

# Affective Labor in Integrative STS Research

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## Abstract

Science and technology studies (STS) practitioners regularly use qualitative research methods to describe the structures and practices of science. Despite a long history of collaborative inter- and transdisciplinary research in the field, key aspects of this type of research remain underexplored. For example, much of the literature on positionality has focused on the vulnerable position of participants and there is considerably less work on how investigators can be vulnerable. We examine how investigators in collaborative sociotechnical integration (CSTI) are vulnerable by presenting two examples of CSTI research that require researcher vulnerability. This vulnerability has an emotional dimension, which also necessitates affective labor. We integrate recommendations from feminist-scholarship to minimize the affective cost to investigators and explore how they might apply to qualitative research more broadly.

## Keywords

integrative research, collaborative sociotechnical integration, affective labor, STS

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## **Introduction**

Throughout the twentieth-century social science evolved to engage technological advancement. During this adaptation phase, the discipline struggled to keep pace with emerging developments (Macnaghten, Kearnes, and Wynne 2005). Despite this, the bureaucratization of social science put the discipline in a position to question processes of innovation, which until the twenty-first century, perpetuated a linear narrative between science and society (Macnaghten 2020). Successive alternatives, in the form of conceptual frameworks and methodologies, were proposed to “open up” how science and technology are researched and governed in the context of broader technological assessment, science policy-making, and “socially shaping” innovation.<sup>1</sup> These alternatives exemplified the modernization and experimentation that characterized this evolution’s ultimate objective to submit science and technology to both internal reflection and inquiry from external publics.

These frameworks and methods came to define the field of science and technology studies (STS). However despite STS’s history of inter- and transdisciplinary research, many aspects of these alternative frameworks and methodologies remain underanalyzed. One aspect that we argue requires further reflection is the role of affective labor in STS or the energy involved in regulating one’s own emotions as part of paid work in order to manage other people’s feelings during social interactions (James 1989; Taylor 1998). By attending to emotions with sensitivity, STS researchers are able to use themselves as “sensors, sources, and processors” (Poldner, Branzei, and Steyaert 2019, 152) to engage participants.

Affective labor occurs when investigators try to act “objectively” (Hochschild 2012).<sup>2</sup> By adopting the position of an objective instrument of data collection, researchers are seen exclusively in a professional capacity where they are expected to control their emotions to appear neutral (Hubbard, Backett-Milburn, and Kemmer 2001). In reality, “true” objectivity can only occur from researchers being as honest as possible about their feelings and biases (Parker and Hackett 2014, 557). In other words, investigators conduct research with feeling which shapes their judgment, perception of participants and interactions (p. 558). So if “private feelings shape our behavior” (p. 557), and researchers are asked to hide even relatively inoffensive emotions (e.g., hunger), then this effort to conceal corresponds to a form of affective labor.

The relationship between STS investigators and participants determines behavioral expectations and, in turn, affective labor. This relationship is

defined by positionality. Holmes (2020) describes positionality as both an individual's world view and the position they adopt toward a research task within the relevant sociopolitical context (e.g., the role of the objective researcher). Positionality has been considered with respect to gender, age, culture (Manohar et al. 2017), and the insider/outsider position (Merriam et al. 2001). Yet while it is well-established that investigators must be aware of positionality when conducting research, there is considerably less work examining how STS researchers' positionality can put them in vulnerable positions.<sup>3</sup>

We argue that vulnerability and affective labor in STS are underdocumented features of collaborative sociotechnical integration (CSTI) methodologies. CSTI encompasses a broad array of methods designed to reveal how science operates and to help scientists engage with the social implications of their research. This is ideally achieved through social-reflexivity or the practice of modifying one's technoscientific<sup>4</sup> practice in response to previously unaccounted for knowledge. CSTI was created to challenge the assumptions about the social dimensions of science (Fisher 2007; Flipse, Van der Sanden, and Osseweijer 2014; M. Holmes 2010; Schuurbiers 2011). The presence of these non-science experts in the midst of scientific communities opens up the possibility of incorporating social science and humanities themes into technoscientific endeavors.

CSTI's aim to motivate reflexivity has led to "affects," "emotions," and "feelings" (which we will hereafter use interchangeably)<sup>5</sup> being increasingly recognized for their practical and theoretical insight (Head and Harada 2017). Emotions in CSTI research come to exist in part because of the positionality that researchers are forced to negotiate as insiders (i.e., friendly consultants) and outsiders (i.e., feared critics; Viseu 2015). This places researchers in a process of negotiation where friendships, hopes, and fears get entangled in their work as part of the "messy, convoluted, and affective nature" of CSTI research (Balmer et al. 2015, 9). The challenge of continuously having to straddle a position between insider and outsider (regrettably) causes many practitioners to remain silent on the affective dimensions of their interdisciplinary collaborations (Balmer et al. 2018).

It has been put forward that the disconcerting differences felt by investigators can become easier to engage and communicate by practicing affective labor (Myers 2015). If this is the case, then affective labor is something not only to be expected but practiced, hence the cost of this labor must be addressed. To better understand the role of affective labor in STS broadly, we begin by recounting the experiences of two CSTI practitioners: an integrated philosopher (IP) and an integrated chemist (IC). The IP is a

philosopher of science integrating themselves in a data science community to investigate their methodologies, while the IC is a chemist using CSTI methods to research new developments in medical technology. The integrative research carried out by the IP and IC are based on popular approaches to CSTI—Socio-Technical Integration Research and the Toolbox Initiative—which, we show, provide insufficient support to investigators who are required to perform affective labor.<sup>6</sup> We will then describe the role of affective labor in reflexivity, showing why it ought to be a formally recognized part of CSTI. Using feminist scholarship, we then explore how improved researcher care (or care for the researcher) might help to address the affective cost of CSTI. We recommend McClelland's (2017) six suggestions for managing affective (emotional) labor, because these are amenable to the CSTI methods presented here and to STS scholarship more broadly.

## **The IP and Sociotechnical Integration Research (STIR)**

STIR is a CSTI method promoting reflexivity. As a means to address overarching goals in STS, such as situating science in society, STIR's integrative researcher (previously known as the embedded researcher) acts as a facilitator to help scientists consider the broader implications of research decisions under their control (Fisher and Mahajan 2010). In this case the IP used STIR to engage data scientists in thinking through the social implications of their data collection and analysis. To show the affective cost of value-rich reflexivity, we begin by reviewing how the STIR protocol works, then through the Reading Papers example—an excerpt from a larger STIR study—we show how investigators can end up conducting affective labor while caring for participants who undertake reflexive processes.

During a STIR intervention (normally lasting four months), the integrative researcher acts as a foreign yet functioning lab member (an insider/outsider position), hosting a series of regularly scheduled conversations with scientists, usually one-on-one. Here, the integrative researcher facilitates midstream modulation or the gradual alteration of technoscientific processes by initiating ongoing reflective interactions that help to situate the research in a broader social context (Smolka, Fisher, and Hausstein 2020). These conversations are structured by the STIR decision protocol, by which the integrative researcher asks the scientist/s iterative questions<sup>7</sup> about how scientific practices could otherwise be carried out and how they relate to society (Fisher 2007).<sup>8</sup> Note that STIR's decision protocol questions are not affectively explicit. The following "Reading Papers" example illustrates the

types of affective responses that can arise from probing questions that flow from the decision protocol.

After several weeks of carrying out the STIR protocol on the potential social implications of data science with analysts in a research lab, the IP noted that conversations with one particular data scientist consistently appeared to be predicated on a set of underlying value-based assumptions. Accordingly, they devoted an entire session to exploring values as they related to research alternatives. This focus on how values relate to alternatives is unique to the IP's intervention. However, the consideration component of the decision protocol (where scientists reflect on their selection criteria for alternatives) is noted for generating social and cognitive concerns that can be motivated by implicit personal or institutional goals, values, and expectations (Fisher 2007). Hence, we have a situation where values are anticipated, but not explicitly given procedural attention.

In an attempt to uncover the values underlying the scientist's research, they were asked to describe their work. The scientist explained "I treat data to extract knowledge." In a move to clarify how even this statement was value-laden (e.g., deciding *how* to treat data), the IP asked the scientist to expand on each word in the statement. Starting with *knowledge*, the scientist began to question what it means to *know* something. Then, the scientist mulled over the extraction process and how it related to creating knowledge. *Treating data* turned to what the manipulation of information meant for knowing, but ultimately it was the "*I*" that was most evocative of reflexivity. When the scientist was asked how *they* carried out research, they reflected on their education, conference participation, subject matter, and then stated, "I don't read papers by women . . . but I'm not sexist."

The abrupt nature of such a heavily value-laden sentence was startling to the IP and in some ways to the scientist as well. The scientist explained that at one point as a junior data scientist, they had been asked to teach a group of female students coding. During the session, the students were talkative, leading the scientist to believe that women were either ill-suited to or uninterested in data science. Given this history, the IP then asked the scientist to reflect on whether they had come across any convincing female scholars since then. Recalling that a co-director of the laboratory was female and highly competent, the scientist realized that they had been mistaken in their estimation of women. Furthermore, they were reminded by the IP that they had described their research goals as committed to carrying out the best analytic research on data possible to "have an effect in the future." At which point, the IP explained how ignoring scholarship based on the author's perceived gender could omit information that was relevant to this goal.

Lastly, and perhaps most importantly, the scientist was personally committed to not being sexist.

Once the scientist recognized the contradiction between their research practice (ignoring papers written by female authors), research goals (the best data analyses possible), and personal beliefs (not sexist), they decided to alter their research practice thereafter—an example of deliberative modulation. The reflexive work carried out by the scientist was highly emotive but ultimately described as a positive experience by the participant. The scientist's emotional reaction should come as no surprise given that adopting or realigning values can involve as much unlearning as learning (Fisher et al. 2015).

It required a substantial amount of affective labor for the IP to care for the scientist through this emotional reflexive process while managing their own emotional response to the participant's statements and values. Given the affective response that certain values (like sexism) can evoke when made explicit, integrative scholars should be better prepared to confront emotions. This example is evidence of the affective labor that goes into CSTI research, which should factor into its affective cost. Before developing recommendations to prepare integrative researchers for performing affective labor, we demonstrate how the need to manage emotions cuts across CSTI methods. This second example shows how even in shorter engagements, with a different integrative researcher, scientific domain, and CSTI method, efforts to engage scientists in socially situated research can involve affective labor and come with an affective cost.

## **The IC and the Toolbox Dialogue Initiative**

The Toolbox Dialogue Initiative is a CSTI method that uses philosophical analysis and conversation to enhance communication in collaborative and cross-disciplinary scientific research (Eigenbrode et al. 2007). A standard Toolbox Initiative approach consists of two main parts: a questionnaire and a workshop. The questionnaire contains different sections, each with a set of core questions and probing statements based on a specific theme (O'Rourke and Crowley 2013). The workshop consists of a dialogue (based on the questionnaire) aimed at revealing core beliefs and values that come through in research assumptions and codes of conduct (Berling et al. 2019; Schnapp et al. 2012).<sup>9</sup> The IC used the Toolbox Initiative method to explore patients' and scientists' reflections on nanotechnology in cancer treatment. To show how affective labor manifested in this case, we begin with an overview of the Toolbox Dialogue Initiative method. Then, we highlight instances of

value-rich dialogue that required affective labor to navigate. This experience echoes that of the IP and provides another example of affective labor in CSTI, which we will use to discuss affective labor in STS and the social sciences more broadly.

During the Toolbox workshop, the IC acted as moderator (or Toolbox representative) and presented several statements about nanotechnology to elicit participants' reflections about dual treatments for cancer (see Duché et al. 2020).<sup>10</sup> The initial focus of the interviews was "nanotechnology" and used probing questions to provoke reflection. Though conversations opened with the term "nanotechnology," the IC found participants naturally gravitated toward other terms such as "cosmetic" and "aesthetic" in relation to post-treatment care. We will primarily focus on answers provided by a scientist-practitioner specialized in oncology, which provoked a strong affective response in the IC.

Patients' narratives of surviving cancer were in clear disagreement with discourse from one particular scientist-practitioner. Through years of experience working with patients and different treatment delivery systems, this participant claimed that cancer treatments currently have "very few" cosmetic impacts (low-ranking on the list of long-term disabilities), and, if troublesome, these can be remedied over time. For the scientist-practitioner, this rendered cosmetic therapies, and the development of an aesthetic transdermal delivery system—which could help major physical alterations like scarring or ectomies by making further treatments topical instead of injectable—unnecessary. However, when asked if it was important to address the visible (aesthetic) effects of cancer treatment, or if it were more of a luxury, the scientist-practitioner answered that it was currently not regarded as a luxury but as a business. When probed again on the long-lasting cosmetic effects of treatments, after having mentioned mastectomy and other drastic biographically disruptive operations, the participant maintained their position.<sup>11</sup>

In this situation, the IC was challenged to manage their affective response and follow the "objective researcher" guidelines of the Toolbox Initiative. In other words, the Toolbox Initiative is "not a philosophy classroom" because the facilitator is required to adopt a passive engagement strategy (O'Rourke and Crowley 2013). As such, the facilitator is not in the role of educator or moralizer; rather than attempting to change the participant's view on the topic, they intent to get them to reflect on it (Schnapp et al. 2012). Hence, when participants such as this scientist-practitioner express views that are factually incorrect or emotionally laden, investigators are tasked with affective labor to manage their responses as they attend

to these participants. Given the affective labor used to carry out this moderator role, in the following section, we delve into why emotions are crucial to integrative research to inform our recommendations for care.

## **Emotions and Vulnerability in Integrative Research**

The experiences of the IP and IC show how affective labor comprises a necessary part of integrative research. Yet affective labor in this type of research is underarticulated in STIR<sup>12</sup> and only discussed in retrospect in the Toolbox Initiative (O'Rourke et al. 2020). In other words, though there may be an acknowledgment of affective labor in some CSTI methods, there is both a lack of attention to the cost of this labor and instruction on how to manage it. At the center of affective labor are emotions which can be understood across six dimensions: frequency, intensity, variety, duration, and type (deep or surface acting; Brotheridge and Lee 2003). Emotional displays occur within the interpersonal context of the relationships between researchers, participants, and topic (Cylwik 2001). In this section, we examine the role of emotions in CSTI research. First, we consider how the reflexive aims of CSTI research generate emotion in the facilitator and heighten vulnerability. This allows us to provide recommendations for CSTI and embedded methods more broadly.

Emerald (2015) describes emotions as assets that can focus or amplify important elements of an interaction. This focus is helpful to integrative researchers tasked with promoting reflexivity, because it can guide them toward themes that situate science in society (e.g., values). Having shown how emotions can manifest in the interpersonal interactions that take place through integrative methods like CSTI, we propose that these emotions play a cognitive role in imagining the consequences of science in society. Returning to the aforementioned CSTI examples, when the participants were asked to consider what implications their research had for society, the IP and IC both noted that emotions arose between themselves and participants, as well as between participants and the topic. However, unlike with emotions in the foreground—those that we are conscious of—unconscious emotional perceptions of external reality in the background appeared to prevent participants' subjective awareness (Parker and Hackett 2014) of how society might perceive their research.<sup>13</sup>

To withstand exposure to their own and others' emotions and harness their sensitivity, investigators are forced to be vulnerable. Vulnerability is defined by Adger (2006) as a state of susceptibility to harm directly related to exposure to stress from social or environmental changes stemming from



the lack of adaptability. In vulnerability research, little attention is paid to the discomfort required for researchers to be vulnerable (Kidd and Finlayson 2006). However, in the few instances, where this is discussed (see Kidd and Finlayson 2006; Behar 1996), emotional vulnerability is portrayed as necessary for both participants *and* researchers who are carrying out integrative research with the aim of reflexivity. The IP was in an emotionally vulnerable position listening to the participant's values and practices which reflected internalized sexist beliefs. Yet, the IP was still expected to guide the participant's reflexivity. This entailed affective labor and emotional management—the act of deliberately suppressing emotional responses to private problems and the behaviors of others (Salovey and Mayer 1990)—in order to help the scientist reflect on their sexist practice and guide them in realigning their values and practice. Likewise, the IC was also in a vulnerable state by having to balance the emotional experiences described by patient-participants and the dismissive comments made by the scientist-practitioner. It required affective labor to adopt the Toolbox Initiative's passive strategy when faced with the tension between what the scientist-practitioner was presenting as fact, and the experiences narrated by cancer survivors (thrivers). This experience supports Viseu's (2015) findings that integrative researchers are often asked to care for participants by learning to observe and protect.

In sum, the reflexivity that is necessary to situate science in society can also have an affective component. We point out that if researchers are required to mask their emotional experiences in order to project a value-free appearance, they are obligated to perform affective labor that they are not trained for. In addition, we explain how emotional reflexivity can be crucial to goals like social reflexivity. This means that in cases where emotional responses are strong, and social reflexivity profound, the cost of affective labor for researchers can become problematically high. Thus, in the following section, we explore researcher-focused care solutions to improve CSTI methods and provide recommendations by which integrative research can become a more investigator-friendly means of investigation.

## **Caring for Investigators in Integrative Research**

To support integrative scholars confronting values and conducting affective labor, we show what a more emotionally supportive version of CSTI research might look like. To manage the vulnerability necessary to guide emotional reflexivity we turn to feminist psychologist Sara McClelland's (2017) recommendations for care. In their work on vulnerable listening,

McClelland highlights the risks created by placing researchers and participants in the same space and asking one person to share while the other listens. Though adopting McClelland's recommendations for CSTI and STS methods may be imperfect, they are still a step toward providing opportunities to dissect and reflect on affective labor in integrative experiences.

McClelland first proposes teaching investigators that not all instances of data collection are the same; the time and level of emotional engagement required varies with each attempt to collect data. Second, emotions should be shared with colleagues or therapists throughout the process (of course while respecting ethical considerations). This way, researchers can find support and speak to their experiences in ways that contribute to knowledge and understanding (Emerald and Carpenter 2015). Third, McClelland recommends transcript analysis and discussion with a group of people similar to the participants but who are not part of the study, which can help to build "communities of informants." By talking through affective elements within communities of informants, new expertise, guidance, or corrections can be brought forward. Fourth, McClelland advises investigators to keep (and use) any notes taken during interviews, as these can sometimes contain (affective) data. Ideally written very close to the interview time, they should include contextual observations of the research setting (e.g., temperature of the room, lighting) that can illuminate confounding influences on the participant and researcher. McClelland (2017) explains that "This move to incorporating the researcher's personal experience as a part of the data record is essential to developing a practice of vulnerable listening" (p. 11).<sup>14</sup> Fifth, integrative scholars should step away from their research before coming back to it so that they can process their emotions. And finally, she recommends building personal self-care strategies, noting that very rarely would this be written into research budgets, but that it "could be developed and sustained throughout the life of a project" (p. 11).

For STIR, as a method tailored to unique interactions, the flexible timing McClelland recommends is already accommodated. Furthermore, this method also recognizes the importance of documentation, which can include affective accounts. As an ongoing part of the protocol, investigators must constantly account for the responses of participants. We build on this methodological dimension by recommending that special attention be paid to the participant's emotional reactions—perhaps even allowing them to confirm or describe their sentiments—as part of STIR's question protocol. And to support integrative researchers, depending on the relationship between the investigator and participants, it might even be beneficial for the researcher to write some of their emotional responses on the question

protocol as well, opening up new opportunities for dialogue. Lastly, we encourage STIR practitioners to discuss the endeavor with others, to help them reflect on their embedded experiences as a reflexive exercise about the social impact of their own work.

The Toolbox Initiative already accommodates a wide array of practitioners and participants, which allows for more diverse data to be collected. However, the Toolbox Initiative's single meeting format does not allow for much reflexivity in the moment. Thus, we encourage an elongation or repetition of the dialogue stage to better accommodate the affective aspects of the probing statements.

This will allow more opportunities for integrative investigators to manage the affective cost of guided reflexivity. McClelland's fifth recommendation, moving away from integrative work and returning to it, might not always be feasible. Furthermore, researcher notes are encouraged in the Toolbox Initiative, so we remind investigators to document observations related to context (e.g., weather, temperature) as well as nonvocal responses (i.e., body language), and any personal feelings that may arise during the interview. We also believe these affective notes should be normalized in academic publications.<sup>15</sup>

To summarize, though STIR and the Toolbox take different approaches to CSTI, we argue that they can both be improved to care for investigators. This care is necessary in order for integrative research to manage the affective labor of helping scientists situate their research in a broader social context. Affective labor and emotional reflexivity necessitate vulnerability, which has an affective cost. Hence, we turned to feminist-inspired models for researcher care, namely McClelland's six suggestions for managing emotional labor. Though we recognize that adopting all six of her recommendations might not be feasible in every circumstance (such as long periods of reflection), space for some care features (like note-keeping or communities of informants) can be integrated into STIR and the Toolbox Initiative to improve care for investigators. Doing so would permit users of these methods to better engage the emotional reflexively at the root of efforts to situate science in society. This has implications for STS and the social sciences more broadly.

## Conclusion

Interest in co-productionist and reflexivity-based methods aimed at helping scientists to situate their research in society is becoming increasingly mainstream in response to calls for more equitable science.<sup>16</sup> Considering

science as a site of complex cultural dynamics is a response to earlier constructivist approaches that presented a “war on science” and nihilism arising from posttruth diagnoses (Chilvers and Kearnes 2016, 2020). Our experiences show that the midstream modulation sought by STIR, and the aim to improve cross-disciplinary communication in the Toolbox Initiative, rests in part on emotional reflexivity: an attentiveness to emotional signals in order to care for participants through self-monitoring. We argue that this constitutes affective labor, which these methodologies do not account for. Thus, we challenge the narrative of “powerful” positionality by exploring the price paid to hold an integrated position. To address the costs of affective labor, we add support recommendations to STIR and the Toolbox Initiative methods, agreeing that the experience and language of emotion is “as much an object of study for STS as it is a necessary resource” (Stark 2019, 118).

Our recommendations are not intended to be exhaustive or feasible in every circumstance; instead, they are adaptable to the realities of these methods. What about integrative research more broadly? CSTI and other coproductionist accounts favor a careful and grounded interpretation of how publics make sense of science (Chilvers and Kearnes 2016, 2020; Jasanoff and Simmet 2017). Likewise, integrated research requires an awareness of publics’ and societies’ needs, active listening skills, and a willingness to be vulnerable in order to imagine how publics will make sense of science. This oscillation between being a vulnerable insider and a socially acute outsider is part of the process of negotiation that the integrated researcher role demands.

However, there are many questions still to be answered for integrated research in general. For example, how do we avoid the trap of cultivating too intense an affect between observer and subjects? What roles do power and inequality play in producing or suppressing emotions? To what extent (if at all) should we “blind” research to emotions (Parker and Hackett 2014, 559)?

In this paper, we have shown why it is important to bring attention to affective labor in integrative sociological research. Beyond informing our understanding of emotions in knowledge partnerships, attending to affective labor can improve researchers’ well-being, for example, by combating feelings of burnout. Burnout can be defined as experiencing emotional depletion and a loss of motivation due to extended emotional stress experienced at work. It comprises emotional exhaustion, depersonalization, and a feeling of lacking personal accomplishment (Galek et al. 2011). It can be caused by relying on unsuccessful methods for

coping with work related-stress, a lack of acknowledgment toward researchers' efforts, or a sense of insufficient control over the results of one's work. This is often the case in STS where negligence can become preferential to addressing emotional difficulties directly (Montero-Marin et al. 2016). The potential consequences of burnout include experiences of guilt resulting from researchers feeling that they are not fulfilling their job, which can cause severe health and motivation impairments (Montero-Marin et al. 2016).<sup>17</sup> This indicates a clear need for a review of integrated methods to verify whether they include consideration for researcher care.

In sum, when we consider what integrated methodologies outside STS or CSTI might have in common with science-centric reflexive research, we find they share vulnerability and affective labor. For example, there may be shared anxiety connected to being "in the field" for the first time or feelings of inadequacy in the face of another expert. Scholars like Atkinson-Graham et al. (2015) put forward that it is worth attuning to these emotionally challenging moments throughout our careers (and lives), because the questioning spirit of "the politics of care in technoscience" is about acknowledging the human dimensions of research, which we agree heighten the potential of these interventions.

### **Author's Note**

This article includes information and analysis from human interviews. It is compliant with the Human Research Ethics approval of the University of New South Wales, Sydney, Australia (Reference: HC16135) and the University of Waterloo International Office of Research (Reference: IT07592) as well as the Mitacs Code of ethics.

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## Notes

1. Examples include “post-normal science” (Funtowicz and Ravetz 1993), “mode II science” (Nowotny, Scott, and Gibbons 2013), citizen science (Irwin 1995), “analytic-deliberative” risk assessment (National Research Council 1996), constructive technology assessment (Rip, Schot, and Misa 1995), “upstream public engagement” (Wilsdon and Willis 2004), “anticipatory governance” (Guston 2014), and “responsible innovation” (Owen, Macnaghten, and Stilgoe 2012).
2. For more on the “objective researcher,” see Blakely (2007) on the importance of stepping away from the idea of a value-free researcher in order to allow new approaches to theory, method, and knowledge exploration.
3. Some exceptions include work by Chiswell and Wheeler (2016) about a junior female researcher immersed in the (male-dominated) farming industry and work by Weiner-Levy and Abu-Rabia-Queder (2012) exploring how being from the same or a different cultural background as the research group can bring its own advantages or disadvantages.
4. We use “technoscience” here to mean a combination of “applied science” (e.g., computer science, engineering) and “basic science” (including medicine).
5. We use these terms somewhat loosely as affects usually refer to “situational phenomena, irreducible to the individuals among whom they circulate or to “atmospheres” through which bodies move” (Seyfert 2012, 42). Emotions consist of bodily manifestations that signal the importance of an event and help to regulate the relationship between the subject and environment (Bericat 2016). Both terms add insight about the connection between individuals and their environments.
6. To be clear, in the integrated philosopher (IP) and integrated chemist’s (IC) experiences, affects occurred in participants as well. However, there is

substantially more work on participant care than researcher care in the literature. For example, see participant care in Daley's (2012) work or Demi and Warren's (1995) account.

7. The four questions in the protocol are the following: What choice has to be made? What should one be mindful of while reflecting on the decision? What are the available resolutions? And, what are the anticipated consequences based on the alternatives?
8. For more on the Sociotechnical Integration Research protocol and methodology, see work by Fisher et al. (2015).
9. For more details on the methodology of a traditional Toolbox Initiative protocol, see O'Rourke (2013).
10. Dual treatment here refers to a system designed and synthesized by the IC that delivers a compound through the skin. It can also be used to treat skin conditions (redness, dryness, and scarring) caused by cancer drugs delivered through the system.
11. If we are to trust the large body of literature centered on "post-treatment care," and the strong bodily, biographical, and psychic disruption caused by cancer treatment (Trusson, Pilnick, and Roy 2016), the scientist-practitioner has many challengers with respect to the importance of aesthetics. Cancer-related cosmetic transformations—even if not as important as other effects such as financial impact during treatment—can sometimes have lifelong posttreatment consequences (Gilbert, Ussher, and Perz 2013).
12. Smolka et al. (2020) acknowledge that affective labor, disconcertment, and responsiveness are important yet understudied aspects of interdisciplinarity.
13. See Weber's support of empathic understanding or analyzing social situations from the participant's perspective (Parker and Hackett 2014, 557).
14. Investigators' anxiety can lead to compulsively writing field notes in order to feel productive (Parker and Hackett 2014, 558). However, in an attempt to be more objective, this can risk compromises in data collection (e.g., reducing qualitative to quantitative).
15. In organizational studies, researchers are already asked to acknowledge their emotions and values (Mohrman 2010).
16. See US President Biden's statements acknowledging that "the benefits of science and technology remain unevenly distributed across racial, gender, economic, and geographic lines" (Biden 2021).
17. For more, see Atkinson-Graham et al.'s (2015) experience of science and technology studies scholars coming together to write a paper and dwell inside emotionally laden moments. They did this in order to take care of one another while going through the struggles of becoming better researchers and technoscientists.

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