

# ***Interviewing the Digital Materialities of Posthuman Inquiry: Decoding the encoding of research practices\****

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## **Abstract**

Have you considered how the many things assisting you with your research—digital recorders, computer assisted qualitative data analysis software (CAQDAS) or even Google Scholar—may also be silently shaping scholarly practices? In this paper, we interrogate the networked, digital landscape of everyday qualitative research practices by unraveling several examples taken from recent empirical studies in educational and social science. Our disentangling and decoding of the digital materialities of qualitative inquiry involves “interviewing” several digital objects—a recording device, a digital camera, an iPod, and a software program—that were recruited at different stages of several contemporary research projects. We deploy Adams and Thompson’s (2011) heuristics for interviewing nonhuman or “thingly” research participants, and apply these to the digital things of qualitative research practices. We suggest that these digital entities—“coded materialities” — participate as co-researchers that transform, extend and support but also deform, disrupt and circumscribe research practice and knowledge construction, and inevitably introduce new tensions and contradictions. Counterpointing two approaches to describing our enacted and pre-objective material worlds—Actor Network Theory and phenomenology, we usher into view some of the hidden and coded materialities of research practice, and glimpse unexpected realities enacted.

Such immersive entanglements ultimately raise new questions about the posthumanist fluencies demanded in social science research practice. One such fluency is reckoning with how our agency as researchers is increasing shared, distributed and supported by digital technologies. Our entanglements with coded materialities introduce new ethical tensions and responsibilities into research practice. Second, new fluencies may also be called into play as the researcher’s work is subject to both deskilling and up-skilling as various technologies sit alongside researchers as co-researchers. Third, when data is viewed as lively, relational and mobile, new enactments of data are possible. Learning to work with these complex data circulations is another posthuman research digital fluency. Fourth, the scale, mobility, and spatial arrangements of the research process are being radically reconfigured as increasingly public and fragmented; these new arrangements bring both tensions and opportunities to be. Finally, with data being frozen and thawed in the fluidity of digitized research spaces, researchers must be attentive to how and what data is being included and excluded. We conclude by suggesting that researchers “build in” opportunities to regularly query the digital tools of their trade.

## **Keywords**

Actor Network Theory, phenomenology, interviewing objects, digital research methods, qualitative research, sociomateriality.

## **Introduction**

Have you ever considered how the many things assisting you with your research—laptop, wireless internet, email, data analysis and visualization software, digital recorder, voice recognition software, digitized transcripts, multimedia files, as well as archiving and encryption software—may also be silently shaping your scholarly practices? For example, perhaps while you were learning to use a new computer-assisted qualitative data analysis software (CAQDAS) program you noticed that your research practices were gently being nudged in a new and different direction? Maybe new and exciting possibilities were opened, but meanwhile others were unexpectedly atrophied or side lined? Alternatively, you may see yourself as independent of, or even the commander-in-chief of your 21<sup>st</sup> century surround? But imagine for a moment a social scientist today without

the familiar surround of research tools: no recorder, no NVivo, no Dragon, no Google, no iPhone or Android. Clearly, the expertise of every professional today is indebted and intimately bound to the ready availability and orchestration of a host of specialized equipment in the performance of specialized work. Such *thingly gatherings* serve in co-constituting and enacting professional practices. Each technology contributes uniquely to the forming, informing, deforming, conforming, reforming, and transforming of practices and their performative outcomes. That is, each technology enrolled into a research practice makes a difference of substance.

The professional artifacts considered in this paper are digital technologies—coded materialities—that are increasingly recruited for, enrolled in, and intertwined with social science research work. This paper is framed by posthumanist thinking. A loosely associated set of perspectives, posthumanism reconceptualizes the human not as an autonomous sovereign, but as an intimately entangled being inseparable from its technologies, environment, and other species. In this paper we call on Actor Network Theory (ANT), phenomenology, and other approaches undergirding human-technology studies and posthuman theorizing to intervene, as Ruppert, Law, and Savage (2013) suggest, in ongoing debates that position the digital as an epochal shift, by instead bringing attention to the *specificities* of the changes inaugurated by the digital.

Interest is growing in how the digital is interposing research practices. A special edition of *Theory, Culture & Society* in May 2013 focused on the “social life of methods” and the National Centre for Research Methods (NCRM) in the UK funded a series of workshops in 2012-2013 to debate “the opportunities and challenges that digitally inspired methods present for social research” (Roberts, Hine, Morey, Snee, & Watson, 2013, p. 3). One of the concerns identified in the NCRM summary report was the black boxing of digital tools, leading to a lack of critical engagement and attention to methodological implications, despite the identification of significant ethical questions and reporting challenges posed by the presence and use of these actors (p. 6). It seems that the encoding of research practices needs to first be brought out of the background to *decode* what is happening. Beer (2012) draws attention to the largely unacknowledged power of algorithms in play which are: “streamlining, making efficient, predicting, making decisions for us, doing work on our behalf, taking some of the agency from researchers and the research process and making it their own” (para 2).

In this paper, we unravel several examples taken from empirical studies to explore the digital landscape of everyday qualitative research practices. This unraveling involved “interviewing” several digital objects—a recording device, a digital camera, an iPod, and data analysis software—that were enrolled and entangled in each research project. The “interview questions” employed are taken from heuristics we have been working with for engaging technologies-in-use as qualitative research participants. We then consider the implications of including digital technologies as co-researchers and discuss the growing sophistication of digital fluencies now demanded of researchers. We begin with a brief consideration of how ANT and phenomenology may serve together as productive counterpoints on this posthumanist quest. Here we cite the work of Tim Ingold (2012), but others have uncovered similarly fruitful overlaps when combining insights from both approaches.

### ***ANT and phenomenology, objects and things***

Ingold (2012) contends that practitioners do not merely inter-act with their materials but rather co-respond with them: “In the act of production, the artisan couples his own movements and gestures—indeed, his very life—with the becoming of his materials, joining with them and following the forces and flows that bring his work to fruition” (p. 435). Drawing on Heidegger and Flusser, Ingold delineates an important phenomenological distinction between “objects” and “things”. By definition, he explains, an object stands against us or is thrown in our path; at best we may interact with it. Whereas, a thing is materiality “thinging”; it is

a gathering of materials in movement—a particular knotting together of the matter-flow—and to witness a thing is to join with the processes of its ongoing formation. To touch it, or to observe it, is to bring the movements of our own being into close *correspondence* with those of its constituent materials. (Ingold, 2012, p. 436)

Within an ANT framing, subject/object separations are undermined through an ontological demotion of the human (subject) and the promotion of the nonhuman (object) by recognizing agency as distributed. With phenomenology, subject/object boundaries are rendered translucent in the immediacy of the prereflective lifeworld. Phenomenology attends primarily to the pathic (*passif*) or perceptual sphere of human being-in-the-world, whereas ANT strives to describe the active (*actif*) world of humans and non-humans networked in dynamic assemblages. Practiced together, our heuristics embed and struggle with these two shifts in emphasis, creating *actif-passif* imbroglios for analysis and reflection. Via this collection of “inventions”, the researcher is

in a position “to make [objects] talk, that is, to offer descriptions of themselves, to produce, *scripts* of what they are making others—humans and non-humans—do” (Latour, 2005, p. 79, emphasis in original).

## Digital devices as co-researchers

We now examine how human and social scientists may find themselves co-responding with the flows, forces, and becoming of the digital materials deployed in their everyday research practices. Re-reading anecdotes drawn from several different empirical studies, we employ Adams and Thompson’s (2011) heuristics to interview a specific technology used in each qualitative research project.

### *The unintended consequences of employing a digital co-researcher*

An educational researcher recalls an incident that occurred in the course of her qualitative research project investigating basic education in Western China:

During a school visit in rural western Sichuan province, I wandered into the central playground. People in this region tend to be poor as the area is challenging to farm. It was lunchtime and the children were outside getting their lunches from the walls outside their rooms. I decided to film the children as they chatted happily. Sitting back down, I scrolled through the pictures I had just taken, ensuring that I had what I wanted, when I noticed a group of children just on the margins of one the images – these children were just outside the actual frame, but it was something about the freeze frame of the photograph that allowed me to notice something that I had not been able to observe when I watched the children earlier. I showed the picture to my colleague who explained, “Those children are pretending to eat lunch. Those children are too poor to bring food from home.” Literally they were the children in the margins of more than my photograph; the ones who typically formed the large numbers of minority children who dropped out of rural schools after their compulsory Basic Education was completed – if not earlier. In an odd drama, these children sat off to the side, with their empty lunch boxes, pretending to eat, taking the same amount of time and effort as their classmates with actual food. (Crichton 2009, para. 8-9, abridged)

Crichton (2009) describes this incident as “an unintended consequence” of doing digital documentation research. Such surprising occurrences reveal the unique but primarily taken-for-granted contributions that technologies, like the digital camera, may make to current research practice. Indeed, it is the digital camera’s specific capacity to both “freeze frame” a windowed version of the lifeworld and then reproduce its collection of images on demand, that led to the unexpected noticing of the school children on the margins. Later, as Crichton (2009) relates, the digital photographs were used as “evidence” of stark childhood poverty, upsetting local Chinese authorities’ claims to the contrary. Here the digital camera evolves from its role as a research instrument in the co-production of visual data to being implicated in the co-construction and revelation of a politically contentious issue. The research assemblage shape shifts into evidence supporting a truth claim, then appears yet again in a research manuscript as an anecdote, and finally, the digital camera shows up here in this conference proceedings on Networked Learning. We may speculate that the camera itself has now been replaced by a newer model, its research days done; the images it produced may be locked in an encrypted file on Crichton’s hard-drive, perhaps a few individual images may also be found in a conference PowerPoint presentation. Regardless, the camera’s participation as an invaluable but unsung co-researcher lingers on in this recollected event.

In its taken-for-granted status as co-researcher, the digital camera regularly participates as a visual documenter and archivist. At the push button command of the principal investigator, the camera produces and stores “frozen framings” of the examined lifeworld for later exposure and analysis. Via *freezing*, the research interest is arrested in its temporal tracks; the moment is focused, captured, and stilled. The subject is rendered “objectively” available for closer scrutiny later as one of many pieces of visual data. Or as McLuhan (1964/2003) put it, the camera “fix[es] people in a superior stare, as if they were objects” (p. 257). The photograph as “mass-produced merchandise” (and now as its fluid digital counterpart) is a “brothel-without-walls” casting the individual into the public domain deprived of privacy (p. 257). More positively, the photograph is a “museum without walls” (380): the captured visual image retrieves the past as present, a figure detached from its original ground. The snapshot directs attention to human posture and gesture, both individual and collective, while “translat[ing] all senses into eye terms” (McLuhan and McLuhan 1988, p. 205). It promotes self-consciousness, and of course is deaf. The frozen fixity of the photographic image also creates “a world of accelerated transience” (McLuhan 1964/2003, p. 266); each found view is now committed to a rolling stream of immobile ephemera. With the digital, these immobilized images now circulate with newfound ease: at

a press of a button or a swipe and click of a mouse, they are viewable, transferable, copy-able, share-able, crop-able, modifiable, delete-able.

Via *framing*, the lifeworld that falls outside the view-finder window disappears from the research scene. What falls inside—even along the edges of the frame—appears in a visually disclosive, evidentiary way. As a co-researcher, the camera “enhances pictorial realism and obsolesces portrait painting” (McLuhan & McLuhan, 1988, p. 99); it may also distort, color, overlook or blindly elide important aspects of the lifeworld being studied. Via its capacity to reproduce the lifeworld as “realistic” visual portrayals that are subsequently (and uncritically) dubbed as “data”, the camera serves to depict qualitative research as a scientific, objective practice rather than an aesthetic, subjective or posthuman, inter-subjective/objective one. The human-researcher-with-digital-camera has become the creator and curator of a specialized museum-without-walls, a museum whose “data” collection is now closely monitored by human ethics boards worried by possible brothel-without-walls exposure. The “digital” in digital camera further complicates the patrol of ethical research borders, through multiplying the opportunities for the photograph—the un-grounded figure—to fall into the wrong hands and be subject to the unforgiving eyes of the global village. Yet the photograph as exposé and thereby as “proof” is also a primary reason for enlisting a digital camera in qualitative research practice. The human-researcher-with-digital-camera is able to generate a digitized, pictorial show, whose framings—including cropping, magnification and other digital editing techniques—may reveal previously unnoticed aspects of a world. Simultaneously, the research subject is immobilized as a visual data point, a file that is now available for immediate circulation, translation and transformation. The digital camera may amplify the critical, noticing eye, but may atrophy or blind the ethical, relational eye.

*Whose, what’s or who-what’s research?*

As digital recording devices evolve and become more sophisticated, portable, and user friendly, they increasingly become enrolled as skilled observers, listeners, and archivists; not just of human research participants but also of other digital tracings. Gourlay (2012) describes a research project in which iPod Touch devices were distributed to students to document their everyday experiences of using technologies in their studies. Here, the iPod Touch takes on the role of field researcher standing in close 24x7 proximity to and juxtaposition with human participants. The artifacts generated by the digital device—photos, videos, sound files, and notes—are later called upon to act as data, but also as stimulus for more in-depth exploration in face-to-face interviews. Following the multiple actors—both human and nonhuman—implicated in these practices, we may start to see the interpellation of the iPod Touch and its collection of digital artifacts as both participants (generating data through their presence and activity at different stages) and as co-researchers (storing, sharing and producing data); a blurring of the positioning of objects and objects created by objects.

Also illustrated is what Ruppert, Law, and Savage (2013) describe as a de-centering of the human expert in order to elicit and generate data. Several tensions surface from this kind of de-centering and the pervasive, unblinking eye of the digital devices in the field. For example, more may be revealed than intended as these devices infiltrate private spaces and private moments, in the same way that Crichton’s (2009) digital camera revealed unexpected nuances in the margins of both the digital photographs and the field. Digital data has light-speed portability and a multiplicity of potential “social lives” far beyond those of handwritten field notes, creating possibilities for further slippages and movements outside the traditional researcher-participant-data relationship. In this de-centering, there is both a de-skilling of the researcher’s work (the downloading of some research practices to digital co-researchers) and an up-skilling. Interfacing with digital co-researchers and working with the digital data generated now includes sophisticated digital curation skills: selecting, arranging, describing, annotating, aggregating (re)using, organizing, interpreting, storing, jettisoning, as well as the care for digital objects (i.e., Barrett 2012; Flanders & Munoz, 2012). These new research activities, along with the recognition of coded materialities as co-researchers necessarily inaugurate new ethical questions and concerns.

### ***Freezing digital data: exclusion and inclusion***

Digital data collection spaces such as wikis, blog postings, and online forum discussions are often in a state of continuous flux, revision, and transformation. Savage (2013) describes such web-based research spaces as characterized by a “proliferation of ‘lively’ data” (p. 4) that is challenging “the straightjacket imposed by positivist statistical procedures” (p. 6). Missing in his critical agenda to grapple with the agency of social research methods is how researchers and their nonhuman co-researchers are necessarily implicated in practices that serve to stabilize, historicize and essentially “freeze” particular moments of the online lifeworld. On the web, researchers engage in multiple software-enabled freezing practices similar to those cited in the camera example above: generating pdfs of postings, taking screen captures, copying and pasting text and images, saving

website finds to Evernote, recording Skype interviews, etc. Kallinikos, Aaltonen, and Marton (2010) argue that such snapshots are pages that have been temporarily assembled and rendered in a particular space and time; they are no longer dynamic web pages but static ones whose link to the original sources is now severed. Such digital artifacts are no longer mobile but frozen, decontextualized “photos”. However, once generated, captured and saved, these digital data are now newly available for further translations and mobilizations. And so, the cast of “lively” characters grows more complex and entangled. Following these actors, questions arise about what exactly is being archived, or in Latour’s (2005) words, what is happening downstream.

Practically, such freezing practices enable researchers to cope with the volume of information continually propagated by the web. Cairns and Birchall (2013) suggest that the horizontal organization of the internet is mobilizing “new tactics, both algorithmic and social, to help make sense and meaning from the swaths of hyperconnected, hyperflexible data” (para. 7). However, there are other implications. Perhaps a screen capture is also enacting what Law (2009) refers to as a barely noticed collateral reality; one of boundary making. Kallinikos et al. (2010) suggest that archiving practices do not simply collect already bounded entities but rather “construct the boundaries that demarcate and make an archival document” (7). Through everyday acts of freezing digital objects, researchers alongside their technological co-researchers, are very much engaged in translation of digital artifacts and data, excluding and including along the way. Following actors inevitably leads to decisions *not* to follow certain actors.

Such decisions encourage consideration of the new-found sociality of data. Within a sociomaterial reading, data is not really a thing but rather a relational effect: it is what it is in a particular moment because of the temporal and spatial networks of relations in which it is ensnared. In the NCRM report cited earlier, Beer argues that “current scholarship in the field of digital methods focuses on digital tools at the expense of an understanding of digital data – including an understanding of the environment and infrastructures that allow data to circulate and accumulate, as well as issues around how data is archived” (Roberts, et al., 2013, p. 13). The way that data both enacts and is enacted within research practices highlights the ongoing tension between fluidity of data (the state of always becoming) and solidification of data (freezing or settling down). Freezing data, at certain points, into an artifact gives it a momentary shape and presence so it can then be shaken into something else in a different set of relations. So that it can open up new meanings, uncertainties, understandings, disruptions.

### ***The encoding of researchers***

We now return to our opening where we imagined a social scientist bereft of his or her current assortment of research instruments and software tools. QSR International, the makers of NVivo qualitative research software, recently constructed a similar imaginary in a YouTube video (2012a), portraying their software as a “solution”, presumably to the “problem” we call qualitative inquiry. QSR International intends to situate NVivo at the core of every qualitative research project, from start to finish: interview data “in”, research report “out”. Yet this software architecture rests on a series of unexamined design decisions that may,

configure and circumscribe us...in more or less significant ways, defining what is relevant and what is not, what needs to be attending to and what not—legitimizing particular ways of being whilst simultaneously delegitimizing (or rendering more or less obscure) equally valid alternatives. (Introna, 2012, p. 115)

In order to reveal the “more or less significant ways” NVivo may serve to re-configure, re-circumscribe, and redefine research practice, several “object interview” questions may be posed: What specific activities does NVivo software invite a researcher to perform? What epistemological frameworks are implicitly or explicitly mobilized in this virtual work environment? And what practices are discouraged, delegitimized or merely diminished?

To explore NVivo’s invitational or *pathic* address, imagine a researcher who has decided to use NVivo. Entering the NVivo 10 software workspace, she is immediately prompted to create a New Project or Open an existing one. She begins by importing all his digital content so far, which consists of several transcribed interviews. Consulting the *Getting Started Guide*, the researcher reads she may now begin by “broad-brush” coding via the creation of thematic “Nodes” or by jumping straight into detailed coding (QSR International 2012b, 23). She decides to jump straight into “detailed coding” of a transcript, since this appears to most closely correspond with how she previously approached her qualitative analysis work by hand. Quickly, the qualitative researcher finds herself immersed in the NVivo workspace, busily coding and querying data.

Necessarily overlooked in this productive human-technology engagement is how the NVivo software code is simultaneously and prereflectively encoding the researcher, both hermeneutically and existentially. All such software provides clearly delineated, finite sets of activities, along with a specialized, local vocabulary designed to ease user navigation of the software environment and the performance of allowable tasks, and an implicit database structure scaffolding how the researcher may accomplish data analysis work. In qualitative inquiry, the term code generally refers to “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldaña, 2013, p. 3). The verb form, to code, is an activity performed on data, “an interpretive act” that variously “*summarize[s]*, *distill[s]*, or *condense[s]* data, not simply *reduce[s]* them” (p. 4, italics in original). In NVivo, the noun form of code is not used at all, but is replaced with the word Node (helpfully rhyming with code); the verb form, to code, now unambiguously understood as a function that the researcher performs by creating uniquely named (coded) Nodes, which may be hierarchically arranged as tree structures. In NVivo, coding is synonymous with the creation of Nodes that may later be queried. Outside qualitative research circles, coding is more commonly associated with programmers (e.g. designing, writing and testing computer code or programs) and cryptographers (e.g. deciphering a code or encoding secret messages). Importantly, concepts such as codes, nodes, queries, and encryption belonged to computing science and database theory long before qualitative inquiry met NVivo. Is it possible that in aligning their scholarly practices with NVivo, researchers are quietly being reconfigured as specialized database administrators?

During a phenomenological research project investigating compassion fatigue among health professionals, Goble, Austin, Larsen, Kreizer and Brintnell (2012) were struck by the difference using Computer-Assisted Qualitative Data Analysis Software (CAQDAS) seemed to make to their research practices. In an effort to understand some of these effects, they employed another of our object interview heuristics, the McLuhan’s (1988) four laws of media. Applying these laws, Goble et al. (2012) found the following: CAQDAS, and more specifically NVivo: Enhances “the equality of data in data sifting”; Obsolesces “the tactility of research” including the disappearance of handwritten notes and playing with cut-up transcripts; Retrieves “the punch-card expert”; and when over-used it Reverses into “data shuffling”.

Goble et al. (2012) noticed that the data analysis software served their team in “effectively remov[ing] irrelevant sections of transcripts while bringing forth the relevant sections...so none would be overlooked” (p. 12). Simultaneously however, the core researchers became distanced from the original texts, no longer working with it “by hand”. Data entry, a new but relatively unskilled task demanded by CAQDAS, was easily outsourced to research assistants. Finally, the research team struggled with the activity of coding central to CAQDAS:

[W]hen coding becomes the means by which analysis takes place and supersedes ones methodology, only generalized thematic description becomes possible. For compassion fatigue researchers, the appeal of coding risked their never exploring the phenomenon’s essence. (Goble et al. 2012, p.13)

Having committed their study to NVivo, they unexpectedly found their deeper methodology compromised. CAQDAS enhances the agency of the qualitative researcher. This agential extension is enacted via the researcher’s subscription to the methodological assumptions and design decisions made by its manufacturer. In order to use CAQDAS, the researcher must, to some extent, adjust their practices to accommodate those adumbrated by the software algorithm. In response, the researcher’s habits of mind shift and reconfigure, gestural regimes topple and reconstitute, familiar vocabularies take on new software significances, and everyday modes of knowing, thinking and doing undergo subtle and occasionally dramatic changes.

## Speaking with things: Decoding the encoding of research practices

In this paper we have sought to give the things of qualitative research—a digital recorder, a camera, an iPod and computer-assisted qualitative data analysis software program—a voice. To accomplish this, we employed a variety of heuristics or “specific tricks” to make the digital materialities of research practice talk, “that is, to offer descriptions of themselves, to produce scripts of what they are making others—humans or non-humans—do” (Latour, 2005, p. 79). Elsewhere we separate these heuristics into two clusters of inquiry (Thompson & Adams, forthcoming). The first cluster of heuristics provides possible entry points for attending and attuning to the digital technologies that matter to research and professional practice. Having attuned to material presences and absences, the second array of heuristics may help to analyze—to gently loosen—a digital artifact’s meshwork in order to reveal otherwise hidden aspects of its thingly participation and contribution.

A complex churn of organic and inorganic entities contributes to the enactment of research and performance of data. Social scientists increasingly perceive, think, act, and speak with and through their digital things. Michael (2004) asks: “how might we go about theorizing the role of nonhumans (technologies, animals, etc.), and their associations with humans, in the production of social data” (p. 5)? In recognizing and decoding our networked, posthuman selves, the taken-for-granted and thus “silenced” nonhuman research crew supporting our efforts suddenly becomes apparent. Like our human research assistants, it now seems important that we take time to interview our nonhuman counterparts before we set to work together as a team. Ingold (2012) writes that “to understand materials is to be able to tell their histories—of what they do and what happens to them when treated in particular ways—in the very practice of working with them” (p. 434). This is a way of speaking with things.

Through counterpointing ANT and phenomenology, we have momentarily raised the taken-for-granted things of research into view in order to witness the oft-unexpected realities enacted incidentally throughout research practices. Such immersive entanglements raise questions about the *posthumanist fluencies* now demanded in social science research practice. Gourlay (2011) describes posthumanist literacies as “practices of meaning-making in a context where the boundaries between analogue and digital, ‘human’ and ‘machine’, are ambiguous and problematic” (p. 1). Our focus in this paper is on those fluencies that matter when researchers become entangled with digital technologies and digital data as co-researchers. We prefer the phrase fluencies to literacies, since it connotes a stronger sense of ethical responsibility, expertise, criticality, and innovation in one’s human-technology interactions and correspondences. Here multiple fluencies may be identified.

One fluency involves reckoning with how our agency as researchers is increasing shared, distributed and supported by digital materialities technologies—coded materialities—introducing new ethical tensions and responsibilities into research practice. Second, new fluencies may also be called into play as the researcher’s work is subject to a potential deskilling and up-skilling as various technologies sit alongside researchers as co-researchers. Third, when data is viewed as frozen *but* lively and mobile, new enactments and understandings of data are possible. Recursive data (data that generates other data) and by-product data (data generated through everyday online activities) are new emergent data forms that Beer and Burrows (2013) point to as evidence of the performativity of data circulation. Fourth, the scale, mobility, and spatial arrangements of the research process and spaces of research are being radically reconfigured as they become more distributed, public, and fragmented; bringing both tensions and opportunities which need to be navigated and negotiated.

One approach to developing ones posthumanist fluencies is to “build in” reflective moments (see Miettinen, & Virkkunen pp. 451-452) as a regular part of ones research practice. Rather than continuing to black-box research tools, techniques, and technologies in their taken-for-granted co-enactment of expert practice, the digital things themselves must also become sites of explicit inquiry:

[A]rtifacts and objects can have two distinct roles in human activity: they can be either its objects or its means (i.e. technologies). In the latter role they have a ‘black-boxed’ nature and they are not in the sphere of conscious attention, i.e. they constitute the tacit dimension of activity (Polanyi, 1958). To crack open the previously hidden self-evidence and ‘givenness’ of ways of acting and to transform the activity, the routines themselves must be made into an object of enquiry, that is, into an epistemic object. (Miettinen & Virkkunen, 2005, pp. 450-451).

The “closed” technical objects that co-constitute social scientists’ habituated research activities must be systematically reflected on as “open” epistemic objects. Making or “building in” time for such epistemic as well as ontological reflection is crucial in understanding how materialities—especially the complex, algorithmic encodings of digital materialities—may co-constitute new research practices and co-produce knowledge via the introduction of new cognitive scripts, new gestural regimes, and prereflectively shared rules and procedures. Without such explicit interventions, human and social science researchers will continue to unreflectively use their digital co-researchers along with their black-boxed algorithmic encodings, and thus unwittingly deploy unexamined existential, epistemological, social, and political designs and imperatives.

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