



Room for Silence: Ebola Research, Pluralism and the Pragmatic Study of Sociomaterial Practices

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Abstract. The notion of sociomaterial practices speaks to a view of routine work in which people and materials are always already entangled. This implies that the commonsense tendency to treat concrete materials and social activity as separate analytical categories may actually muddy more than illuminate our understanding of practices. Engaging work from science and technology studies, this broad view of materiality refers not only to the physical properties of machines but also to software and algorithms, electrical grids and other infrastructure, buildings, human bodies, ecological systems etc. Despite remarkable enthusiasm, the conversation about sociomaterial practices occasionally has devolved into philosophical turf wars, engendering pleas for pluralism. All too often, such lofty conceptual debates lose sight of pragmatic concerns such as technology design work or humanitarian action. This essay traces both issues to a tension between adopting a grand philosophical Ontology, versus undertaking detailed empirical studies of particular concrete work practices. I argue that studies exploring the practical specifics of particular sociomaterial practices should be granted room for silence with respect to some theoretical commitments, on the grounds that this will afford a more lively pluralism. For ethnomethodologists, this re-orientation to grand theory is a matter of methodological rigor and theoretical sophistication. For pragmatists, room for silence has to do with the dilemma of rigor or practical relevance. This is not to say that key concepts are unnecessary—they can provoke us to look beyond narrow disciplinary confines and standard assumptions about the scope of field studies. Through an account of the 2013–2016 Ebola outbreak in West Africa, I show how these conceptual debates matter for empirical research and for design practice. In this case, complex technical *and* biosocial processes made a concrete difference in the course of the outbreak and the humanitarian response to it. For practitioners no less than for researchers, this case throws into sharp relief the real human stakes of grasping how the material world gets caught up in workaday human activity.

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1. Introduction

In the varied topography of professional practice, there is a high, hard ground where practitioners can make effective use of research-based theory and technique, and there is a swampy lowland where situations are confusing “messes” incapable of technical solution. The difficulty is that the problems of the high ground, however great their technical interest, are often relatively unimportant to clients or to the larger society, while in the swamp are the problems of greatest

human concern. Shall the practitioner stay on the high, hard ground where he can practice rigorously, as he understands rigor, but where he is constrained to deal with problems of relatively little social importance? Or shall he descend to the swamp where he can engage the most important and challenging problems if he is willing to forsake technical rigor? Donald Schön, *The Reflective Practitioner* (1983).

While Donald Schön addressed professional practitioners in this classic statement on the dilemma of rigor or relevance, few would doubt that scholarly communities also tend to form their own views of the “high, hard ground.” For practical purposes we could not possibly advance every argument from first principles. Instead, we tend to publish our work for communities that share enough in empirical interest, methodological norm, theoretical perspective and standard of rigor to streamline the difficult work of advancing knowledge. Weinberg (2002) calls these loosely bounded communities “dispute domains,” and emphasizes that they can be located socially and politically. Tracing how they have changed historically is one way of recognizing that they are still changing today, in light of fresh concerns and with more or less allegiance to particular traces of disciplinary genealogy. Our standards of conceptual and empirical rigor are always up for debate, and the academy’s relevance to the wider world hangs in the balance. These issues have sparked long and searching reflection in the Computer Supported Cooperative Work (CSCW) community, thanks to our attention to practical technology design challenges and celebration of multidisciplinary perspective (Schmidt and Bannon 2013).

In this essay I consider how the dilemma of rigor or relevance may apply to recent efforts among practice theorists to recast “the social” and “the material” in technology studies. The term sociomaterial practice speaks to a view of routine activity in which people and materiality are always already entangled and analytically inseparable. It challenges the tendency to compartmentalize the “social characteristics” of people’s work and various processes of the material world, as if studying each compartment in isolation were entirely natural and sensible. In this broad view, materiality refers not only to the physical properties of machines but also to software and algorithms, electrical grids and other infrastructure, buildings, roads, human bodies and ecological systems etc. The notion of sociomaterial practices speaks to CSCW’s longstanding concern with the nature of work by engaging what some have called the “ontological turn” in science and technology studies and social theory more broadly (Lynch 2013; Mol 1999; Woolgar and Lezaun 2013).¹

In recent years, foundational work by information systems researchers Orlikowski (2007) and Orlikowski and Scott (2008) has sparked a surge of sociomateriality papers and conference activity spanning information systems, organization studies

¹ This ontological turn should not be confused with the largely distinct notion of ontology design and knowledge management as discussed for example by Holsapple and Joshi (2002).

and CSCW. This was followed by attempts at conceptual elaboration and clarification that have been enlightening at times and in other cases devolved into acrimonious turf wars (Mutch 2013; Scott and Orlikowski 2013). One can hardly say the word ‘sociomaterial’ at certain academic conferences without being asked by audience members to clarify one’s allegiance—whether one is a sociomaterial radical (i.e. an advocate of the philosophy called agential realism) or a sociomaterial conservative (i.e. a philosophical critical realist) (Niemimaa 2016). This essay is critical of how the study of sociomaterial practices has veered towards a kind of sociomaterial-ism, seduced by grand visions of an all encompassing “theory of everything” rooted in a singular and totalizing philosophical Ontology. Such efforts have engendered urgent cries for pluralism (Scott and Orlikowski 2013) and more than a little frustration with, to use George Orwell’s expression, the smelly little orthodoxies of the day.

At the same time, some see the increasingly philosophical bent of the sociomaterial practice discourse as impenetrable or irrelevant to practical concerns such as empirical inquiry and concrete design work. While design research and the literature on sociomateriality share an interest in concrete materials, they emerge out of different scholarly traditions. CSCW researchers have begun forming a practical interventionist design agenda that takes sociomaterial complexities seriously, but they acknowledge that “some might claim that the two are epistemologically so far from each other that it is not possible to unite them” (Bjørn and Østerlund 2014, p. 7).

The central argument of this essay is that pluralism and practicality are related, and that they might both be addressed through an orientation to theory that I will call *room for silence*. I develop this notion based on a scene recounted in the essay *Silence in Context: Ethnomethodology and Social Theory*, in which Lynch (1999) describes the prominent ethnomethodologist Harvey Sacks taking questions after a public lecture in 1975. One man reportedly asked, “if I put a gun to your head, and asked you to name the theorist who had the most influence on your work, who would you mention?” Lynch continues:

Sacks was smoking a cigarette (which was permissible in the US at the time). He paused. With head down, and his cigarette at the lip of an ashtray, he held the pause while periodically flicking the ashes. This went on for a minute or two. The pause seemed endless at the time. To say it was a pregnant pause was not enough. This pause had time to give birth and raise a family. At long last, Sacks looked up and quietly declined to answer the question... As Sacks himself has taught us, silence is an accountable mode of communicative action, and this silence surely was a vivid instance of such action. Sacks did not simply fail to answer the question. His long pause was not merely the absence of an answer. It was a studied, and instructive, silence (1999, p. 211-212).

This essay offers a conceptual defense of this kind of silence, and explores its relevance (what it makes room for) in design research and practice. To this end, I trace connections from design research to the turn to practice in social theory.

Following Nicolini (2012) and Kuutti and Bannon (2014), I argue that practice approaches are obviously heterogeneous, yet nonetheless bear a remarkable *family resemblance* by which we can distinguish them from alternative psychological, economic and sociological theories of human action. Recognizing family resemblance is more precise and artful than dividing the conceptual terrain into tidy categories or enumerating lists of required conceptual elements. Many researchers use this sense of family resemblance to justify their pluralism, including a tendency to draw on a varied ‘toolkit’ of kindred practice concepts from study to study.

If the study of sociomaterial practices is to remain as pluralistic as the broader turn to practice from which it emerged, I argue that it will need to grant researchers room for silence with respect to some conceptual and Ontological commitments. I embrace Walsham’s (2005) call to let “a thousand theoretical flowers bloom” in our understanding of human and machine agency, and I go one step further by welcoming ethnomethodological and pragmatic skepticisms of theoretical abstraction. If field studies of sociomaterial practices are not granted room for silence with respect to the adoption or advocacy of a philosophical theory of all objects, this nascent conversation might fall short of its potential to address matters of real human concern.

In the second half of the paper, I offer an account of the 2013–2016 Ebola outbreak in West Africa, synthesizing a range of secondary sources. While such an analysis clearly falls short of the concrete detail that an extended field study might offer, I nonetheless hope to show by example how these conceptual debates matter for empirical research and for design practice. In this case, biophysical and material processes made a concrete difference in the course of the outbreak and the humanitarian and technical response to it. Practitioners were acutely aware of these complexities and they popularized several expressions—“build back better” and “staff, stuff, space and systems”—to grasp and draw attention to the sociomaterial dynamics of their work. For the designer of technical systems, the practical implications of these dynamics may not be entirely obvious. Nonetheless, grappling with the full sociomaterial complexity of these practices speaks to the classic point and purpose of field studies in systems design—the opportunity to make workaday life more visible, in the hope that this will enable us to design for the real world.

In conclusion this essay offers three distinct contributions. First, I modestly refigure the conceptual map of the sociomaterial practice discourse, emphasizing Lucy Suchman’s (2006a) seminal contributions, practical design issues and the multidisciplinary perspective that has long been important in CSCW. In some sense this analysis brings the study of sociomaterial practices ‘back home’ to themes that animate CSCW research, while also framing the relevance of developments in CSCW to adjacent fields such as information systems, organization studies and global health. Second, I show how conceptual pluralism and practical relevance are related, and that both might be cultivated through an orientation to theory that I call *room for silence*. This kind of pluralism allows us to take the dilemma of rigor or relevance seriously, without ignoring key concepts or becoming “anti-theory” in the name of research impact. Finally, my explanation of the Ebola outbreak illustrates

how and why systems designers should begin to grasp sociomaterial complexities in the routine work of global health and humanitarian action. That is to say, the case shows how the concept of sociomaterial practices can be relevant for ethnographic field studies and for the pragmatic practice of human-centered design.

2. Linking systems design, theories of practice, and pluralism

Most studies of sociomaterial practices are not particularly concerned with design issues, and for this reason it is important to ground our discussion in some sense of what we mean when we refer to design. While the conceptual terrain of design practice, design thinking and human-centered design is not at all fixed or coherent, Bannon and Ehn (2013) observe that “the two main approaches discussed in the design field are the rational problem-solving model and the reflective practice paradigm.” Simon’s neo-positivist view of the designer as rational problem-solver in *The Sciences of the Artificial* (1996) has had a major impact on the design research community. Yet Schön’s pragmatist-inspired view of the designer as reflective practitioner has been more influential in the art and craft-oriented design professions, participatory design, and CSCW. With over 50,000 Google Scholar citations and a wide practitioner audience, Schön’s (1983) book *The Reflective Practitioner* is possibly the most influential work of design scholarship ever published.

Schön describes design as a reflective conversation with the materials of the situation. He introduces a case in architectural design (1983, p. 76) by observing that the process of making is typically complex, that the designer’s moves are likely to have intended and unintended consequences. The course of design work emerges in practice, because the designer cannot fully predict or control how the concrete materials of the situation will respond to her initial moves. The designer shapes a situation in accordance with her initial perception of it, the situation “talks back,” and she responds to this material back talk with new moves or actions. In this perspective, the designer is generative and artfully adaptive. The materials also shape the course of this work; their ‘back talk’ often manifests a kind of *material agency* (Holeman and Barrett 2017).

Schön does not discuss pragmatic philosophy in any direct or extended fashion in *The Reflective Practitioner*, yet this legacy is widely recognized in his work. Experiencing perplexity in concrete situations, pursuing on-the-spot experiments and learning-by-doing are central to the pragmatist view of inquiry and insight. One might also attribute Schön’s tendency to neglect discussing theory for the sake of theory to his pragmatic bent, given that pragmatists view abstraction as inevitably distorting concrete lived experience. Yet his relative silence with respect to abstract theories has left room for many scholars to read notions of reflective practice in light of other, more theory-heavy works.

For example Levina (2005, p. 112) holds that “reflection-in-action is essentially a structural, practice-based concept,” referring her readers to the work of Giddens (1984) and Bourdieu (1977). Yanow and Tsoukas (2009) suggest that we reread

reflection-in-action in phenomenological, in particular Heideggerian terms. In his impressive ethnography of photocopy repair work, Orr's (1996) two central, intertwined analytical constructs are reflective practice and "situated action." The latter refers to Suchman's (1987) influential book *Plans and Situated Actions*, which draws heavily on ethnomethodology and has been a mainstay of CSCW research. The links between ethnomethodology and pragmatism are particularly salient. Their calls for a return to concrete experience and skepticisms of theoretical abstraction, as well as shared interest in how doubt, perplexity or material disruption can trigger situated problem solving, have led some to argue that ethnomethodology advances the "unfinished business" of pragmatism (Emirbayer and Maynard 2011). Pragmatism, ethnomethodology, phenomenology, structuration and praxeological scholarship—to identify what these diverse theoretical perspectives have in common, we might say that they are all theories of practice.

Many researchers orient their investigations based on one of these schools of thought. However, the notion of a *turn to practice* in social theory invokes the body of work as a whole. The conversation about sociomaterial practices emerged within this turn to practice, explicitly recognizing pluralism rather than any one theory as its native conceptual terrain. Thus if we are to trace links between pragmatic design issues, pluralism and studies of sociomaterial practices, we must first examine the broader tradition of pluralism in practice studies.

Theories of practice emphasize habitual activity and the concrete details of how people perform their daily work, with a process-oriented and relational view of social phenomena as ongoing accomplishments. They locate 'the social' not in the individual behavior of classic psychology or the social norms and structural determination of classic sociology, but in concrete practices. Reckwitz (2002) describes practices as "routinized forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge" (p. 249). In ordinary use the word practice may simply refer to how people work or play on a regular, habitual basis. Practice theories generally also hold that a practice "forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements" (Reckwitz 2002, p. 250).

Nicolini (2012) identifies seven important bodies of practice theory: 1) the 'praxeology' of Bourdieu and Giddens; 2) practice as tradition and community; 3) Marxist perspectives on practice as activity; 4) practice as accomplishment in the ethnomethodological tradition; 5) conversation or discourse as practice; 6) Heideggerian and Wittgensteinian views of practice as "the house of the social;" and 7) pragmatism, which has received more attention in the Americas than among Nicolini and other European theorists. There are obvious and important differences among these schools of thought, yet Nicolini makes a compelling argument that they nonetheless bear a recognizable *family resemblance*. Like Nicolini, I use the term family resemblance in reference to Wittgenstein's observation that we do not

typically recognize the relatedness of things such as games or the faces of family members based on any one essential common feature. Rather, they are connected by a series of overlapping similarities which typically are clearly recognizable, even if we cannot identify a single feature shared by all. This observation bears extended reflection because it is the logical basis of pluralism for many practice scholars. It would be myopic to consider only the differences between various streams of practice theorizing, if we did not first recognize that their common vision of *homo practicus* is clearly distinguishable from the rational *homo economicus* and the classic norm-following *homo sociologicus*.

Kuutti and Bannon's (2014) review of the turn to practice in systems design builds explicitly on Nicolini's work. Rather than attempting to synthesize these diverse theories of practice, they observe that Giddens' (1984) structuration theory has influenced information systems research, ethnomethodology has gained prominence in CSCW and activity theory and phenomenology have been important in participatory design. Each of these communities subsequently interlaced with other branches of technology and design research in important ways. Over time, many scholars have begun deliberately switching among these kindred theoretical sensitivities in order to better grasp distinctive features of particular cases. This generally has not entailed any attempt to systematically unify or homogenize practice theories conceptually. Rather, drawing on a toolkit of practice concepts and sensitivities, while committing to "hold our tools lightly" (Weick 1996) has become a matter of course for many practice scholars. Nicolini calls this "programmatically eclectic," or more simply, toolkit pluralism (2012, p. 213–215).

Ethnomethodology poses an important test for this pluralism, for it stands apart from theories that posit a conceptual map or explanation of practices. Ethnomethodology revolves around a particular order of phenomena which it calls ethno-methods, the practical activities or work through which people accomplish the general orderliness of their daily lives. Ethnomethodologists begin with the premise that these ways of life are locally produced and incredibly diverse, so they reject accumulating abstract knowledge about the *general* form or characteristics of practices. Ethnomethodology does have key concepts (e.g. accountability, reflexivity, indexicality, membership), yet Lynch (1997, p.18) likens these concepts to "a ticket that allows entry into the ethnomethodology theatre, and is torn up as soon as one crosses the threshold" of empirical field studies. For this reason, ethnomethodologists argue that practices should always be theorized through concrete empirical examples and detailed descriptions rather than being slotted-in to generalizable theoretical frameworks e.g. as instances of habitus, or an activity system (Suchman 2000).

Openness to ethnomethodology suggests that ways of theorizing particular practices through granular, empirically-driven field studies may be taken as seriously as contributions to the corpus of abstract generalizable theories. Pragmatically inclined studies are often seen as part of the practice discourse on similar grounds. Because ethnomethodology and pragmatism are skeptical of the kind of abstraction that characterizes other theories of practice, many classically trained sociologists regard

research in these traditions as lacking conceptual rigor or as offering “no contribution” (to theory). Yet the toolkit pluralism of Nicolini and many others recognizes relations with these schools of thought on the grounds that they bear a clearly recognizable family resemblance.

Like pragmatism, ethnomethodology bears reflection here not only because it shows the reach of meaningful pluralism, but also because it has been enormously influential in design research and practice. In fact, one important CSCW text refers to “ethnomethodologically-informed ethnography” as functionally synonymous with “ethnography” as far as systems design is concerned (Crabtree 2006, p. ix). In recognizing that Schön’s vision of design as reflective practice bears an unmistakable family resemblance to Suchman’s notion of situated action and other practice scholarship, we have located an important stream of design research in relation to the sociomaterial practice discourse that I review in the following section.

3. Sociomaterial practices

Despite widespread recognition that technology and social processes are at work in most organizations, Jackson et al. (2002) observe that many studies exhibit a “tendency to tilt,” focusing narrowly on one and neglecting the other. It is all too easy to write about the “social characteristics” of a workplace without reference to concrete materials, or to write about a product’s “functionality” without meaningfully documenting how it actually functions in practice. These studies may seem to make commonsense observations about a narrow topic, but when they overstate the importance of that topic in the larger course of events, they can end up implicitly promoting a light form of either social determinism or technological determinism. This problematic tendency is difficult to surface without extended theoretical reflection, because the idea that “the social” and “the material” are first and foremost separate concerns is baked into our research methods, research topics and even the organization of research disciplines. Latour (2005) argues that the tendency to tilt has to do with how researchers conceive of their remit, e.g. as ethnographers we are here to perform a study of “social practices.” We might try to explain how social or human factors shape technology, but this presumes that social factors were separate from material factors in the first place, which seems absurd when we consider practices holistically:

To distinguish a priori “material” and “social” ties before linking them together again makes about as much sense as to account for the dynamic of a battle by imagining, first, a group of soldiers and officers stark naked; second, a heap of paraphernalia—tanks, paperwork, uniforms—and then claim that “of course there exists some (dialectical) relation between the two.” No! one should retort, there exists no relation whatsoever between the material and the social world, because it is the division that is first of all a complete artifact. To abandon the division is not to “relate” the heap of naked soldiers with the heap of material stuff, it is to rethink the whole assemblage from top to bottom and from beginning to end (Latour 2005, p. 75-76).

While such concerns had been percolating for some time, particularly in science and technology studies, Orlikowski struck a chord in 2007 with a provocative essay titled, *Sociomaterial Practices: Exploring Technology at Work*. She begins with the premise that materiality is inextricably bound up with *all* cooperative work and goes on to argue for studying sociomaterial practices in ways that recognize “the constitutive entanglement of the social and the material in everyday life.”

A year later Orlikowski and Scott (2008) undergirded this discussion of sociomaterial practices with an extensive review of research published by four leading organizational theory journals in recent decades. They observe that 95% of this research does not acknowledge the presence of technology, despite the obvious ubiquity of technology in organizational life. Rather than interpreting this trend as coincidence or mere oversight, they argue that it speaks to underlying problems with how we have theorized the “social” processes of workplaces as somehow separate from materiality. They then review studies that specifically concern technology and argue convincingly that most of this work can be grouped into three streams of research. Reviewing their outline is important because it provides the basis for a discussion of the family resemblance that characterizes each stream of research.

In the first stream, technology is a discrete entity with inherent characteristics and it may be studied in terms of its diffusion or for how it influences social or organizational phenomena. Generally adopting a variance perspective that is amenable to statistical analysis, technology is often posited as an independent or moderating variable. While this perspective has lost favor in CSCW and IS, it remains alive and well in other disciplines that study technology. For example, much of the research involving digital technologies in lower income settings currently takes place in the nascent fields of mHealth, eHealth and digital health, which are conceptually based in public health and medicine and remain solidly within the first stream.

A great deal of CSCW research falls closer to a second stream of research, in which “technology is understood as part of the complex process through which organizing is accomplished” (Orlikowski and Scott 2008, p. 446). In this process-oriented view, the ways that people interact with technology are taken to change over time and from context to context. Technology and situated human activity are understood as mutually dependent and co-evolving.

Research stream II rejects the implicit technological determinism of stream I and it is more amenable to taking processes of design and emergence seriously. However, it still begins with the idea that technology and ‘social practices’ are distinct in their fundamental nature or ontological form, and therefore analytically separable. Implicitly or explicitly, this ontological premise of separateness precedes any attempt to document how they relate to or impact one another. When technology and work are seen as first and foremost separate, it remains all too justifiable writing about social practices or cooperative work in ways that wholly neglect concrete materials, as if there were any companies that do not have to deal with technologies, buildings, infrastructure etc. On the other hand, even accounts of technology design,

implementation or use often focus so narrowly on social dynamics that they neglect to describe in detail how the technology actually works and whether its form or operation might have shaped certain turns in the course of design and implementation. Either way, concrete material “vanishes from view in the preoccupation with the social” (Orlikowski 2007, p. 1437). For this reason, Orlikowski and Scott (2008) conclude that starting from a place of analytical separateness has engendered the problematic ‘tendency to tilt,’ even in the second stream of technology research.

Addressing this problem is the central contribution of their 2008 paper, which is appropriately titled *Sociomateriality: Challenging the Separation of Technology, Work and Organization*. They argue that a third school of technology research is emerging and could be helpfully recognized with the umbrella term sociomaterial practice. This term expresses the aspiration of writing about human activity and materiality more holistically, such that neither systematically fades from view when we write about practices. The term further implies that this will only be accomplished with a clear transition in our implicit unit analysis, away from human actors and objects as essentially self-contained entities with inherent properties that are somehow prior to complex interactions. Instead, it places whole practices as analytically and ontologically prior—whole in the sense that they are saturated with recurring relations among the myriad materials and humans that co-produce the practice at hand. This view implies that materiality is *inevitably* integral to how practices are performed, and further that it typically shapes how they emerge or change over time. That is to say, it considers the qualities or features of objects in a performative idiom, taking their agency seriously whenever materials make a difference in shaping everyday life.

Orlikowski and Scott attribute the term sociomaterial to Suchman (2006a) and Mol (2003) and develop it further in relation to feminist work from science and technology studies (Barad 2003), Pickering’s Mangle of Practice (1995) and Actor Network Theory (Callon 1986; Latour 2005). Not all of this broader work emphasizes practice concepts, yet Orlikowski and Scott explicitly situate sociomaterial practice as an “umbrella term,” within social theory’s practice turn. Emphasizing the pluralism inherent in this body of thought, they observe (p. 462) that, “attempts to identify an encompassing, systematic ‘practice theory’ have largely given way to the suggestion that the concept of practice is most effectively used as a way of framing and orienting research (Schatzki 2001, p 4.)” They offer “some thoughts” about how research in this vein might be framed, “without wishing to preclude any approach to studying sociomateriality” (p. 463).

These works sparked a surge of sociomateriality papers: at the time of this writing Orlikowski and Scott (2008) has 1403 Google Scholar citations and Orlikowski (2007) has 1932. While the debate has been most dense in information systems journals, CSCW researchers have clearly been part of the conversation. This success has engendered three trends that motivate this essay’s call for room for silence.

3.1. Sociomateriality: a fashionable buzzword?

The first is the flippant use of the term sociomaterial practice in ways that are not recognizably distinct from research stream II above. Some would even say that sociomaterial practice became a buzzword. Attendees of conference meetings such as the Agency, Materiality and Practice workshop at the European Group for Organization Studies in 2014 will recall extended discussion of how and why the term sociomateriality was being used in writing that largely retained the citations and analytical tendencies of research stream II.

3.2. Clarifying and elaborating the concept of sociomaterial practices

The second trend, which is in some respects a response to the first, has to do with theoretical clarification and elaboration. For example Jones (2014, p. 895) says of the recent surge of sociomateriality papers that, “only a few, however, address all of the notions that Orlikowski suggests are entailed in sociomateriality, namely materiality, inseparability, relationality, performativity, and practices, with many employing the concept quite selectively.” Such work is helpful when taken for educational purposes, as a critical response to sociomateriality trending as a buzzword. However, if taken as a definitional rulebook or list of required conceptual elements, a structure for empirical details to be slotted into, it would strike some as more stifling than illuminating. It certainly would be more confining than the open-ended provocations of Orlikowski (2007) and Orlikowski and Scott (2008).

Whether explicit treatment of each of these notions is optional or required hangs in part on a discussion of whether there is “anything new” about sociomaterial practice as a conceptual category. Many information systems and CSCW researchers had already drawn on Actor Network Theory (Monteiro and Hanseth 1996; Walsham and Sahay 1999) and the software tool and material approach (Ehn and Kyng 1986; Ehn 1988). The latter work is based on Heideggerian phenomenology (Heidegger 1996; Dreyfus 1991), which has subsequently been recognized as a sophisticated philosophical basis for the study of sociomaterial practices (Sandberg and Tsoukas 2011). Critical observers (e.g. Kautz and Jensen 2013) have highlighted that sociotechnical systems theorists were critiquing the artificial separation of technical and social phenomena as early as the 1950s! As such Barley et al. (2011) write, “although one could use ‘sociotechnical’ as a synonym for ‘sociomaterial,’ we prefer the latter term because it has fewer historical connotations.” Even without the historical connotations of systems theorizing, we would do well to recall Reckwitz’s (2002) definition of practices, in which the integral components of human activity and various concrete

materials were not to be analyzed separately from the practice as a whole.² Thus Jones (2014, p. 899) quite rightly observes that materiality, inseparability, relationality and performativity were already central themes for many practice theorists—for careful students of Reckwitz, the term sociomaterial practices is mildly tautological.

In light of these concerns, Jones (2014) suggests that sociomateriality is theoretically novel enough to be worth our time, but only if we attend to all of the five key notions which can be isolated from Orlikowski and Scott (2008). This orientation to general definitions places a premium on the categorical novelty of abstract concepts, when it comes to proving that a study offers a conceptually rigorous and ‘real’ contribution to learning. This risks implying that new conceptual language is only worth embracing if it plugs ‘gaps’ in the corpus of theories. This is a markedly different tack than examining whether any particular example of empirically-driven writing bears a family resemblance that is recognizably distinct from research streams I and II. It is also different than, for example, suggesting that we reflect on all five notions when we read relevant studies and try to understand how the concept of sociomaterial practices might be generative in our own research. This abstract definition-oriented tendency cannot be wholly separated from the third trend that merits our attention.

3.3. Turf wars

The third trend engendered by the sudden and striking success of the sociomateriality discourse is turf wars. In 2013 Mutch published a critical essay titled *Sociomateriality: Taking the Wrong Turning?* Recounting his full argument is beyond the scope of essay; I will only draw attention to the fact that Mutch favors critical realism and that his critique rests on taking the term sociomateriality as more or less synonymous with Barad’s (2003) philosophy of agential realism, which Orlikowski and Scott have favored in subsequent empirical studies of sociomaterial practices. Scott and Orlikowski’s (2013) response to Mutch briefly defends their use of Barad’s work, but in the main their response is an urgent plea for pluralism and openness in technology research: “If there is a measure of healthy scholarship then it is surely our capacity to sustain the conditions that foster openness and experimentation in the framing and doing of our research endeavors” (2013, p. 77).

Subsequently there have been many responses and responses to the responses; Mutch’s essay now has 153 Google Scholar citations. In one of the more widely cited responses, Leonardi (2013) argued that there is room for both agential realism and critical realism in studying sociomaterial practices. Critical realism is particularly

² The ethnomethodological notion of *indexicality* is relevant here; for an explanation of the concept in technology research, see Suchman (2006a, p. 77). Most writing on sociomaterial practices treats this concern in reference to the notion of *relationality*, which Feldman and Orlikowski (2011, p. 1242) describe as the view that “no phenomenon can be taken to be independent of other phenomena.”

suiting to Leonardi's (2011) prior work on the metaphor of imbrication, which suggests "the gradual overlapping and interlocking of distinct elements into a durable infrastructure as one useful way to think about the process by which the social and the material become the sociomaterial" (Leonardi 2013, p. 70). More recently Niemimaa (2016) explained the differences between sociomaterial radicals (agential realists) and sociomaterial conservatives (critical realists) with the aim of supporting a well-informed pluralism in which researchers avoid mixing perspectives into inappropriate "conceptual *mélanges*." In response to Niemimaa, Cuellar (2016, p. 60) argued that "critical realism is not properly part of the sociomaterial stream of research as it violates the five basic notions of sociomateriality (Jones, 2014)." Use of the word *violate* is noteworthy; it implies that Jones' (2014) five notions have ossified or been upgraded to the status of required conceptual elements, now commanding a stricter and more rule-based allegiance than may initially have been intended.

Contributions to these turf wars have generally been highly philosophical in tone, many offering no empirical material at all. While most tip their hats to Scott and Orlikowski's (2013) or Leonardi's (2013) calls for pluralism, to my knowledge none substantively address the conceptual nature or practical quality of this pluralism. The pluralism that most of these papers take for granted is onerous. It forces the taking of philosophical 'sides' at the expense of relevance to practice, and as I will argue in the following section, it is not the only form of pluralism available to us.

4. Does sociomaterial invoke an ontology or ontologies?

A pragmatic response to the criticism that there is "nothing new" about studying sociomaterial practices would be that concepts are tools and they are worth the work we are able to do with them. The evidence that the term sociomaterial practice has analytical purchase is to be found not only in the surge of citations but in the way that discussion of the term has helped people to recognize and correct the problematic *tendency to tilt* that Orlikowski and Scott (2008) documented in technology research streams I and II. Taking this critique seriously gives shape to the particular family resemblance by which we can distinguish substantive studies of sociomaterial practices from how stream II studies tend to theorize practices. The question of family resemblance can only be worked out on a case by case basis though; in this way it is different than recourse to required elements or sorting concepts into tidy categories. Whether we choose to debate family resemblance on a case by case basis, or instead address the question of "what's new" by debating general philosophies in the abstract, hangs in part on how we take the term sociomaterial to relate to the topic of ontology.

For the purposes of this essay, let us use the term Ontology to refer to the sort of philosophical theory of all objects that Pickering (1995, p. 246) forthrightly calls a "theory of everything." Insofar as an Ontology (with a capitol O) such as agential realism or critical realism is developed in reference to empirical study, we might also

refer to it as an empirical philosophy. In contrast, let us discuss ontologies (all lower case) in reference to the nature and composition of particular historically locatable things and practices. A key difference is that we can sensibly discuss ontologies in the plural. There are multiple kinds of things and practices in the world; for example, salmon are ontologically different in kind than sewing machines. Yet an intellectually coherent position can have only one Ontology. There is no conceptually coherent universe in which Pickering's (1995) mangle of practice fully co-exists with Barad's (2003) agential realism or with the critical realism of Mutch (2013). If taken in their full measure, such grand and totalizing Theories supersede comparable alternatives.³ In contrast, historical ontology in the tradition of Hacking (2002) tends to remain more grounded in concrete cases, as is the tendency for a great deal of empirical work in science and technology studies (Lynch 2013), anthropology (Livingston 2012) and CSCW. If in doubt about whether a particular body of work is better understood as ontological or Ontological, any theory (or philosophy) branded as an "-ism" is likely of the more totalizing kind. In a sense, this essay explores whether Orlikowski's (2007) seminal exploration of sociomaterial practices is being reformatted as a kind of sociomaterialism. The shift appears to be well underway, as Orlikowski's (2007) seminal paper explored sociomaterial practices, a year later Orlikowski and Scott (2008) discussed sociomateriality and some now write of a sociomaterialist perspective (Niemimaa 2016).

If Leonardi (2013) and others are to be believed, it is entirely feasible to cultivate a research community or even an *-ism* in which intellectually incommensurable perspectives are at least tolerated. Suppose one researcher studies algorithmically hybridized orange juice and another the cultivation of genetically rare heirloom apples. The orange researcher may embrace agential realism while the student of apples defends critical realism. A healthy pluralism will grant that both studies should be potentially publishable, that their agreeing to disagree is a less bad option than disqualifying either party *a priori*. In practice this kind of pluralism has proven onerous though; having been assigned peer reviewers from the competing branch of the sociomaterial practice discourse remains a regular topic of handwringing and hushed corridor talk. Some anonymous reviewers are particularly blunt about which variants of sociomateriality "make sense." Thus a kind of lip service-pluralism seems to be the status quo for the sociomaterial practice discourse at the present time.

An alternative perspective would take these two examples not as sweepingly generalizable (and therefore contradictory) studies of critical realism and agential realism but merely as studies of apples and oranges. Apples are different than

³ Reckwitz (2002) underscores this distinction through reference to the German: "First of all, it is necessary to distinguish between 'practice' and 'practices' (in German there is the useful difference between Praxis and Praktiken). 'Practice' (Praxis) in the singular represents merely an emphatic term to describe the whole of human action (in contrast to 'theory' or mere thinking). 'Practices' in the sense of the theory of social practices, however, is something else. A 'practice' (Praktik) is a routinized type of behaviour which consists of several elements, interconnected to one other."

oranges. Moreover, some apples may be ontologically different than other apples. Pragmatic concerns such as designing digital procurement systems or even global trade deals that are fair to organic or heirloom apple orchardists may depend on whether we understand these differences through serious field studies that produce sufficiently granular empirical insights. Concrete arguments about the nature of orange juice are unlikely to undercut pragmatic concerns about the nature of apples; it is only in the clash of Ontological philosophies that these studies may seem to discredit each other and engender urgent cries for pluralism. As Lynch (2013, p. 446) puts this distinction, “an empirical treatment of topics associated with ontology should not be confused with the adoption or advocacy of a philosophical theory of objects.”

The alternative tack of exploring ontologies and the multiplicity of practices runs close to the anti-monism of Mol in *The Body Multiple* (2003). In a piece introducing the Japanese translation of her influential book (Mol 2016), she explains that she was in some respects inspired by the story of a friend’s relative who prayed at Shinto shrines in the morning and Buddhist temples in the evening. He found no apparent contradiction or tension in this habit because his religious practice was simply that, *a practice*, not systematic philosophy. In Mol’s view, multiple kinds of practices often go side by side or tangle together in ways that universally generalizable and infinitely applicable philosophical positions cannot. Some would say that this kind of anti-monism is vital for any lively and politically relevant pluralism. As one of the last century’s most astute observers of pluralism wrote, it affords “the ideal of freedom to choose ends without claiming eternal validity for them” (Berlin 2000, p. 242).⁴

For some, preference for Ontology or ontologies, for sociomaterialist stances or exploration of sociomaterial practices, will return us to the question of how contributions are judged to be theoretically rigorous or to offer “anything new.” Doing field studies to investigate the production or ontological form of particular sociomaterial practices—say becoming homeless amidst a tech boom or breastfeeding in engineering workplaces or skipping school in a digital age—will be regarded by some as contributions to theory on those topics. Others will treat such scholarship as “merely” empirical contributions, particularly if they have been primed to expect lengthy discussion of agential realism or some other *-ism* that feigns Theoretical or Ontological relevance to all the technology in all the workplaces. Will our collective sense of finitude allow for writing about sociomaterial practices in both ways, or will the exigencies of peer review require Ontological contributions of grander stature? In other words, is the sociomaterial practice discourse willing to grant field workers *room for silence* with respect to Ontological debate?

⁴ In his classic essay on pluralism, Berlin goes on to argue that there are two kinds of freedom and that they are both vitally important in practice, yet conceptually irreconcilable. The stubborn search for a “final solution” that reconciles them or determines which matters more is, he argues, a rejection of pluralism and a basis for totalitarian thinking. See also Karl Popper’s (2013) *The Open Society and Its Enemies*, including the luminous introduction by Václav Havel.

The question may seem like yet another matter for categorical debate. Categorical, definitional debate presumes that the one correct answer will be found or, if agreement cannot be reached, that the taking of sides will be inevitable. This presumption is unnecessary if we reframe consideration of Ontology and ontologies as at least partially a question of pluralism. With this reframing, we would not necessarily draw away from discussion of Ontologies. We need not choose to remain ignorant of the concept of sociomaterial practices, or the problematic *tendency to tilt*. However, we would ask on what grounds we limit ourselves exclusively to the pluralism of taking sides when it is also conceptually sound and practical to see that some field studies are as incomparable as apples and oranges. In the following section I will argue that this more sweeping pluralism is necessary if we are to welcome contributions informed by ethnomethodology. That is to say, room for silence is necessary if the study of sociomaterial practices is to remain as openly plural as the broader turn to practice from which it emerged.

5. Ethnomethodology and room for silence

Questions of what constitutes a theoretically robust contribution speak to how we understand rigor and regulate the porous boundaries of a scholarly dispute domain. As I suggested in the opening paragraph of this essay, such debate often involves selective homage, critique or neglect of particular aspects of disciplinary genealogy. Most recognize that the sociomateriality discourse emerged from within the practice perspective. Some even note the pivotal influence of Lucy Suchman, who introduced many technology researchers to ethnomethodology in *Plans and Situated Actions* (1986) and to the notion of sociomaterial practices in the second edition of the same book (2006). For our purposes this genealogy is quite important. If there is any room for ethnomethodology in the study of sociomaterial practices, and the pragmatic contributions to systems design which such studies have afforded, then there must be room for silence when it comes to slotting findings into abstract Ontological debates.

My notion of room for silence is based on a scene described by Lynch (1999) and recounted in the introduction to this essay. The prominent ethnomethodologist Harvey Sacks was asked, “if I put a gun to your head, and asked you to name the theorist who had the most influence on your work, who would you mention?” After a long and dramatic silence, Sacks quietly declined to answer the question. Were a novice or nervous person to fall silent on stage, the audience may not clearly see why. But in other cases, in light of context, silence speaks volumes. In the curious case of Harvey Sacks on stage, one pictures a towering and magisterial silence.⁵

To place Sacks’ silence in theoretical context, Lynch goes on to describe two theoretical concepts that are central to ethnomethodology and that are of lasting relevance for the study of sociomaterial practices. The first of these is “unique

⁵ For a more recent, Wittgensteinian treatment of silence as communicative action, see Williams (2014).

adequacy.” While Garfinkel’s writing on this matter is deeply convoluted, Lynch draws our attention to the fact that people who have attained real mastery in a practice have necessarily discovered means of distinguishing competent performance from incompetence. These methods are typically unique to the practice in question. Competent doctors have unique perspective on how doctoring is accomplished, as do lawyers in judging the performance of fellow lawyers and designers in designerly ways of knowing. We might employ the standardized methods of professional sociology to understand the accomplishments of designers, but will practicing designers judge these methods to be adequate for distinguishing masterful from immature or incompetent design work? When understood as a standard of methodological rigor, unique adequacy requires researchers to become so competent that fellow practitioners will take their findings as seriously “instructive in and consequential for” (Livingston 1986, p. 6) their ongoing work.

The second ethnomethodological concept that Lynch discusses is an attitude of analytical “indifference.” At first blush this may imply a detachment from the practitioner’s pragmatic concerns. It is true for example that an ethnomethodological study of surgical practice will focus on how surgical procedures are “achieved” by particular teams, rather than whether their practice is optimal in safety, efficiency or fairness. At the same time, practicing indifference does not entail freeing oneself from prior theories and potential sources of bias in the empiricist sense embraced by some proponents of grounded theory (Suddaby 2006). It is not a matter of embracing a strictly methodological and empirical program while systematically ignoring theoretical debates. Whatever critiques we might reasonably direct at ethnomethodology, we can be sure that Garfinkel’s preoccupation with Durkheim’s aphorism in *Ethnomethodology’s Program* (2002) was no exercise in neglecting social theory. Suchman’s (1987) *Plans and Situated Actions* is hardly light on theory, and Sacks’ knowing silence was no sign of mere ignorance. As Lynch (1999, p. 221 italics original) puts it, “indifference is not a matter of *taking something away*, but of *not taking up* a gratuitous ‘scientific’ instrument: a social science model, method, or scheme of rationality for observing, analyzing, and evaluating what members already can see and describe as a matter of course.” Researchers working in this vein might benefit from reading Ontological works and they might knowingly beware the problematic *tendency to tilt* that characterizes so much social research, even while viewing the adoption or advocacy of an Ontological philosophy with indifference.

Taken to a radical extreme, unique adequacy and an attitude of indifference could undercut every general methodological rule, analytic procedure or evaluative criterion.⁶ Taken in more modest measure, they still suggest that participant observers should actually participate (rather than merely shadowing), attain real competency in the practices they study, and write in a way that reflects their competency. That is to

⁶ This point of clarification is significant because it is often misrepresented in the CSCW research community. The ethnomethodological principle of indifference applies to ethnography *as a formal method* as much as it applies to any of the formal theories that ethnographers may employ.

say, they constitute a strong version of the ethnographic program of understanding ordinary ways of life from a native point of view. Once made explicit, it becomes clearer that this indifference to grand *-isms* surfaces frequently among ethnographers, particularly those whose work bears the influence of ethnomethodology. Suchman (2006b, p. 325) puts it succinctly in a telling book review:

Why, rather than indexing a complex and internally variegated (even contentious) discussion, do either cyber or technofeminism become isms? What does it mean to coin an 'ism', rather than (just) to enter into a collective and multi-vocal discussion with one's own, particular line of argument?

She offers a similar perspective in the introduction to her book *Human-Machine Reconfigurations* (2006a, p. 1–2) which merits consideration because, again, it was the first major work to introduce the notion of sociomaterial (no hyphen) practices to an audience of technology researchers:

Casper (1994) proposes that discussions of nonhuman agency need to be reframed from categorical debates to empirical investigations of the concrete practices through which categories of human and nonhuman are mobilized and become salient within particular fields of action. And in thinking through relations of sameness and difference more broadly, Ahmed (1998) proposes a shift from a concern with these questions as something to be settled once and for all to the occasioned inquiry of “which differences matter, here?” (ibid. p. 4). In that spirit, the question for this book shifts from one of whether humans and machines are the same or different to how and when the categories of human or machine become relevant, how relations of sameness or difference between them are enacted on particular occasions, and with what discursive and material consequences.

This perspective has clear implications for the acerbic debates that we discussed earlier. Reserving room for silence does not entail discrediting works in the mold of agential realism or critical realism or mangle of practice, far from it. But it does involve openness to a thoughtful ‘not taking up’ of such grand theoretical narratives when we put our findings in print. Writing in this vein holds potential to re-specify the challenge of grasping sociomaterial complexities as something that practitioners do as a matter of course in their ongoing work. This repositions the ethnographer as an apprentice and an explorer who systematically documents what practitioners already sense about how their work is caught up in the material world. This is a sharp departure from the tendency to position the ethnographer as an expert theorist who perceives sociomaterial complexities that practitioners lack the theoretical training to see for themselves. When a commitment to pluralism (rather than outright rejection of theoretical concepts) is our logical basis for allowing this re-orientation to abstract theory and re-specification of the role for empirical inquiry, we are granting what I call room for silence.

Some will no doubt expect ethnomethodologically informed studies to justify their approach more capably than I have managed here. However, given ethnomethodology's central place in CSCW research, in the turn to practice and in seminal studies of sociomaterial practices, we really should reverse the onus of explanation. In light of Suchman's ethnomethodological leanings and Mol's anti-monism, why not pursue a more lively pluralism? This would allow for studies that ask, how are sociomaterial complexities relevant in the concrete practices we observe, here? With the question of relevance we return to how pluralism and practicality are related, and to how both might be addressed through the orientation to theory that affords room for silence. In the final portion of this essay I offer a concrete case of how sociomaterial complexities may be relevant for practice, and at the same time illustrate how room for silence enables us to emphasize matters of great human concern.

6. The 2013–2016 Ebola outbreak in West Africa

By May 2016, the World Health Organization had reported 28,616 suspected Ebola cases and 11,310 deaths, mostly in Guinea, Liberia and Sierra Leone (WHO 2016). While far from offering the depth of an ethnographic field study, the following analysis draws on extensive news reports, blog posts and peer-reviewed literature, four public lectures by Ebola responders (including two by leading authority Paul Farmer) and dozens of informal conversations with colleagues who were involved in the Ebola response. Such a dataset clearly lacks the granularity needed for an authoritative, design-oriented account of the outbreak. Nonetheless, I was able to identify three themes that merit further attention.

6.1. Failure to imagine the limits of technical fixes

First, some well-meaning humanitarian efforts were remarkably naïve about what material goods to send and how these might be used to address the outbreak. As reported in *Fast Company* (Brownstone 2014) and *Politico* (Allen 2014), tech giants including Google, Amazon and Ericsson, and techie charities including the Paul G. Allen Foundation donated thousands of smartphones to the Ebola response. We might acknowledge the eminent reasonableness of players in tech focusing on what they do best. Yet there is an obvious tone-deafness in sending smartphones to health workers who were dying in waves for lack of rubber gloves and masks that would have made patient care safer (Dahn et al. 2015). A senior innovation advisor at UNICEF went so far as to say that, "it might be better to dump the smartphones into the ocean than to dump them onto the Ebola emergency response" (Allen 2014).

The choice of smartphones, powerful computing machines that must be charged daily, betrayed ignorance of the infrastructural shortcomings (including poor access to electricity) that enabled Ebola to spread in the first place. Some would call it a failure of imagination (Farmer 2013), in which the path of intervention reflected the

well-meaning technocratic preconceptions of foreign aid workers more than pragmatic and empathetic cooperation with people who were struggling, and often failing, to survive. To be sure, the Ebola outbreak was exacerbated by intense communication challenges, but these had to do with poor coordination and running out of airtime for phones people already had to hand, not a lack of computing power. Such feckless attempts at digital intervention highlight the need for rapid, nuanced and design-oriented field studies of local work practices, to inform outbreak response.

6.2. Immodest claims of social causality

Second, a steady stream of news reports commented on “traditional burial practices,” observing that customary ways of touching the bodies of the deceased had enabled Ebola to continue spreading. Anthropologists were called on to help healthcare organizations understand these practices. These social explanations of burial practice persisted despite widespread recognition that rubber gloves had run entirely out of stock in many places (Dahn et al. 2015). Few news agencies plumbed the moral implications of these claims—that West Africans were ignorant, rather than, say, courageous and caring beyond measure, for burying their loved ones even when they lacked the means to do so safely. Taken in isolation, such social claims all too easily suggest that thousands of West Africans died because of their “local culture” rather than because they were poor, because local clinics and the health workforce had been decimated by decades of civil war and under-investment.

Narrowly focused claims about the “social characteristics” of a humanitarian crisis can direct attention away from the widespread scientific consensus that this pathogen could never have proliferated in regions with relatively robust material infrastructure for public health. Farmer (2003, p. 216–220) has argued that such immodest claims of social causality often play out when social scientists attempt to explain infectious disease outbreaks and other drivers of human suffering in terms of their own niche field of expertise, without sufficient grounding in the pragmatic realities of responding to such cases. Clearly, there is a need to anchor social analysis of the Ebola outbreak in concrete practices of care.

6.3. Recognizing biosocial and sociomaterial complexities

In this way we observe a problematic *tendency to tilt* toward either simplistic presumptions about what technology will fix, or narrowly social explanations of what are in fact more complex affairs. Farmer’s antidote to simplistic technocratic and biomedical claims on the one hand, and immodest claims of social causality on the other, is a more integrated approach to biosocial analysis of outbreaks (Farmer 2000). This approach seems highly appealing when we consider how Ebola survivors were subsequently enlisted as workers in the Ebola response. For example, when Ebola

spread to the home of Liberian nursing assistant Salome Karwah (Figure 1), the disease killed her mother, her father, her brother, aunts, uncles, cousins and a niece. Salome, her sister and her fiancé survived. According to TIME magazine:

Karwah used to joke that survivors had “super powers” — because after overcoming the disease they were forever immune from it. Like any superhero, she often quipped, it was her moral duty to use those powers for the betterment of humankind. So as soon as she recovered, she returned to the hospital where she had been treated — the Médecins Sans Frontières (MSF) Ebola treatment unit just outside of the capital, Monrovia — to help other patients. Not only did she understand what they were going through, she was one of the rare people who could comfort the sick with hands-on touch. She could spoon-feed elderly sufferers, and rock feverish babies to sleep (Baker 2017).

Salome Karwah was not alone in this work; her fellow survivors were actively recruited. By mid-2015, fully one quarter of the 1500 Ebola responders employed by the charity Partners in Health were Ebola survivors (Farmer 2015b). Mobilizing Ebola survivors in a campaign to contain the disease seems to suggest a remarkable form of biosocial organizing. And never does cooperation seem more central to the human condition than when we see it in responses to such terrible adversity.⁷ When we study how these practices emerged and try to explain why they emerged in this form and not otherwise, we should avoid any facile tendency to tilt towards whatever causal explanation suits our discipline’s topical/methodological interests or might ‘make a point’ in the latest theory-governed discourse. In fact, many proponents of biosocial analysis would urge us to look much further afield and more deeply into history, to how centuries of extractive colonialism and deforestation, slave-trading and ongoing human rights abuses “continue to be embodied as viral disease in West Africa” (Richardson et al. 2016, p. 1).

At first blush, biosocial analysis would seem similarly helpful in explaining the Ebola-driven “outbreak of outbreaks.” Ebola so extensively disrupted routine health services, including immunization for Measles, that it has been estimated more people will die from Measles as a result of Ebola than will die from Ebola directly (Takahashi et al. 2015). This has to do with the fact that many were reasonably afraid of clinics during the outbreak and may still be avoiding them. Additionally, the higher survival rate for measles infection is offset by the fact that it is more contagious and thus operationally more difficult to contain than Ebola. Perhaps most importantly, clinics remain urgently understaffed because so many health workers died of Ebola. It would be impossible to explain these events without reference to both the biological basis of infectious disease and the social conditions in which the

⁷ This story may seem all the more poignant and complex in light of news that Salome Karwah recently died in childbirth, in part because fellow health workers were afraid to touch an Ebola survivor who unexpectedly began to have seizures after giving birth (Baker 2017).



Figure 1. Ebola fighter Salome Karwah as TIME person of the year

outbreak occurred, yet the materiality of the case clearly extends beyond the biological. It was widely reported that a primary disruption in routine health services was the death of health workers who ran out of personal protective equipment: rubber gloves, masks etc. (Dahn et al. 2015) and were unable to coordinate with parties that might have resupplied them. Routine health system monitoring data now show that the rate of immunization for Measles dropped precipitously, with somewhat predictable consequences for future outbreaks.

The mass die-off of health workers was driven at least in part by an incredibly high case fatality rate: as of 2015 roughly 70% of those infected with Ebola had died. Yet among those transported to European and American hospitals, case-fatality rates were under 20% and among American citizens flown home, not a single person died (Farmer 2015b). Such unequal outcomes, as seen in Figure 2, sparked a heated debate that played out in policy circles and in news media such as the New York Times:

Medical experts seeking to stem the Ebola epidemic are sharply divided over whether most patients in West Africa should, or can, be given intravenous hydration, a therapy that is standard in developed countries. Some argue that more aggressive treatment with IV fluids is medically possible and a moral obligation. But others counsel caution, saying that pushing too hard would put overworked doctors and nurses in danger and that the treatment, if given carelessly, could even kill patients... Even two of the most admired medical charities have squared off over the issue. Partners in Health... supports the aggressive

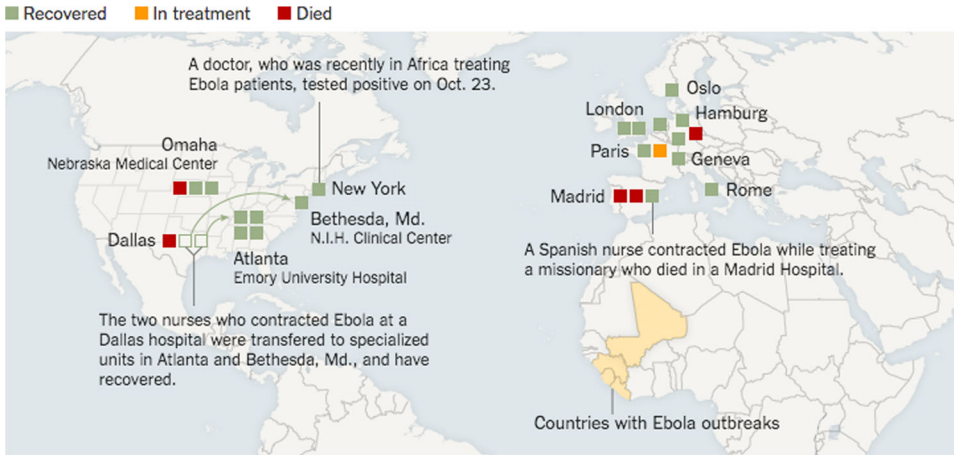


Figure 2. Cases of Ebola treated outside West Africa as of Jan. 5, 2015 Reprinted from Askhenas et al. (2015)

treatment. Its officials say the more measured approach taken by Doctors Without Borders is overly cautious. “M.S.F. is not doing enough,” said Dr. Paul Farmer, one of the founders of Partners in Health, using the French initials for Doctors Without Borders, whose staff members have worked on the front lines of Ebola outbreaks for years. “What if the fatality rate isn’t the virulence of disease but the mediocrity of the medical delivery?” (McNeil 2015).

Ebola patients can lose up to five quarts of fluid a day through diarrhoea and vomiting, and it is extremely difficult for patients to replace that amount of fluids and electrolytes by simply drinking oral rehydration salts. Yet it is also difficult to insert and monitor IV needles while wearing three layers of gloves and foggy goggles, not to mention donning full-body protective suits and working in clinics that lack air conditioning to mitigate the oppressive tropical heat. In fact, for the Ebola Treatment Units set up in tents or old abandoned school houses, it was difficult even to safely dispose of such large volumes of diarrhoea and vomit. Noting that Ebola patients produce roughly 40 times more waste than other patients, one Scientific American article opened with the blunt headline, *What Can Be Done with All the Ebola Waste?* (Maron 2014). The chilling implication of Farmer’s comment about mediocre care delivery is that, where only African lives were at stake, a socialized willingness to surrender to the challenge may have been more damaging than the challenge itself.

My broader point is that at the heart of the fiercest policy debates, the most urgent questions about the survival of those afflicted and the haemorrhaging of West African health systems, were a bundle of relatively mundane empirical questions about the nature of Ebola responders’ work practices. Operational complexities and social expectations about what kind of care Africans deserve (or can pay for) clearly played a role, as did concrete material realities. The materiality shaping the course of the outbreak clearly included and transcended biology, and thus the work practices of

Ebola responders are probably not well described as *social* or even *biosocial*, so much as *sociomaterial*. This third theme of my analysis of the Ebola outbreak—the entanglement of human activity and multiple kinds of materials in complex sociomaterial practices—is incredibly relevant to future field studies and to the design of technical systems to support cooperative responses to epidemic disease.

To this day, many medical experts see aggressive IV therapy as clinically impossible, given the concrete material constraints of West African health systems. Others continue to argue that whatever the technical and organizational challenges, simply accepting that Africans will experience dramatically higher case fatality rates is yet another failure of imagination. If the Ebola case fatality rate cannot be reduced without additional medical practices such as IV therapy, and these practices are only possible through a broader transformation of the sociomaterial practices that characterize West African health care, then the more holistic transformation is in order. Rather than fecklessly dumping smartphones on outbreaks, systems designers would do well to take this holistic health systems strengthening mandate seriously.

As a final point, I would like to recognize that practitioners and researchers were remarkably self-aware and vocal about these issues as the outbreak unfolded. In a series of essays for the London Review of Books Dr. Farmer called for more holistic investment in “staff, stuff, space and systems” in order to contain this outbreak and be ready for the next one (Farmer 2014, 2015a). These “Four Ss” have become something of a health systems strengthening rallying cry for many global health practitioners. In a similar vein, then-Director of the World Health Organization Margaret Chan (2015) highlighted the call to “build back better,” which had gained favor among Ebola responders. If these expressions withstand academic and policy critique, they may prove incredibly pragmatic. They offer preemptive responses to important questions such as: should organizations use funds earmarked for Ebola to address the Measles outbreak of outbreaks? Or, is building digital systems to train community health workers and address the general health worker shortage (Panjabi 2017), a meaningful way of dealing with the aftermath of Ebola and preparing for the next outbreak? We can hardly expect practitioners to address these questions with the language of ‘sociomaterial’ practices. Yet I would argue that more detailed field studies of concrete practices, in all their sociomaterial complexity, are precisely what we will need if we are to design interventions that honor their pleas for more holistic health systems strengthening.

7. Discussion of the empirical case

Reading the Ebola case in light of how it matters for future research and design efforts, the following paragraphs address three issues. First, I discuss the pragmatic relevance of this analysis in terms of human-centered design and humanitarian action. Second, I reflect on how the concept of sociomaterial practices informed the case analysis. Finally, I consider how the notion of ‘room for silence’ applies to this analysis, and with what pragmatic consequences.

7.1. Using this case to inform a more human-centered design practice

The case above highlights the emergent sociomaterial entanglements of Ebola pathogen and human bodies, means of burying the deceased, health systems infrastructure and coordinated distribution of protective equipment, the die-off of health workers and resurgence of the Measles pathogen. Today's empty clinics cannot be explained without attention to historical conditions and the recent failings of Ebola interventions, including some feckless attempts to intervene with digital technologies. The popular "build back better" slogan was generally used to communicate the importance of addressing these issues in a holistic, integrated manner. While this case description lacks the granular depth of an ethnographic study, it presents several insights that might inform future fieldwork or design projects.

The first will be obvious to the CSCW community: shipping hardware before having documented existing work practices and situational requirements is often problematic. If any still doubt the importance of studying cooperative work practices before deploying computing systems, the Ebola case provides yet another cautionary tale for our archives.

The second insight is more specific to the social circumstances of foreign-driven global health and humanitarian action in Africa and poor communities around the world. In this case the media repeatedly depicted the afflicted population's social and cultural practices as self-harming and the narrative was widely repeated among practitioners. Yet deeply entrenched social expectations—among foreign aid experts—about what kinds of care Africans deserve or can pay for may have shaped Ebola's path of destruction even more profoundly. Any attempt to document the social characteristics of such disease outbreaks should begin with careful consideration of whose social life ought to bear more serious scrutiny.

A final empirical insight is that focusing narrowly on technology, biophysical insights or social dynamics would be problematic in the Ebola case, given the remarkable sociomaterial complexity in how the outbreak emerged and continued to wreak havoc for several years. This perspective complements recent work on complex systems, including efforts to develop coupled models of poverty, disease and ecological change (Ngonghala et al. 2014), and attention to "syndemics" that emerge with the synergistic interaction of multiple diseases (Singer 2009). These insights should inform how designers think about their unit of intervention, as Kuutti and Bannon (2014, p. 3544) note, "for the Practice paradigm, a whole practice is the unit of intervention; not only technology, but everything related and interwoven in the performance is under scrutiny and potentially changeable, depending on the goals of the intervention."

With this broad sense of the practice as the unit of design and intervention, Ebola and other outbreak responders face an important decision about the high-level framing of their work. While it may seem like commonsense to frame Ebola efforts within a reactive "emergency response" paradigm, an alternative approach to humanitarian action would emphasize a longer term vision of health systems

strengthening. Whether implicit or explicit, such a framing might for example shape whether designers see it as possible or necessary to support intravenous fluid administration, or logistics systems for mundane medical commodities like rubber gloves. It might even lead design teams to look further afield, for example exploring digital learning systems such as the Community Health Academy (Panjabi 2017) as meaningful responses to the Ebola outbreak and safeguards against similar outbreaks in the future.

The debate about which of these approaches is more substantively human-centered should take place in reference to granular empirical studies of health workers' concrete practices. The promise of such studies is that, by making work visible (Suchman 1995), they may increase designers' ability to grasp the complexity of their endeavors. In this sense, this Ebola case builds directly on the tradition of practice-oriented design research that I reviewed at the beginning of this essay. Informed by Schön's view of reflective practice, Suchman's notion of situated action or kindred perspectives, such studies often emphasize how doubt, perplexity, material 'back-talk' or disruption can trigger reflection-in-action and situated problem solving. In this view, grappling with the complexity of emergent practices is something that good designers consistently do in the course of their work, as do users of technical systems. Design-oriented researchers have an opportunity to participate, observe and theorize these experiences in ways that make researchers and practitioners alike more perceptive and articulate. When pursued in this manner, pragmatic studies of sociomaterial practices would not necessarily refigure how designers must attend to the emergent complexity of practices, but they would suggest new ways of exploring and writing about what makes practices so complex. In this sense the concept opens up opportunities for design research, which I will discuss further below.

7.2. Using the concept of sociomaterial practices

My description of the Ebola outbreak is empirically-driven, and for some it may not be entirely obvious how the analysis was shaped by the concept of sociomaterial practices. Clearly I have maintained a degree of room for silence; anyone hoping to find Jones' (2014) five notions listed point by point or any defense of *-isms* will have been disappointed. The discerning reader may see that notions of practice, material agency, performativity, inseparability and relationality have each left a mark, though these marks are studiously subtle. On the basis of family resemblance, however, we can clearly recognize that this writing has more in common with other explorations of sociomaterial practices than with Orlikowski and Scott's (2008) characterizations of technology research streams I and II. I avoid the pitfall of tilting towards narrowly social or technological explanations, and yet neither do I presume this tendency to be problematic. I marshal evidence to *argue* that it would be problematic in this particular case. The tech-deterministic perspective is implicit in feckless attempts at digital intervention and the tech-utopian attitude that *smartphones will fix it!* Purely

“social” explanations are shown to be problematic in cases where they all too easily seem to blame people for the traumas they experience, eliding the crass materiality of poverty and the real sociomaterial complexity of the situation at hand.

This analysis would have been very different if I had never read about the concept of sociomaterial practices. The term sociomaterial reminds us that we study work to learn about the work, not the social characteristics of the work, but the whole, gritty and visceral experience of workaday life in all its complexity. To use Lynch’s metaphor of theoretical tools as theatre tickets, the notion of sociomaterial practices helped me to cross the threshold into new theatres of observation, exploring disease dynamics and medical equipment that my academic department certainly expected me to neglect. The limitation of studying social interaction, bio-social interaction, or socio-technical interaction, is that these views of interactivity and emergence are limited by the analyst’s disciplinary niche. The field of view may be broader than in tech- or bio-deterministic research, but it remains less holistic than when we consider the manifold complexity of the sociomaterial practices at hand. I tore up the theoretical ticket as soon as I began writing about the concrete details of the Ebola case, not because the concept had been unhelpful, but because I wanted to make room for the indigenous concerns of the case itself.

As a design practitioner, I cannot afford to systematically ignore any one category of concrete materials or the complexities and controversies they engender in practice. The Ebola outbreak was a high stakes case for coordinating with mobile phones and we cannot appreciate its complexity if we analyze “social characteristics” as an isolated category or digital technology as the only materials that the designer’s work will shape (or be shaped by). Yet this is precisely what many theoretical *and methodological* guidelines for ethnographic field studies seem to encourage. For example, Crabtree et al. (2009) are passionate and effective advocates for the kind of granular, empirically driven field studies that are particularly relevant to design. Elsewhere, Crabtree has described this approach as follows:

Ethnomethodologically-informed ethnography... is an approach to social research that is of increasing interest to the designers of collaborative computing systems. Rejecting the use of theoretical frameworks and insisting instead on a rigorously descriptive mode of research, the approach is considered to provide a valuable means of analyzing the social circumstances of systems usage (Crabtree 2006, p. ix).

Despite claiming to reject theoretical frameworks, the above statement presents ethnography with an implicit conceptual framing of “social circumstances” baked in. The problem with rejecting all theoretical framing, if we were to take this mandate too literally, is that it would be impossible to avoid filling in the gaps in our understanding of “the social” with whatever popular notions our ordinary life experiences (or undergraduate sociology courses) had supplied. It seems absurd to suppose that my analysis of the Ebola case would have been more enlightening if I

had been less well read at the outset, that the findings would have been more pragmatic if only I had sustained an ethic of conceptual abstinence with respect to the problematic tendency to tilt. In fact, that kind of refusal to grasp key concepts and cautionary insights is not the model of scholarship exhibited by Crabtree, Garfinkel, Lynch, or Suchman. Their scepticism of abstract theory is not a matter of cultivated conceptual ignorance so much as a practice of reserving room for silence when we set ourselves to the task of analysing and writing up insights from fieldwork.

7.3. Reserving room for silence

Though engaging, this subtle style of writing is often lambasted as “atheoretical.” Yet examples abound of ethnographers and practice theorists who push back against this characterization. Wacquant’s gripping ethnography of a boxing gym in a Chicago ghetto is an apposite example. When reviewers critiqued *Body & Soul* (2004) as largely atheoretical, Wacquant’s (2005) full-throated response focused on:

confusion that the reviewers make between the frugal use of theoretical tools and their gaudy display in self-identified theoreticist discourse... the reviewers of *Body & Soul* fail to comprehend the theory of action and structure embedded in it. Accordingly, they do not realize that the low visibility of that theory is by design and not by default, and that it entails a conception of theoretical work, methodological practice, and ethnographic reporting at variance with the standards of conventional U.S. field studies by which the reviewers insist to measure it (2005, p. 443).

While Wacquant acknowledges being “frugal” in his use of theoretical tools, he does not admit that the work is “light” on theory, or only minimally influenced by his grasp of theory. Neither does he try to justify having neglected the wider world of theory in favor of a more local focus on available theories of boxing or of ghettos. Rather, he argues that his writing is permeated with a robust theory of practice that “originates in the thought of Aristotle and the medieval Scholastics and that was used by Weber, Durkheim, and Mauss before being retrieved by Husserl, Heidegger, Merleau-Ponty, and Elias, and later thoroughly reworked by Bourdieu” (Wacquant 2005, p. 443). It would be impossibly tedious review this long history all over again with each new publication, hence the importance of establishing dispute domains in which there is ample room for silence. Note Wacquant’s suggestion that this conception of theoretical work, methodological practice and ethnographic reporting may be less well established in a U.S-centric dispute domain than e.g. in Europe.

A perennial challenge of this approach is that reviewers may not see the influence of deeply embedded yet low visibility theoretical tools, and it may be easier for them to see how their own favoured theories would be relevant. For example, it is presently not at all atypical for anonymous reviewers to offer criticisms such as, “I don’t see why the authors have chosen sociomateriality when it seems like a more familiar

theory such as ANT would do.” To be sure, it is reasonable to suggest that Actor Network Theory would have been suitable for analyzing the Ebola case. Despite the differences between these theories (with respect to habitual aspects of human activity in particular), discussion of sociomateriality has clearly been shaped by ANT. This particular kind of dialog with reviewers may be generative at times, but it can also have negative consequences. It can make authors feel pressured to justify their conceptual work by putting their theoretical tools on gaudy display in self-identified theoreticist discourse. As an alternative, authors seeking room for silence might follow the lines of Kunda’s (2013, p. 22) critical response:

Does it make a difference? On what basis was I able nevertheless to make my arguments? Would using Foucault [or ANT] have improved the validity of my arguments or just their perceived legitimacy? And is the ultimate purpose of writing to continually exemplify with data and demonstrate the validity of the language and claims of canonical writers?

The degree to which an analysis foregrounds the language and claims of canonical scholars raises the final aspect of room for silence that I would like to emphasize: the opportunity to make room for the language and practical concerns of practitioners. In this respect, room for silence advances a long tradition of advocating for CSCW field studies that are more pragmatic and design-oriented than ethnography or the human sciences in general:

Replacing this kind of detailed empirical study with generic cultural interpretations runs the real risk that attention will be diverted away from what people do and how they organize action and interaction in diverse contexts of everyday life (Crabtree et al. 2009).

As I write this manuscript, technology designers are making sense of what can be done to build back better after Ebola, of what may be done to address the global Zika outbreak, of the clear and present danger that as many as 20 million human beings will die of starvation in famines spread across four regions in 2017 and 2018 (Sengupta 2017). These situations present challenges of real human concern; our writing can and should convey something of the gritty texture and *heat* of living through them. As a very basic standard of human-centeredness, designers should be asked to ponder the scientific, moral, political and operational grounds on which Africans afflicted with Ebola were receiving different care and experiencing dramatically higher mortality than Americans and Europeans who fell ill. When the practitioner debate feels heated and morally charged, our writing should feel freighted with meaning—when there’s blood and a body count, there should be hand wringing.

To document such cases as mere instances of “constitutive entanglement” or “intra-action” or “imbrication,” with the primary aim of besting some other variant

of sociomateriality, is not the same as to address these problems through searching, critical reflection on the activities, language and claims of practitioners. In truth, extracting conceptual puzzles of relatively little social importance from within situations of great human concern strikes many practitioners as ironic and troubling, particularly if they understand this to be a systematic tendency of an academic *modus operandi*.⁸ Practitioners' failures of imagination and hard won successes merit our attention. If we are to recount their lived experience with sociomaterial practices, in ways that are seriously instructive in and consequential for their ongoing efforts, we had better make room to write about the practical specifics and pragmatic consequences of their work.

Some few shining paladins of sociomateriality might transcend the dilemma of rigor or relevance, directly addressing matters of real human concern even while fully and explicitly engaging the language and claims of canonical Ontological philosophers, all in relation to the same empirical data. However, most fieldworkers will continue to experience something of a dilemma here. A lively pluralism will encourage both tacks, granting some studies room for silence with respect to theoretical elaboration, just as other conceptually-useful papers are granted relative reprieve from the difficult work of establishing clear implications for design and/or practice.

8. Conclusion

Ethnography is still a relatively artistic, improvised, and situated form of social research where the lasting tenets of research design, theoretical aims, canned concepts, and technical writing have yet to leave a heavy mark. In the end, this is the way I think it should be, for a persuasive and widely read ethnography will always be something of a mess, a mystery, and a miracle. John Van Maanen, *Tales of the Field* (2011, p.175).

William James (1907) once described pragmatism as “a new name for some old ways of thinking.” The paradox that something old can yet be novel is easily understood as a matter of novelty *in context*. Hacking (2007) makes this point succinctly: “had I begun my formal study of philosophy in the United States... I would have been educated in the shadow of logical positivism. Hence I would have discovered pragmatism as rebellious liberation.” I would say the same of room for silence, that it is a new name in a novel context for some old ways of thinking about pluralism and practicality. I am hardly the first author to voice concern over the distorting character of increasing abstraction or the dilemma of rigor or relevance; pragmatists have labored here for well over a century. Yet by creatively re-reading the

⁸ Dorothy Smith (2005) makes roughly this argument in the early pages of *Institutional Ethnography: A Sociology for People*.

recent sociomaterial practice discourse in light of these concerns, this essay offers several contributions.

First, to outline a conceptual basis for room for silence I have modestly redrawn the map of the sociomaterial practice discourse, emphasizing a broader range of practice theories and clarifying the particular kind of pluralism that is widely embraced in social theory's turn to practice. I argue that Wittgenstein's notion of family resemblance, applied on a case-by-case basis, is a more artful way of recognizing proper practice theorizing than categorical, definitional debate or lists of required conceptual elements. In particular I draw attention to ethnomethodology and to design work in the pragmatic reflective practice tradition as test cases for this pluralism. I draw on the writing of Suchman, Lynch, Mol and a range of works from science and technology studies that are directly relevant to questions of pluralism. Given that Orlikowski (2007) notes having "borrowed" the term sociomaterial from Mol (2003) and Suchman (2006a), it is ironic that so few have returned to these works for their insights about the importance of pluralism. It also bears mentioning that Suchman's work has been deeply influential in CSCW and, thanks in part to her long participation in this research community, so has the kind of pluralism she espouses. By reasserting Suchman's seminal influence and sustained relevance to this trans-disciplinary discourse, I am in some sense suggesting how we might bring the exploration of sociomaterial practices 'back home' to themes that have animated CSCW research for decades.

Second, I argued that pluralism and practicality are related, and that they might both be cultivated through an orientation to theory that I call room for silence. In this view, generating abstract "theories of everything" and elaborating or debating them in relation to empirical observations is only one way of contributing to learning. A complementary approach is to focus on fieldwork and the guiding question, how are a range of materials and human activities integral in producing the concrete sociomaterial practices we observe *here*? For the ethnomethodologist this is a matter of theoretical and empirical sophistication, for the pragmatist it speaks to the dilemma of rigor or relevance. Either body of concerns, and surely others as well, might lead us to embrace Nicolini's (2012) toolkit pluralism or heed Weick's (1996) admonition to 'hold our tools lightly.' When a commitment to pluralism is our logical basis for allowing this re-orientation to theory and to ongoing exploratory fieldwork, we are not wholesale rejecting theoretical abstraction so much as we are granting room for silence—a *via media* of sorts.

Finally, I illustrate the pragmatic consequences of these conceptual debates through an empirical account of the 2013–2016 Ebola outbreak in West Africa. My analysis of the case highlights the immodest claims of social causality and technocratic failures of imagination that at times have characterized global health and humanitarian interventions. The case shows how Ebola responders grappled with the sociomaterial quality of their work. They came up with expressions such as, "build back better" and, "staff, stuff, space and systems" to make sense of these sociomaterial complexities and to strive for more holistic perspective on their

emerging work practices. Representing this lived experience in writing is indeed an ontological concern. Yet if our scholarly aim is to *address* matters of real human concern, it is not necessary or inevitable that such exploration of ontological topics will involve advocating for Ontological philosophies or *-isms* of any kind. Rather, the contribution of this case analysis is that it could inform more detailed field studies, and ultimately the task of making outbreak response efforts more visible, in the hope that this would enable us to design for the real world. In this way the case illustrates how analysis and writing that reserves room for silence can remain conceptually nuanced and practically relevant.

Through these contributions, I hope to build a bridge between sociomaterial perspectives on complex practice and the pragmatic work of designing human-centered cooperative systems for the social good, for human rights and for humanitarian aid around the world. While I have offered a conceptual defense of room for silence, I am aware that many fieldworkers will appreciate this approach simply because they enjoy a more informal relationship with theory. I feature the quote above to register my opinion that embracing room for silence with this attitude is fine, even if some scholars will label it ignorant or even insolent. As Van Maanen has most astutely observed, ethnography's relation to grand theory has long been troubled, not for lack of effort or intelligence among ethnographers, but because formal rules and frameworks often break down under the strain and astonishing complexity of real life. Whatever our professional obligations to remain embedded in disciplinary norms and standard ways of figuring contributions to learning, design researchers who address messy social problems often feel a fierce sense of urgency to transcend these confines. In the conceptual scramble that often ensues, some of my fellow travellers may see the notion of room for silence as a reprieve from formalisms and orthodoxies. This strikes me as sensible, for a persuasive account of how computer supported cooperative work can make for a better world will always be something of a mess, a mystery and a miracle.

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