are there other ways to do this? You see, for me, this is an ethical discussion." Scientists emphasised that finding answers to these questions would be particularly relevant as soon as they started with the data analysis: "these are complex data, but an analysis with precaution can nevertheless produce nice results."

While rereading these transcripts, my body functioned as a processor and put different fragments – my ethical concern and the scientists' epistemological concern –together in a new way. This vignette crafted on the basis of a memo from ethnographic data analysis captures how my body functioned as processor:

> Reading the transcripts of these conversations made me burst into liberating laughter. I realised that our collaboration on identifying biases has enhanced socio-technical integration all along because it has contributed to taking into account the ethical dimensions of scientists' work as an integral part of their work.

Throughout and after the STIR study, my body served as a sensor, source and processor, which allowed me to acknowledge a de facto modulation (ethics only relate to the treatment of study participants), a reflexive modulation (ethics are also in the data and relate to recognising potential biases), and a deliberate modulation (potential biases will be taken into account in the data analysis). This modulation sequence could be captured because I chose to amplify my disconcerting experience of difference. If I had chosen to suppress or ignore my disconcertment, me and my collaborators would likely not have made connections between the video task as an ethical and as an epistemological object. Our collaboration would have been less revealing, and its dynamics would have been less responsive.

The amplification of difference resulted in responsivity. According to Rosa, only something that is "utterly different can actually speak to us in its own voice" (Schiermer and Rosa 2017, 4). Responsivity depends on hearing someone else's voice and discerning one's own voice. For this purpose, it helps to actively heighten differences, here, the difference between perceptions of what counts as relevant ethical aspects of a scientific study design. My sense of difference informed my choice to repeatedly confront my collaborators with my concerns about the video task, which, in turn, fuelled my and their sense of difference. The amplification of difference stands in a dialectical relationship with responsivity. We became mutually responsive to one

another over the course of our ongoing and evolving interactions and discussions, which I recognised later as socio-technical integration.

5.5.2 Minimising difference

Responsivity presupposes difference, but if there is constant opposition or contradiction, responsivity is impossible. To establish a condition between consonance and dissonance that allows for responsivity (Rosa 2018), I made efforts to minimise difference between me and my collaborators while facilitating a STIR focus group. I had taken the initiative to organise a group reflection process for the Silver Santé research team at the end of my first period of fieldwork to pursue a twofold objective. On the one hand, I aspired to share insights from fieldwork with the Silver Santé team in a way that would demonstrate the utility of participant observation for the enhancement of socio-ethical reflections on scientific research. On the other hand, I hoped that making myself useful for the research team would exhibit that I had become a bona fide insider in their laboratory life. For this purpose, it was important to put my ability to listen, learn and assimilate under test, especially in view of the stir I had caused in relation to the aforementioned video task.

In a two-hour focus group session, I briefly explained the STIR protocol to the Silver Santé research team and offered them five questions which, over the course of our ongoing collaboration, had stood out to me as opportunities for decision-making that seemed to be relevant to most team members. The group swiftly gravitated to the question: whether and how to disclose clinically relevant incidental findings (for instance, the detection of a brain tumour in a research scan) to Silver Santé participants. While listening to the researchers' conversation about whether or not they would like to settle on that question, I experienced a moment of disconcertment:

> After ending my presentation with a list of opportunities for decision-making, I anticipated that the research team would immediately engage in an animated discussion. Comments and suggestions, however, were rather timid and intermitted by awkward moments of silence. I was worried that scientists had not comprehended my talk fully, that I had negligently let too many social science concepts slip in and that I had made them feel uncomfortable by suggesting to collaboratively reflect on a question that appeared to be out of their comfort zone. These ruminations made me feel queasy, and I even experienced a pronounced twist in my stomach when a researcher remarked that the question about the disclosure of individual results was already answered. The researcher explained that the study protocol, informed by international guidelines for good clinical practice, defined exactly how to proceed if study examinations produced individual abnormal results indicative of health hazards.

The vignette from the beginning of the focus group session captures how my body sensed a difference between the researcher's understanding of ethics as rule following and my observations of situational ethics practices in the Silver Santé Study. The researcher seemed to follow familiar patterns of equating ethics with practice guidelines and research regulation, which required 'ethics management' instead of 'ethics deliberation' (Aircardi et al. 2018; Maasen 2018). This conception of ethics stood in sharp contrast to my observations of negotiations among researchers about how to do 'good research' in specific incidences that were not covered by the study protocol (see chapter 3). Yet, instead of expressing my embodied sense of difference, I engaged in affective labour to remain silent and fade into the background.

> I resisted the impulse to justify my selection of questions for discussion and took a step back. I was carefully listening and feeling into the discussion as it was unfolding in order to identify moments in which my interventions would help follow the STIR decision protocol or would subtly push the group to think about concrete cases in which they struggled with communicating individual results to participants. Most of the time, however, I focused on writing down what the researchers said, making sure that I would closely stick to their terminology and modes of expression. Despite my efforts to integrate in the research group over the last months, I realised that researchers were still perceiving me as a foreign social science student, and that they received my actions with certain thoughts and emotions that I found difficult to anticipate. As this partly unsettled me, I tried to demonstrate that I grasped their considerations, meticulously taking notes of the discussion on the whiteboard.

This vignette illustrates how I minimised the difference between me and my collaborators by avoiding appeals to my own expertise and commitments, using only terms, values, mandates and concepts that they recognised. I tried to alter my ingrained social science habitus, using my body as a source to move with my collaborators and their concerns. In mapping their decision-making processes with the STIR method, the Silver Santé team members revealed situational interpretations of the study protocol and their context-specific judgements about which course of action would be ethical in a given situation (cf. Pickersgill 2012). They identified diverse practices to advise participants and their general practitioners of elevated cholesterol levels, high average numbers of sleep apneas or unusual results of neuropsychological tests. A heightened awareness of the ways in which they tinkered with the study protocol made them acknowledge that efforts to follow general rules and procedures involved "case-by-case" decision-making.

It was not until the end of the session, that my body relaxed after processing what the researchers had discussed and how my performance in organising the focus group had affected our relationship.

> At the end of the discussion, the Silver Santé team concluded that whether and how to disclose individual results to participants was an intricate question, which they had answered repeatedly with the phrase 'it depends.' I feared the team would leave the session with a feeling of dissatisfaction, a lingering impression that this was not worth their time, asking themselves 'what this was good for,' because no clear-cut solution had been reached. Therefore, I felt relieved, when a PhD researcher approached me later on to thank me for the 'useful discussion' and suggested that the team should have such collaborative deliberations more often to better understand the ethical implications of different aspects of their work. I was startled when she asked me if the discussion had also been relevant for me, if I had gathered useful data for my PhD research.

Although, back then, I was unsure how to answer the scientist's question, I realised later on that the focus group was crucial for my PhD research for it had altered the relation between me and my collaborators. It fostered our rapport by enhancing its responsivity. The focus group made the Silver Santé research team aware that I understood their concerns and prioritised them over mine: asking them to choose a question for discussion, minimising appeals to my expertise and values, and trying to probe them in ways that would be helpful for them. In return, the researchers cared for what was relevant for me, making efforts to meaningfully contribute to my PhD project. Affective labour rendered us attentive to the needs of the other, facilitated a collaborative exploration of situational ethics and generated responsivity.

Responsivity enabled the emergence of a midstream modulation sequence. Allowing disconcertment to affect my body made a de facto modulation (ethics is rule following) discernible. Disconcertment was an indicator of an ethical difference between me and my collaborators, but instead of pushing it into the centre of attention, I minimised difference through affective labour. I used my body as a source to spot moments in which asking probing questions would contribute to a reflexive modulation (ethics is case-by-case decision-making). The collaborative process strengthened our rapport because it made tangible that mutual understanding and reciprocity was possible despite differences. Reciprocity is here not reduced to a logic of exchange as in a bilateral contract. Instead, reciprocity refers to a sense of "obligation to reciprocate attentiveness to others" (Puig De La Bellacasa 2017, 120) because one cares affectively for their becoming. The emergence of reciprocity helped me and my collaborators draw connections between different conceptions of ethics: ethics as rule following and ethics as situational judgement. It resulted in a deliberate modulation (case-by-case decision-making became a deliberate element of applying general rules locally). In the modulation sequence, ethics was remade by minimising difference and establishing affective connections across disciplinary divides. Initial scepticisms vanished, trust was established and a responsive relation emerged as a fertile ground for ensuing socio-technical integration.

5.5.3 Recognising difference

One of the results of establishing a responsive relationship with my collaborators was that they welcomed me for a second period of fieldwork in their research group in autumn 2019. Towards the end of the year, two scientists approached me with the request to give a presentation about SSH scholarship on meditation research. I had previously shared with them some excerpts from Purser's recently published book *McMindfulness* (2019), about which we had chatted over lunch. The scientists suggested to continue our lunch conversation with the entire Silver Santé team in a more formal setting since it could widen the horizon of socio-ethical reflections on the study. I took their request as a chance to create further connections between my immersion in the critical SSH culture and their participation in the productive culture of biomedical research. As I was curious to find out whether this would promote socio-technical integration, I decided to organise a focus group with ample room for discussion on the relevance of SSH critiques for Silver Santé research practices.

During the focus group, a moment of disconcertment occurred that turned out to impact the writing of my dissertation and the scientists' engagement with their principal object of research. The vignette that captures my memory of the event also depicts how affective labour on one's own bodily responses to a moment of disconcertment can sharpen sensitivity toward the affects experienced by other bodies and enable responsivity:

> As I told my collaborators, SSH scholars had published a plethora of critical analyses of the 'hype' around mindfulness and its scientific research. These analyses covered, among other themes, the 'mcdonaldisation' of mindfulness, pro-religious agendas among meditation researchers, ethically dubious studies on meditation in the military, and religious studies critiques according to which mindfulness-based trial interventions distorted contemplative practices by taking them out of their religious contexts. After my presentation, the Silver Santé team plunged into the discussion. I fielded several of their questions, provided additional information and critically assessed the interests of the authors whose work I had presented – a cultural practice in the research team that usually indicated whether a claim could be trusted.
>
> Following up on the religious studies critique about the decontextualisation of meditation in scientific experiments, a PhD researcher asked the group whether meditation was separated from religion in the Silver Santé Study. Suddenly, the room fell silent, except for someone who cleared her throat self-consciously. I resisted the urge to break the unpleasant silence and instead attended to the sensations in my body. I felt how the ambiance had changed: disconcertment filled the room and seemed to affect all of us viscerally. Then, one of the senior

> scientists said hesitantly that the European Commission did not fund research on religion. The Silver Santé Study conducted clinical trial research on a secular meditation programme. The PhD researcher, however, tentatively took issue with this account by remarking that some of the expert meditators who had participated in the study, including the renowned monk Matthieu Ricard, identified as Buddhists. As the senior researcher kept on insisting that the meditation intervention was not religious, the topic was dropped swiftly.

This snapshot illustrates how I used my body as a sensor to recognise disconcertment in me and my collaborators. Disconcertment indicated a difference between the emphasis the senior scientist had laid on the secular nature of the meditation programme and the inclusion of study participants for whom meditation was a religious practice. By exploring how disconcertment suffused and revealed itself in my body, I became sensitive to my collaborators' bodily expressions of unsettlement in the encounter of different, seemingly incommensurable versions of their research object: meditation as a secular versus a religious practice.

One could interpret the affective experience of difference as a bodily manifestation of the wider institutional constraints that researchers find themselves in – here the necessity to write grant proposals in ways that appeal to prospective funders (Myers 1990). Yet, the results of my fieldwork activities brought me to an alternative conclusion. Several members of the research team had previously emphasised that, in the context of the Silver Santé Study, meditation was a clinical trial intervention. In the study, meditation was a brain training, similar to learning a foreign language, whose impact on mental health and well-being the research team investigated. This singular understanding of meditation was challenged in the focus group. The disconcerting experience of difference between multiple objects of meditation was not a concern about the rhetoric of funding applications, but a sudden recognition that meditation was "more than one" (Law 2004, 62). Our bodies served as a source to productively unsettle a singular enactment of meditation as a brain training by making connections between SSH critiques of taking meditation out of context and biomedical research on a mindfulness-based clinical trial intervention.

It was only half a year later, after my body had processed the event, that I changed my interpretation of it. I had initially taken the moment of disconcertment as evidence that the religious dimension of meditation played a role, albeit subordinate, in the Silver Santé Study. This understanding was fuelled by my initial analytical supposition that I would discover instances of "ethical boundary work" (Wainwright et al. 2006) around the relation between science and religion on the laboratory floor. Throughout my fieldwork, however, I realised that religion was what Lee et al. (2019) call a "rare bird," that is a "shy species, very hard to spot

while observing its environment" (p. 286). By staging a critical SSH intervention, I thought I had managed to lure the rare bird out of its nest.

Yet, over time, I let myself be moved more by my empirical observations than by my analytical presumptions. I realised that meditation in the Silver Santé Study was neither religious, nor not religious, nor religious and not religious at the same time. Instead, it was "more than one and less than many" (Law 2004, 62), something in-between singularity and plurality whose nature depended on its continuous crafting. The ontology of meditation did not precede the practices that constituted the Silver Santé Study. While going through fieldnote diaries and interview transcriptions, I noticed that these practices – related to grant proposal writing, protocol adherence, the study intervention, study examinations and researchers' shoptalk – enacted meditation as not religious. Although this object was temporarily destabilised in a moment of disconcertment in the focus group, I kept myself from exaggerating the significance of this event. I dropped the idea to write an analysis of the intersection between religion and science. Such an analysis would perform the Silver Santé Study in a way that would not be in line with the world enacted by my collaborators. It would make meditation many, insisting that considering meditation as religious and not religious would be equally valid. This argument, however, would impose my epistemological interest on my collaborators. As I became responsively aware what mattered to them in the context of their study (i.e., research on a cognitive-affective brain training), I decided to change the analytical focus of my dissertation.

Analysing the focus group and its aftermath through the midstream modulation framework reveals a modulation sequence: a de facto modulation (meditation is one) in the Silver Santé team was challenged by a reflexive modulation (meditation is more than one) during the focus group, and led to a deliberate modulation (meditation is more than one and less than many) in my dissertation. Responsivity contributed to these collaborative outcomes. The modulation sequence would not have occurred if, on the one hand, I had insisted on my analytical presuppositions. Failing to recognise which ontology of meditation was relevant to the research of my collaborators, I would have written a critical analysis far removed from the issues at hand. On the other hand, if I had not dared to confront Silver Santé researchers with SSH critiques of their field of research, staying silent on the religious dimension of meditation, I would have missed out on an opportunity for socio-technical integration. We would not have become reflexively aware that objects come into being in different ways through socially embedded, situated activities, and that the social is thus integral to my collaborators' and my own epistemic practices. As responsivity, especially if nourished by sustained affective labour, helps circumvent the pitfalls of armchair critique and uncritical subordination, it becomes an opener for alternative forms of socio-technical integration.

5.6 Discussion

In the excerpts from my STIR study considered above, disconcertment was neither an extraneous nor distracting phenomenon, but rather played a central role in attempts at collaborative socio-technical integration. Although the comparative account of my analysis emphasises similarity in both the nature and origin of disconcerting experiences, the choices made in attending to the experiences vary considerably across the three excerpts of the STIR study. Over the course of regular STIR exercises with Silver Santé researchers, I chose to amplify difference through repeated confrontations. During the first focus group, I chose to minimise difference through incrementally reconsidering my habitus in relation to that of my collaborators. In the aftermath of the second focus group, I chose to recognise difference through symbolically acknowledging diverging world-making practices in my dissertation. A fuller account of the social, cultural and political contexts behind these choices – for instance, with regards to gender and age (Conley 2014; Glerup 2015) – is beyond the scope of this chapter. Rather, I emphasise that these choices were made within a methodological frame of interdisciplinary collaboration. In each case, my choices were informed by and resulted in responsivity, and generated alternative possibilities for socio-technical integration.

One may question, however, on which grounds I made these choices – that is, why I felt entitled to confront my collaborators with my disconcertment regarding the video task, but silenced the impulse to do so in response to a scientist's assertion that ethics was rule following. My experience of disconcertment was in both cases fuelled by the affective charge and bodily experience of ethics. I sensed a difference between my ethical system of orientation and that of my collaborators. Drawing attention to such differences in STIR has previously been accused of stimulating "midstream manipulation" (Smolka et al. 2021, 17) instead of midstream modulation. If an SSH scholar makes her normative commitments explicit, she runs the risk of imposing her position on her collaborators. If an SSH scholar is not transparent about her commitments – holding back her own views in STIR exercises – she might express these commitments inadvertently over the course of other fieldwork activities, and, thus, subtly manipulate her collaborators to endorse her views.

An embedded SSH scholar, however, is not an ethics arbiter, pointing out the 'right' and 'wrong' to the technoscientific practitioners she observes by drawing on some general principle. Instead, she is, at least temporarily, an immersed participant in 'ethics in the making' in a technoscientific space. She facilitates and co-shapes reflections on the ethical as it emerges in practice together with her collaborators. Her responsibility is "a matter of pragmatic ethos" (Stengers 2005, 188) which implies paying attention as best as she can and being as discerning as possible in a particular situation. She should try to feedback nuanced observations and interpretations of midstream modulation in a careful and respectful way, both for verification

and for probing her collaborators' capacities to exercise moral and epistemic responsibility for their own practices (Fisher 2018).

What it means to feedback carefully and respectfully could be considered as "equivocal speech" (Fitzgerald et al. 2014a, 716). Equivocal speech does not necessarily obscure transparency or eschew confrontations, but "is attentive to the things that are better left unsaid, to the feelings that are as well off not articulated and to the senses of awkwardness and ignorance that will probably not help anything if openly acknowledged" (ibid.). Equivocal speech cannot be formalised: one cannot develop a technique or a set of rules and strategies for embodying this mode of speaking. It is rooted in the capacity to sense the nuanced equivocations of feelings, both in oneself and in others, and to keep collaborating with and through them. This capacity is acquired in the very process of developing responsivity in a collaborative project.

5.7 Conclusion

Describing and analysing my intimate experiences of disconcertment helps illuminate the role of affect in interdisciplinary collaboration in at least four ways. First, it responds to recent calls for having a closer look at STS research practices to scrutinise how they generate and configure data (Lippert and Douglas-Jones 2019). I have displayed scenes of what an embedded SSH scholar actually does in a technoscientific space to foreground how embodied, affective experiences shaped collaborative processes and outcomes. Tracing how I experienced and, thus, enacted STIR in different ways reveals some of the subtle yet consequential choices that polished presentations of methods in articles and textbooks do not account for. While my analysis highlights how affects factor into the collaborative generation of STIR data, future studies could further unpack the STIR method by shedding light on ambivalences and troubles in applying its analytical categories to collaborative practices (cf. Lippert and Mewes 2021).

Second, I contribute to recent discussions on the analytical relevance of studying affect in STS research (e.g., Balmer et al. 2018; Smolka et al. 2020; Steinert and Roeser 2020). I combine theoretical insights from postcolonial studies, feminist epistemology, organisational studies, sociology and STS to develop a heuristic that provides resources for analysing disconcertment. The heuristic's value resides largely in that it allows me to interpret my empirical observations to illustrate how the body plays an important role in collaborative interdisciplinary research choices, interactions and developments. While the heuristic applies to and is descriptive of each of the cases presented here, it does not prescribe what choices embedded scholars should make. Rather, it serves to analytically present different modes of dealing with disconcertment in interdisciplinary collaboration. These modes do not constitute a monolithic plan for long-term repeated interactions, but refer to possible ways of handling difference through affective labour.

Third, affective labour, disconcertment and responsivity emerge as important yet understudied aspects of interdisciplinarity that may prove informative in understanding stories of both success and failure in attempts at collaborative socio-technical integration. Failures in interdisciplinary collaborations have been attributed to traditional knowledge hierarchies, prescriptive arrangements and deep-seated power imbalances, which position SSH scholars as either critical outsiders or co-opted insiders (e.g., Rabinow and Bennett 2012). These dynamics can make it challenging to notice and address epistemological, methodological, ethical and other differences between collaborators. Here, I have explored the effects of observing and engaging with the affective substrates that can underlie these differences. In doing so, I have shown that moments of disconcertment can be approached as "values levers" (Shilton 2012) that enable the opening of technical practices and workflows to more diverse considerations and to alternative responses. Instead of allowing these moments to go unnoticed, embedded scholars can view them as collaborative resources for opening new conversations that are sensitive to different value systems and wider social values.

I further emphasise that mobilising disconcertment as a collaborative resource requires bodies to do affective labour. Affective labour helps SSH scholars to navigate their liminal position by establishing responsive relationships with their collaborators. In doing affective labour, the body can detect, probe and process disconcerting moments in which hegemonic ways of doing research become destabilised. The body plays an essential role in creating a responsive relation among collaborators that is neither overly distant nor co-opted. Responsivity opens up a space between these two poles where research objects, disciplinary boundaries and conceptions of 'good' research can be remade in the encounter of different disciplinary cultures. To develop bodily skills that foster responsivity, I suggest that embedded SSH scholars could draw on practices developed in joint projects by movement practitioners, anthropologists and artists (e.g., Andersen and Høbye 2019; Vermeulen and Scholtes 2020). These practices might help further sensitise and calibrate the body as an instrument for STIR.

Finally, I follow Myers (2012) in suggesting that affective labour has the potential to unsettle dominant ways of seeing and approaching the world. This potential lies in the combination of affective labour as "caring for" and "caring about" (Schrader 2015, 668) the openness of one's collaborators' research practices to more diverse forms of inquiry. This type of voluntary care work is a condition for generative critique and it proceeds through open-ended inquiry. It differs from the type of enforced care for outreach and educational activities that maintain the status quo and that SSH scholars are frequently charged with (Viseu 2015). Affective labour involves simultaneously caring about the socially robust emergence of technoscientific trajectories as well as responsive forms of interdisciplinary collaboration, which cannot be enforced or scripted in advance.

My STIR study indicates that the potential of affective labour and responsivity to generate behavioural change, that is, deliberate modulation, should not be underestimated. Affect-oriented integration research is not only a symbol of evolving efforts to institutionalise the social shaping of technoscience; it also has concrete effects on cultural and material practices – practices that may otherwise reproduce traditional, prescriptive arrangements in interdisciplinary collaborations and technoscience. In choosing to engage with the disconcerting aspects of collaboration, I hope to point to the resources for generative critique that come with this challenging terrain.

INTERLUDE IV

The second part of the dissertation comprises two STIR studies in contemplative science. Chapter 5 tested the hypothesis that regular interdisciplinary dialogues guided by the STIR protocol could enhance capacities of Silver Santé team members to reflexively engage with valuation work. The results suggested that STIR dialogues were associated with reflexive and practical effects: conceptions and practices of ethics were diversified, awareness of potential scientific biases was heightened and a taken-for-granted ontology of meditation was interrogated. Chapter 6 was designed to scale up the effects found in chapter 5. It tests the hypothesis that non-recurrent dialogues between contemplative scientists guided by the STIR protocol enhance their capacities to reflexively engage with valuation work. Whereas chapter 5 built on a time-intensive process of interdisciplinary engagement with a particular group of researchers, chapter 6 introduces a methodological adaptation of STIR that could be put to broader use in research contexts (e.g., team building workshops and PhD trainings). STIR practitioner dialogues require less time investment by participating researchers and empower them to appropriate socio-ethical considerations through collaborative reflection among colleagues. In designing practitioner dialogues and documenting their collaborative outcomes, chapter 6 makes pragmatic contributions to contemporary debates on the ethicality of contemplative science. Practitioner dialogues provide a platform for contemplative scientists to relate abstract value discussions to concrete work practices. By reflecting on what counts as ethical in everyday work, scientific careers and contemplative aspects of life, contemplative scientists could strengthen capacities for navigating value conflicts.

In analysing such value conflicts, chapter 6 is not only revelatory for R(R)I researchers interested in patterns of valuation work and possibilities for their inflection, but also generates STS knowledge on contemplative science. It helps characterise contemplative science as an epistemic culture in which scientific research is guided by community-specific values and convictions. While chapter 5 examined how Silver Santé researchers modulated the dynamic interrelation between scientific practices and reflexive engagement with their social contexts (e.g., socio-ethical considerations, research regulations), chapter 6 concentrates on an aspect of this context that is particularly meaningful for contemplative scientists. This aspect is scientists' personal investment in contemplative practices, worldviews and values. Contemplative scientists often experience a tension between the values endorsed by their contemplative identity versus those relevant to their scientific persona. Contemplative values, such as slowing down and taking time for introspection, finding a personal anchor within and practicing compassion to all living beings, can conflict with the fast-paced, competitive scientific lifestyle focused on reaching career targets, rather than inner peace. Chapter 6 draws out how STIR practitioner dialogues among contemplative scientists supported them in performing valuation work to resolve conflicts between contemplation and science in their day-to-day work practices and career trajectories.

The methodological development and analysis of STIR practitioner dialogues incorporates some of the lessons learned from deploying STIR in the Silver Santé research team. I elaborate on three of these lessons in the remaining part of this interlude. First, feedback by Silver Santé researchers on our interaction and communication inspired the development of practitioner dialogues. When explaining the STIR method to the Silver Santé team, I used technical vocabulary, such as 'modulating the midstream' and 'enhancing reflexive capacities.' Such vocabulary made it difficult for scientists to understand what I proposed to do and raised objections against the method. A researcher derived from my explanation that I presumed contemplative scientists would lack reflexivity in engaging with the social contexts of research. He protested against this presumption, pointing me to all the events that the contemplative science community had organised to respond to socio-ethical critiques of the field. He was sceptical about the set-up of the study that I had proposed: a social scholar would support a natural scientist in building reflexive capacities. It seemed to imply a "deficit model," here not referring to the limited public understanding of science (Wynne 1993), but to scientists' deficiency in socio-ethical reflexivity (Irwin 2014, 73). To defend my methodology, I responded that STIR assumed scientists to have capacities for ethical reflection, but that these capacities often remained untapped due to disciplinary conventions and hectic routines of laboratory research. His concern, however, induced me to think about alternative study designs that would avoid associations with the deficit model. The idea emerged to teach the STIR protocol to scientists who would then pair up to engage in practitioner dialogues, in which they would guide each other through the protocol, rather than relying on facilitation by an SSH scholar.

Second, to make participation in STIR more attractive for contemplative scientists, I made efforts to enhance the credibility of my research. Although the members of the Silver Santé team had generously participated in a large number of interviews, regular STIR exercises, focus groups and discussions on my academic writing, I had the gnawing impression that they were wondering what my research was good for and why they were taking part in the first place. After all, I had difficulties to explain in a jargon-free, comprehensive manner what my research was about and why making time for me in their already full agendas would be relevant to them. I also found that the credibility of my research was rather meagre, since it was not embedded in the Silver Santé Study unlike the integrated ethics and society programme of the Human Brain Project (Aircardi et al. 2018). Instead, I was an unknown PhD student from another academic discipline working on my own with funding from a bursary. To ensure that the STIR study presented in chapter 6 would have more credibility and more obvious relevance for contemplative scientists, I secured support from the contemplative science community before launching the project. I gained financial support from MLE's award programme for early-career researchers[13] to signal to the contemplative science community that the institution considered my study as a relevant contribution to the field. In addition, STIR practitioner dialogues were planned to take place during a workshop organised as part of the Mind-Brain-Mindfulness Seminars, a meeting point for researchers interested in contemplative science that is associated with MLE.[14] In offering me a platform to carry out the STIR study, the seminar organisers facilitated the participant recruitment process.

Lastly, chapter 6 builds on the conclusions drawn from chapter 5 by introducing "values levers" (Shilton 2012) as a guiding concept to analyse STIR practitioner dialogues. A concluding remark of chapter 5 was that moments of disconcertment could be considered as collaborative resources for reflexive dialogues. More specifically, they could be approached as values levers that pry open discussions on socio-ethical considerations and value conflicts in technoscientific workflows. Chapter 6 examines this proposal by scrutinising the conditions in STIR practitioner dialogues that facilitate reflexive and practical modulations. The analysis zooms into scientists' situated reflection processes to identify bodily, intersubjective and improvisational carriers of practitioner dialogues. It highlights that the relational properties of STIR dialogues, like bodily experiences and affective communication, are an important but as-yet understudied factor in the successes and failures of collaborative socio-technical integration.

13 https://www.mindandlife-europe.org/our-work/evas/
14 https://mindbrainmindfulness.wordpress.com/

Chapter 6

Leveraging integrative capacities: cultivating hybrid role identities through STIR practitioner dialogues in contemplative science

Chapter 7

Conclusive remarks: ethics in action in contemplative science

7.1 Introduction

In the empirical chapters of this dissertation, I analysed how values are enacted in contemplative science. I further explored how engaged STS research can critique contemplative science in a way that interrogates and productively disrupts taken-for-granted ways of doing 'good' research. This research was motivated by debates on the ethicality of contemplative science fought out in academic and more popular discourses over the last decade. Whereas proponents of contemplative science emphasise its potential to tackle societal challenges, contribute to human flourishing, and to set an example for doing science more benevolently, opponents express ethical concerns about future applications and socio-cultural implications of studies on contemplative practices like mindfulness meditation. By assuming that scientific knowledge will automatically have normative effects, they fuel the 'hype' around research on the mind and the brain, alerting us prematurely that such research will inevitably change our culture, morality and conception of personhood in pernicious ways. In this dissertation, I sidestepped these rather abstract and to some extent speculative debates. Instead of assuming a boundary between research and its future transformative effects, I studied practices of valuation in present-day scientific work.

The main finding of this dissertation is that contemplative scientists mobilise different strategies and repertoires to valorise their work – they perform what I named *valuation work.* The concept of valuation work captures how scientists make seemingly incompatible values, forms of authority and systems of orientation merge, coexist or alternate in practice. While proponents of contemplative science proclaim that research on mindfulness meditation is grounded in contemplative values, such as 'to be of service' and 'to take care,' I found that such values were in tension with and needed to be balanced against scientific values, such as objectivity and internal validity. The first part of the dissertation *described* valuation work at scientific conferences, meetings and on the laboratory floor. It illuminated how deliberations on and practical attempts to resolve value conflicts were inextricably bound up with scientific socialisation processes and knowledge production. The second part *re-scribed* valuation work by analysing how it was made visible and modifiable in reflexive dialogues, group discussions and online workshops. The analysis indicates that science does not automatically have the normative effects over which opponents of contemplative science lament. For example, meditation research does not necessarily cut off Buddhist roots of mindfulness by turning it into a clinical trial intervention, neither does it automatically result in improved mental health and well-being in society. Instead, both Buddhist and modern framings of meditation can be traced, destabilised and modulated in scientific work practices through engaged STS research. The re-scriptive part of the thesis demonstrated how engaged STS research guided by the STIR method *critiqued* contemplative science generatively. STIR helped enhance reflexive capacities

of contemplative scientists to recognise, question and remake the ways in which they take socio-ethical dimensions of their work into account as an integral part of that work.

This concluding chapter elaborates on the theoretical, methodological and practical contributions of the dissertation. First, it draws out how the empirical chapters expand the concept of valuation work. Second, I advance the methodological reflexivity of this research by articulating how my positionality changed at different sites over the course of the thesis project and how these changes affected STS knowledge production. I also add a methodological reflection on my experiences with the STIR method to highlight how the application of the method could be refined to overcome the challenges and limitations that I encountered in the research process. Third, an impact paragraph spells out the social contributions of this dissertation, including the practical effects of STIR and attempts at scaling up such effects across institutions.

7.2 Theoretical contributions

This dissertation introduces the concept of valuation work in the context of contemplative science and, more specifically, in its biomedical branch of clinical trial research. While bioethics concentrates on normative analyses of biomedical research and practice, STS scholars have examined the development, implementation and problematisation of bioethics in practice (Felt et al. 2009; Jacobs 2018; Hedgecoe 2004; Salter 2007). Empirical research emphasises that the normative is to a large degree grounded in everyday practices of laboratories and clinics (Easter et al. 2006; Swallow et al. 2020; Wadmann and Hoeyer 2014). The concept of valuation work is a theoretical contribution to the sociology of bioethics (López 2004). It allows us to see 'ethics in the making' by opening the black box of 'ready made ethics' in regulatory frameworks of clinical trial research and in taken-for-granted norms of doing 'good' biomedical research. These two types of ethics are inspired by Latour's (1988) *Science in Action* which traces the social construction of scientific facts. Latour contrasts "ready made science" when facts are established after the closure of a scientific controversy with "science in the making" (p. 4) when what counts as facts is up for debate and contestation. He illustrates the distinction with a Janus-faced figure, one face looking young like facts in their infancy proposed and refuted at conferences and in journal articles, while the other is elderly like facts grown old on the pages of academic textbooks (Figure 5). As Latour uses this illustration as an entry point to understanding how scientific knowledge is constituted, it is not an exact blueprint for understanding how regulatory frameworks are made and applied. Although the analogy between 'science in action' and 'ethics in action' is somewhat limited, it is used here to visualise how the concept of valuation work contributes to discourses in applied ethics.

Applying the idea of the two-faced Janus to ethics, I conceive of 'ready made ethics' as norms, rules and regulations that are commonly considered as ethical, remain unquestioned or taken for granted after the closure of ethical deliberations, discussions and negotiations. Once all agree on the ethical course of action, people seem to forget that situated, context-dependent deliberations, in short 'ethics in the making' (cf. Latimer and Puig De La Bellacasa 2013) were required to arrive at the agreement. What is ethical to do appears self-evident or as something to be looked up in rules & regulations documents in the context of professional practice. While conducting ethnographic fieldwork in the Silver Santé Study, I noticed that researchers equated ethics with following the rules of the clinical trial protocol. Such rules – for example, 'a study intervention cannot be extended beyond its official end' or 'the study intervention entails participation in weekly group sessions' – seem to be generally applicable across research teams, study groups and geographical locations. Just like well-established scientific facts, they are "devoid of any trace of ownership, construction, time and place" (Latour 1988, 23). Based on the assumption that ethical issues pertaining to a particular piece of research are unlikely to vary geographically, guidelines for good research practice are standardised and, in some countries, research ethics committees are delocalised (Hedgecoe 2012).

This assumption, however, neglects two interrelated processes of negotiation: one characterises the making of clinical trial guidelines, regulations and protocols themselves (Moreira 2005; Stewart and Smith 2015; Zuiderent-Jerak 2021), while the other occurs in the localisation of standardised rules and situated ethical decision-making in everyday research practice (Hauskeller et al. 2019; Wainwright et al. 2006; Will 2007). This dissertation reveals that, in the latter process, scientists tend to be Janus-faced. The old face tries 'to get the rules straight,' while the young is sometimes upset about 'all the useless rules' which may contradict what feels ethical in a particular situation (Figure 6). There is a difference between the young-and-old Janus face of science and of ethics. While it is strictly methodological for Latour – the old face is an obstacle to lay people's understanding of science, not a phenomenon in its own right (Wilson 2017) – it refers to the difference between conceptions and practices of ethics. I observed scientists insisting that 'if you follow the rules, you do ethical research' although their practices revealed that ethical research depended on *how* they followed the rules and *who* judged their actions. In fact, they often struggled with the perceived imperative to follow general rules closely, while realising that the rules did not govern their application in local contexts and particular situations. To capture the tensions that emerged from looking into two directions at once, I developed the theoretical lens of valuation work.

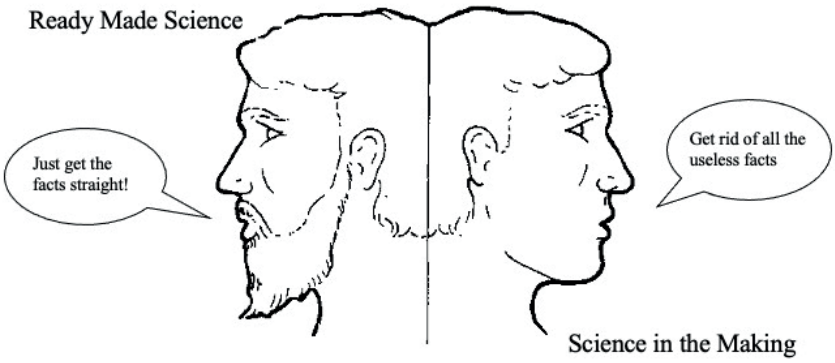

Figure 5. Science in Action
Copy from Latour (1988, 7).

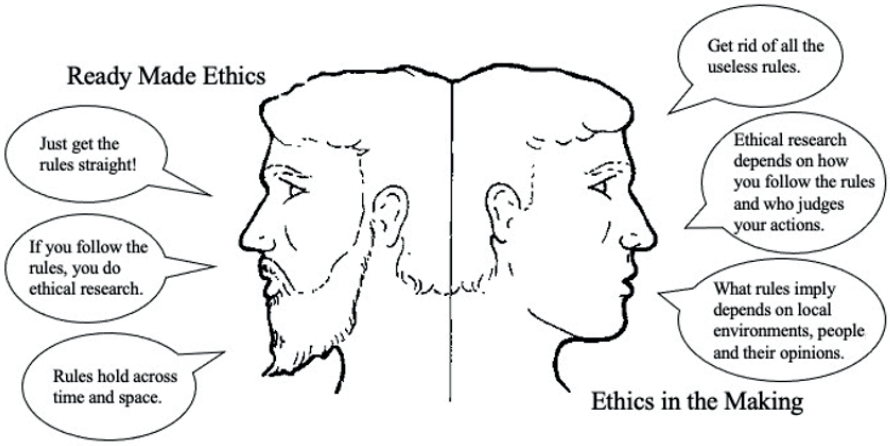

Figure 6. Ethics in Action

Valuation work encapsulates both collective negotiations about the application of rules, standards and norms, as well as working towards personal values and ethical sensitivities. Consequently, ethical practice is shaped by personal beliefs and feelings, the communities in which individuals are socialised, and the regulatory frameworks in which they operate. Taken together these formal and informal institutions, discourses and embodied convictions, which prescribe what one ought to do, configure the repertoires that are mobilised to valorise one's actions. Tensions between such repertoires are resolved through different practical strategies. The concept of valuation work describes how repertoires and strategies interact. Furthermore, its re-scriptive dimension sheds light on possibilities to transform this interaction. Each empirical chapter provides another analytical vocabulary to specify the descriptive or re-scriptive dimensions of valuation work. Valuation work is thus an umbrella term encompassing

several sub-concepts: regimes of valuation (chapter 2), epistemic goods (chapter 3), midstream modulation (chapter 5) and values levers (chapter 6). These concepts help analyse different ways in which valuation work is performed and inflected.

Regimes of valuation refer to scientific norms embedded in practices of justification. The analysis of regimes of valuation in chapter 2 reveals that valuation work is both new and old: it emphasises specific values anew in response to critical backlashes, while also exhibiting historical path dependence (Mahoney 2000). Contemplative scientists actively performed social responsibility, contemplative values in science as well as diversity and inclusivity to defend their research against socio-ethical critiques. In deploying these regimes of valuation, scientists alluded to historical authorities in contemplative science to justify their present-day actions with historical continuity. While the analysis of regimes of valuation illuminates the relation between the past and the present in practices of justification, the concept of *epistemic goods* foregrounds the relation between knowledge and ethics in situated practices of doing 'good' research. A presupposition widely shared among scientists is that ethical deliberation concerns the implications of science but is not part of knowledge production per se (Pickersgill 2012). To overcome this separation, the concept of epistemic goods joins epistemology with different conceptions of the good, highlighting that valuation work – here balancing partly incoherent goods – is constitutive of knowledge-making practices.

In analysing such valuation work in the 'midstream' of a clinical trial, chapter 3 indicates that good research can neither be defined 'upstream' in the design phase of the clinical trial protocol, nor can it solely be evaluated 'downstream' once the trial is finished and results are published (cf. Fisher et al. 2006). Although the stream metaphor brushes over multiple feedback loops that complicate the three-stage flow of a clinical trial (Will 2010), I use it here to highlight that the midstream is a phase where valuation work occurs but tends to remain hidden from view. As normativities come into being through individual and collective deliberation on values in the midstream, it is also a phase where valuation work is modifiable. The concept of *midstream modulation,* which is used to analyse the empirical data in chapter 5 and 6, captures the inflection of scientific norms and values through scientists' reflexive engagement with broader socio-ethical contexts in STIR dialogues. It denotes the gradual alteration of valuation work through engagement research methods like STIR.

Chapter 6 shows that *values levers* can function as carriers of midstream modulation. They are relational practices that pry open discussions on valuation work as it is already taking place in midstream activities. In STIR practitioner dialogues pairing contemplative scientists from different institutions, extending STIR questions, recognising shared epistemic living spaces and attending to embodied ethics made scientists reflexively aware of value conflicts and possibilities to resolve them. Such values levers turn "cold morality" into "hot ethics": they

make "invisible, solid, moral routines become fluid in ethics, so they – if necessary – can be readjusted to the new situation" (Swierstra and Rip 2007, 6).

In examining the reflexive and practical effects of making valuation work visible and malleable through engaged STS research, this dissertation contributes to literature on "exnovation" (Mesman 2011; see also Iedema et al. 2013, 2019). The concept as introduced by Mesman has nothing to do with the meaning of exnovation in the literature on technology life cycles, where it denotes destabilization, phasing-out and dismantling of technologies (David 2018; Kimberly 1981; Koretsky 2022). According to Mesman and Carroll (2021), exnovation amalgamates "excavation" – digging out and exposing what is already there – and "innovation from within" – using what is already there as resources for improvement (p. 157). This understanding of exnovation has guided a variety of practice improvement studies in healthcare settings spanning, among others, interprofessional communication (Carroll et al. 2018), patient safety (Pedersen and Mesman 2021), infection control (Wyer et al. 2015) and palliative care (Collier et al. 2018). These studies acknowledge the abilities of healthcare practitioners to order their day-to-day practices and creatively respond to tensions, conflicts as well as unexpected disruptions. In explicating these oft-hidden competencies of ordering and alignment, they capitalise on the strengths embedded in healthcare practices to make these practices even more smooth, adaptable and efficient.

In this dissertation, I applied the idea of exnovation to the oft-overlooked socio-ethical dimensions of scientific work practices. I documented how valuation work occurred in contemplative science to shed light on the competences and resourcefulness of scientists to let different orders of worth, seemingly incompatible epistemic goods and alternative ethical systems coexist. Inspired by postcolonial studies in STS revealing that non-Western societies and communities hold together in creative tension multiple cosmologies (Law and Lin 2010; Verran 2018) and different forms of knowledge (Verran 2001; Verran and Christie 2007), this dissertation explored how scientists made connections between diverging ethical worlds. I observed how scientists, in performing valuation work, created "partial connections" (Strathern 2005) to hold multiple practices of valuation together. The connections are described as partial because they allowed for "doing difference together" (Verran and Christie 2011), maintaining difference between practices of valuation while joining them together in a new pattern. In the empirical chapters, they were also referred to as strategies that scientists deployed to resolve value conflicts. Chapter 2 examined how the narration and performance of *folk history* connected industrial and inspirational orders of worth to valorise contemplative science as a project of reenchantment. Chapter 3 shed light on *tinkering strategies* through which multiple epistemic goods were combined to successfully complete a clinical trial on mindfulness and compassion meditation. Chapter 5 analysed how *affective glue* stuck together conceptions of ethics dominant in clinical trial research and those common in the social sciences, which

stimulated changes in thought and action in interdisciplinary collaboration. Chapter 6 revealed that contemplative scientists engaged in different forms of *contemplative integration* to resolve tensions between values endorsed by their contemplative self and those pertaining to their scientific persona. These findings suggest that both scientific work and STS engagement research can be exnovated by learning from the creative labour of making partial connections or, to put it differently, the strengths existing within valuation work.

7.3 Methodological reflexivity and reflection

Exnovation rests on the assumption that reflexivity helps practitioners see their judgements and practices in new ways and thus change behaviour accordingly. Increasing reflexivity does not only appear as the privileged option for practice improvement and social responsiveness (Barben et al. 2008; Fisher et al. 2015; Iedema et al. 2019; Schön 1984), but has also become an influential, though widely contested, methodological virtue in STS. Bloor ([1976] 1991) made a seminal argument for a general principle of reflexivity according to which STS scholars should apply their analysis of how scientists construct aspects of the natural world to their own rhetorical constructions of the social world. In his "inventory of reflexivities," Lynch (2000, 27) classifies Bloor's principle of reflexivity under "methodological reflexivity" (p. 29). Methodological reflexivity has become a canonical feature of ethnography where it brings into light the positionality of the ethnographer: her identity, commitments and attachments in relation to the groups studied. Drawing on Stirling (2006) and Thoreau (2011), I disambiguate the understanding of reflexivity from the competing notion of reflection. Methodological reflection mirrors everything that lies in the field of view and, in this way, enables the researcher to identify challenges and limitations that become apparent when putting a specific method into practice. Reflexivity, by contrast, focuses on the self and its transformation. It typically reveals the social contingency of the researcher's identity, interests, values and priorities as well as the ways in which her positionality shapes knowledge production.

However, Lynch (2000) argues that "there is no particular advantage to 'being' reflexive, or 'doing' reflexive analysis, unless something provocative, interesting or revealing comes from it" (p. 42). When everything is revealed as construction, rhetoric and discourse, then this does not tell us why the constructed nature of knowledge matters. Reflexivity matters in the context of this dissertation first and foremost for critically engaged STS and R(R)I scholars whose identity is salient in the potential integration of social science knowledge in another knowledge ecology (Balmer et al. 2015; Doubleday and Viseu 2010; Freeth and Vilsmaier 2020; Viseu 2015). Downey (2021) suggests that engaged STS scholars should ask themselves: "whom does one have to become to [critically] participate" (p. 230). I answer this question retrospectively for engaged scholars struggling with multiple commitments to learn from my experiences.

Moreover, the section on shifting positionalities may be relevant for other collaborating parties (e.g., technoscientific practitioners) because all those participating in collaborative research may find themselves at times with conflicting commitments. In the following, I discuss how such conflicts can be resolved by renegotiating identities across and within interactions as one learns more about them. Afterwards, I zoom into methodological challenges pertaining specifically to collaborations guided by the STIR method to offer concrete suggestions for handling such challenges in future research.

7.3.1 Shifting positionalities

In studying and engaging with contemplative science at the laboratory and the community level (Keating et al. 1992), I observed how my positioning at both levels changed over time in opposite directions. At the laboratory level in the Silver Santé Study, I was initially perceived as an *outsider*. As a foreign social science scholar who lacked experience in neuroscientific and clinical research, it was unclear to the researchers how I could participate meaningfully in their work. To clarify my research agenda, I had given a presentation to the Silver Santé team several months before I joined them for fieldwork in September 2018. Yet, it was challenging to convey social science concepts, such as 'critical collaboration' and 'socio-technical integration.' It took time until the researchers opened up to me, welcoming me as an *outsider inside* the Silver Santé Study. After learning my collaborators' vocabulary, recognising their priorities and establishing a relationship of trust over the course of participant observation and regular STIR dialogues, I developed sufficient "interactional expertise" (Collins 2004; Collins and Evans 2002) to join their discussions and ask relevant questions stimulating their deliberations on science and ethics.

Contrary to my experience in the Silver Santé Study, I was immediately perceived as an *insider* at the community level of contemplative science. As the community is interdisciplinary in nature – ranging from the neurosciences and clinical research, over psychology and other social sciences, to the humanities – researchers interested in any kind of inquiry in contemplative practices attend contemplative science conferences and meetings. To pass as a contemplative scientist, an important characteristic is to not only study but also practice contemplation (Komjathy 2018; Wallace 2007). As I was an active Vipassana meditator when I started my PhD research, I easily bonded with other conference participants both on a spiritual and on an academic plane. Over time, however, I moved from being perceived as 'one of them' to 'one who studies them.'

My ambivalent position became evident when I received the European Francisco J. Varela Award 2019 and subsequently carried out the awarded research. The award is an integral component of MLE's support for scientists and scholars whose research proposals promise

to advance contemplative science.[15] I received the award for the project presented in chapter 6, which is a study not only *for* but also *on* contemplative science. In recruiting participants from the contemplative science community to participate in the study, I came to be perceived as an *insider outside.* While contemplative scientists noticed that my interest in becoming part of their community was partly motivated by my epistemological agenda (i.e., to produce STS knowledge on contemplative science), they also started to value me for my critical outsider perspective on the development of their field and practices. In the role of an insider outside, I was invited to become a co-author of a conference presentation (Lukas et al. 2020) and an opinion piece (Van Vugt et al. in preparation), both making suggestions for how to make academia and contemplative science in particular more mindful and compassionate.

Although the shifts in positionality appear here as though they were smooth and linear – from outsider to outsider inside at the laboratory level and from insider to insider outside at the community level – they were more flexible and laboursome in practice. Shifting positionality required ongoing valuation work. At contemplative science conferences and meetings, I valorised my experience in meditation to establish rapport in conversations with contemplative scientists. To recruit them for my Varela Award project and to make myself useful as a co-author, I foregrounded my social science expertise. In the Silver Santé Study, I mentioned my background in meditation only when talking to researchers who meditated themselves, but downplayed it in conversations with those for whom meditation was a lifestyle intervention just like any other. To the latter group, I presented myself as a social science scholar studying ethics practices in the Silver Santé Study, signalling that we had a shared interest in lifestyle intervention research.

Valuation work is an important part of R(R)I engagement because it enables engaged scholars to "play the chameleon" (Balmer et al. 2015, 16). Moving between roles over time and contexts has a twofold purpose: to gain access to knowledge about scientific practices, and to take a position from which critique can be voiced that contributes to value reflections among scientists. In chapter 5, I analysed how amplifying, minimising and recognising difference were situational methodological choices, which positioned me in relation to my collaborators somewhere on a spectrum between antagonism and subordination. These situational choices were shown to facilitate generative critique, a critique that unsettled hegemonic ways of thinking and opened up reflections on alternative courses of action. Although I argued in chapter 4 that the STIR method would support social scholars in steering a middle course between what Barry and Born (2013) call "service-subordination" (p. 11) and "agonistic-antagonism" (p. 12) in interdisciplinary collaborations, the actual experience of deploying STIR makes me rethink my earlier claim. Generative critique does not rest in a 'golden middle,' but is a

15 https://www.mindandlife-europe.org/our-work/evas/

movement through different positionalities. By tuning into the affective fabric of collaborative interactions, engaged scholars can move dynamically back and forth between critical distance and critical friendship to foster reflexive inquiry across disciplinary divides.

7.3.2 Challenges in practicing STIR

As positionality is continuously evolving, transparency about research objectives, including underlying assumptions and normative expectations, goes beyond informed consent in "pre-engagement activities" (Te Kulve and Haico 2011, 700), which set the stage of a STIR study before its actual onset. Instead, it is part of what Mesman and Carroll (2021) call "iterative preparatory work" (p. 166) continuing throughout the whole project and ensuring that collaborative practices remain open for negotiation. Such preparatory work has remained a blind spot in STIR literature although it is foundational for the completion of a STIR study. An important aspect of preparatory work is to carefully reflect on the language used to communicate about STIR with scientists and engineers. In Balmer et al.'s (2015) experiences of post-ELSI collaboration, the strategic framing of a research project is crucial in shaping collaborative spaces which allow certain positions of the engaged scholar to flourish. Strategic framing of engaged research, however, is a challenging task, partly because social science concepts can evoke unexpected associations and sense-making in researchers with other disciplinary backgrounds (Thoreau 2011).

For example, I introduced myself as an "embedded humanist" (Fisher and Mahajan 2010, 216) to the Silver Santé research team. I used the expression to indicate that societal concerns and ethical demands would not be brought to the Silver Santé Study from the outside, but instead would emerge internally from the study and embedded interactions with a social scholar versed in the humanities. As Fisher and Mahajan already note, however, the term can evoke associations with "embedded journalism" (ibid.) used in the 2003 Iraq war where civil journalists were assigned to military units to provide a narrowly controlled media image of the war. Some Silver Santé researchers wondered whether I would join the team as a science journalist, which raised scepticism since they had made negative experiences with journalists misrepresenting their work in news articles. To clarify my motivations and role, I emphasised that I was a PhD researcher interested in studying ethics practices. Yet, mentioning the catchword 'ethics' gave the impression that I would perform 'ethics management,' taking on the role of a 'watchdog' in evaluating whether scientists behaved ethically or not (cf. Leese et al. 2019). Although I tried to explain that I was not an ethicist but an empirical researcher who would document and interrogate but not evaluate their work practices, scientists remained confused about my agenda. Despite ongoing valuation work to clarify my positionality, I remained an "out-of-category person" (Cerwonka and Malkki 2007, 3), with whom trust was established slowly, over the course of ongoing interactions and through discussions on the written chapters of my dissertation.

In retrospect, I assume that I could have erected a better foundation for my collaboration with the Silver Santé team had I incorporated a careful reflection on my language use in preparatory work. For instance, I could have followed embedded SSH scholars who borrowed the label "field philosopher" (Brister and Frodeman 2020), originally coined by Frodeman (2003), to introduce themselves to their collaborators. In calling myself a field philosopher, I might have avoided an immediate association with ethics and could have left the research agenda more open, to be determined collaboratively in the field (cf. Branch-Smith, n.d.). In the following, I reflect on further challenges encountered in my STIR studies pertaining to the (1) steering of soft impacts, (2) significance and scope of modulations, and (3) boundedness of the midstream. Such methodological reflections can feed into preparatory work and support the refinement of future research with the STIR method.

(1) Steering of soft impacts: My research probed the potential of STIR to identify and steer "soft impacts" (Swierstra and Te Molder 2012) of contemplative science. As soft impacts are difficult to agree upon, quantify and explain causally, R(R)I scholars have acknowledged that it is challenging to anticipate and assess such impacts and that there is no established methodology for doing so (Kiran et al. 2015). To fill the methodological lacuna, scholars have worked with technomoral scenarios (Haen 2015; Swierstra 2015a; Swierstra et al. 2009), analyses of technological mediation (De Boer et al. 2018; Kiran et al. 2015; Kudina and Verbeek 2018) and guidelines for responsible experimentation with new technologies (Van De Poel 2011 2013, 2016). STIR neither engages in speculative exercises to anticipate the ways in which scientific research might change society, culture and morality in the future, nor does it provide an ethical framework to assess the acceptability of such research in the present. Instead, STIR traces how scientists themselves in everyday research reflexively engage with potential soft impacts and whether such engagement could be guided into more socially responsive directions through dialogues with an embedded SSH scholar.

Chapter 5 analysed how a soft impact was modulated through interdisciplinary STIR dialogues with Silver Santé researchers. The soft impact was identified in a video task that measured how meditation in comparison to a foreign language training would influence participants' emotional responses to the suffering of others. Whereas I considered the stereotypical representation of suffering as disability and life in the Global South in the video footage as a soft impact of science, Silver Santé researchers looked at it from an epistemological perspective. They focused on the scientific consequences of a narrow representation of suffering, identifying it as a source of bias and making use of STIR dialogues to develop courses of action that could eliminate bias. Through our ongoing collaboration, they transformed "second-order reflective learning" – learning that involves reflection on socio-ethical aspects and value-based premises of research – into "first-order reflective learning" – learning that remains within the boundaries of the existing value system and background theories (Schuurbiers 2011, 772). This

observation suggests that STIR kept scientists locked in dominant ways of thinking, rather than helping them reconsider the socio-ethical consequences of their research. The data from STIR practitioner dialogues analysed in chapter 6 made me draw a partly overlapping conclusion: the effects of STIR were ambiguous, promoting both first- and second-order reflective learning.

Instead of considering the finding of first-order reflective learning as a negative result, I follow Schuurbiers (2011) and interpret it as a prerequisite for second-order learning: "research participants' willingness to engage in critical reflection on the broader socio-ethical context of research was seen to be dependent on their perception that the collaboration also improved the achievement of their own (research) interests" (p. 786). Similar to Schuurbiers's collaborators, the Silver Santé research team developed a heightened interest in working with STIR, inviting me to facilitate a reflexive group session on socio-ethical critiques of contemplative science, after I had proven the method's usefulness in advancing their research. The collaborative outcomes of STIR were thus consonant both with scientific interests in epistemological impacts and social agendas for steering soft impacts, indicating that a common ground between historically divergent values can be cultivated in reflexive dialogues.

(2) Significance and scope of modulations: Although several STIR studies, including this dissertation, have stimulated second-order reflective learning (e.g., Fisher 2007; Flipse et al. 2013; Richter et al. 2017), the method has been criticised for reducing the consideration of socio-ethical dimensions of science into a depoliticised form self–reflection. According to such critiques, institutional and wider political problems tend to become individualised, contained in the domain of personal decision-making, which may reinforce existing hegemonic social orders, disciplinary boundaries and knowledge hierarchies (Borck 2018; Latimer and Puig De La Bellacasa 2013; Thoreau and Delvenne 2012). Against this background, one may wonder whether the midstream modulation sequences outlined in the STIR studies in chapter 5 and 6 widened the horizon of socio-ethical reflections of contemplative scientists in a way that impacted their scientific practices and culture significantly. To elaborate on the meaning of 'significance' by means of an analogy, one could contrast "for example, the ethical, personal, irrelevant option of taking shorter showers versus the significant political option of shutting down all the coal stations" (Puig De La Bellacasa 2017, 133). In a similar vein, one may wonder whether STIR can go beyond its original purpose of knowledge production and serve as an instrument for sociotechnical change in R(R)I if all it achieves is making scientists reflexively aware of situated ethical decision-making, the multiplicity of their study object and possibilities to combine science and contemplation, to name some results of the STIR studies presented here. One may question whether such micro-level changes in thinking are worth the time, energy and resources invested in a STIR study.

Despite the limited scope of the midstream modulations analysed in this dissertation, I suggest that they provide evidence for STIR's potential to make significant contributions to science governance. Chapter 5 and 6 demonstrated that contemplative scientists tapped into their capacity to reflect on the broader values and social settings implicated in their routine specialised knowledge practices. This is remarkable given the tendency for technoscientific practitioners to deflect rather than embrace normative inquiry (Cech 2014; Newberry 2007; Smith-Doerr 2006). Recognising alternative courses of actions, rather than confirming existing ones, is a condition for generative critique that destabilises hegemonic structures. Large-scale changes of these structures are ultimately rooted in the individual capacity of reflexive decision-making, not only of those in power, but also of all those who participate in and thus create an organisation and its wider culture (cf. Fisher 2019a). Along these lines, the evidence that STIR enhances reflexive capacities indicates that the method is not only a tool to study the conditions of socio-technical change, but could also serve as a resource to actually bring that change about.

(3) Boundedness of the midstream: To test the potential of STIR to generate reflexive and practical effects in the Silver Santé Study, the method was strategically planned to intervene in the midstream of the Age-Well clinical trial. The midstream is a phase in research and technology development where activities are neither fully determined by "upstream" research and development agendas, nor are they limited to an instrumental "downstream" approach to their implementation (Fisher et al. 2006, 490). Fisher et al. note that the stream metaphor – despite its allusions to sand banks, back currents and eddies – is not an accurate model of research and development because it posits an inevitable flow from research funding, over basic and applied research, to technological development and societal benefits. They nevertheless consider the metaphor to retain valuable information, namely that the so-called midstream was largely neglected by traditional approaches to science and technology governance focusing on upstream technology assessment and downstream regulation. Midstream modulation, by contrast, steers how researchers, either individually or in groups, constantly make decisions about their day-to-day work practices, experimental setups, data collection, analyses procedures, etc.

The boundedness of the midstream – where it starts and ends – has so far remained largely unspecified in theoretical literature and empirical STIR studies, partly because it is highly context-dependent. Mertens (2018), for example, points out that emerging medical technologies follow other temporalities than technologies associated with high uncertainty and possible adverse effects for which midstream modulation approaches were originally developed (e.g., nanotechnology, genetic modification, synthetic biology). As medical technologies remain flexible even after implementation, the midstream in clinical settings extends into a "seemingly never-ending transitional phase" (p. 290) where room for change always remains. As there is

no distinct post-market phase, she suggests that the governance of these technologies requires continuous monitoring and reviewing. She concludes that the implementation of governance frameworks like R(R)I and the modulation of midstream socio-technical integration need reinterpretation as context demands.

In the context of clinical trial research, efforts to steer socio-technical integration processes should span all stages of a trial. Randomised-controlled clinical trials are usually run in three stages: (1) the trial is designed and its procedures are fixed in the clinical trial protocol; (2) the trial is conducted as prescribed by the protocol; (3) once the data are collected and verified, they are analysed according to a pre-specified analysis plan (Friedman et al. 2015). Departures from the trial protocol are considered as possible sources of bias and thus largely avoided. Although I have shown in chapter 3 that the implementation of a protocol involves tinkering and *ad hoc* decision-making, possibilities for inflecting socio-technical integration in the second and third stage of a clinical trial are limited. The timing of my STIR study (in the middle of the second stage) might be one of the reasons why the scope of midstream modulations in the Silver Santé Study was relatively small in comparison to previously published STIR studies on more exploratory technoscientifc practices (Conley 2014; Flipse et al. 2014; Schuurbiers 2011). If STIR is deployed as a means to generate practical modulations in clinical trial research (rather than in its original design as a mode of research), the midstream should be conceptualised so as to include all three stages of a clinical trial.

7.4 Impact paragraph

As methodological reflections on the relation between engaged research and science governance reveal, this dissertation is permeated by the agenda to combine scientific with social impacts. Therefore, the requirement for candidates seeking to attain their doctoral degree at Maastricht University to attach an impact paragraph to their dissertation appears almost redundant here. Hence, instead of enumerating the impacts of this dissertation, I use this paragraph to go one step back and reflect on the different meanings of impact as well as the difficulties in assessing it. For instance, I recognised a tension between scientific impact measured in journal publications and social impact in terms of contributions to science governance. My interest in publishing the results of my STIR studies was sometimes at odds with my 'activist' interest in exploring STIR's potential to serve as a form of soft science governance, stimulating reflexive and practical transformations of technoscience. Although all participants had agreed that STIR dialogues were used for academic publications without revealing their identity, one of them admitted that this aspect of our interactions made him reluctant to openly share his decision-making processes, concerns, fears and wishes, knowing that our conversations were recorded.

He took the view that our dialogues could have been more productive if they had not been "exploited" for academic publishing.

Trade-offs between different forms of impact indicate that evaluating research achievements involves careful reflection on research processes. Applying one of the main insights of this dissertation to my own research, I seek to discuss and evaluate its impacts within the context of locally configured practices, where balancing acts between different ways of doing good research become apparent. Along these lines, this impact paragraph elucidates challenges in assessing the outcomes of STIR and presents strategies deployed to address these challenges. I also add suggestions for how to improve practical efforts in contributing to science governance through STS engagement research. Finally, I highlight what STS engagement research and contemplative science can learn from each another on the basis of this dissertation. To ensure that this impact paragraph is aligned with the regulation governing the attainment of doctoral degrees at Maastricht University, I list additional impacts (publications, presentations, educational activities) in table 7.

Table 7. Scientific and societal impact in numbers of publications, presentations, teaching and science communication activities

CATEGORY	REFERENCE	DESCRIPTION
Publications for humanities and social science (STS) audiences	Smolka, Mareike. 2022. "Making epistemic goods compatible: Knowledge making practices in a lifestyle intervention RCT on mindfulness and compassion meditation." *BioSocieties.* https://doi.org/10.1057/s41292-022-00272-w.	Publication based on chapter 3
	Smolka, Mareike. 2021. "The Ethnographic Patchwork Quilt: A post-publication methodography." *The Sociological Review.* https://doi.org/10.51428/tsr.djop2330.	Blogpost on co-constructing ethnographic knowledge with research informants
	Smolka, Mareike. 2021. "Why does controversy persist? Paradigm clash, conflicting visions and academic productivity in the aesthetics of religion." *Science as Culture.* https://doi.org/10.1080/09505431.2021.1918077.	Article written in the context of the PhD research, which was ultimately not included in the dissertation.
	Smolka, Mareike, and Sebastjan Vörös. 2021. "Writing Life: An Interview with Sebastjan Vörös." *Somatosphere.* http://somatosphere.net/2021/writing-life-sebastjan-voros-mareike-smolka.html/.	Interview with a philosopher of mind, science, and religion working in contemplative science
	Smolka, Mareike, Erik Fisher, and Alexandra Hausstein. 2021. "From Affect to Action: Choices in Attending to Disconcertment in Interdisciplinary Collaborations." *Science, Technology, & Human Values* 46(5): 1076–1103. https://doi.org/10.1177/0162243920974088.	Publication based on chapter 5
	Smolka, Mareike. 2020. "'Confer-ring' at contemplative studies conferences: Conference ethnography in a time of COVID-19." *Conference Inference. Blogging the World of Conferences.* https://conferenceinference.wordpress.com/2020/10/11/confer-ring-at-contemplative-studies-conferences-conference-ethnography-in-a-time-of-covid-19-mareike-smolka/.	Blogpost on conference ethnography at online contemplative science events
	Smolka, Mareike. 2020. "Generative Critique in Interdisciplinary Collaborations: From Critique of and in the Neurosciences to Socio-Technical Integration Research as a Practice of Critique in R(R)I." *Nanoethics* 14(1): 1–19. https://doi.org/10.1007/s11569-019-00362-3.	Publication based on chapter 4
	Smolka, Mareike. 2019. "Towards better science and modesty in the Cognitive Science of Religion and Contemplative Science?" *Verkündigung und Forschung* 64(2): 142–150. https://doi.org/10.14315/vf-2019-640208.	Book review of contemplative science and cognitive science of religion literature
	Smolka, Mareike. 2018. "'Sticky business' inspires: Enacting ethics by adding syrup to laboratory life." *EASST Review* 37(4). ISSN: 1384–5160.	Review of the annual conference of the European Association for the Study of Science and Technology 2018
Publications for wider publics	Smolka, Mareike. 2020. "Che fine ha fatto? Khenpo A Chös Regenbogenkörper." Contribution to the Night of Museums 2019. Centre for Cultural Research Lübeck, Germany. https://www.zkfl.de/vermitteln/zkfl-in-der-museumsnacht/smolka.html.	Critical reflection on contemplative science research presented at the Night of Museums 2019 in Lübeck, Germany
	Smolka, Mareike. 2018. "'Cosmonaut for a night': The experiences of a Silver Santé volunteer." *Point of view*. Silver Santé Study, The Medit-Ageing Project. https://silversantestudy.eu/points-of-view/.	Interview with a participant in the Age-Well trial for the public website of the Silver Santé Study
	Smolka, Mareike. 2017. "Responsibility in the Silver Santé Study means caring for others." *Point of view*. Silver Santé Study, The Medit-Ageing Project. https://silversantestudy.eu/points-of-view/.	Summary of Master thesis on responsibility in meditation research for the public website of the Silver Santé Study

Table 7. Scientific and societal impact in numbers of publications, presentations, teaching and science communication activities

CATEGORY	REFERENCE	DESCRIPTION
Presentations for humanities and social science (STS) audiences	12/2021 "Ethics in Action in Contemplative Science." Presentation to the Science and Technology Policy research group at the School of Social Sciences and Technology. Technical University Munich, Germany.	Presentation providing an overview of the dissertation
	09/2021 "Insights into MUSTS Practices of Collaborative Research." Presentation at the Association for Studies in Innovation Science and Technology – United Kingdom Annual Conference. Online.	Presentation based on chapter 5
	05/2021 "Conflicting epistemic goods, informal care practices, and multiple research objects in a clinical trial on mindfulness meditation." Presentation at the Nordic Science and Technology Studies Conference. Online.	Presentation based on chapter 3
	03/2021 "Generative Critique in local productions of sleep apnea: Destabilising standard ways of interpreting curves, categorising health vs. illness, and doing research ethics." Presentation at the Chronic Living International Conference on quality, vitality and health in the 21st century. University of Copenhagen, Denmark.	Presentation of ethical practices and conundrums related to the incidental finding of the obstructive sleep apnea syndrome in Age-Well participants of the Silver Santé Study
	08/2020 "From Affect to Action: Choices in Attending to Disconcertment in Interdisciplinary Collaborations." Presentation at the Joint International Conference of the European Association for the Study of Science and Technology and the Society for Social Studies of Science. Online.	Presentation based on chapter 5
	11/2019 "Engaged ethnographer meets non-participant observer: on the production of normativities in writing and doing research." Presentation and discussion with Dr. Bas De Boer at the Ethics and Politics of Emerging Technologies network meeting. Maastricht University, the Netherlands.	Methodological discussion on engaged STS research
	08/2019 "STIRring up clinical research and contemplative science: on the production of bias and 'good' meditation research." Presentation at the Centre for STS-studies. Aarhus University, Denmark.	Presentation on the social construction of bias in contemplative science
	06/2019 "Studying emotions in meditation research: ethics and epistemology entangled?" Presentation at the Transdisciplinary Conference on BIAS in Artificial Intelligence and Neuroscience. Nijmegen, the Netherlands.	Presentation on the social construction of bias in contemplative science
	12/2018 "The Meditating Brain in Context. Eliciting Ethical Reflections in Neuroscientific Meditation Research." Presentation in the research colloquium organised by Alfred Nordmann. Institute of Philosophy, Technical University Darmstadt, Germany.	Presentation on STIR in the Silver Santé Study
	11/2018 "STIR intervention and ethnography in the Silver Santé Study." Presentation at the Ethics and Politics of Emerging Technologies network meeting. University of Twente, Enschede, the Netherlands.	Presentation on STIR in the Silver Santé Study
	07/2018 "Controversy in the Aesthetics of Religion: When religious studies go cognitive, visions on how to study religions clash." Presentation at the International Conference of the European Association for the Study of Science and Technology. Lancaster, United Kingdom.	Presentation based on the article published in *Science as Culture* (Smolka 2021), which was not included in the dissertation.

Table 7. Scientific and societal impact in numbers of publications, presentations, teaching and science communication activities

CATEGORY	REFERENCE	DESCRIPTION
Presentations for contemplative scientists	08/2021 "Towards a compassionate academy and a compassionate open science." Keynote with Dr. Marieke Van Vugt, Dr. Zoltan Dienes, Annika Lübbert, Dr. Wolfgang Lukas, Dr. Enrico Fucci, Dr. Mary Rees, Dr. Frank Schumann and Susannah Deanne at ESRI 2021. Online.	Presentation based on manuscript co-authored with contemplative scientists and scholars, which proposes practical strategies to introduce compassion-related values in academia
	08/2021 "Cultivating Contemplative Science Identities through STIR Practitioner Dialogues." Poster with Dr. Erik Fisher at ESRI 2021. Online.	Poster based on chapter 6
	07/2021 "Tracing Collaborative Reflection Moment-to-Moment: Bringing Science & Technology Studies to Contemplative Science and Vice Versa (Preliminary Results)." Presentation with Dr. Erik Fisher at Mind-Brain-Mindfulness Intercity Seminar. Online.	Presentation based on chapter 6 for contemplative scientists who participated in the presented research
	11/2020 "The Mindful Researcher: Transforming Academia from Within." Presentation with Dr. Wolfgang Lukas at CRC 2020. Online.	Contribution to a presentation of the Mindful Researchers Initiative which seeks to align contemplative science with contemplative values
	10/2020 "Ethnographic insights into Medit-Ageing: Preliminary reflections on six months of fieldwork." Presentation at the European Consortium Meeting of the Medit-Ageing Research Group. Online.	Presentation for the European consortium of the Silver Santé Study on preliminary results of the first and second phase of fieldwork in the Age-Well clinical trial
	08/2020 "Digital conference ethnography at ESRI 2020. An inquiry into technological mediation of academic community building." Poster at ESRI 2020. Online.	Poster introducing theory and objectives of conference ethnography at contemplative science events
	10/2019 "Ethics in Action: Engaged Ethnography in the Silver Santé Study." Poster at CSS 2019. Fürstenfeldbruck, Germany.	Presentation providing an overview of the dissertation
	02/2019 "Ethics in Neuroscience: Creative solutions to ethical challenges in the Silver Santé Study. Preliminary results." Presentation at the Biomedical Research Institute Cyceron. Caen, France.	Presentation for the Silver Santé research team on preliminary results from the first phase of fieldwork and STIR in the Age-Well clinical trial
	07/2018 "The meditating brain in context: eliciting ethical reflections on neuroscientific meditation research." Presentation at ICM 2018. Amsterdam, the Netherlands.	Presentation providing an overview of the dissertation
	01/2018 "Le cerveau en méditation. Des défis éthiques de la recherche sur la méditation en neurosciences." Presentation at the Biomedical Research Institute Cyceron. Caen, France.	Presentation for the Silver Santé research team introducing theory, method and objectives of ethnographic fieldwork and STIR in the Age-Well clinical trial
	07/2017 "Responsibility in Neuroscience: A case study on ethical boundary-work in conventional and unconventional cognitive enhancement research." Poster at ESRI 2017. Fraueninsel Chiemsee, Germany.	Presentation of Master thesis results on responsibility in meditation research

Table 7. Scientific and societal impact in numbers of publications, presentations, teaching and science communication activities

CATEGORY	REFERENCE	DESCRIPTION
Educational STIR events for students, researchers and professionals	01–12/2022 "Socio-Technical Integration Research Seminar Series 2022." Organisation with Dr. Erik Fisher, Cynthia Pickering and Lyric Peate.Online.	Monthly online seminar series to build a global STIR community including researchers, policy makers and professionals
	04/2022 "Socio-Technical Integration Research." Workshop at Arizona State University, Tempe, United States.	STIR workshop for Bachelor students in the course "Innovation in Society."
	02/2022 "From FAIR to FAIRI: Open Science principles in qualitative research." Presentation to metascience research group chaired by Don van Ravenzwaaij at the Faculty of Behavioural and Social Sciences. University of Groningen, the Netherlands.	Presentation on FAIR principles in STIR studies based on chapter 6
	11/2021 "Critical Neuroscience for Psychologists." Interactive Online Workshop organised with Dr. Flora Lysen. University Bonn, Germany.	Workshop on STIR and critical neuroscience scholarship for students and researchers from psychology and neuroscience
	10/2021 "FAIR Interviews & Focus Groups in Qualitative Social Science Research." FAIR Coffee Lecture. Maastricht University, the Netherlands.	Presentation on FAIR principles in STIR studies based on chapter 6
	05/2020 "Socio-Technical Integration Research." Workshop at University College Maastricht. Maastricht University, the Netherlands.	STIR workshop for Bachelor students in the Research Methods course trajectory
	11/2019 "Socio-Technical Integration Research." Poster with Erik Fisher at a conference of the network for integrated research. Leipzig, Germany.	Poster on the STIR method for a network of researchers involved in collaborative research
	08/2019 "Socio-Technical Integration Research." Workshop at Interacting Minds Centre, Aarhus University, Denmark.	STIR workshop for researchers from the cognitive sciences, anthropology and other disciplines
	05/2019 "Socio-Technical Integration Research." Workshop at University College Maastricht. Maastricht University, the Netherlands.	STIR workshop for Bachelor students in the Research Methods course trajectory

7.4.1 Evaluating STIR achievements

Although Yaghmaei and Van De Poel's (2020) edited volume on the *Assessment of Responsible Innovation* explores promising approaches to assess the effects of R(R)I activities, the literature on evaluating the achievements of sociotechnical collaborations is still in its infancy (Fisher 2019a). Studies analysing such collaborative projects mention the struggles in assessing outcomes in terms of how science and innovation trajectories are modulated, but postpone the development of evaluative methods and practices to future research (e.g., Aircardi et al. 2018; Åm and Sørensen 2015; Pansera et al. 2020). Studying the evolution and effects of interdisciplinary R(R)I initiatives at a synthetic biology centre in the UK, Pansera et al. (2020) conclude: "The impact on daily routines, practices and outcomes within the Centre remains elusive and as yet unquantified. Measuring responsiveness, impact and outcomes remains an area for significant development in this respect" (p. 404). The language of measuring, however, is rather unsuitable for sociocultural interventions, since measurement presumes the existence and validity of a pre-existing yardstick and a uniformity or at least comparability of impact. Uniformity and comparability apply to pre-designed interventions with rigidly executed plans and narrowly delineated outcomes, but are largely absent from open-ended collaborations whose effects are often difficult to detect, let alone quantify (e.g., enhanced reflexive awareness, increased sense of agency). Consequently, the goal of evaluating achievement should not be measuring impact, but assessing learning.

Following a "learning-oriented evaluation approach" (Klaassen et al. 2020, 230) to collaborative sociotechnical integration, Fisher (2019a) notes several challenges in tracing and documenting learning outcomes, here reflexive and practical changes in technoscience. Given that changes in practice often develop over time, documenting such development requires qualitative approaches that are highly attentive to contextual details. Such approaches are not only labour-intensive, but can also potentially distract from actual collaboration. As mentioned above, I experienced a tension between recording STIR dialogues for subsequent analysis and establishing a productive collaborative relationship. To handle such tensions and trace the effects of STIR over time, I followed a longitudinal approach to documentation in the Silver Santé Study. The collaborative project was designed as a two-phase STIR study: the first phase lasted four months and involved regular STIR dialogues with Silver Santé researchers; the second phase took place one year later when I spent three months with the research team to trace the effects of the first phase. The time investment helped establish a relationship of trust between me and my collaborators, which facilitated reflexive learning and enabled me to generate context-sensitive, ethnographic data on our interactions as well as their effects.

Even if such effects can be detected, it remains unclear whether they solely result from the collaboration or from any other factors and processes unfolding in a technoscientific space at the same time (Fleischer 2015). For example, while Silver Santé researchers were engaging in regular

STIR dialogues with me, they were also participating in a graduate course on research ethics and integrity. One could thus question whether the reflexive change documented in chapter 5 – shifting from a conception of ethics strictly related to the treatment of study participants to a recognition of ethics in empirical data – resulted from STIR or from the graduate course. To reduce such ambiguity, I discussed the nature and origin of any changes I had observed with my collaborators. In doing so, I adopted Mertens's (2009) approach to transformative research and evaluation, according to which those at the centre of transformation – here the embedded SSH scholar and her technoscientific collaborators – should also be central to its evaluation. However, collaborating parties may disagree with each other as to the origin or significance of transformation (e.g., Åm and Sørensen 2015). I navigated such disagreements by asking my collaborators to read and comment on excerpts from my dissertation. In careful negotiation and co-creation processes, we revised my analyses and ultimately agreed on a shared account.

Given that the evaluation of collaborative R(R)I projects is vulnerable to contestation and social desirability biases, the question poses itself whether one can possibly define their success or failure. In answering this question, I follow proposals for a processual understanding of success in critical collaboration (Evans et al. 2021) and co-laboration (Niewöhner 2021). Accordingly, success is not defined in terms of outcomes of an engaged research process (e.g., the number, scope and significance of deliberate modulations in STIR). Instead, one should ask whether the process was good (e.g., complying with the ethos of engagement in STIR: methodological rigor, ethical transparency and careful listening). Along these lines, Evans et al. consider the creation of a space for discussing alternative framings of problems, decisions and objects as a positive effect of critical collaboration in and of itself. Based on this understanding of success, this dissertation reinvokes the longstanding call in STS engagement and practice improvement research to open up "reflexive spaces" (Iedema and Carroll 2011): discussion fora where conventional approaches, opinions and practices as well as their underlying assumptions are made available to reconsideration and revision. Rather than asking what we can achieve in such spaces, we should think about how they can be designed, established and preserved.

7.4.2 Suggestions for opening up reflexive spaces

The call for reflexive spaces needs to be reiterated since managerial reforms of the university system expected to increase output and efficiency through auditing and ranking structures (Fochler 2016a; Shore 2008) continue to curtail time, space and resources for reflection across academic fields and disciplines (Felt 2017a). Chapter 6 made evident that contemplative science is equally affected even though meditative practices and contemplation on the wider purpose of research are defining features of its scientific ethos. In parallel, Van Oudheusden and Shelley-Egan (2021) recently emphasised the urgency of reflexive questioning of science and technology development in light of their contested roles in the COVID-19 pandemic, climate change debates and the emergence of 'post-truth' politics. Therefore, it is all the more

important that engaged STS scholars reinforce their practical efforts in establishing, expanding and protecting reflexive spaces. This thesis makes three suggestions to work into this direction.

First, scientists, policy makers and engaged scholars alike need to accept that creating and preserving reflexive spaces takes time. Without an engaged scholar charged with facilitating reflexivity, scientists usually do not take the time to confront and articulate complexity inherent in everyday work practices (cf. Iedema and Carroll 2011). Becoming aware of value conflicts embedded in such complexity tends to slow down the work flow, since it actuates scientists to find ways for resolving or living with such conflicts. Preparing, documenting, and following up on the shift from awareness raising over deliberation towards a change in behaviour also takes time – in fact, I was in regular contact with Silver Santé researchers from 2017 to 2020 and have continued to discuss my research analyses with them throughout 2021 and 2022. Time is thus not only an investment on the part of the collaborating scientists but also on the part of the engaged SSH scholar for whom extended periods of ethnographic fieldwork and interdisciplinary collaboration become increasingly difficult to integrate with academic duties and strict timeframes of (PhD) projects (Günel et al. 2020).

Taking the temporal dimension of reflexive spaces into account, I suggest that STS engagement researchers make common cause with Slow Science (Stengers 2018) and Slow Innovation (Steen 2021) movements. In this way, they could appeal to policy makers to reward careful engagement across disciplinary divides and socially responsive science instead of attending to the putative need for speed and efficiency. In doing so, they need to keep in mind that pace is one value that must be balanced against others, especially in crises like the COVID-19 pandemic when the speedy development of vaccinations became more important than upholding traditional standards of peer review (Bak-Coleman and Bergstrom 2022). My call for slowing down is thus a matter of selective deceleration, which involves efforts to find the "'appropriate' pace" (Woodhouse 2016, 267) in each context of research and innovation.

Second, calls for "open innovation" and "open science" under Horizon Europe (Robinson et al. 2020, 209) and in the revised framework of RI by Owen and Pansera (2019) should become equally relevant to STS and R(R)I scholars. I propose to adapt and apply FAIR principles (Findability, Accessibility, Interoperability, Reusability)[16] to our data management practices. To put the proposal into practice, I cooperated with a data steward for humanities and social science research to make the STIR data pertaining to chapter 6 not only FAIR but FAIRI. By adding the principle of 'interpretability' to the acronym, I acknowledge that qualitative social science data needs to be published together with extensive data documentation including detailed information about the community under study, the positionality of the researcher(s)

16 https://www.go-fair.org/fair-principles/

and the research practices to reveal how the research process and its wider context shaped the data. Making STIR data FAIRI enhances transparency and accountability so as to avoid hidden value advocacy (Kropp 2021, 124; Thoreau 2011). Whether an ethical issue was brought up for discussion by the embedded scholar or her interlocutors can easily be verified if recordings or transcripts of STIR dialogues are openly accessible. Moreover, such transcripts could be used for future research – for example, to integrate data across STIR studies or to re-analyse dialogues through alternative theoretical frameworks – and for teaching novices how to analyse midstream modulations. In that sense, data collection in reflexive spaces should follow FAIRI principles to ensure that what is happening in these spaces is transparent and will likely contribute to future reflexive work.

Third, after opening up reflexive spaces in interdisciplinary R(R)I collaborations, we need to think about how to keep these spaces open once the embedded scholar leaves a technoscientific space. To this end, several proposals for the institutionalisation of reflexive spaces have been put forward (e.g., Carroll and Mesman 2018; Pansera et al. 2020; Stahl et al. 2021). This dissertation contributes to this emerging body of literature by studying one such proposal empirically. Instead of assuming that the existence of a reflexive space depends on the presence of an embedded SSH scholar, chapter 6 explored the potential of STIR practitioner dialogues led by scientists to enable reflexive and deliberate modulations. Due to the positive results, I suggest that STIR practitioner dialogues could be a form of reflexive space that is more durable over time and scalable across institutions than collaborative sociotechnical integration approaches facilitated by SSH scholars. Integrating regular practitioner dialogues into organisational structures requires assigning roles and responsibilities to scientists for learning the STIR method, situating it in the particularities of a technoscientific environment and developing infrastructures that facilitate its regular use. External policy drivers, institutional incentives and peer dynamics rewarding such local leadership could catalyse the organisational integration of reflexive spaces (Pansera et al. 2020).

7.4.3 Mutual learning

To conclude the impact paragraph, I acknowledge that impact is bidirectional (if not multidirectional). Rather than adopting a linear model of impact according to which it travels solely from social science research to the community under study and wider society, I am also interested in feedback loops from the community under study to STS (Bieler et al. 2021b). Inspired by the focus on mutual learning in critical participation and critical collaboration, I ask what contemplative science and STS engagement research can learn from each other. This dissertation indicates that STS engagement methods can learn from contemplative scientists' practical competences in performing valuation work: appealing to the values embedded in contemplative science's history (chapter 2) and making contradictory epistemic goods compatible (chapter 3). In turn, contemplative scientists can enhance their capacities

to reflect on the socio-ethical dimensions of their work – developing a heightened awareness of alternative ethics practices (chapter 5) and possibilities to resolve value conflicts (chapter 6) – by learning from STS engagement methods like STIR. To describe the bidirectionality of impact in more detail, I first elaborate on impact flowing from contemplative science to STS and, second, from STS to contemplative science.

Examining how different values are enacted and made to coexist peacefully in contemplative science helps STS engagement researchers diversify their methods for inflecting valuation work. More specifically, this dissertation suggests that engagement researchers seeking to advance R(R)I could pay more attention to the role of history in valuation work. While several R(R)I scholars have emphasised the relevance of reconstructing historical developments for anticipatory governance and knowledge production (Nordmann 2014; Wilsdon 2014; Zimmer-Merkle and Fleischer 2017), I consider folk histories as a promising anchor point for engagement. Folk histories are wider social narratives through which people commonly contextualise present-day behaviour. They manifest, transmit and perpetuate the norms and values guiding a community. The folk histories of contemplative science revolving around Francisco Varela and John Kabat-Zinn enable scientists to combine charismatic authority with scientific legitimacy. To critique such historical valuation work in a generative manner, methodological approaches need to be developed. For example, historical narrative-building workshops could bring alternative histories – either imagined or reconstructed – up for discussion to provoke reflexivity about the values embedded in historical accounts.

Although the envisioned engagement method seeks to stimulate and enhance reflexivity, it does not rely on the premise that contemplative scientists lack cognitive-emotional reflexive capacities. Instead, it recognises that reflexivity is generally conceived as an important skill and virtue among contemplative scientists. At contemplative science events, an early lecture by Varela (1979) was frequently invoked to paint a portrait of the ideal-type contemplative scientist. This scientist is not a "technician" (p. 6) for whom science is a matter of puzzle solving, but a "scientist *tout court*" (p. 7) for whom science is a form of personally transformative contemplation. For the scientist *tout court* ethical deliberations are part and parcel of scientific thought and practice. He or she must engage with questions, such as: Why do I perform this experiment? Is the experiment worth killing animals? What is its wider societal purpose and relevance? Who might care in the future about what I study now? While the ideal-type contemplative scientist embodies reflexive questioning, the real-life contemplative scientist is often deprived of enabling conditions, like time and space, for reflexivity to flourish. STS engagement can establish enabling conditions for reflexivity by providing tools, curating contexts and generating social dynamics that help contemplative scientists enact values and cultivate virtues, which they consider as foundational to their identity.

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Samenvatting Nederlands

In de afgelopen jaren is het potentieel van contemplatieve praktijken zoals mindfulness-meditatie ter verlichting van moderne kwalen zoals stress, chronische condities en ouderdomsziektes bestudeerd op grond van neurowetenschappelijke, psychologische en klinische benaderingen. Onderzoekers die zulke studies verrichten, en die ook wel 'contemplatieve wetenschappers' worden genoemd, treden regelmatig in de media op, waardoor ze wetenschappelijke legitimiteit verlenen aan de voordelen van meditatie. Terwijl voorstanders van contemplatieve wetenschap dit soort onderzoek louter in een positief daglicht plaatsen, bijvoorbeeld als een bijdrage aan de oplossing van mondiale crises, wijzen tegenstanders op het ethisch dubieuze karakter ervan. Sommige sociale onderzoekers en boeddhistische beoefenaren zijn bang dat meditatie door de wetenschappelijke framing ervan wordt losgemaakt van haar intellectuele, affectieve en ethische wortels in het boeddhisme en dat het aldus bruikbaar wordt gemaakt voor omstreden, problematische of onethische doeleinden, bijvoorbeeld als concentratietraining in het leger of productiviteitsbooster in grote ondernemingen. In plaats van een abstract betoog te ontwikkelen over deze mogelijke normatieve effecten van contemplatieve wetenschap (al dan niet positief) en ze op de toekomst te projecteren, wordt in de dissertatie het ethische karakter van contemplatieve wetenschap verkend door bestudering van hoe waarden in de praktijk ontstaan. Deze verkenning wordt gestuurd door de volgende onderzoeksvragen: Hoe krijgen waarden in contemplatieve wetenschapspraktijken gestalte? Hoe valoriseert en rechtvaardigt de contemplatieve wetenschapsgemeenschap het eigen onderzoek als epistemologisch rijk en ethisch goedaardig? Hoe zijn kennis-genererende praktijken verbonden met wetenschappelijke normen van goed onderzoek over meditatie? Hoe kan collaboratief onderzoek kritiek

uitoefenen op contemplatieve wetenschap op een manier die leidt tot veranderingen in denken en handelen?

Voor de beantwoording van deze vragen wordt in deze dissertatie gebruik gemaakt van theorieën en methoden uit het vakgebied Science & Technology Studies (STS), en hiermee verwante discoursen over Responsible Innovation en Responsible Research and Innovation (R(R)I). Meer in het bijzonder gaat het hierbij om een combinatie van *multi-sited* etnografie en collaboratief onderzoek, gestuurd door aanpassingen van de Socio-Technical Integration Research (STIR) methode voor bestudering en bekritisering van waarderingspraktijken in contemplatieve wetenschap. Het belangrijkste resultaat is dat contemplatieve wetenschappers verschillende strategieën en repertoires mobiliseren om in de praktijk gestalte te geven aan bepaalde waarden – zij doen, anders gezegd, aan 'waarderingswerk' (*valuation work*). Dit concept geeft weer hoe wetenschappers ervoor zorgen dat in de praktijk ogenschijnlijk tegenstrijdige waarden, vormen van gezag en oriëntatiesystemen samengaan, naast elkaar bestaan of elkaar afwisselen. In het eerste deel van het proefschrift (hoofdstuk 2 en 3), dat is gebaseerd op etnografisch onderzoek in het laboratorium, bij wetenschappelijke bijeenkomsten en conferenties, wordt verhelderd dat onderhandelingen en praktische pogingen om waardenconflicten op te lossen onlosmakelijk verbonden zijn met wetenschappelijke socialiseringsprocessen en kennisproductie. In het tweede deel (hoofdstuk 5 en 6) wordt erop gewezen dat dergelijk waarderingswerk zichtbaar en modificeerbaar kan worden in interdisciplinaire samenwerking en dialoog tussen contemplatieve wetenschappers, gestuurd door het beslisprotocol van STIR. Hoofdstuk 4 verbindt deze twee delen door gebruik te maken van inzichten ontleend aan etnografisch onderzoek voor de toepassing van STIR in interdisciplinaire samenwerking van contemplatieve wetenschappers. In het eerste hoofdstuk van de dissertatie wordt de onderzoeksprocedure uitgebreid beschreven. Hieronder volgt een samenvatting van de inhoud van de overige hoofdstukken.

Het tweede hoofdstuk bestudeert contemplatieve wetenschap als een geval van (post-) moderne hertovering (*reenchantment*). STS-onderzoek heeft gewezen op het gelijktijdige bestaan van wetenschappelijke aspiraties gericht op het volledig verklaarbaar maken van de wereld naast tegengestelde krachten gericht op hertovering: gevoelens van ontzag en verwondering, zoektochten naar transcendentale betekenis en morele waarden en praktijken verwant met magische toverij. De gevalsstudie over contemplatieve wetenschap laat zien dat geschiedenis een belangrijke rol speelt in de hertovering van hersenonderzoek. Uitgaande van historische etnografie wordt in dit tweede hoofdstuk geanalyseerd hoe de contemplatieve wetenschapsgemeenschap het verleden als verhaal gestalte geeft tijdens conferenties, bij openbare herdenkingsbijeenkomsten en in gepubliceerde tekstuele verslagen, teneinde dit onderzoeksveld te valoriseren als een project van hertovering zonder de wetenschappelijke legitimiteit ervan te ontkrachten. Eerst wordt getoond dat de populaire geschiedenis van contemplatieve wetenschap betoverende eigenschappen aan het vakgebied toeschrijft door het combineren van

Weberiaanse ideaaltypes van charismatisch en rationeel gezag. Vervolgens worden alternatieve geschiedenissen van meditatie-onderzoek gereconstrueerd, en hun afwezigheid in het officiële verhaal wordt verklaard in relatie tot de charismatisch-rationele januskop van de contemplatieve wetenschap. Tot slot wordt aangetoond dat contemplatieve wetenschappers zich baseren op het verleden bij het mobiliseren van waarderingsregimes als onderdeel van het rechtvaardigen van hun werk in het licht van socio-ethische kritiek. De analyse draagt bij aan de academische literatuur over waarderings- en rechtvaardigingspraktijken door te laten zien dat geschiedenis als een repertoire ter verdediging van wetenschap tegen critici fungeert, en dient om nieuwe onderzoekers aan te trekken en een onderzoeksgemeenschap rond de fascinatie met betovering op te bouwen.

Het derde hoofdstuk onderzoekt de verstrengeling van praktijken van waarderingswerk en wetenschappelijk onderzoek in de Silver Santé studie, een lifestyle-interventie *randomised controlled trial* (RCT) over mindfulness en compassie-meditatie. Bestudering van meditatie in een RCT vormt een uitdaging, want een interventie die uitgaat van een mix van mensen, vaardigheden en activiteiten moet worden gestandaardiseerd. Dit hoofdstuk beschrijft hoe onderzoekers, door die uitdaging aan te gaan, met uiteenlopende kennis-genererende praktijken hierop hebben gereageerd. Er wordt verder teruggegrepen op praxeografie, een onderzoek naar praktijken verwant met etnografie, om normatieve dimensies van kennis-genererende praktijken te analyseren. Onderzoekers jongleerden met normen zoals interne validiteit, haalbaarheid, objectiviteit en geoefend oordeelsvermogen. Strategieën om spanningen tussen normen op te lossen waren: het onderzoeksprotocol herinterpreteren, formele regels volgen en informele zorg verlenen, en het protocol van studietaken aanpassen. Deze analyse is niet alleen relevant voor het begrijpen van hoe waarderingswerk in feitelijke praktijken van meditatie-onderzoek wordt uitgevoerd; de analyse problematiseert eveneens wat als bewijs geldt in *evidence-based medicine*. In plaats van kennisbeoordeling onder verwijzing naar een 'gouden standaard' wordt in dit hoofdstuk voorgesteld dat bewijsclaims geplaatst dienen te worden in de context van hun productie om ze in eigen termen te kunnen evalueren.

Als overgang van observatie naar collaboratief onderzoek biedt het vierde hoofdstuk een methodologisch verslag van de rol van kritiek in interdisciplinaire R(R)I-samenwerkingsverbanden, die streven naar de aansluiting van techno-wetenschappelijke arbeid bij bredere socio-ethische overwegingen. Terwijl de rol van kritiek in R(R)I-gemeenschappen tot dusverre relatief weinig specifiek is geweest, wordt in dit hoofdstuk 'generatieve kritiek' besproken als een praktijk tussen enerzijds 'leunstoelkritiek' en anderzijds 'gebrek aan kritische distantie'. Op grond van participerende observatie in de hierboven genoemde klinische studie over mindfulness en compassie-meditatie worden in dit hoofdstuk verschillende vormen van kritiek geïdentificeerd en wordt uitgelegd hoe zij van invloed waren op de interacties tussen onderzoekers van de Silver Santé studie en de externe adviesraad. Onderzoekers brachten leunstoelkritiek in verband

met een alternatieve opvatting van meditatie als relationele praktijk in plaats van individuele mentale training, wat bijdroeg aan een meer sociaal responsieve publieke representatie van de studie. Op grond van generatieve kritiek kunnen ogenschijnlijk stabiele objecten anders worden opgevat, vooral op momenten wanneer gevestigde manieren van kijken en kennen ter discussie staan. Om de formulering van generatieve kritiek in interdisciplinaire samenwerking te vergemakkelijken, werd een aangepaste versie van STIR ontwikkeld door methodologische beginselen van Video-Reflexieve Etnografie erin op te nemen.

Het vijfde hoofdstuk beschrijft hoe ik ben omgegaan met mijn eigen standpunt (*positionality*) als onderzoeker in de toepassing van deze aangepaste versie van STIR in de praktijk. Sociale onderzoekers beklemtonen dat het vermogen van interdisciplinaire samenwerking om de sociale vorming van techno-wetenschap te sturen vaak wordt ingeperkt door hun liminale positie. Zij worden doorgaans in de positie gedrongen van vijandige outsider, dan wel gecoöpteerde insider. Bij de poging met deze dynamiek om te gaan is mij gebleken dat aandacht voor affecten mogelijkheden kan openen voor productieve betrokkenheid voorbij disciplinaire grenzen. Het hoofdstuk analyseert ervaringen van vervreemding (*disconcertment*) in een STIR-studie verricht met het Silver Santé onderzoeksteam. Met het oog hierop wordt in dit hoofdstuk een heuristiek ontwikkelt die 'vervreemding', 'affectieve arbeid' en 'responsiviteit' met elkaar verweeft om de rol van het lichaam in interdisciplinaire samenwerking te analyseren. Die heuristiek draagt bij aan het naar voren brengen van hoe lichamen affectieve arbeid verrichten wanneer zij responsiviteit genereren tussen samenwerkende actoren op momenten van vervreemding. Responsieve lichamen kunnen fungeren als 'sensoren', 'bronnen' en 'processoren' van ervaringen van onderscheid. De analyse laat zien hoe aandacht voor affecten een stimulans bleek voor methodologische keuzes om het verschil tussen samenwerkende actoren te erkennen, vergroten of minimaliseren. Hoewel de effecten van zulke keuzes situatie-afhankelijk zijn, wist ieder onderzocht effect responsiviteit te ontlokken. Responsiviteit heeft de samenwerkende actoren ondersteund bij het realiseren van generatieve kritiek, die bijdroeg aan de herformulering van het technische in termen van het sociale. Deze analyse vormt een bijdrage aan STS onderzoek naar de rol van affect in successen en mislukkingen van collaboratieve socio-technische integratie.

Het zesde hoofdstuk beschrijft en analyseert online workshops met contemplatieve wetenschappers van verschillende instellingen en verruimt daardoor het toepassingsgebied van STIR. Het presenteert de resultaten van een samen met Erik Fisher verrichte studie over de verhouding tussen het vermogen tot socio-technische integratie in wetenschappelijk werk en activiteiten gericht op het behoud van hybride rolidentiteiten. In literatuur over de governance van wetenschap wordt reflexieve participatie in de sociale vorming van techno-wetenschap wel geframed als het vermogen van wetenschappers om binnen beperkende structuren meer agency uit te oefenen. Dit vermogen wordt verondersteld sterk aanwezig te zijn in wetenschappers met

hybride rolidentiteiten, zoals contemplatieve wetenschappers die het wetenschappelijke zelf vermengen met het contemplatieve zelf. Op basis van deze veronderstellingen zijn in het kader van de hier gepresenteerde studie contemplatieve wetenschappers uitgenodigd om te reflecteren op naderende besluiten in dialoog met hun collega's, gestuurd door het STIR-protocol. Verder hebben wetenschappers aan interviews over hun ervaring van de dialoog deelgenomen. De analyse wijst erop dat STIR-dialogen tussen wetenschappers een stimulans vormen voor reflectie op en verandering van praktijken in reactie op waarde-conflicten. Door het vaststellen van de voorwaarden die zulke veranderingen faciliteren, beklemtoont de analyse de vaak niet erkende relationele, interpersoonlijke praktijken in STIR-dialogen, die wetenschappers in de studie in staat stelden om structurele effecten op hun agency te weerstaan en ermee om te gaan. Contemplatieve wetenschappers hadden daarbij aandacht voor hun hybride rolidentiteiten, terwijl zij op reflexieve wijze deelnamen aan de sociale constructie van onderzoek.

In enkele concluderende opmerkingen zijn de resultaten van de empirische hoofdstukken samengebracht om te schetsen hoe inzichten van ieder hoofdstuk het concept van waarderingswerk verruimen en licht werpen op mogelijkheden voor de aanpassing ervan door collaboratief onderzoek. Na enige bespiegeling op methodologische beperkingen wordt de bredere relevantie van de uitkomsten besproken. Kort samengevat voegt deze dissertatie een empirisch perspectief op 'ethiek in actie' toe aan publieke en academische debatten over 'ethiek in theorie' in contemplatieve wetenschap. Dit gebeurt door de bestudering en bekritisering van de processen waarmee wetenschappers zich engageren met de socio-ethische aspecten van hun werk. Er wordt aangetoond dat contemplatieve wetenschap niet automatisch de normatieve effecten heeft die voor- en tegenstanders verwachten. Door bijvoorbeeld mindfulness-meditatie tot object van onderzoek te maken, verliest zij niet noodzakelijk haar ethische basis in het boeddhisme, net zomin als dergelijke meditatie automatisch leidt tot verbetering van de geestelijke gezondheid en het welzijn in de samenleving. Wel kunnen zowel boeddhistische als moderne framings van meditatie worden opgespoord, gedestabiliseerd en veranderd in wetenschappelijk werk door reflexieve praktijken die al zijn ingebed in contemplatieve wetenschap en praktijken die worden gestimuleerd door collaboratief onderzoek zoals STIR. Dit illustreert dat wetenschappers verantwoording nemen voor de manieren waarop hun onderzoek van invloed is op samenleving en cultuur – het soort impact dat gewoonlijk wordt verondersteld buiten het bereik van hun verantwoordelijkheid te vallen. De dissertatie is dan ook niet alleen relevant voor contemplatieve wetenschappers, maar ook voor andere techno-wetenschappelijke beoefenaars, beleidsmakers en sociale onderzoekers. Gezamenlijke inspanningen gericht op het openen van 'reflexieve ruimte' – waar conventionele benaderingen en overtuigingen beschikbaar worden gemaakt voor heroverweging en herziening – kunnen immers de sociale sturing van techno-wetenschap faciliteren.

Deutsche Zusammenfassung

Seit einigen Jahren wird das Potential kontemplativer Techniken (zum Beispiel Achtsamkeitsmeditation) moderne Leiden wie Stress, chronische Erkrankungen und Alterserscheinungen zu lindern mit neurowissenschaftlichen, psychologischen und klinischen Ansätzen erforscht. Mediationsforscher*innen finden große öffentliche Aufmerksamkeit, werden in die Medienwelt eingeladen und verleihen auf diese Weise den erhofften Vorteilen von Meditation wissenschaftliche Legitimität. Während Befürworter*innen der Meditationsforschung dieses Feld als wichtig und vielversprechend präsentieren, sogar ein Potenzial der Meditationsforschung herausstreichen globalen Krisen entgegenzuwirken, bringen Gegner*innen gesellschaftspolitische Bedenken und ethische Zweifel zum Ausdruck. Nicht nur Sozial- und Geisteswissenschaftler*innen, sondern auch buddhistische Meditationstechniken Praktizierende sehen es kritisch, wenn durch die neurowissenschaftliche Erforschung und Neudefinition von Meditation eine kontemplative Praxis von ihren intellektuellen, affektiven und ethischen Wurzeln im Buddhismus abgetrennt und zu gesellschaftlich umstrittenen, problematischen und unethischen Zwecke eingesetzt wird, zum Beispiel als vermeintlich einfach verfügbare Ressource zur Selbsthilfe, als Tool zur Steigerung der Arbeitsproduktivität, als propagierte Selbsttechnik im Firmengeschäft oder sogar zu militärischen Zwecken. Vor diesem Hintergrund richtet die vorliegende Dissertationsschrift ihren Blick auf die normativen Aspekte der Meditationsforschung selbst und geht der Frage nach, wie im konkreten Forschungshandeln mit ethischen Konflikten umgegangen wird. Anstatt normative und soziale Aspekte der Mediationsforschung abstrakt zu betrachten, untersucht die Dissertation, wie Werte im Forschungshandeln praktisch in Erscheinung treten, auf welche Weise und unter welchen Umständen auf Spannungen zwischen ethischen und epistemischen Werten

eingegangen wird und wie solche Aushandlungsprozesse konstruktiv gestaltet werden können. Diese Untersuchung wird von den folgenden Forschungsfragen geleitet: Welche epistemischen und ethischen Werte stehen in der Mediationsforschungspraxis zur Debatte und wie geraten sie in Konflikt? Wie legitimieren Wissenschaftler*innen ihre Forschungen als epistemisch gehaltvoll und als ethisch gerechtfertigt? Wie genau hängen Forschungspraktiken mit den epistemischen Normen guter Meditationsforschung zusammen? Welche Möglichkeiten gibt es für Sozialwissenschaftler*innen Mediationsforschung nicht nur zu beobachten und von außen zu kritisieren, sondern an ihr auf eine Weise teilzunehmen, dass sich Denken und Handeln in der Forschung verändern?

Um diese Fragen zu beantworten, bediene ich mich theoretischer und methodischer Ansätze aus den Science & Technology Studies (STS) sowie der zugehörigen Diskurse zu Responsible Innovation beziehungsweise Responsible Research and Innovation (R(R)I). Methodisch verbinde ich eine multi-lokale Ethnographie mit teilnehmender und interaktiver sozio-technischer Integrationsforschung (STIR). Der Hauptbefund der Dissertation ist, dass Wissenschaftler*innen in der Meditationsforschung auf verschiedene Strategien und Repertoire zurückgreifen, um in normativen Konfliktlagen zu vermitteln, wenn unterschiedliche Werte praktisch in Erscheinung treten. Auf diese Weise verrichten sie, was ich hier ‚Wertungsarbeit' nenne. Das Konzept der Wertungsarbeit erfasst, wie Wissenschaftler*innen scheinbar unvereinbare Werte, Formen von Autorität und kulturspezifische Orientierungssysteme verbinden, abwechseln oder koexistieren lassen.

Im ersten Teil der Dissertation (Kapitel 2 und 3) untersuche ich anhand von ethnographischen Beobachtungen im Labor, bei wissenschaftlichen Treffen und Konferenzen, wie die Lösung von Wertekonflikten eng mit der Wissensproduktion einerseits und den Sozialisierungsprozessen der Beteiligten andererseits verbunden ist. Der zweite Teil (Kapitel 5 und 6) wechselt von der ethnographischen Beobachtung zur interaktiven Forschung und zeigt, wie die Wertungsarbeit mittels der STIR-Methode sichtbar und veränderbar gemacht werden kann. Kapitel 4 verbindet beide Teile, indem es die Einsichten der ethnographischen Forschung zur methodischen Adaption von STIR auf die Meditationsforschung verwendet. Dieser Untersuchungsgang wird im ersten Kapitel im Detail dargelegt. Im Folgenden werden die Inhalte der nachfolgenden Kapitel der Dissertation genauer dargestellt.

Das zweite Kapitel behandelt das Feld der Meditationsforschung als Beispielfall für eine (post-)moderne Wiederverzauberung. Entgegen Max Webers klassischem Topos von der Entzauberung der Welt durch Wissenschaft und Technik deuten Befunde der STS Forschung darauf hin, dass das wissenschaftliches Streben die Welt vollständig zu erklären mit Prozessen ihrer Wiederverzauberung einhergeht, weil oftmals gerade naturwissenschaftliche Forschungseinsichten Gefühle des Staunens und der Verwunderung auslösen und sogar

mit der Suche nach transzendentalen Bedeutungen, moralischen Werten und rituellen Tätigkeiten verbunden sein können. Dabei kommt der Geschichte der Meditationsforschung eine zentrale Rolle zu, wie dieses Kapitel anhand einer Ethnographie zeigt, die verfolgt, wie Wissenschaftler*innen bei Konferenzen, Gedenkfeiern und in veröffentlichten Berichten die Geschichte dieser Forschungen nacherzählen und performativ einsetzen, um ihr Forschungsfeld als ein Projekt der Wiederverzauberung aufzuwerten, ohne dabei wissenschaftliche Legitimität einbüßen zu müssen. Solche Nacherzählungen der Geschichte der Meditationsforschung verleihen ihr regelrecht wundersame Qualitäten, da sie Max Webers Idealtypen charismatischer und rationaler Autorität miteinander vereinen. Sie stehen aber in Widerspruch zu historiographisch nachvollziehbaren Entstehungsgeschichten. Hier argumentiert das Kapitel, dass deren Abwesenheit vom anerkannten Narrativ sich mit dem Hinweis auf den charismatisch-rationalen Januskopf der Meditationsforschung erklären lässt, zumal deren Akteure Geschichte sichtbar strategisch einsetzen, wenn sie Wertungsordnungen mobilisieren, um ihre Arbeit vor sozio-ethischen Kritiker*innen zu rechtfertigen. Damit leistet dieses Kapitel einen Beitrag zur Erforschung von Wertungs- und Rechtfertigungspraktiken und zeigt, wie der performative Gebrauch von Geschichte dazu dient, Wissenschaft gegen Kritik zu verteidigen, Nachwuchsforscher*innen zu rekrutieren und den Zusammenhalt einer Forschungsgemeinschaft durch Wiederverzauberung zu stärken.

Das dritte Kapitel untersucht das Ineinandergreifen von Wertungspraktiken und wissenschaftlicher Forschung in der Silver Santé Studie, einer randomisierten kontrollierten Studie (RCT) mit einer Verhaltensintervention zu Achtsamkeits- und Mitgefühlsmeditation. Meditation in einem RCT zu erforschen erfordert sie als Intervention zu standardisieren, obwohl Meditation häufig von personellen Eigenarten, individuellen Fähigkeiten und sozialen Aktivitäten abhängt. Das Kapitel beschreibt deshalb zunächst, wie Forscher*innen dieser Herausforderung mit unterschiedlichen Forschungspraktiken begegneten. Zu diesem Zweck stützt sich das Kapitel auf ethnographische Praxeographie, mit der die normativen Dimensionen von Forschungspraktiken analysieret werden: Die Komplexität von Forschungsprojekten wie der Silver Santé Studie führt dazu, dass Forscher*innen mit scheinbar eindeutigen und unbezweifelbaren epistemischen Normen wie Validität, Wirksamkeit und Objektivität jonglieren, das heißt ihr geschultes Urteilsvermögen einsetzen müssen, um die Durchführbarkeit der Studie nicht zu gefährden. Um die Spannungen zwischen verschiedenen epistemischen Normen aufzulösen setzten sie dabei auf folgende Strategien: das Forschungsprotokoll umdeuten, informelle Fürsorge mit formeller Regeltreue paaren, das Forschungsprotokoll anpassen. Diese Dissertation gilt der Erforschung der Ermöglichungsbedingungen ethisch verantwortlicher Studien in der Meditationsforschung, aber diese Ergebnisse sind auch relevant, um zu problematisieren, was in evidenzbasierter Medizin als Evidenz gilt. Denn sie zeigen, dass Evidenzbehauptungen nicht mithilfe allgemeingültiger Standards, sondern im Kontext der konkret situierten Bedingungen der Wissensproduktion evaluiert werden können.

Das vierte Kapitel verlagert das methodische Vorgehen von partizipativer Beobachtung auf integrativ teilnehmende Forschung. Dazu werden Verfahren der Kritik als Methoden der interdisziplinären R(R)I Kollaboration verwendet, um die technisch-wissenschaftliche Arbeit mit sozio-ethischen Abwägungen abzugleichen. Während Kritik in R(R)I Diskursen bisher relativ unspezifisch behandelt und verwendet wurde, unterscheidet dieses Kapitel verschiedene Formen von Kritik und führt ‚generative Kritik' als eine Praxis in der Mitte zwischen feindlich kritischer Ablehnung und kritikloser Nähe ein. Basierend auf partizipativer Beobachtung in der Silver Santé Studie beleuchtet die Analyse, wie verschiedene Modi der Kritik die Interaktionen zwischen Forscher*innen auf der einen Seite und dem externen Studienbeirat auf der anderen beeinflussten. Tatsächlich sorgten die Forscher*innen selbst dafür, dass die ‚Lehnstuhlkritik' des Beirats ‚generativ' wurde, indem sie ein anderes Verständnis von Meditation hervorbrachte, die schlussendlich zu einer verantwortlicheren Darstellung von Meditation in der öffentlichen Wissenschaftskommunikation der Silver Santé Studie führte. Aus diesem Beispiel lässt sich folgern, dass generative Kritik für selbstverständlich gehaltene Sichtweisen und Herangehensweisen auflockern und dadurch scheinbar stabile Objekte als veränderbar offenbaren kann. Um solche Formen produktiver generativer Kritik in interdisziplinären Kollaborationen zu begünstigen, wird schließlich eine Adaption von STIR vorgeschlagen, welche Grundprinzipien der video-reflexiven Ethnographie in die Methode einfügt.

Das fünfte Kapitel beschreibt, wie sich durch Anwendung dieser adaptierten Form von STIR meine Position als Forscherin im Verhältnis zu meinen Kollaborationspartner*innen dynamisch veränderte. Teilnehmende Forschung mittels der STIR-Methode zielt darauf ab, die soziale Formgebung von Technikwissenschaften zu beeinflussen. Eine oft geäußerte Klage ist dabei, dass die Position der teilnehmenden Sozialwissenschaftler*innen in interdisziplinären Kollaborationen zu marginal sei, weil sie entweder als feindselige Außenseiter*innen oder als kooptierte Mitglieder positioniert würden. Bei Versuchen diese Dynamik zu lenken stellten sich für mich jedoch verschiedene Interventionsmöglichkeiten heraus. Vor allem affektive Erfahrungen können Möglichkeiten eröffnen, produktiv über disziplinäre Grenzen hinweg zusammenzuarbeiten. Das Kapitel analysiert Verfremdungserfahrungen als eine Ressource für Kollaboration in einer STIR-Studie mit der Silver Santé Forschungsgruppe. Zu diesem Zweck wird eine Heuristik entwickelt, die Verfremdung und affektive Arbeit miteinander verknüpft, indem sie die Responsivität des Körpers in interdisziplinärer Kollaboration ins Zentrum der Analyse und der davon abgeleiteten Intervention stellt. Körper verrichten affektive Arbeit in Momenten der Verfremdung und können deshalb als Sensoren, Quellen und Prozessoren von Verfremdungserfahrungen der Differenz dienen. Meine Analyse zeigt auf, wie insbesondere solche Verfremdungserfahrungen die methodologischen Entscheidungen bei der Studiendurchführung so beeinflussten, dass die Differenzen zwischen Kollaborationspartner*innen verstärkt, verringert oder anerkannt wurden. Die methodologischen Entscheidungen im Rahmen der STIR-Methode lösten Responsivität aus und setzten generative Kritik in der Kollaboration

frei, die dabei half, technische Verfahren neu auf soziale Erwägungen zu justieren. Damit leistet dieses Kapitel einen Beitrag zur STS Forschung zur Rolle von Affekten in den Erfolgen und Fehlschlägen von kollaborativer sozio-technischer Integration.

Das sechste Kapitel beschreibt und analysiert eine online-Intervention im Rahmen der STIR-Methode und erweitert so deren Anwendungsbereich. Diese gemeinsam mit Erik Fisher durchgeführte Studie erforscht die Potenziale für sozio-technische Integration aufgrund hybrider Rollenidentitäten. In der Literatur zu R(R)I wird die Fähigkeit zur reflexiven Teilnahme an der sozialen Lenkung von Technikwissenschaften als besondere Fertigkeit von Wissenschaftler*innen definiert. Diese Fertigkeit soll besonders bei Forscher*innen mit hybriden Rollenidentitäten ausgeprägt sein, wie zum Beispiel bei Meditationsforscher*innen, die eine wissenschaftliche mit einer kontemplativen Rolle in sich vereinen. Für die hier vorgestellte Studie wurden deshalb Meditationsforscher*innen rekrutiert, um eine bevorstehende forschungsbezogene Entscheidung im Rahmen eines STIR-Dialogs mit einem Kollegen oder einer Kollegin aus einer anderen Institution zu besprechen. Außerdem wurden Interviews mit Studienteilnehmer*innen geführt, um heraus zu finden, wie sie die STIR-Dialoge empfanden. Auf diese Weise stellten die STIR-Dialoge eine Intervention der mittleren Forschungsphase zwischen Konzeption und Ergebnissen dar, die für eine ethisch nachhaltige Beeinflussung von Forschung im R(R)I-Konzept für besonders entscheidend gehalten wird. Die Analyse meiner Beobachtung der Modulationen in der Zwischenphase („*midstream*“) deutet darauf hin, dass STIR-Dialoge unter Wissenschaftler*innen tatsächlich Reflexionen zu Wertekonflikten anleiten und eine daraus resultierende Veränderung der Forschungspraxis unterstützen können. Als besondere Hebel solcher Wertungsarbeit konnten Bedingungen in STIR-Dialoge identifiziert werden, die Wissenschaftler*innen befähigten strukturellen Einschränkungen ihres Handlungsspielraums zu widerstehen oder mit ihnen besser zurechtzukommen. Insbesondere dadurch, dass Wissenschaftler*innen hybride Rollenidentitäten pflegten, unterstützten sie gleichzeitig die soziale Lenkung von Forschung.

Im abschließenden Kapitel der Dissertation werden die Resultate der empirischen Kapitel zu einer theoretischen Synthese zusammengeführt. Es wird herausgearbeitet, wie die Resultate das Konzept der Wertungsarbeit erweitern und Möglichkeiten aufzeigen, Wertungsarbeit produktiv im Sinne von R(R)I einzusetzen. Die Dissertation ergänzt und erweitert die theoretische Debatte zu ethischen Fragestellungen in der Meditationsforschung mit einem empirisch gesättigten Blick auf ‚Ethik in Aktion‘. Die Dissertation kann dabei zeigen, dass Meditationsforschung keinesfalls automatisch jene normativen Effekte hat, welche die Befürworter*innen und Gegner*innen erwarten. Wenn Meditation zum Forschungsobjekt in neurowissenschaftlichen Studien wird, verliert sie nicht zwangsläufig ihre ethischen Wurzeln im Buddhismus, aber eben so wenig ist garantiert, dass Meditationsforschung automatisch zu mehr Aufmerksamkeit oder gar Friedfertigkeit führen wird. Vielmehr können sowohl buddhistische

als auch moderne Vorstellungen von Meditation in neurowissenschaftlicher Forschung wie in der Silver Santé Studie verfolgt werden. Aber unabhängig davon besteht die Möglichkeit, solche vorab fixierten Konzeptionen im Laufe der Forschungspraxis zu dynamisieren und zu modifizieren – entweder durch reflexive Überlegungen, Diskussionen und Praktiken, die bereits in der Meditationsforschung vorkommen, oder durch solche, die von interaktiv forschenden Sozial- oder Geisteswissenschaftler*innen angeregt werden. Dieser Befund weist darauf hin, dass Wissenschaftler*innen Verantwortung dafür übernehmen, wie ihre Forschung Gesellschaft und Kultur beeinflusst, obwohl sie üblicherweise nicht davon ausgehen, dass diese Auswirkungen ihrer Arbeit in ihren Verantwortungsbereich fallen. Damit wird die Dissertation nicht nur relevant für Meditationsforschung, sondern auch für Forscher*innen anderer Disziplinen sowie für technisch-wissenschaftliche Fachkräfte, Politiker*innen und interagierende Sozialforscher*innen. Diese Gruppen sollten sich gemeinsam dafür einsetzen ‚reflexive Räume' zu etablieren, wo konventionelle Ansätze und Überzeugungen neubewertet und überarbeitet werden können, um die sozio-politische Lenkung von Technikwissenschaften zu erleichtern und zu stärken.

Résumé français

Au cours des dernières années, des neuroscientifiques, psychologues et chercheur·euse·s clinicien·ne·s ont étudié le potentiel des pratiques contemplatives, comme la méditation de pleine conscience, pour soulager les maux modernes tels que le stress, les maladies chroniques et les signes de la vieillesse. Ces chercheur·euse·s ont été mis·e·s en avant dans les médias afin d'apporter une légitimité scientifique aux bienfaits de la méditation. Alors que les partisan·e·s de la recherche sur la méditation présentent ce type de recherche comme étant incontestablement bienveillante et capable d'apporter des solutions aux crises mondiales, ses opposant·e·s la trouvent douteuse sur le plan éthique. Certains chercheur·euse·s en sciences sociales et praticien·ne·s bouddhistes s'inquiètent du fait qu'un encadrement scientifique de la méditation la dépouille de ses racines éthiques, affectives et intellectuelles ancrées dans le bouddhisme la rendant susceptible d'être utilisée à des fins non éthiques, par exemple pour enseigner des techniques de concentration mentale à des fins militaires, ou pour stimuler la productivité dans les entreprises. Au lieu de raisonner de manière abstraite sur les effets normatifs de la recherche sur la méditation (en bien ou en mal) et de les projeter dans le futur, cette thèse explore l'éthique de la recherche sur la méditation en étudiant comment les valeurs émergent dans la pratique. Cette étude est guidée par les questions suivantes : Comment les valeurs sont-elles adoptées dans les pratiques de la recherche sur la méditation ? Comment la communauté de la recherche sur la méditation valorise-t-elle et justifie-t-elle sa recherche comme étant épistémologiquement riche et éthiquement bienveillante ? Comment les pratiques de production de savoir sont-elles liées aux normes scientifiques de la recherche sur la méditation ? Comment la recherche collaborative peut-elle critiquer ces pratiques d'une manière qui soit génératrice de changements dans la pensée et l'action ?

En répondant à ces questions, cette thèse s'appuie sur les ressources théoriques et méthodologiques du domaine *Science & Technology Studies* (STS) ainsi que sur les discours interdépendants sur *Responsible Innovation* et *Responsible Research and Innovation* (R(R)I). Elle combine l'ethnographie multi-site et la recherche collaborative guidée par des adaptations de la méthode STIR (de l'anglais *Socio-Technical Integration Research*, recherche sur l'intégration socio-technique) pour étudier et critiquer les pratiques d'attribution de valeur dans la recherche sur la méditation. La principale conclusion de cette thèse est que les scientifiques de la méditation mettent en place différentes stratégies et répertoires pour mettre des valeurs en pratique – il·elle·s effectuent ce qui est qualifié ici de « *valuation work* ». Le concept saisit la manière dont les scientifiques font fusionner, coexister ou alterner des valeurs, des formes d'autorité et des systèmes d'orientation apparemment incompatibles. Dans la première partie de cette thèse (chapitres 2 et 3), des recherches ethnographiques menées en laboratoire, lors de réunions et de conférences scientifiques, mettent en évidence que les délibérations et les tentatives pratiques de résolution des conflits de valeurs (c'est-à-dire *valuation work*) sont inextricablement liées aux processus de socialisation scientifique et à la production de savoir. La deuxième partie (chapitres 5 et 6) montre que ce *valuation work* peut devenir apparent et modifiable dans le cadre d'une collaboration interdisciplinaire et de dialogues entre scientifiques guidés par le protocole de décision STIR. Ces deux parties sont reliées dans le chapitre 4, dans lequel les enseignements de la recherche ethnographique sont utilisés pour proposer une adaptation de la méthode STIR au cas de la collaboration interdisciplinaire avec des chercheur·euse·s sur la méditation. La procédure de recherche est décrite en profondeur dans le premier chapitre de la thèse. Dans les paragraphes suivants, le contenu des autres chapitres est résumé de manière plus détaillée.

Le deuxième chapitre étudie la recherche sur la méditation comme un cas d'enchantement (post-)moderne. La recherche STS a montré que les aspirations scientifiques à rendre le monde totalement explicable coexistent avec des tendances contraires aspirant au ré-enchantement : des sentiments de crainte et d'émerveillement, une recherche de sens transcendantal et de valeurs morales, et des pratiques proches de la sorcellerie magique. L'étude de cas sur la recherche sur la méditation révèle que l'histoire joue un rôle important dans le ré-enchantement de la recherche sur le cerveau. En s'appuyant sur l'ethnographie historique, le chapitre analyse la façon dont la communauté de la recherche sur la méditation raconte et met en scène sa propre histoire lors de conférences, d'événements commémoratifs et dans les comptes rendus écrits publiés pour valoriser ce domaine de recherche en tant que projet de ré-enchantement sans déstabiliser sa légitimité scientifique. Premièrement, je montre que l'histoire des recherches sur la méditation telle qu'elle est racontée par les chercheur·euse·s eux·elles-mêmes confère au domaine des qualités enchanteresses en combinant les types idéaux wébériens d'autorité charismatique et rationnelle. Deuxièmement, les histoires alternatives de la recherche sur la méditation sont reconstruites et leur absence du récit officiel est expliquée en relation avec le visage de Janus, à

la fois charismatique et rationnel, de la recherche sur la méditation. Troisièmement, on constate que les chercheur·euse·s sur la méditation ont recours à l'histoire pour justifier leur travail compte tenu des critiques socio-éthiques. L'analyse contribue à la sociologie pragmatique concernant la valorisation et la justification en révélant que l'histoire fonctionne comme un répertoire pour défendre la science contre les critiques, attirer les chercheur·euse·s novices et former une communauté de recherche autour de l'attrait de l'enchantement.

Le troisième chapitre examine les dimensions normatives de la recherche scientifique dans le projet Silver Santé Study, un essai contrôlé randomisé (ECR) d'intervention sur le mode de vie consacré à la méditation de pleine conscience et de compassion. L'étude de la méditation dans le cadre d'un ECR présente la difficulté de standardiser une intervention qui repose sur un ensemble distinct de personnes, de compétences et d'activités. Ce chapitre décrit comment, pour relever ce défi, les chercheur·euse·s ont adopté diverses pratiques de production de savoir. Pour ce faire, le chapitre fait appel à la praxéogaphie, une enquête sur les pratiques qui s'apparente à l'ethnographie. Le concept de « biens épistémiques » (*epistemic goods*) est présenté pour analyser les dimensions normatives des pratiques de production de savoir. Les chercheur·euse·s ont jonglé entre des biens épistémiques partiellement incohérents – validité interne, faisabilité, évaluation de l'efficacité, prise en compte des effets qualitatifs, objectivité, jugement spécialisé – et ont résolu les tensions qui existaient entre eux. Les stratégies pour résoudre les tensions ont été les suivantes : réinterprétation du protocole d'étude, prise en charge informelle tout en respectant les règles formelles, adaptation du protocole d'étude. L'analyse est pertinente pour comprendre comment des valeurs se mettent en pratique dans la recherche sur la méditation et pour problématiser ce qui compte comme preuve dans la médecine fondée sur les faits. Au lieu d'évaluer les connaissances en se référant à un « étalon-or », ce chapitre suggère que les preuves scientifiques doivent être placées dans le contexte de leur production afin de les examiner selon leurs propres critères.

Pour aller de l'observation participative à la recherche collaborative, le quatrième chapitre offre un compte rendu méthodologique du rôle de la critique dans les collaborations interdisciplinaires de R(R)I qui cherchent à aligner le travail technoscientifique avec des considérations socio-éthiques. Alors que la critique est restée jusqu'à présent relativement peu spécifiée dans les communautés de R(R)I, ce chapitre présente la « critique générative » comme une pratique intermédiaire entre la « critique à distance » et « le manque de distance critique ». En s'appuyant sur l'observation participative à l'essai clinique susmentionné, l'analyse identifie différents modes de critique et met en lumière la façon dont ils ont façonné les interactions entre les chercheur·euse·s de chez Silver Santé Study et de son Conseil Consultatif Externe. Les chercheur·euse·s ont fait en sorte que la critique à distance permette une compréhension alternative de la méditation en tant que pratique relationnelle plutôt qu'un entraînement cérébral privé, ce qui a contribué à une représentation publique de l'étude plus réceptive sur le

plan social. La critique générative peut remodeler des objets apparemment stables lorsque des modes de perception et de connaissance considérés comme allant de soi sont ébranlés. Pour faciliter l'émergence de la critique générative dans le cadre d'une collaboration interdisciplinaire, une version modifiée de la méthode STIR est développée grâce à l'intégration des principes méthodologiques de l'ethnographie vidéo-réflexive.

Le cinquième chapitre décrit comment ma position par rapport à l'équipe du projet Silver Santé Study a changé flexiblement en mettant en œuvre cette version modifiée de STIR. La littérature sur la recherche collaborative souligne que le potentiel de la collaboration interdisciplinaire qui cherche à influer sur le façonnement social de la technoscience est souvent limité par la position liminale des chercheur·euse·s en sciences sociales. Il·elle·s ont tendance à être positionné·e·s soit comme des *outsiders* adversaires, soit comme des *insiders* cooptés. Pour tenter d'infléchir cette dynamique, j'ai découvert que le fait de s'intéresser aux expériences affectives peut offrir la possibilité de nouer des engagements productifs au-delà des clivages disciplinaires. Le déconcertement (*disconcertment*) est analysé comme une ressource de collaboration par une étude STIR menée avec l'équipe de recherche de chez Silver Santé Study. À cette fin, le chapitre développe une heuristique qui associe le déconcertement, le travail affectif et la responsivité pour analyser le rôle du corps dans la collaboration interdisciplinaire. L'heuristique permet de mettre en évidence la manière dont les corps effectuent un travail affectif lorsqu'ils génèrent de la responsivité entre les collaborateur·rice·s dans les moments de déconcertement. Les corps responsifs peuvent jouer le rôle de « capteurs », de « sources » et de « transformateurs » d'expériences déconcertantes en matière de différence. L'analyse montre comment les moments de déconcertement ont stimulé les choix méthodologiques pour reconnaître, amplifier ou minimiser la différence entre les collaborateur·rice·s. Bien que les effets de ces choix soient situationnels, chacun de ceux examinés ici a suscité la responsivité. Cette dernière a aidé les collaborateur·rice·s à mettre en œuvre une critique générative qui a permis d'intégrer les aspects sociaux à la technoscience. Cette analyse contribue à la recherche STS sur le rôle de l'affect dans les réussites et les échecs de l'intégration sociotechnique collaborative.

Le sixième chapitre analyse une intervention en ligne guidée par la méthode STIR qui en élargit la portée. Il présente les résultats d'une étude menée avec Erik Fisher sur la relation entre les capacités d'intégration sociotechnique dans le travail scientifique et les activités de préservation des identités de rôles hybrides. Dans la littérature consacrée à la gouvernance de la science, la participation réflexive au pilotage social de la technoscience a été présentée comme une capacité des scientifiques à exercer une plus grande action au sein de structures contraignantes. Cette capacité est censée être accentuée chez les scientifiques ayant des identités de rôle hybrides, comme les chercheur·euse·s sur la méditation qui fusionnent les identités scientifique et méditative. A partir de ces suppositions, dans la présente étude j'ai invité des chercheur·euse·s sur la méditation à réfléchir à des décisions imminentes au cours de dialogues

avec des collègues d'une autre institution guidés par le protocole STIR. J'ai ensuite interviewé ces mêmes chercheur·euse·s à propos de leur expérience de ce dialogue. L'analyse suggère que ces dialogues peuvent aider les scientifiques à réfléchir et à changer leurs pratiques en réponse aux conflits de valeurs. En identifiant les conditions qui facilitent de tels changements, l'analyse souligne les pratiques relationnelles et interpersonnelles dans les dialogues guidés par le protocole STIR qui ont permis aux scientifiques de résister et de faire face aux contraintes structurelles. Ainsi, les chercheur·euse·s sur la méditation ont pris soin de leurs identités de rôles hybrides tout en participant de manière réfléchie à la construction sociale de la recherche.

Dans les conclusions, les résultats des chapitres empiriques sont regroupés en démontrant comment les idées de chaque chapitre étendent le concept de *valuation work*. Après une réflexion sur les limites méthodologiques, la pertinence plus large des résultats est discutée. En bref, grâce à l'étude et à la critique des processus par lesquels les scientifiques s'engagent dans les aspects socio-éthiques de leur travail, cette thèse ajoute une perspective empirique sur « l'éthique en action » aux débats publics et universitaires sur « l'éthique en théorie » dans la recherche sur la méditation. Elle révèle que la recherche sur la méditation n'a pas automatiquement les effets normatifs que ses partisan·e·s et ses opposant·e·s anticipent. Par exemple, en faisant de la méditation de pleine conscience un sujet de recherche, elle ne perd pas nécessairement ses racines éthiques bouddhistes ; elle n'améliore pas non plus la santé mentale et le bien-être dans la société de manière automatique. Au contraire, les conceptions scientifiques et bouddhistes de la méditation peuvent être tracées, déstabilisées et modifiées dans le travail scientifique à travers des pratiques réflexives qui sont déjà incorporées dans la recherche sur la méditation et celles qui sont stimulées par la recherche collaborative comme STIR. Cette trouvaille montre que les scientifiques peuvent assumer la responsabilité de la manière dont leurs recherches influencent la société et la culture – le type d'impact qui est généralement considéré comme ne relevant pas de leurs responsabilités. Par conséquent, cette thèse n'est pas seulement pertinente pour les chercheur·euse·s sur la médiation. Elle l'est aussi pour d'autres praticien·ne·s technoscientifiques, les décideur·euse·s politiques et les chercheur·euse·s en sciences sociales car elle suggère que des efforts conjoints pour créer des « espaces réflexifs », où les approches et les convictions conventionnelles peuvent être réexaminées et révisées, sont susceptibles de faciliter le pilotage social de la technoscience.

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Writing a dissertation in the humanities and social sciences is sometimes depicted as a lonesome journey. Unlike our colleagues in the natural sciences who are often embedded in laboratory research groups and contribute to larger projects, social scholars tend to work on individually conceived projects. Indeed, I sometimes felt lonely, especially in the last two years of my PhD trajectory, when I spent hours and hours in my room to read, write and contemplate. Although I am convinced that these hours were necessary to advance my thinking – by developing an argument, analysis and interpretation only to find the snag(s) and do it all over again – I was looking forward to the time when the (self-)imposed isolation would end. Therefore, it fills me with even more joy to write my "acknowledgements" and to remember all the generous people who made this dissertation possible by offering their support, insights, advice, care, friendship and love.

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laughing with someone you love
is diving into the ocean after rolling in mud, is drinking ice tea in the desert,
is meeting your guru,
is timeless
laughing with someone you love,
is a hair's breadth from enlightenment.
(Excerpt from "Laughing Buddha" by Ruben Laukkonen)

About the author

After receiving her German high school diploma (*Abitur*) at Gymnasium Ulricianum Aurich and completing a one-year language course in Standard Chinese at Chengdu University in China, Mareike Smolka (born in Leer, Germany, 1992) studied sociology, philosophy, and sustainability sciences in the Liberal Arts & Sciences programme at University College Maastricht (UCM) in the Netherlands (2012–2015). Her undergraduate programme included a semester abroad in Santiago de Chile where she studied philosophy and fine arts at Pontificia Universidad Católica de Chile. Afterwards, Mareike completed a research internship at the Leibniz Centre for Literary and Cultural Research in Berlin and obtained a Master of Science degree in Cultures of Arts, Science & Technology Research at the Faculty of Arts & Social Sciences (FASoS) at Maastricht University (2015–2017). Her studies were supported by a scholarship from the German Academic Scholarship Foundation (*Studienstiftung des Deutschen Volkes*).

Mareike began with the preparations for her PhD research in 2017 during a Post Research Master Fellowship at FASoS. In 2018, she received two scholarships for her PhD project, one from the Centre for Cultural Research Lübeck in Germany and the other from the German Academic Scholarship Foundation. Scholarships enabled Mareike, among others, to conduct ethnographic fieldwork for two semesters at the Biomedical Research Institute Cyceron in France and to complete a one-month research stay at the Interacting Minds Centre at Aarhus University in Denmark. Her research was further supported by the Francisco J. Varela Research Award from the European Mind & Life Institute and by Fulbright Germany. She completed

her PhD project during a four-month Fulbright research stay at the School for the Future of Innovation in Society at Arizona State University in the United States in 2022.

During her PhD research, Mareike was affiliated to the Institute for the History of Medicine and Science Studies of the University Lübeck and enrolled in the Graduate School of the Centre for Cultural Research Lübeck. She also became a member of the European Association for the Study of Science and Technology (EASST), the Society for the Social Studies of Science (4S), the German Association for Science & Technology Studies (stsing), and the Ethics & Politics of Emerging Technology (EPET) research network.

In addition, Mareike worked as a junior teaching fellow at UCM. She taught and coordinated a course trajectory in quantitative and qualitative research methods and tutored a course in philosophy of science at the Maastricht Science College. She further worked as a qualitative methods tutor in the Global Health Master programme at the Faculty of Health, Medicine, and Life Sciences at Maastricht University and as an adjunct teaching fellow in the Science, Technology & Society programme at CODE University Berlin. After gaining ample teaching experience, Mareike obtained the University Teaching Qualification in 2020. Besides, she has acquired editorial skills while serving as an editorial assistant for the *Journal of Responsible Innovation*.

In August 2022, Mareike started her postdoctoral research at the Human Technology Centre at RWTH Aachen in Germany, where she coordinates the activity field that focuses on collaborative research. She also partakes in the society module of the NeuroSys project in which she collaborates with scientists, engineers, industrial actors, and other stakeholders to both study and contribute to the reflexive governance of the emerging innovation ecosystem around the development and production of neuromorphic computing hardware for Artificial Intelligence applications. The project allows her to further pursue her research interests in interdisciplinary collaboration and R(R)I.