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Data, Methods and Writing: Methodographies of STS Ethnographic Collaboration in Practice

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Methods have been recognised in STS as mattering for a long time. Indeed, it might be possible to tell the history of STS in terms of attention to and reasoning about method in the social study of science and technology. One might dive into this by attending to how Kuhn's (1970) work with cases has crystallised a large following in case studies of science, which demonstrated that practising case studies simultaneously produced theory. One might note Mulkay's (1981) call for more attention to how data is analysed within the social studies of science. One could fast forward to the study of *Laboratory Life* (Latour and Woolgar, 1986: 273) in which we are presented with archetypical versions of what it "mean[s] to be ethnographic" and to exercise "reflexivity" and learn we can never get at "what really happened". Law's (2008) development stories of STS lean on (laboratory) ethnographies as central to STS, for these matched the earlier historical case studies. These STS ethnographies established a boundary object with which STS scholars could weave a pattern: From such ethnographic accounts, substantively we learn that knowledge is produced locally. Ethnography has over the recent decades been highlighted as a key method in STS (e.g. Knorr-Cetina, 1995; Beaulieu, 2010). And that STS ethnography is specifically shaped by being often configured to consider its forms of collaboration or intervention in the field (Hess, 2001; Zuiderent-Jerak and Jensen, 2007).

Here is a problem knot: we, STS scholars, have learned that knowledge gets produced locally, supposedly we need to be, or are, reflexive about that (see Lynch 2000), and that ethnography is helpful to understand *how* knowledge is produced. Understanding our method of ethnography ethnographically might then seem to be of highest importance. However, ethnographically produced STS has largely resisted publicly scrutinising its methods by classical disciplinary criteria (validity, reliability). And Law's *After Method* (2004) pushes STS further, suggesting that social science methods add mess to the world, rather than representing 'the real' with precision. This makes us curious – as we often see STS accounts referring to realities that are other than the authors themselves – consider references to fish, to a datacentre, to a country or a city, to a ministry of science, technology and innovation. Here we sense implicit or explicit commitments to 'out-theres'; the real is presumed, even if it is hybrid, contingent, processual, never completely represented.[1] We wonder about the STS scholar's own doing of method in and between field and desk, their doing of data, the meeting between the researcher and the researched and their

collaborations. STS researchers may embrace the conclusion of science in action that methods are unpredictably performative, including our own. However, these sidesteps a more direct troubling of methods: What are our methods, specifically *STS ethnographic methods*, performative of, and how are these methods performative?

This special issue focuses on how methods matter, specifically on how STS ethnographic collaboration and its data are translated into ethnographic writing, or are performative of other reality effects. This shift from methods in general to the narrowly scoped focus on STS ethnographic collaboration and its data deserves a brief explanation: We consider 'STS ethnography' a heuristic with which we hope to momentarily capture certain features and tendencies of empirical research in the field. Approaching ethnography as a heuristic responds to the observation that 'ethnography' might be problematised as a license for 'anything goes' in STS (as one of our reviewers put it). Yet, despite reflexive moves, realist references abound within stories written and plausibilised by both, showing data or research materials or checking interpretations with research collaborators. We do not approach ethnography with an implicit methodological standard of how ethnography, how data or collaboration ought to be practiced. In this absence, foremost, this SI is empirically oriented.

Three sets of reasons motivate us to explore this problem knot. First, ethico-politically, we take the normative position that it is a matter of principle that if STS analyses others' method assemblages, we ought to also analyse our own. We should render our practices subject to analysis, too.

Second, theoretically conceived, analysing our method practices follows from engaging with Feyerabend (1993) and Haraway (1988): We can frame our project as positioned 'against method' when considering methods as set research procedures, as standards or recipes. With Feyerabend's theorisation, we envision law-and-order methods as only marginally fit to analyse an unruly world. Feyerabend mobilises historical materials to show that any kind of research practice might work; whether it works is performed within retrospective accounts – in discourse (see Mulkay, 1985). In practice, methods cannot be explained by law-and-order accounts sufficiently well; instead, Feyerabend calls for analysing methods in terms of anarchism. In this spirit, our project is to render methods uncertain. Methods, in the remainder of this text, should always be read as situationally practised, as assembling and assembled. We, furthermore, diagnose STS as collectively not paying sufficient attention to its method practices, analysing how and whether these work and for or against something. Drawing on Haraway, we consider the realist researcher as in need to make explicit their situated knowledge practices. Explication serves, here, to enable 'account-ability', and therewith the possibility to take on 'response-ability'. These abilities matter within a collective space, in which different actors hold each other to account, asking each other to respond to questions on the specifics of how knowledge claims are performed in heterogeneous and potentially violent 'apparatuses' (Haraway, 1988; see also Barad, 1998).

Third, beyond the way by which standard methodology makes methods accountable ('methods-as-in-the-textbook'), developing a conversation and a culture of publication that renders methods in situated practice accountable ('methods-in-action') can help in several pragmatic ways, relevant for STS researchers: Constructively, taking on this problem knot promises to generate insight that supports method development. Problematisingly, we might identify implicit patterns across STS research practices, for instance, shared forms of reasoning or politics. And for teaching, the studies produced in reaction to this problem knot offer valuable insight into how STS works.

Exploring the problem knot of STS's own methods-in-action brings to attention the messy landscape of method practice. Our objective in this exploration is to develop a genre of writing about method that fosters response-ability and enables the audience of research output to position themselves between the research materials and practices that were invested into the study. This special issue hopes to contribute to STS engagement with its methods by way of *methodography*. Methodography serves as a genre of analytic writing that articulates specificity and scrutinises the situated practices of producing STS knowledge.

This methodographic project recognises several established forms of relating to our own methods in STS. Heuristically, consider these forms in a space between calls for methodological rigor (Rodrigues and Mulkay, 2018), for seemingly classical disciplining (Jasanoff, 2017) and the celebration of weedy mess, an ecology of methods and composting (e.g. Haraway, 2016). In resonance with the latter, affirmative, approach to messy methods we locate inventing (ever) new methods, which subsequently can be inventorised (e.g. Lury and Wakeford, 2012; Jungnickel, 2020).

The papers in this special issue take part in inventorying STS methods with a focus on how STS ethnographic collaboration configures its data, with what effects. This analytic genre contrasts with the politics of disciplining and standardising method practice. Thinking about method writing as a genre also standardises, not the methods, but how we make method practice explicit and offer accounts of that practice for discussion and analysis. This issue, thus, does not provide method recipes but provides STS with partial articulations of how method assemblages come to matter in shaping analysis, writing and the worlds of collaborators.

We hope this SI on methodography of ethnographic STS collaborative research is generative in multiple ways. We see it as conducting critique, problematising STS methods from within STS. This means the field would improve on its capacity to address the implications of seemingly 'borrowing' methods from other fields (e.g. interviews or participant observation), whilst performing theoretical anarchism and celebrating mess, still performing no-nonsensical realist references to the worlds the ethnographies conduct research *in* and *on* as well as develop scholarly accounts *of*.

This methodographic take can support developing the field of STS by understanding the differential capacity of and within method assemblages to enable response-abilities. Understanding how different cases (or moments) of method practice constrain and enable specific relations in which researchers and participants can hold each other to account does not only further assess how our research is embodied, materialised and always partial, but also stabilises the ground on which we might negotiate our methods in interaction with other inter/in/disciplined scholars and our collaborators.

We hope this SI enacts an invitation to develop the methodographic genre as a form of reflexively, critically and empirically informed practice of attending to our own methods' data practices. However, rather than vague forms of 'being reflexive', we envisage methodographic analytic writing as a practice that articulates the specificities of situated STS method and data practices and how these relate to an antecedent reality or enact realities. This could further collective discussion of STS research-in-action. We hope, the field can draw on this genre not only for established researchers in STS aiming to question and scrutinise their methods but also for graduate students looking for alternatives of a classical 'method chapter' in their theses.

Finally, the methodographic genre furthers STS's opportunity to engage constructively with other fields and disciplines that might value STS's theoretical developments but are troubled by their implications for method. We can showcase how a field can generate a space for carefully problematising its methods without recourse to well-standardised "law-and-order" methods. This matters specifically concerning contemporary uncertainties about the status of social sciences and humanities. We might work towards exemplifying how methods' performativity can be empirically analysed, whilst simultaneously problematising the very enactment of the empirical.

This special issue has emerged in a set of conversations that were infrastructured and supported in relevant direct and indirect ways. We, as editors, have met and conceived of the frame of this project as fellows of Hans-Böckler Stiftung, a foundation operating alongside German labour unions, shaping our process with a political bias to care for labour, including the labour in scientific work; we conducted a workshop in 2018 in Berlin (Lippert and Douglas-Jones, 2019); continued the conversation at the EASST 2018 Lancaster conference; since then delved into the methodographic genre virtually and in meetings in hotels and cafés in Berlin. Some output of this process got published elsewhere (Hahn et al., 2018; Lippert, 2020; Smolka et al., 2021; Borgman et al., 2021), complementing this issue.

This editorial continues by locating the methodographic project in the social sciences and STS, and introducing each of the SI's contribution. It then draws out core concerns about practising STS ethnographic collaboration, problematising what this means for our understandings of data and collaboration, and closes by exploring how this issue nuances our concept of methodographic writing.

Locating methodographic analysis and writing

This SI contributes to the research conversation about the social studies of social science and its knowledge-making.[2] This reflexive orientation emerged around the 1980s and has much grown since the 1990s; STS has had a significant voice in this orientation (e.g. Camic et al., 2011). This conversation's early stages have been circumscribed in a working bibliography by Mair et al. (2013; a more recent review of the field does not seem to exist). Still, Kuznetsov (2019) problematises in *EASST Review* a missing subfield of "social science studies" in STS. Why should STS be interested in an investigation of social science practices, specifically methods?

Following Law and Urry (2004) we think of social science methods, including method use and practice in STS, as making realities – social and socio-material worlds. They ask: "which realities? Which do we want to help make more real, and which less real?" (Law and Urry, 2004: 404). We recognise a range of implicit and explicit political orientations in STS – including for instance critical traditions, feminist technoscience studies, the engaged programme or services for big tech industry. Do scholars with such orientations effectively use methods to achieve the intended effects? But we need to ask more broadly: how are social science methods performative, and of what? The making of worlds appears not as a post-practice effect but as partially configured within research practice. For instance, Strathern (1996) analyses the position of a researcher to cut networks of research strands and lines of investigation. The researcher is positioned in a tricky situation, facing moral and political dilemmas in the way they operationalise method (see, for instance, the case of ethnography discussed by Fine, 1993). Yet, graduate school method writing training can effect students to fake the qualities of qualitative research – such as when phony positionalities or qualities of collaboration are performed (Macfarlane, 2021). In societies reconsidering the status of sciences and humanities (not least reacting to so-called 'alternative facts'), an empirically informed understanding of our social scientific methods can be helpful in multiple ways, as outlined above.

Two strands of STS literature and conversations are key to our take on the social studies of social science(s) – methodography and, more broadly, the social life of methods.[3] The relevant push for the first, the notion of methodography, comes from Greiffenhagen et al. (2011). They analyse social scientists' reasoning practices. Specifically, they position their approach as interested in grounding an actual account of the production of knowledge (engaging with all the messy details and contingencies of practice), rather than a virtual account, a version of what got done, streamlined for users (say readers of a methods chapter). Following them turns methodological troubles from problems into phenomena for investigation (Greiffenhagen et al., 2015).[4] At the same time, the mundane practices and interaction with material and informational infrastructures of research come into focus. Such practices may seem boring and not well frameable as 'innovative', 'experimental', 'in(ter)ventive'; but the 'ethnography of the boring' is well applicable to this line of inquiry (see Star, 1999).

The second conversation is broader, with two STSy SIs explicitly addressing 'the social life of methods' (Law and Ruppert, 2013; Savage, 2013). This conversation is centrally informed by exploring how social research methods are shaped in social relations, and how these methods shape the social world. A core result of that exploration is that methods can be well conceptualised in terms of their heterogeneous components and relations – humans, pens, paper, computers, whiteboards, rooms, recorders, cameras, algorithms, libraries, teaching amongst other things. Intended and unintended results of method practice are considered an outcome of the configuration of such components and relations. Concepts like

apparatus (Barad, 1998), device (Law and Ruppert, 2013), configuration (Suchman, 2012) or agencement/assemblage (Deleuze and Parnet, 2007; Law, 2009) are thus mobilised to address such heterogeneous components and relations in situated practice. Work contributing to this conversation has been largely interested in other social scientists' research work; including experimental and inventive research assemblages. But some work has also auto-(ethno)graphically turned to its constitution (see e.g. the inventory by Lury and Wakeford, 2012; or the collection on practices of comparing by Deville et al., 2016).

Across these two strands, we highlight several analytical foci. One significant methodological tension cutting across analyses of research methods-in-practice concerns the ability to render observations explicit, the role of the conceptual in that and following strategies of introspection versus extrospection. Where introspective analyses are seen as risking (re)producing virtual accounts of knowledge production (Greiffenhagen et al., 2011), telling stories of how assemblages were conceived (Law and Ruppert, 2013), extrospective accounts appear as promising analysis of what happens in method practice (Greiffenhagen et al., 2011; Lippert and Douglas-Jones, 2019). Still, Garforth's (2012) critique of the privileging of observational methods matters, as these are ill-suited to address non-visible and non-audible forms of practice, e.g. thinking. Savage (2013) concludes his analysis of the challenges in analysing the social life of methods in terms of 'making explicit', which however will never be complete, but necessarily displaces the implicit. In parallel, we can consider the discussion of -ology vs -graphy by Lynch (2013): he argues against research limited to philosophically founded concepts and favours "historical and ethnographic investigations" (Lynch, 2013: 459) that come without presumption about the world under investigation. Yet, concepts are necessarily present in making explicit, in both intro- and extrospective strategies. And neither can we imagine all practices in a method assemblage to be subject to investigation. A circular problem, necessitating the cuts that Strathern noted in 1996.

Another analytical focus concerns the empirical. Both, the conversations on methodography and the social life of methods imply an interest in research into empirical realities. But, "what is the empirical?", we get asked – and analysing precisely this theme, Adkins and Lury's special issue (2009) problematises the empirical being given, recordable for the researcher. There is no such thing as raw data (Gitelman, 2013). Generating data about subjects involves questions of politics and justice – who is turned into data, who is given a voice, who silenced, who speaks in data analysis and empirical story-telling, and again questions of in/visibility (e.g. TallBear, 2017). At our 2018 workshop (Berlin), we learned, some empirical researchers try to circumvent these questions, and the troubles of control relations around data, by framing their methods as not generating and analysing 'data', but 'research materials'. We were intrigued: What happens to research practice if 'data' come to stand in for troubling relations of control, and when a researcher seeks to avoid these troubles with a substitute framing ('material')? Methodology might argue that data troubles cannot be avoided in empirical research. We suggest that practices of avoidance or ignorance might shape research-in-practice.

A related analytical highlight is the dominant move of 'being reflexive', within scholarly discourse in which data and methods cease to be innocent. Reflexivity is called for as an internal and public practice (though, others oppose dominant forms of reflexivity, e.g. Bourdieu (2003), proposing instead participant objectivation; see Lynch (2000) for an inventory of reflexivities): The researcher is to be aware and to show that awareness (see Ashmore (1989) for a classic case in STS). This awareness is to be concerned with the researcher's method configuration and its performative relation to what the research attempts to empirically relate to. Yet, that reflexivity is hard to practice as it is so deeply discursively shaped, to be framed in a mass of relevant conceptual considerations and critical introspection, but inter-dependent with collective intellectual practice (see Campbell, 2004; Macfarlane, 2021). The writing of reflexive, compelling, but not too compelling, accounts is fittingly of significant concern in STS and beyond, e.g. in anthropology and sociology (Clifford and Marcus, 1986; Atkinson, 1990; Lynch and Woolgar, 1990).

A final analytical focus is collaboration. With the making, un- and remaking of ethnographic epistemic and material entities (Pérez-Bustos et al., 2018), ethnography invents and intervenes in the social. Cropping up repeatedly within this literature, collaboration is widely called for; a norm to allow participation or to generatively intervene looms in STS (Hess, 2001; Zuiderent-Jerak, 2015) and beyond, e.g. in citizen science (Strasser et al., 2019). Collaboration has been analysed as shaped by a multitude of forms and power relations (e.g. Hackett and Rhoten, 2011; Niewöhner, 2016), raising questions about the enactment and redistribution of capacities for control (Herberg and Vilsmaier, 2020). Within heterogeneous relations among collaborators, researchers take partially conflicting roles (Balmer et al., 2015). Across such ongoing and emerging re/configurations of roles, control and power, we invited authors to explore how their collaborative research practices shape ethnographic data in multiple ways such as in allowing, preventing and configuring the making, reading and translation of data.

The contributions

Drawing on such developments in the literature by STS on method and STS method, we were curious what kind of knowledge a methodographic analysis could generate. Within the scope of this SI are the situated practices of STS ethnographic collaboration and its data practices, both of which participate in enacting, and jointly shape, what STS ethnography conducts researches on. This SI consists of six contributions that attend to this scope.

Ryanne Bleumink, Lisette Jong and Ildikó Zonga Plájás' analysis, 'Composite Method', compares enacting two methods employed to research the absence and presence of race. The empirical context is facial composite drawing, used in criminal investigations. First, they use observational methods in a natural setting, in a police station's interrogation room, recognise its limits, and subsequently they devise a video-supported experiment that is apt to produce materials that the analysts can differently learn from. The paper highlights how that experiment configured collaboration and creative process, and it shows how they used their experimental method to substantiate several ways of thinking through and enacting difference in shaping the relationship between individual and population.

Alexandra Endaltseva and Sonja Jerak-Zuiderent focus on 'Embodiment work in Ethnographic Collaborations'. Their empirical object is ethnographic fieldwork by one of the authors with/in a Russian patient organisation. With this empirical material, they show and analyse the embodied work of care in enacting and reflecting on method. This analysis recognises the role and distribution of resources in powering the ethnographic collaboration. Collaboration, they argue, figures as composition, it moves and thrives in pausing. Across their problematisation of ethnographic work, its crafting and maintenance, this analysis is attentive to care by acknowledging the performativity, fragility, and open-endedness in the making of a common world across the temporal space of the epistemic process, from pre- to post-engagement within the field.

Helena Karasti, Andrea Botero, Joanna Saad-Sulonen and Karen Baker analyse 'Visualising devices for configuring complex phenomena in-the-making'. Empirically, their story is concerned with infrastructures for long-term socio-ecological research in Finland and Europe. The authors focus on visualisations that they devised for their own research team's process of understanding the phenomena they were studying, and that they also used to engage with research collaborators and intervene in the phenomena. Quite literally, the analysis of these visualising devices addresses how re-imagination can be achieved, opening up knowledges about the phenomena. In that way, visualisation devices are turned into practices, that con-figure what they re-present. Rather than attempting to stabilise or standardise these method devices, the authors argue for keeping these sufficiently adaptable to achieve the work of in(ter)vention in collaboration.

The PECE Design Team, here specifically Aalok Khandekar, Brandon Costelloe-Kuehn, Lindsay Poirier, Alli Morgan, Alison Kenner, Kim Fortun and Mike Fortun reflexively discuss their making of PECE – the Platform for Experimental Collaborative Ethnography – and how their making involved learning about their experimental ethnographic

methods. They come to understand ethnographic work as moving and they analyse the making of their infrastructure as supporting and accounting for such a 'Moving Ethnography'. They recognise how their specific lineage in conversations in anthropology and STS, about ethnography and critical theory, has shaped their practices and commitments in performing ethnography as well as in infrastructuring ethnographic data and collaborative ethnographic research. Rather than stabilising knowledge, PECE is analysed as opening up – questions, data, findings, possibilities.

Francesca Grommé and Evelyn Ruppert analyse the performativity of a workshop that was aimed at 'Imagining Citizens as More than Data Subjects'. Specifically, they had designed the workshop to intervene in the way citizens were imagined by statisticians working at the national and international level. The analysis employs retrospective narratives of the two authors on the workshop's unfolding to question whether or how in the workshop's interactions re-imaginations were achieved. In the workshop's speculative epistemic collaboration they identify, they argue, 'friction' as characterising the collaborative engagement. Specifically, they show how the workshop did not achieve total alignment or radical rupture, but kept collaborators in epistemic touch, with friction emerging between their differences. This friction, they suggest, was generative of possibilities to sense and adapt to the difficulties in the practices of thinking and developing formulations and visualisations together.

Casper Bruun Jensen's 'Say Why You Say It' engages with the problem of ethnographic practice and writing with a focus on how writing configures data. To illustrate his reconstruction of the problem, he employs retrospective accounts of his work in authoring two ethnographic texts about realities emerging in the world(s) of the Mekong river, in Southeast/East Asia. In his accounts, he problematises the imaginary of delineating ethnographic from rhetorical effects in writing. For that he shows how writing ethnography can involve a back and forth between so-called theory and so-called empirical data, questioning the relationship between ethnography as a method and as writing. Ethnographic writing, for him, is necessarily putting into proportion and relation texts and realities. Writing, he argues, should be considered as yet another practice that forms a collective of heterogeneous companions – making the author appear as effectively performing a collaborative companionship.

Finally, this issue includes a book review essay by Stefan Laser. He discusses one monograph and two edited volumes that turn STS and ethnographic research practice into objects of investigation. These, he argues, contribute – mobilising a range of disciplinary approaches – to STS method conversation by way of building bridges, mediating between methodological ideals on the one hand and research realities on the other.

Re/con/figuring data and collaboration in STS ethnography

The STS ethnographic genre is described by Pérez-Bustos et al. (2018) as significantly characterised by situating its knowledge production as well as analysing how its ethnographic objects are made, remade and unmade. This issue continues this line of characterisation and explores specifically how ethnographic collaboration and its data are practised. Widely absent from this line of analysis is legitimising method practices relative to prescriptive methodological accounts (such as Hess's, 2001). The focus on practices renders uncertain what ethnographic data and collaboration mean. At the same time, rendering data and collaboration practices as well as their infrastructures explicit makes partially available for collective discussion of how knowledge is situated. Whilst situated knowledge might be heralded in abstract, the contributions of this SI take steps to make explicit the particular circumstances of enacting data and collaborative relations.

Practising STS data

Data appears across a broad spectrum of framings. Marginally, we recognise the framing of data as being collectable, and as found, e.g., in interview transcripts. From this perspective, data seems quite untroubled. However, as we move away from this margin, we find a much more dominant pattern across the contributions of an understanding of data as non-antecedent. Gitelman's

'*Raw Data' Is an Oxymoron* (2013) comes to mind because it addresses at its core manifold ways of how data is enacted in material practices, always 'cooked', and that the dichotomies of raw versus cooked, the untouched or unprocessed versus the touched or processed, do not sit well with STS work on data production in the sciences. This is because 'finding' data already involves a process, including theoretically or otherwise shaped selections of what counts as data, cuts in recording and transcribing data, and choices in representing data within fieldnotes. Similarly, an implicit concept of data as heterogeneously enacted and actant itself looms in this SI.

We learn from Khandekar et al. (2021) that the idea of data collection involves in practice ongoing decisions of what to turn into data and what not to datafy, thus figuring 'data collection' and 'analysis' as folded into each other. Jensen's (2021) illustration of how concepts from literature shaped attention in the field, thus shaping how data was constituted, powers an argument for understanding the empirical and the conceptual as effects of writing practice. Boundaries between field and concepts become uncertain. Data and field emerge as configured – when data of a field is re-located and placed within visual re-presentations and subsequently offered back to collaborators, intervening thus in how the field appears or in what the field consists of (Karasti et al., 2021).

Yet, not always is ethnographic observation in the 'natural setting' pertinent to the researcher's interests. For instance, research subjects cannot be observed closely when the professional police framework may not allow so (Bleumink et al., 2021), or the research informants might not 'naturally' engage with the question of interest (Grommé and Ruppert, 2021). In such situations, some of the authors engaged in experimental practices. To compose data informing their research interest, Bleumink et al. designed an audio-visual recording experiment in which the practices they wanted to observe were prefigured through an experimental set-up. An interactive workshop setting was used by Grommé and Ruppert to gather informants from different fields and to jointly engage in design practices, which was to show how specific (re)imaginations became possible. Similarly working with design, Karasti et al. crafted material and digital devices to learn about the field and intervene in it.

Ethnographic data was also recognised as processed in data devices by Karasti et al. and Khandekar et al. The latter analyse their ethnographic commitments as requiring a data infrastructure in which the data container is everything but inert: what surrounds data shapes what and how content in the container is possible. Data, in their infrastructure, is not to be contained but to be kept alive. Data living in, and as, an ecology allows for continuous re-visioning, re-reading, re-framing, powering a research project's analysis as well as others' research, seeding data as generative of collaboration. Specifically, this implies data is rendered available for continuing and conflictual re/interpretations. Open access to data (open data) and open access to the data infrastructure's code is part of their take. They call these multiple ways of relating to data and performing data as opening data, and their analysis can be read as normatively calling for such opening.

Practising STS collaboration

Ethnographic collaboration, we learn, can seek to observe everyday practices in a field, or can seek to engender new practices. Another differentiation appears in whether the methodographic analysis presents the researcher(s) as configuring their method as an experimental collaboration, i.e. whether they analyse their ethnographic method as having to collaboratively enact an experiment to render the practices observable. This involves a concern with quality: achieving the desired effects well.

Collaboration can be understood in terms of the work, the action and the movement involved in achieving the collaboration. Discussing the range of movement(s) involved in collaborative ethnography is one analytic strategy (Khandekar et al., 2021). Alternatively, we can understand collaboration by stressing how movement involves variation of speed, how collaboration can thrive in pausing, as Endaltseva and Jerak-Zuiderent (2021) show. In their take, collaboration depends on slowing down, carefully achieving a collaborative relationship to work together with their collaborators (in their case also the health movement) in solidarity. Collaboration here is

enacted in solidarity with the settings in which the ethnographer seems to find the collaborators. Instead of focusing on forms of movement, collaboration work can be analysed with respect to how researchers and collaborators manage to achieve some form of sync, partial sameness, or, in contrast, how researchers use the collaboration to intervene and create a rupture. In between such extremes, an analytical strategy is to focus on the interests of the participants and explore what researchers and collaborators orientate themselves at. Grommé and Ruppert provide a study of collaboration work in which the collaboration thrives on working with and across such difference of interests.

Collaborators may, however, conduct their practices in settings in which they cannot be observed. Collaboration ethnographically can then mean creating a setting in which the practices can be observed. This is the strategy by Bleumink et al., who attend to how that setting configures the participants, how they can entice actors to participate in their experimental setting, how the ethnographers' learning about the practice cannot be untied from that constructed setting. Collaborative ethnography here takes on a character of an experimental apparatus in which humans and nonhumans 'intra-act' (Barad, 1998). Such an apparatus can be a frame for collaborative intra-action that would not 'naturally' occur but is decisively designed by the experimenters. In between designing experimental collaborative spaces and collaborating within a 'natural setting', collaborative learning can crystallise in the engagement with devices that re-present the setting. Karasti et al. present such devices and analyse how their (visual) re-presentations, or practices of co-designing such devices, intervene in the field that they research as well as how that intervention is also inventing that very field.

Across these contributions, we find many illustrations of the socio-technical resources mobilised for achieving collaborations amongst humans. Jensen's analysis shifts the perspective and addresses how the ethnography-as-text configures the way the ethnographer, their concepts and data are made to work together – here addressing these textual actants as companions rather than as collaborators.

Writing methodography

Writing methodographically can foreground what methods are performative of and how. We find that STS ethnographic method achieves differences with data and collaboration practices. The method is performative of identifying differences in the field and in generating differences. Differences as epistemic and other real-worldly effects are achieved by way of enacting movement and pausing, by configuring and composing method infrastructure's entities and relations, without rendering these inert or inaccessible. Instead, openness characterises the methods analysed in this SI.

To conclude, we reflexively draw together what it means to write a methodography, and we return to what writing methodographies might do for the field of Science and Technology Studies.

The contributions to this issue illustrate a range of strategies for analysing methodographically. Overarchingly, they present methods within the scope of a material-semiotic practico-situated ontology. That is to say, they turn methods into a topic by way of approaching methods as if these are materially-semiotically enacted, achieved in specifically situated practices. We find traces of materiality – artefacts like paper, receipt, camera, pencil, car; living and embodied entities, humans; places and environments; digital visualisations and metadata. We find scholarly STS discourses through and through – for instance concepts of embodiment, devices, experimentation or collaboration – that have shaped method development. We find explorations of the lineages, multi-institutionally and internationally distributed networks within which the design and the enactment of methods are located as well as methods performed – in a cab, in a police station, a living room. Such rich material is analysed by the methodographies in several ways: by way of close descriptions of the embodied and emplaced configuration of methods, the researchers, human and non-human participants or companions; by way of identifying patterns in fieldnote data and teasing out 'meta-method' themes; by way of exploring the performativity, world-making effects, of the method assemblages. And the issue contains an analysis that questions the very rendering of semiotic actants as empirical, and instead analyses ethnographic method as

also achieving textually the divide between the conceptual and the empirical. Across several of the contributions, the practice of conducting a methodography is described in terms of a back-and-forth, for instance, between empirical moments, theoretically informed concepts, mediated by writing and, mostly implicitly, by analysis.

The back-and-forth in the analyses takes the reader close to the weaving of the methodographic story. This matters because particularities of method-in-that-moment are foregrounded, allowing the author to show how, at this moment, things might be made the same, or might be made as different. Difference can be translated (re-presented whilst betrayed) within methodographic writing insofar as different versions of translations can be explored and discussed.

The reader can take a position of interest in this apparatus and the translations it produces by way of engaging with the material-semiotic traces presented. Extrospectively described entities and their relations, articulating the practicalities in the method's configuration, enable the reader to compare these research practicalities to other practicalities, experienced outside of the text.

For the field of STS, methodographies can crystallise interest in methods. We think of interest here with Stengers (2000): *Inter-esse*, being situated in between, can power a collective engagement of those who take part in a research apparatus, without requiring all participants to agree, even the authors do not have to agree (with themselves). An interested analysis of methods provides the reader with the materials that position the reader-participants in a way that allow them to hold to account as well as to consider the contingencies and particularities that, as humans or non-humans, con-figure the research apparatus and its epistemic effects.

To look ahead, we imagine this SI's versions of writing methodographically as part of a broader spectrum of analytical approaches. At one end of this spectrum, we might explore how method practices and infrastructures are enacted in situated action, at another end how such situations might be shaped by a cultural and political economy of methods. The agenda then involves asking what doing research well means at such theoretical intersections. And how can our collective process care for the methods, method users and developers, the fiddling and the mess, whilst considering the disciplinary-economic-worldly situatedness of STS scholar's research practices? We hope this SI supports STS in asking these questions *together*. Beyond methodographic inquiry undertaken individually and in peer constellations, foremost, we hope for collective dialogue and mutually shaped troubling of our method practices.

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References

Adkins L and Lury C (2009) Introduction: What is the Empirical? *European Journal of Social Theory* 12(1): 5–20. DOI: 10.1177/1368431008099641.

Ashmore M (1989) *The Reflexive Thesis: Wrighting Sociology of Scientific Knowledge*. Chicago, IL: University of Chicago Press.

Atkinson P (1990) *The Ethnographic Imagination: Textual Constructions of Reality*. London, UK: Routledge.

Balmer AS, Calvert J, Marris C et al. (2015) Taking Roles in Interdisciplinary Collaborations: Reflections on Working in Post-ELSI Spaces in the UK Synthetic Biology Community. *Science and Technology Studies* 28(3): 3–25. DOI: 10.23987/sts.55340

Barad K (1998) Getting Real: Technoscientific Practices and the Materialization of Reality. *Differences: A Journal of Feminist Cultural Studies* 10(2): 87–91. DOI: 10.1515/9780822388128-007.

Beaulieu A (2010) Research Note: From Co-Location to Co-Presence: Shifts in the Use of Ethnography for the Study of Knowledge. *Social Studies of Science* 40(3): 453–470. DOI: 10.1177/0306312709359219.

Bleumink R, Jong L and Plájás IZ (2021) Composite Method: The Absent Presence of Race in Experimental Film and Facial Composite Drawing. *Science & Technology Studies* 34 (3):17-37. DOI: 10.23987/sts.80293.

Borgman CL, Wofford MF, Golshan MS and Darch PT (2021) Collaborative Qualitative Research at Scale: Reflections on 20 Years of Acquiring Global Data and Making Data global. *Journal of the Association for Information Science and Technology* 72: 667–682. DOI: 10.1002/asi.24439.

Bourdieu P (2003) Participant Objectivation. *Journal of the Royal Anthropological Institute* 9(2): 281–294. DOI: 10.1111/1467-9655.00150.

Camic C, Gross N and Lamont M (eds) (2011) *Social Knowledge in the Making*. Chicago, IL: University of Chicago Press.

Campbell K (2004) The Promise of Feminist Reflexivities: Developing Donna Haraway's Project for Feminist Science Studies. *Hypatia* 19: 162–182. DOI: 10.1111/J.1527-2001.2004.Tb01273.X.

Clifford J and Marcus GE (eds) (1986) *Writing Culture: The Poetics and Politics of Ethnography: A School of American Research Advanced Seminar*. Berkeley, CA: University of California Press.

Deleuze G and Parnet C (2007) *Dialogues II*. New York, NY: Columbia University Press.

Deville J, Guggenheim M and Hrdlićková Z (eds) (2016) *Practising Comparison: Logics, Relations, Collaborations.* Manchester, UK: Mattering Press.

Endaltseva A and Jerak-Zuiderent S (2021) Embodiment in Ethnographic Collaborations: Composition, Movement, and Pausing within the Multiple Sclerosis Society in Russia. *Science & Technology Studies* 34 (3): 38-54. DOI: 10.23987/sts.96101.

Feyerabend P (1993) *Against Method*. 3rd ed. London, UK: Verso.

Fine GA (1993) Ten Lies of Ethnography: Moral Dilemmas of Field Research. *Journal of Contemporary Ethnography* 22(3): 267–294. DOI: 10.1177/089124193022003001.

Garforth L (2012) In/Visibilities of Research: Seeing and Knowing In STS. *Science, Technology, & Human Values* 37(2): 264–285. DOI: 10.1177/0162243911409248.

Gitelman L (ed) (2013) *'Raw Data' is an Oxymoron*. Cambridge, MA: The MIT Press.

Greiffenhagen C, Mair M and Sharrock W (2011) From Methodology to Methodography: A Study of Qualitative and Quantitative Reasoning in Practice. *Methodological Innovations Online* 6(3): 93-107. DOI: 10.4256/Mio.2011.009.

Greiffenhagen C, Mair M and Sharrock W (2015) Methodological Troubles as Problems and Phenomenona: Ethnomethodology and the Question of 'Method' in the Social Sciences. *British Journal of Sociology* 66(3): 460–485. DOI: 10.1111/1468-4446.12136.

Grommé F and Ruppert E (2021) Imagining Citizens as More than Data Subjects: A Methodography of a Collaborative Design Workshop on Co-producing Official Statistics. *Science & Technology Studies* 34(3): 103-124. DOI: 10.23987/sts.89444.

Hackett EJ and Rhoten DR (2011) Engaged, Embedded, Enjoined: Science and Technology Studies in the National Science Foundation. *Science and Engineering Ethics* 17(4): 823–838. DOI: 10.1007/S11948-011-9307-X.

Hahn C, Hoffman AS, Slota SC, Inman S and Ribes D (2018) Entangled Inversions: Actor/Analyst Symmetry in the Ethnography of Infrastructure. *Interaction Design and Architecture(s) Journal* 38: 124–139. Available at: http://www.mifav.uniroma2.it/inevent/events/idea2010/doc/38_7.pdf (accessed 5.8.2021).

Hammersley M (2020) From Methodology to Methodography? *Methodological Innovations* 13(3). DOI: 10.1177/2059799120976995.

Haraway D (1988) Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14(3): 575–599. DOI: 10.2307/3178066.

Haraway D (2016) *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press.

Herberg J and Vilsmaier U (2020) Social and Epistemic Control in Collaborative Research — Reconfiguring the Interplay of Politics and Methodology. *Social Epistemology* 34(4): 309–318. DOI: 10.1080/02691728.2019.1706115

Hess DJ (2001) Ethnography and the Development of Science and Technology Studies. In: Atkinson P, Coffey A, Delamont S, Lofland J and Lofland J (eds) *Sage Handbook of Ethnography*. Thousand Oaks, CA: SAGE, pp. 234–245.

Hyysalo S, Pollock N and Williams R (2019) Method Matters in the Social Study of Technology: Investigating the Biographies of Artifacts and Practices. *Science & Technology Studies* 32(3): 2–25. DOI: 10.23987/sts.65532.

Jasanoff S (2017) A Field of Its Own. In: Frodeman R, Thompson Klein J and Pacheco RCS (eds), *The Oxford Handbook of Interdisciplinarity*. Oxford, UK: Oxford University Press, pp. 173–187.

Jensen CB (2014) Continuous variations: The conceptual and the empirical in STS. *Science, Technology, & Human Values 39*(2): 192–213. DOI: 10.1177/0162243913502866

Jensen CB (2021) Say Why You Say It: On Ethnographic Companionship, Scale, and Effect. *Science & Technology Studies* 34(3): 125-137. DOI: 10.23987/sts.102599.

Jungnickel K (ed) (2020) *Transmissions: Critical Tactics for Making and Communicating Research*. Cambridge, MA: The MIT Press.

Karasti H, Botero A, Saad-Sulonen J and Baker KS (2021) Configuring Devices for Phenomena in-the-Making. *Science & Technology Studies* 34(3): 55-77. DOI: 10.23987/sts.95083.

Khandekar A, Costelloe-Kuehn B, Poirier L et al. (2021) Moving Ethnography: Infrastructuring Doubletakes and Switchbacks in Experimental Collaborative Methods. *Science & Technology Studies* 34(3): 78-102. DOI: 10.23987/sts.89782.

Knorr-Cetina K (1995) Laboratory Studies: The Cultural Approach to the Study of Science. In: Jasanoff S, Markle GE, Peterson JC et al. (eds) *Handbook of Science and Technology Studies*, Revised edition. Thousand Oaks, CA: SAGE, pp. 140–167.

Kuhn TS (1970) *The Structure of Scientific Revolutions*. Enlarged (2nd Ed). Chicago, IL: University of Chicago Press.

Kuznetsov A (2019) Changed but Undescribed? What STS Could Say on the Research Practices of Social Sciences. *EASST Review* 38(1). Available at: https://web.archive.org/web/20210324092833/https://easst.net/article/changed-but-undescribed-what-sts-could-say-on-the-research-practices-of-social-sciences/ (accessed August 12 2021).

Latour B and Woolgar S (1986) *Laboratory Life: The Construction of Scientific Facts*. 2nd Ed. Princeton, NJ: Princeton University Press.

Law J (2004) *After Method: Mess in Social Science Research*. London, UK: Routledge.

Law J (2008) On Sociology and STS. *The Sociological Review* 56(4): 623–649. DOI: 10.1111/J.1467-954X.2008.00808.X.

Law J (2009) Actor-Network Theory and Material Semiotics. In: Turner B (Ed) *The New Blackwell Companion to Social Theory*. Oxford, UK: Blackwell, pp. 141–158.

Law J and Ruppert E (2013) The Social Life of Methods: Devices. *Journal of Cultural Economy* 6(3): 229–240. DOI: 10.1080/17530350.2013.812042.

Law J and Urry J (2004) Enacting the Social. *Economy and Society* 33(3): 390–410. DOI: 10.1080/0308514042000225716.

Law J, Ruppert E and Savage M (2011) The Double Social Life of Methods. *CRESC Working Paper Series* Centre for Research on Socio-Cultural Change 95.

Liegl M and Wagner E (2013) Is the Research Medium the Message? On the Performativity of Media within Social Research. *Distinktion: Scandinavian Journal of Social Theory* 14(3): 241–245. DOI: 10.1080/1600910X.2013.860611.

Lippert I (2014) Studying Reconfigurations of Discourse: Tracing the Stability and Materiality of 'Sustainability/Carbon'. *Zeitschrift Für Diskursforschung* 2(1): 32–54. Available at: http://nbn-resolving.de/urn:nbn:de:0168-ssoar-52883-2 (accessed 5.8.2021)

Lippert I (2020) In, with and of STS. In: Wiedmann A, Wagenknecht K, Goll P and Wagenknecht A (eds) *Wie Forschen mit den 'Science and Technology Studies'? Interdisziplinäre Perspektiven*. Bielefeld, GE: transcript, pp. 301–318.

Lippert I and Douglas-Jones R (2019) 'Doing Data': Methodography in and of STS. *EASST Review* 38(1): 35–39. https://web.archive.org/web/20210217124910/https://easst.net/article/doing-data-methodography-in-and-of-sts/

Lippert I and Verran H (2018) After Numbers? Innovations in Science and Technology Studies' Analytics of Numbers and Numbering. *Science & Technology Studies* 31(4): 2–12. DOI: 10.23987/sts.76416.

Lury C and Wakeford N (2012) *Inventive Methods: The Happening of The Social*. London, UK: Routledge.

Lynch M (2000). Against Reflexivity as an Academic Virtue and Source of Privileged Knowledge. *Theory, Culture & Society* 17(3): 26–54. DOI: 10.1177/02632760022051202.

Lynch M (2013) Ontography: Investigating the Production of Things, Deflating Ontology. *Social Studies of Science* 43(3): 444–462. DOI: 10.1177/0306312713475925.

Lynch M (2014) From Normative to Descriptive and Back. In: Soler L, Zwart S, Lynch M and Israel-Jost V (eds) *Science after the Practice Turn in the Philosophy, History, and Social Studies of Science*. New York: Routledge, pp.93–113.

Lynch M and Woolgar S (1990) Preface. In: Lynch M and Woolgar S (eds) *Representation in Scientific Practice*. Cambridge; MA: The MIT Press, pp. vii-x.

Macfarlane B (2021) Methodology, Fake Learning, and Emotional Performativity. *ECNU Review of Education* DOI: 10.1177/2096531120984786.

Mair M, Greiffenhagen C and Sharrock W (2013) Social Studies of Social Science: A Working Bibliography. *NCRM Working Paper* 08(13). Available at: http://eprints.ncrm.ac.uk/3219/ (accessed 5.8.2021).

Mewes JS and Sørensen E (eds) (2017) Ethnographies of Objects in Science and Technology Studies. *Ethnographies of Objects in Science and Technology Studies* 1: 1–89. DOI: 10.13154/eoo.1.2017.1-89.

Mulkay M (1981) I.3 Action and Belief or Scientific Discourse? A Possible Way of Ending Intellectual Vassalage in Social Studies of Science. *Philosophy of the Social Sciences* 11(2): 163–171. DOI: 10.1177/004839318101100204.

Mulkay M (1985) *The Word and the World: Explorations in the Form of Sociological Analysis*. London, UK: George Allen & Unwin.

Niewöhner J (2016) Co-Laborative Anthropology. Crafting Reflexivities Experimentally. In: Jouhki J and Steel T (eds) *Etnologinen tulkinta ja analyysi. Kohti avoimempaa tutkimusprosessia* [Ethnological Interpretation and Analysis. Opening Up the Research Process]. Helsinki: Ethnos, pp. 81–125.

Pérez-Bustos T, Martinez Medina S and Mora-Gámez F (2018) What is "(Un)Making" STS Ethnographies? Reflections (not exclusively) from Latin America. *Tapuya: Latin American Science, Technology and Society* 1(1): 131–137. DOI: 10.1080/25729861.2018.1551825.

Rodrigues E and Mulkay MJ (2018) On SSK and Conversing with Scientists: Eugénia Rodrigues Talks with Michael J. Mulkay. *Engaging Science, Technology, and Society* 4, 408–422. DOI: 10.17351/ests2018.242

Savage M (2013) The 'Social Life of Methods': A Critical Introduction. *Theory, Culture & Society* 30(4): 3-21. DOI: 10.1177/0263276413486160.

Schaffer S (2013) How Disciplines Look. In: Barry A and Born G (eds) *Interdisciplinarity: Reconfigurations of the social and natural sciences*. London, UK: Routledge, pp. 57–81.

Smolka M, Fisher E and Hausstein A (2021) From Affect to Action: Choices in Attending to Disconcertment in Interdisciplinary Collaborations. *Science, Technology, & Human Values* 46(5): 1076–1103. DOI: 10.1177/0162243920974088

Stengers I (2000) *The Invention of Modern Science*. Minneapolis, MI: University of Minnesota Press.

Star SL (1999) The ethnography of infrastructure. *American behavioral scientist* 43(3): 377–391. DOI: 10.1177/00027649921955326.

Strasser B, Baudry J, Mahr D, Sanchez G and Tancoigne E (2019) 'Citizen Science'? Rethinking Science and Public Participation. *Science & Technology Studies* 32(2): 52–76. DOI: 10.23987/sts.60425.

Strathern M (1996) Cutting the Network. *Journal of the Royal Anthropological Institute* 2(3): 517–535. DOI: 10.2307/3034901

Suchman L (2012) Configuration. In: Lury C and Wakeford N (eds) *Inventive Methods: The Happening of The Social*. London, UK: Routledge, pp. 48–60.

TallBear K (2017) Standing With and Speaking as Faith: A Feminist-Indigenous Approach to Inquiry. In: Andersen C and O'Brien J (eds) *Methods in Indigenous Studies*. Minneapolis, MI: University of Minnesota Press, pp. 78–85.

Wiedmann A, Wagenknecht K, Goll P and Wagenknecht A (eds) (2020) *Wie Forschen mit den 'Science and Technology Studies'? Interdisziplinäre Perspektiven*. Bielefeld, DE: transcript.

Zuiderent-Jerak T (2015) *Situated Intervention: Sociological Experiments in Healthcare*. Cambridge, MA: The MIT Press.

Zuiderent-Jerak T and Jensen CB (2007) Editorial Introduction: Unpacking 'Intervention' in Science and Technology Studies. *Science as Culture* 16(3): 227–235. DOI: 10.1080/09505430701568552.

Notes

1 This SI presumes that something good emerges out of being more or differently explicit about our method practices. We recognise that contributions to STS can be primarily theoretical or conceptual, not making empirical claims. Yet, how these are related stays for us as interesting as understanding how scientific theories are related to practices in a laboratory. Our concern is with how the empirical is woven into STS theory, even if theory and the empirical are mixed (Jensen, 2014).

2 The reader might find some discussion in this editorial that is not necessarily specific to STS, but relevant to disciplines like sociology and anthropology, too. However, not in scope of this SI is how method development and standardisation in these disciplines shaped the in(ter)disciplined or interconceptual field of STS (for this in(ter)disciplining, compare Schaffer, 2013 and Jasanoff, 2017; for interconceptual, see Lynch, 2014).

3 We recognise a broader literature on (meta)research on research practices in STS, in which methods have not always been the chosen perspective on practice. For instance, Mewes and Sørensen (2017) provide an edited collection of the work with objects in STS ethnography; Lippert and Verran's (2018) special issue on numbers highlights comparatively how putting into practice different analytical concepts (of numbering) are performative of distinct analyses. Hyysalo et al. (2019) show that research designs and study templates matter; Lippert (2014) details the shift between a methodological design for qualitative data analysis and the mess of a mixed paper-based and digital research configuration. A volume edited by Wiedmann et al. (2020) focuses on the troubles and frictions of working with concepts in STS research practice. STS has been deeply interested in the performativity of media, 'novel' digital devices as well as dominant method devices employed by social scientists (Law et al., 2011; Liegl and Wagner, 2013), recognising the role of materiality and human as well as non-human agency.

4 As expected for intra-sociological debate, that very ethnomethodological investigation is also questioned for its lack of turning the methodographic gaze on the ethnomethodologists' practice (Hammersley, 2020).

Composite Method: Studying the Absent Presence of Race in Facial Composite Practice

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Abstract

This methodographic paper explores the performativity and materiality of methods in STS research practice. Studying the absent presence of race in facial composite drawing in the Netherlands, the confidential nature of criminal investigations put constraints on our possibilities to study this practice. To generate data to work with, we created an ethnographic experiment producing two facial composites in collaboration with two forensic artists. We recorded the drawing process using a variety of (audiovisual) technologies to produce different materializations of the event. Tinkering with and analyzing the generated materials sensitized the ethnographers to three different modes of doing difference in which race surfaces in the process of facial composite drawing: 1) touching as describing; 2) layering and surfacing; and 3) articulating the common. We argue that different modes of doing ethnography, for instance, conducting research with audiovisual and experimental methods, can open up new ground to approach difficult and slippery objects such as race.

Keywords: ethnographic experiment, absent presence, race, facial composite, co-laboration

Introduction

This paper is an ethnographic account of the performativity and materiality of methods in STS research practice. As part of a research project on how race comes to matter in forensic identification technologies, we studied the knowledge practices of forensic artists who draw facial composites for criminal investigations in the Netherlands. In this paper, we reflect on how our own knowledge practices are performative of our account of the absent presence of race in this specific forensic technique. Together with our interlocutors, we carried out an 'ethnographic experiment' (Mann et al., 2011; Fortun, 2012). In this experiment, we created two facial composite drawings outside the forensic setting of the police station. This collaborative experimental set-up and our use of

audiovisual methods shaped our data and analysis in particular ways. In this paper, we address how the material affordances and limitations of our methods sensitized us to the enactment of race in facial composite practice in a different way than ethnographic observations in the questioning room at the police allowed for.

The contribution of this paper is twofold. First, we aim to contribute to the STS literature on ethnographic experimentation (see for example Mann et al., 2011; Fortun, 2012; Niewöhner, 2016; Sánchez Criado and Estalella, 2018) by providing a methodographic account (Greiffenhagen et al., 2011; Lippert, 2020) in which we explore the work that audiovisual methods can do in and for STS research practice. Methodography comprises the empirical study of qualitative research methods in practice by addressing "what it means to do ethnography in STS settings" and attending to how data gets configured in ethnographic collaboration (Lippert and Douglas-Jones, 2019). In particular, we focus on how the use of audiovisual methods in our ethnographic experiment, generated opportunities for 'co-laboration' and joint reflexive moments (Niewöhner, 2016) between the researchers and forensic artists.

Second, we aim to contribute to the STS literature on the (re-)surfacing of race in forensic practices, the case of facial composite drawing. In contrast to the ample work produced on race and novel forensic DNA technologies (see for example Ossorio, 2006; Sankar, 2012; Schwartz-Marín et al., 2015; Skinner, 2018; M'charek et al. 2020; Hopman and M'charek, 2020), the mundane forensic practice of facial composite drawing has not yet received any attention from STS scholars (one exception is Nieves Delgado, 2020). Combining written text with audiovisual montage, we demonstrate how race comes to matter in the practice of facial composite drawing. Thereby we build on the notion of absent presence (Law, 2004) as an analytical tool that allows us to study how race comes about as a relational object (M'charek et al., 2014a). As Law (2004: 83) writes, "what is being made present always depends on what is also being made absent". We attend to the presences and absences through which race comes about in facial composite drawing by closely following the making of two facial composites in the experimental sessions. In our methodographic account, we emphasize how tinkering with the different (audiovisual) recordings and combing them in a montage, served as a way to address this relationality and bring to the fore material-semiotic realities made absent from the final image, but that nonetheless form part of the facial composite.

The film clips in this multimodal article (Collins et al., 2017; Westmoreland, 2017) make tangible the technologies and materialities through which race is enacted in the practice of facial composite drawing. We invite our readers not only to follow the written argument, but also to watch the clips. In this paper we argue, based on our analysis of *both* the absent presence of race *and* our research method, that different modes of doing ethnography, for instance conducting research with audiovisual and experimental methods, can open up new ground to study difficult and slippery objects, such as race, in practice.

Race and facial composite drawing

M'charek et al., building on the work of Law (2004), argue that race in Europe can be understood as a pattern of absences and presences: "race in Europe is an *absent presence* that oscillates between reality and nonreality because it is not a singular object but rather a pattern of various elements, some of which are made present and others absent" (M'charek et al., 2014a: 462). Race comes about in "many different guises" (M'charek et al., 2014a: 462). Balkenhol and Schramm (2019: 587) therefore argue that it is important to ''draw careful attention to the heterogeneous, fluid and often surprising ways in which race may surface in concrete practices". This calls for a relational approach to- and ethnographic exploration of- how race is enacted in practice, rather than defining what it is beforehand. One good candidate to study the absent presence of race is forensic identification technologies.

Forensic identification technologies rely on a range of actors such as police officers, forensic scientists and legal experts. In the context of different settings such as the courtroom, laboratory, crime scene and media, a continuous exchange between materials, knowledge and people takes place. In facial composite practice for

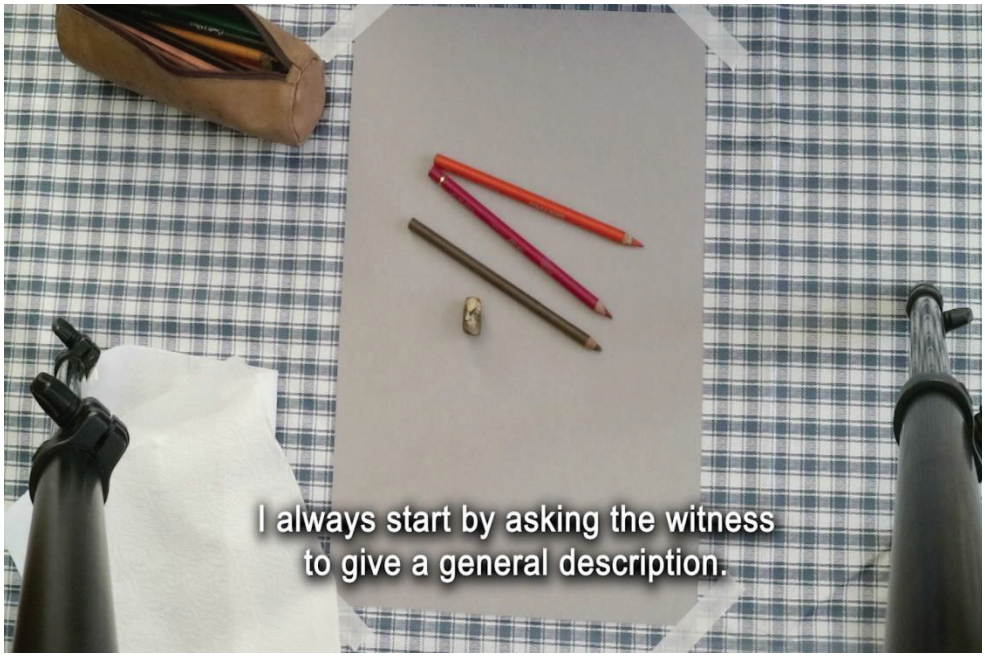
instance, a facial image of an unknown individual suspect is drawn in a collaboration between a forensic artist and a witness and circulated via the media. In order to arrive at the facial image, witnesses and forensic artists need to differentiate between individuals. However, to make comparison and communication possible, the individual suspect is placed within a broader population (M'charek, 2000). In facial composite drawing, devices such as descriptive categories and reference images are used to aid this process.

As we show in this paper, it is in these practices, in particular in the oscillation between the individual and the population, that race surfaces. To be sure, race here cannot be reduced to something fixed in the body, neither a quality of the body but, as M'charek (2013) argues, is a relational object that is enacted differently in different practices. A relational approach thus allows us to attend to the different materialities of race without fixing and naturalizing it (M'charek, 2013: 424).

Sensitized by this relational approach to race, Ryanne[1], part of the RaceFaceID project[2], set out to study the practice of facial composite drawing in the Netherlands. To do this, she was granted access to a forensic department of the Dutch police where she conducted fieldwork for over one year. While Ryanne was able to observe the making of the facial composite in the questioning room[3], she encountered several methodological challenges. These challenges led us to develop an ethnographic experiment. Before moving to the questioning room at the police to see what these challenges entailed in Ryanne's research practice, we explain what a facial composite is and what it is used for.

The facial composite in criminal investigations

A facial composite drawing[4] is the facial depiction of an unknown criminal suspect based on a description of this individual by an eyewitness of a crime. Portraying a face of an unknown suspect is not a new criminal investigation tool and neither an exclusively Dutch practice. One of the first known facial composites was made in 1881 in the United Kingdom of the British 'railway murderer' (Taylor, 2000: 12). In absence of evidence that could lead to a suspect, the criminal investigation team may call upon a forensic artist. It is the task of the forensic artist, together with the eyewitness, to create a facial image of the suspects face.



Clip 1. Introduction to the complexity of facial composite drawing. We hear both the forensic artists explain their drawing method and we see the materials involved in the process. In the first case the image is cropped around the drawing paper. In the second case the frame is wider, showing the position of the paper on the table between the legs of the tripod on which the camera is mounted. All clips can be accessed here: https://vimeo.com/channels/1451961

During Ryanne's fieldwork period in 2016–2017, facial composite drawing was a practice that was hardly standardized in the Netherlands.[5] All elements, from forensic artists to drawing- and interview techniques, reference materials, witnesses, criminal investigators and questioning rooms, differed on any occasion. In Clip 1, we emphasize the variety in ways of drawing facial composites by contrasting the beginnings of the two composite sessions in the experiment. The short clip demonstrates that not only the materials differ, such as the different drawing papers and pencils, but also the artists, which becomes observable by seeing different hands moving in and out of the frame and listening to their different voices. In addition, the explanations provided in the clip, hint at the differences in drawing style, reference material and information gathering that are used by these artists. To watch Clip 1, click on the image.

When a composite drawing is requested by the police, the forensic artist sets up an interview with the witness and introduces the witness to the process. In the interview, the witness provides a description of what they remember about the appearance of the suspect. Communicating a visual experience and retrieving a face from memory is hard work. In forensic psychology, emphasis is put on the difficulties of verbally describing a face from memory (see for example Van Koppen and Lochun, 2010). The forensic artist brings reference materials to the interview that are used to help the witness articulate what they remember about the appearance of a suspect. This material consists of photographs or illustrations of different faces or facial features, precisely to go beyond the verbal.

In addition, an eyewitness account is not a straightforward process of verbalizing what a witness saw with their eyes only. For example, a particular accent or the proximity of an asylum center might make the suspect look like 'a foreigner' (Jong and M'charek, 2018). Or the smell of alcohol and dirty clothes might make somebody look like 'a homeless person.' Experiences, histories, knowledges, biases and other sensorial perceptions of the onlooker are folded into what is seen. As Haraway noted, vision is always an embodied and situated practice: "the view from a body, always a complex, contradictory, structuring, and structured body" (Haraway, 1988: 589).

From the situated practice of the witness-interview, we also learn that the forensic artist is not merely a mediator between the mental image the witness holds of the suspect and the product of the facial depiction. As the interview commences, the reference materials are laid out, the eyewitness account takes shape and is translated into the drawing. This situational becoming of the eyewitness description is why forensic artists prefer not to sit right in front of the eyewitness when doing the composite, but side by side, to avoid that the witness starts describing features of the face of the artist (Taylor, 2000: 214-215).[6]

When the facial image on the paper corresponds to the witness account of the suspect, the facial composite is first fixed by either using fixative or saving it on a desktop, and then handed over to the criminal investigation team. The criminal investigation team decides if and where to circulate the facial depiction. When presented in the media, a facial composite is always accompanied by contextual information such as the type of crime, date, time and location.[7] The aim of circulation via mass media is that members of the public recognize an individual in the composite drawing and subsequently that one of these recognized individuals can be identified as the suspect of the crime by the investigation team.

We should stress here that the drawing that results from the interview will not be a representation of a single individual. It is not a portrait photograph, but rather a composite face based on the descriptive categories used by the witness. In the search for an individual, the facial composite produces a 'suspect population' (Cole and Lynch, 2006) that is narrowed down by certain physical characteristics and facial features. A composite should therefore look neither too specific nor too generic. When the composite drawing is too generic, criminal officers, who have to trace every single lead, face the risk of receiving too many leads pointing to a range of different individuals. As such, the composite loses its function. This is where circulating a composite representing a minority population, or an 'uncommon' face, becomes more informative than a composite that

resembles someone from the majority population in a specific area (M'charek, 2000). The public is invited to locate the individual suspect within a certain *population*.

Population categories thus play a crucial role in decision making around the use of facial composites and in mobilizing the public. Such categories also play a role in the interview with the witness. In making the facial composite, different population categories come about in verbal descriptions, sorting of reference materials and the act of drawing. These categories are articulated and redefined in order to shape, reshape and refine the facial depiction. In the RaceFaceID project, we ask when and how, in these processes, population becomes race.

From fieldwork to experimental film

On a Thursday morning in the spring of 2016, Ryanne sits in the corner of an interrogation room in a police station in the Netherlands. Ryanne was assigned that particular chair in the corner because, as the forensic artist told her: "we don't want the witness to describe *you*." Her position in the room, out of sight from the witness, was thus a consequence of the practice of composite drawing in a criminal investigation. This room was not very different from any other questioning room Ryanne had encountered: unpretentious white walls, blinds to keep inquisitive eyes out, a desk with a computer and just enough chairs to accommodate all people present. The absence of a clock in the room suggested the irrelevance of the passing of time. The people gathered in this room included one facial composite drawer, an eyewitness, two criminal investigators and Ryanne, the ethnographer.

Ryanne was writing as much as she could in her notebook, as the facial composite drawer started to interview the witness. Opposite to the drawer and next to the window sat the seemingly nervous witness, between them only a small table filled with a desktop computer and one big open black folder. The witness, struggling to find the right words to describe the physical appearance of the suspect, flipped through the pages with facial images, selecting, pointing, naming, doubting, negotiating and jumping back and forth between images while discussing the images with the facial composite drawer. From her chair in the corner of the questioning room, Ryanne tried to observe what the facial composite drawer and the witness were doing. She wrote down the words: flipping, pointing, jumping. But she could not see what was happening *on* the table and the drawing paper. What did the witness point at? What did the drawing process look like? Processing her notes later on, she realized the limitations of her observations.

The facial composite drawer, aware of the difficulties of verbalizing physical appearance, uses visual reference materials precisely to avoid verbal accounts, to avoid words. Challenged to attend to what happened with the reference images and on the drawing paper at the table however, Ryanne found herself producing her own written descriptions of the images. She noticed that in her writing, she herself reified the categories the drawer so carefully tried to avoid. What happens in the non-verbal interaction between the witness, the artist and the reference material and on the drawing paper are thus crucial aspects of facial composite drawing practice. Ryanne was not able to address and analyze these non-verbal ways of doing similarities and differences through her ethnographic method of observation in the police station. Was jotting down field notes the best way to go about generating data? It surely was the only tool she had for the moment, as she was not allowed to make use of any kind of recording device during the sessions due to confidentiality agreements.

Ryanne's concerns about doing research 'well' resonate with recent discussions in STS about how our methods shape the knowledge we produce as STS ethnographers (Law, 2004; Lippert and Douglas-Jones, 2019). Discussing the shared challenges of doing fieldwork in forensic settings and studying race, Ryanne and two of her colleagues in the RaceFaceID Project, Lisette and Ildikó, developed the idea of working together to attend to the facial composite practice in a different way. We aimed to create a space in which the making of a facial composite drawing could be witnessed and recorded in a way that the institutional space of the questioning room did not allow for. We opted for a format that not only made it possible to generate different materializations of the event: film, drawing, note taking, audio recording

and sensorial experience, but that also made it possible to juxtapose these materials in an experimental montage to attend to the absent presence of race in the practice. Together with two forensic artists we therefore set up an ethnographic experiment in which we created two facial composite drawings.

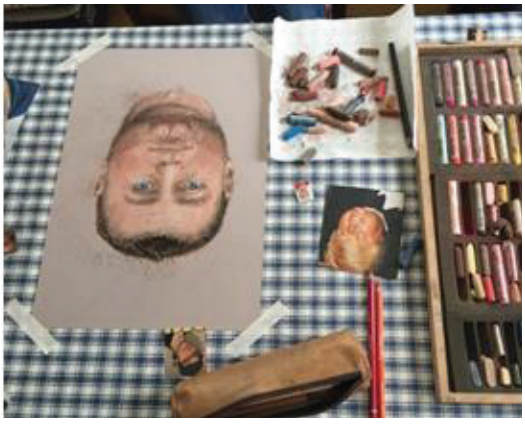
Ethnographic experimentation: co-laborative explorations

Creating two facial composite drawings outside of the police headquarters made it possible to work around confidentiality and ethical agreements Ryanne had with the police. These agreements included the prohibition to audiotape interactions in the questioning room, limitations to collect visual material and instructions to anonymize all information that could be used to trace a specific criminal investigation or individual. But designing an experimental setting ourselves did not come with less ethical considerations, it rather elicited different ones.

First, whose face to use as a 'suspect?' Facial composite drawings are criminal investigation tools. Composite drawings are circulated to the broader public: "Who recognizes *this* suspect's face?" The face in a facial composite drawing is thus criminalized by its mere presence in the medium itself (M'charek, 2013). This made us hesitant to ask just anyone. We would have offered our faces, but it had to be a person unknown to the facial composite drawers. We decided to ask the partners of Ryanne and Ildikó to contribute their faces. Both of them understood the implications and agreed to their face being used in a composite drawing. Lisette volunteered to act as the 'witness' in one session and a forensic science student volunteered to participate in the other session. For our experiment, we asked the 'witness' to look at the portrait picture of the 'suspect' and to describe the appearance to the forensic artist. Hence, some of the elements that are specific to the facial composite drawing in a police setting, such as the need to remember and emotions that come with experiencing assault or witnessing a criminal event (Van Koppen and Wagenaar, 2010), are not part of this experiment.

Second, how to get the forensic artists on board of our experiment? Shared interests are crucial for working together, although these interests do not have to be the same for all actors involved (Star and Griesemer, 1989; De la Cadena, 2015). In the case of the facial composite, the lack of publishable material was a shared concern between the ethnographers and the forensic artists. Privacy regulations and confidentiality agreements form a barrier for forensic artists in compiling a portfolio with which they can present their work to the police and public. So we agreed on a trade-off. Aside from working on an experimental film, Ildikó edited a clip for one of the drawers to use when presenting her work in public settings.

We worked with two forensic artists who were key interlocutors in Ryanne's fieldwork at the Dutch police. Both artists, each with years of experience in drawing facial composites for the police, were eager to be part of the experiment.



Figures 1a (left picture) and 1b (right picture). These pictures depict two techniques used by two different composite artists. The placement of the pictures next to each other invites the viewer to compare the techniques and observe the differences.

One artist works as a criminal investigator for law enforcement and draws with a pencil in black and white. She uses a Jacques Penry PHOTO-FIT toolkit from the early 1970's with parts of faces as a reference database as pictured in Figure 1a (Penry, 1971). The second drawer is an artist who works as a freelance composite drawer for law enforcement. She uses different techniques, working with colored soft pastels and images of faces cut out from magazines (Figure 1b).

The working relationship we maintained with the composite artists is best characterized by what Niewöhner (2016) refers to as 'co-laboration.' Co-laborative anthropology is about "creating space and infrastructure for 'reflexing' as a collective epistemic activity" (Niewöhner, 2016: 5). This mode of working together does not require a shared goal nor does it produce interdisciplinary shared outcomes[8] but rather fosters disciplinary reflexivities. Niewöhner proposes a conceptualization of reflexivity that redistributes it as something that is produced between actors in/and the phenomenon rather than a quality that can be monopolized by the ethnographer. This conceptualization of reflexivity also gives room for an account of the skilled work of the forensic artists.

While preparing the two sessions with the composite drawers and thinking with the generated material afterwards, we kept referring to our project as an 'ethnographic experiment.' It was not an experiment aimed at testing a predefined hypothesis, but rather a set up aimed at generating an experimental openness, crafting space for us to be taken by 'surprise' (Hacking, 1983; Rheinberger, 1997). Driven by our curiosity about the absent presence of race in facial composite drawing, we created a stage for reality to unfold in order to generate knowledge (Sánchez Criado and Estalella, 2018). The aim was not to produce general or representative knowledge, as Mann and colleagues describe the specificities of the ethnographic experiment: "the creativity of experimental methods is in their ability to configure reality in an original way. Rather than linking causes and effects so as to create predictability, ethnographic experiments generate unprecedented possibilities" (Mann et al., 2011: 239). Drawing on Rheinberger's notion of experimental systems as "vehicles for generating questions" that have to "engender unexpected events" (Rheinberger, 1997: 28–33), Fortun (2012) argues for 'experimental ethnographic systems' in which the ethnographer stages encounters for new articulation to emerge. It is in Fortun's (2012) sense that we designed our ethnographic experiment to be creative.

Thus we did not aim to replicate a police composite drawing session, where the ethnographer was hidden in a corner of the room as not to interfere with the process. We set up an encounter that allowed for interaction between the ethnographer, forensic artist, witness and recording equipment, to study the absent presence of race in facial composite drawing in a different way, for new articulations and questions to emerge. In particular, it was through the editing and analyzing of the audiovisual materials that we produced novel configurations of the composite drawing sessions.

Experimental film and montage

In editing the recorded footage and composing this multimodal article, we drew on literature from the field of visual anthropology (Banks, 2007; MacDougall, 1998, 2005) as well as STS (M'charek, 2014). In the tradition of experimental film, montage can evoke hidden dimensions of ethnographic reality (Suhr and Willerslev, 2013). Rather than considering audiovisual records as imprints or representations of 'reality,' experimental filmmakers separate the image, sound and text to evoke 'the invisible' or to make conceptual and theoretical statements. As M'charek explains:

> Just like a collage, a montage is about making rather than representing nature out there. But a montage is somewhat different too. Firstly, montages are often politically motivated, in the sense that they aspire to create a political effect. Secondly, for example in film montage, the aim is to narrate a story without relying on spatial or temporal continuity. With a technique of rapid cuts juxtaposing different times and places, film montage does not hide temporal ellipses but rather draws attention to them. (M'charek, 2014: 46–47)

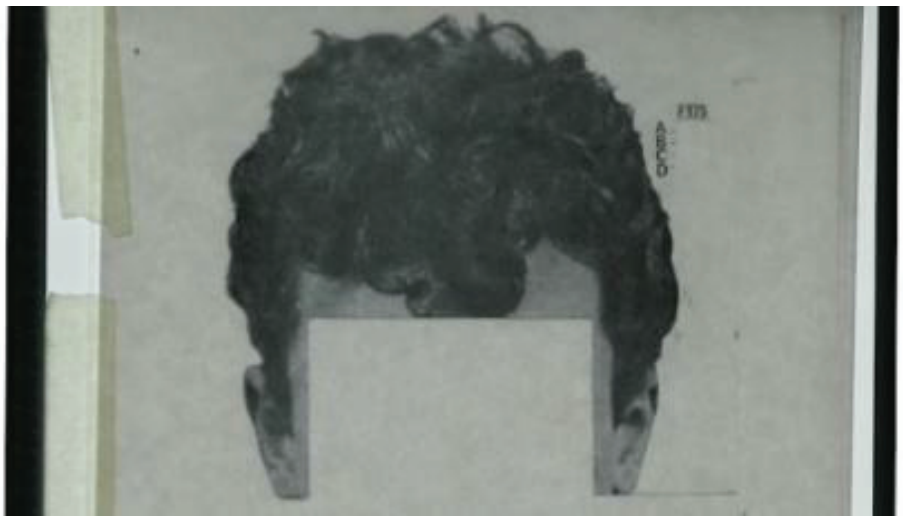
Working with layering, juxtaposition or sensorial dissonance, experimental filmmakers also reflect

on the material and technological affordances of the medium itself. Participants, including the researchers, interlocutors and audiences are invited to explore, see and feel rather than read and listen. As such, experimental film "invites the spectator to undergo a visual and auditory experience we might describe as a performance" (Schneider and Pasqualino, 2014: 4). Composing our film clips, we aimed at crafting a reflexive space for co-laborative performance that does not end with(in) the experiment but unfolds and extends beyond it through inviting our audience to engage with the experimental montage. The film clips offer a platform for visual engagement with the process of drawing the facial composites, the materials and technologies involved. Hence, audiovisual montage is not only another method for generating ethnographic data, but becomes instrumental in the analytical process of meaning creation.

As scholars in STS and feminist theory have argued, picturing practices are reliant on different technologies, and on embodied and partial perspectives (Haraway, 1988; Minh-ha, 1982). We draw on the concept of technologies of vision (Haraway, 1988; Grasseni, 2007) precisely to attend to the complex material and technological configurations of drawing the facial composite. As we suggested above, vision here is not only a matter of remembering, describing and drawing but is dependent on the paper, pencils, crayon, drawing board or computer, reference images, and bodies present. Simultaneously we emphasize how our camera, sound recorder and the experimental setting itself are all constitutive of making the facial composite. Take a look at Clip 2 and pay attention to how these interactions take shape in practice.

Composite method and the absent presence of race

On the morning of one of the ethnographic experiments, the living room of a residential house in the south of the Netherlands was set up for a facial composite drawing session. The mood was cheerful, playful even, amongst the people gathered around the dinner table, quite different from the atmosphere in the questioning room at the police. Ildikó positioned the tripod with camera on the table to record the drawing from above. A black voice recorder was placed next to it, to record the sound, and Ryanne sat down with a notepad and pencil to write down what she could observe. The artist put a brown leather case with pencils on the table. She took out an eraser and three pencils: red, orange and brown (see Figure 2a). Under the tripod, Ildikó fixed the drawing paper to the table with masking tape. The artist put a wooden box with colored soft pastels and a box with bright white tissues on the table. If it weren't for the contrasting white color of the tissues, the grey color



Clip 2. Technologies of vision. Drawing a facial composite is a complex process in which various technologies of vision are mobilized. For the moment, we withhold the image of drawing the face and steer attention towards the verbal description, materials, imaginations as well as the materials generated by the ethnographers such as field notes and additional audiovisual recordings.

of the drawing paper would go unnoticed. When Ryanne asked about the color of the paper, the artist explained that the greyness of the paper was used to accentuate skin tone.

Then the artist placed a white plastic Tupperware box on the table (see Figure 2b). The box was filled with envelopes with written labels: "white middle 30-40," "white young 15-30," "Moroccan young," "African," "white old," "Balkan," "Turkish Moroccan old," "Eastern Bloc,"[9] "South America," "Mediterranean: Portugal Spain Italy Greece," "foreign diverse," "girls," "Moluccan," "Asian." These envelopes contain hundreds of pictures of faces in different shapes, colors and sizes, cut out by the artist from newspapers and magazines. The labels on the envelopes in the Tupperware box represent a configuration of skin color, ethnic, national, regional and continental categories. By linking these categories to physical appearances, through the collections of images inside the envelopes, population becomes race.

The content of the envelopes is the result of 30 years of experience with drawing facial composites. During these years, new categories were added by the forensic artist when her practice required so. The category "girls" for example was added after the composite drawer was asked to draw her first female suspect. In her career, the artist was only asked to draw girls twice, which made further division of the category irrelevant for her practice. In contrast, the category "white" [men] has three subdivisions: young, middle, old and the category "Moroccan" [men] has two subdivisions: young and old. A new envelope comes about when a (new) category holds descriptive relevance. The collection of envelopes thus gives an insight in what categories were made relevant in practice and reveals how, throughout the years, witnesses used different categories to differentiate between populations.[10] It is telling that the categories on the envelopes resonate with the colonial and migration history of The Netherlands while, 'Dutch', as a category, is notably absent.[11]

The envelopes that organize the reference materials are used as devices to move from a category or population to features of the individual suspect. The other forensic artist we worked with has her reference material organized differently. She uses two folders: one containing images of facial features of people with light skin tones and the other folder containing facial features of people with dark skin tones. These images are all in grey scale and taken from standardized police photos.[12] In our experiment, she presented the two folders to the witness with the question: "which folder do we need?" Doing so, she avoided any verbal reference to the binary categorization of skin color that lays at the core of the organization of the reference images in the two folders. As such, prioritizing skin color as a marker of difference.

Thus, the separation of reference images in the two folders materializes race as skin color, while the envelopes fix the relation between ethnic and national categories and physical appearance. But race figures not only in these categorization systems. As the suspect is made known, through situating the individual in population

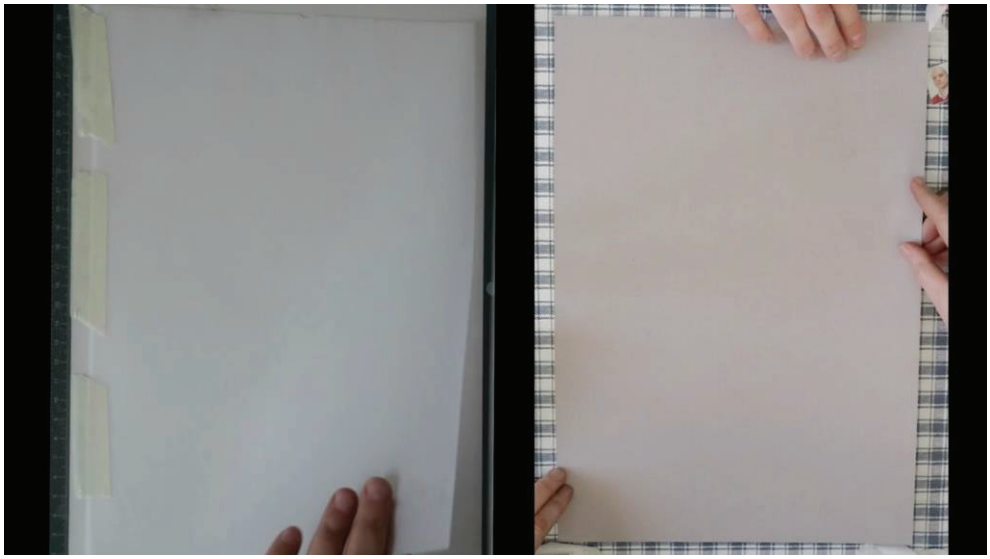
Figures 2a (left image) and 2b (right image). Preparing the table. Left image, with the drawing materials laid out, the artist is ready to start drawing. Right image shows the Tupperware box with envelopes that contain reference images of faces.

categories (see also M'charek et al., 2014b), the potential of racialization always haunts the composite drawing practice. In our analysis of the two drawing sessions, we distilled three different modes of doing difference in which the relation between the individual and the population takes shape in facial composite practice: 1) touching as describing; 2) layering and surfacing and; 3) articulating the common.[13] We disentangled the collected materials: written fieldnotes, visual images, sound, transcriptions, verbal and sensorial information, and layered these in an experimental montage to visually present the three modes in film clips that accompany the discussion of the three modes of doing difference.

Touching as describing

We might think about the drawing of a facial composite as a sequence of consecutive translations (Latour, 1999) from a mental image into a verbal description into a graphic image. Research, in particular within forensic psychology, often deals with verbal descriptions of witnesses only, not including other ways of communicating physical appearance (see for example Van Koppen and Lochun, 2010). In our experiment we learned that there is much more at stake in making a facial composite than moving between the realm of the visual and verbal. "How is the chin?" the composite artist asks. "Well…" and Lisette, in her role as witness, touches her chin with her left hand. "*This* part *here* is not so pronounced but the jaw's line goes more *like this*." This, here and like this in the witness' description become tangible by her fingers wandering over her own face. The forensic artist nods approvingly and starts to draw.

This made us curious about the instances in which Lisette and the artist were using the words "this" and "that." In order to explore further these instances, we shifted our attention to observing the visual material. To what were these indicative pronouns referring? Watching the footage, we could hear the words but not see what the witness did or pointed at (see for example Clip 3 [00:18–00:30]). Filming an event thus also comes with its media specific limitations. Importantly, no method holds the promise of a 'full picture.' Just as Ryanne, in the questioning room of the police, could not see everything that she thought would be relevant, by placing the camera on top of the drawing table in the experimental setting, Ildikó also cropped out elements that proved to be crucial later on. Everything outside of the frame of the camera was rendered invisible. However, we could hear the description on the sound recording



Clip 3. Modes of doing difference: touching as describing. The montage attends to the effects of fixing the camera above the drawing paper during the composite sessions. The close-up of the hands wandering over the face [00:50-01:00] was filmed as an afterthought while we were analyzing the footage. The discussion of the resulting depiction was filmed with a handheld camera at the end of the drawing session [01:18-01:22].

and Lisette, who was acting as the witness, could also recall what had happened.

Lisette noted that the touching of her face was rather an unconscious reflex in the moment of trying to communicate to the forensic artist what she remembered about the shape of the suspect's face. The touching and pointing proved effective as it encouraged the forensic artist to draw. Using her own body as a reference, Lisette simultaneously performed a comparison between her own face and that of the suspect, by touching her chin. From the similarity of both having chins, she was able to point at the difference between her chin and that of the suspect. The facial shape of the suspect here comes to matter through the articulation of difference mediated by the body of Lisette as a reference and touch as a mode of specification.[14] Touch here thus not only implies a bodily gesture, but performs an act of world making (Puig de la Bellacasa, 2009).

This experience also made us attentive to other ways in which touching, pointing and gesturing played a role in the drawing process. Take for example the following instance. For the drawing paper not to move while recording, we fixed the paper to the drawing board with a piece of adhesive tape. Shortly after the drawer started to outline the face with a pastel, she stops. Something is wrong. She says: "I put the paper upside down, can I still turn it?" After detaching and turning the cardboard around, in Clip 3 [00:00–00:10], we see how the drawer gently strokes the surface of the paper with the top of her fingers. "Look," she says, "see the dimples" referring to the structure of the paper. She explains that smooth paper will not allow long work on the drawing as the paper will get clogged. When she starts to draw the egg-shape again, on the other side of the paper, the texture of the cardboard becomes visible: small symmetrical dots as a first outline of the facial features and their approximate position emerge (Clip 3 [00:10–00:18]).

The texture of the paper enables the gradual transformation of the facial composite from a generic human face into an individualized face. The face thus consists not only of colors, shades, and lines but also of dots which are alien to the face yet constitutive of it. We again see how vision is not only about the realm of the visual but also, in the case of drawing a facial composite, linked to touch and texture. Vision here entails a distributed attention involving a variety of senses but is also reliant on a variety of technologies. Both the physical body and the rough paper allow oscillation between the population and the individual, until the paper becomes clogged and the image more distinct.

In the example above, the chin was not racialized through the act of touching. However, in touching as a way of doing difference lies a potential for the racialization of facial features.[15] Race may surface when a hand touching the face to articulate difference enacts a stereotype. For example, using the hands to make 'slanty eyes,' not to describe the shape of the eyes of the individual suspect, but to mobilize a stereotype in order to situate the suspect in a racialized population. Thus, race is not necessarily implicated in the gesture itself, but comes about in relation to racial stereotypes.

Layering and Surfacing

Separately recording the audio and video files allowed us to analyze the recordings as different layers and reconfigure the materials in different ways. By replaying, pausing and fast forwarding the video recordings, we could jump through the linear time line of the drawing process. Layering text, sound and image enabled us to foreground certain aspects of the composite drawing practice, while backgrounding others. Paying close attention to the emergence of the facial features on the drawing paper, instead of the whole process at once, sensitized us to see that the composite face was made layer by layer. Clip 4 is illustrative of this continuous process in which the face, layer by layer, comes about. From a blank piece of paper [00:01] to a facial outline [00:16] and a sketch of the face [00:56]. The face is not simply composed by assembling different ready-made parts, the artists rather employ a process of surfacing and layering.

In a facial composite, instead of drawing (parts of) the face by putting "hard, dark lines of equal 'weight'" on the paper (Taylor, 2000: 113), the mouth does not have lines, just darker and lighter drawn patches indicating shadow or reflection of light. These patches are not immediately put side by side on the paper, but are the result of layering

one material on top of the other: pastel on paper and pastel on pastel (Clip 4 [00:00–00:19]). By layering, the forensic artist suggests depth to articulate the individual and specific facial shape. Layering is also used by the artist to make a part of the (sur)face vague while other parts are made to stand out. This is done in cases in which the witness is not completely certain about what they have seen. Layering is thus a technique that allows the face of the suspect to come to the surface slowly. Layering allows room for error and correction as a layer can be added to partially cover what was there before. We see this for example in the moving of the hairline in the color facial composite in Clip 4 [00:46–01:00].

As the clip demonstrates, not only the layers of pastel and pencil on paper but also the layers of different materials and equipment on the table are important. In the case of the PHOTO-FIT drawing there is a light table on top of which tracing paper is attached.[16] Then, the different eye, nose or mouth samples are slipped under the tracing paper and the witness is asked to place them in the right position (Clip 3 [01:04]). Element by element: hair, eyes, nose and mouth. The composite drawer then takes her pencil and draws the contours of the facial element on the paper. But we should not stop at the surface of the paper. Perhaps not as visible as the pastels and reference materials, our recording devices and all digital devices used to make and watch the clips are additional layers that shape the materialization of the composite faces.

Layering also happens when the witness glances at the reference material, selecting and putting aside pictures that do, do not or might resemble the suspect's face. The catalogues or the Tupperware boxes holding the envelopes with the reference images are of importance. Several rounds of selections are made across population categories: "Male, white, between age of 30 and 50." When the forensic artist selects a single envelope and spreads its content over the table, the witness is presented with a large variety of images of individual faces, displaying a range of skin tones, nose shapes, hair colors, facial contours etc. Race, though being at the core of organizing the reference materials becomes absent present. As the redundant envelopes are literally taken off the table, the focus shifts from differences between populations to the differences between the *individual* faces that are now spread on the table. However, when the witness shuffles, selects and clusters these facial images, new (potentially racial) categories surface.

Layering in the process of making facial composites thus always implies an accumulation of visual information that adds up to a final verdict. From the flat surface of the paper to the layered drawing, a suspect's face emerges. At the end of the facial composite session, the reference materials and categories that informed the forensic artist about the suspect's face are folded

Clip 4. Modes of doing difference: layering and surfacing. The clip shows how the face comes about layer by layer.

into the image. Although the drawing is fixed on a screen or paper, the facial composite, as a materialized image of a suspect's likeness is never final. The facial composite needs openness to elicit recognition from the public. When it circulates, the media and the public add additional layers of interpretation to the facial depiction. Yet again, new classifications may surface.

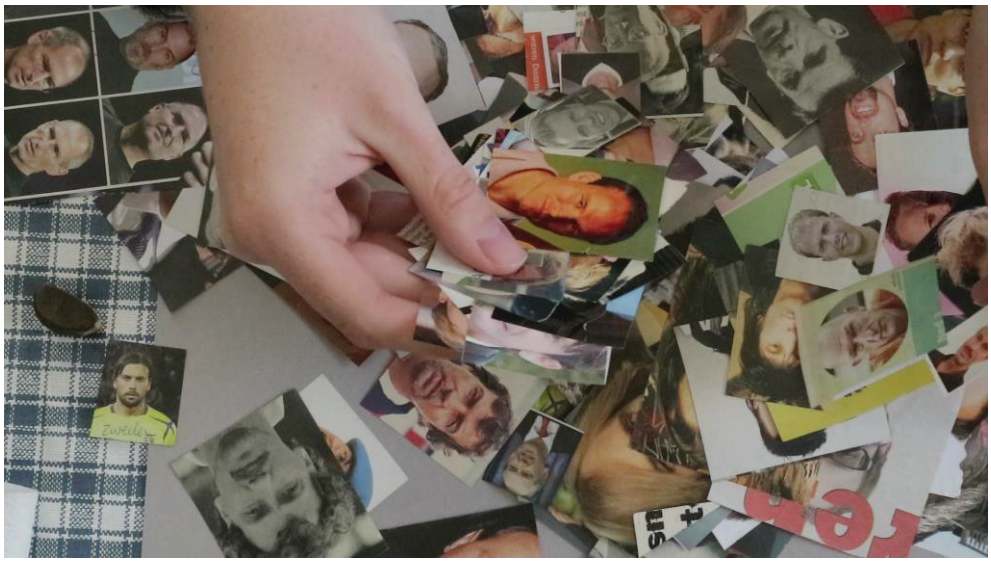
Articulating the common

Working with the collected material and transcribing one of the interviews we were struck by the number of times one of the witnesses referred to 'the normal' when describing our suspect. The words 'normal' or 'ordinary'[17] and 'just' were used frequently (in Dutch *normaal* and *gewoon).* When answering the question of the forensic artist: "Can you remember where the beard grows?" our witness thinks for a second and then answers: "Everywhere! Actually, just like a normal beard." What to make of this?

'Normal' is always situated and contextual. It must be contrasted with or measured against that which stands out: the abnormal, the not-as-usual, atypical or unexpected. This has implications for criminal investigation in general and the forensic art of making facial composites in particular. The first implication is that deviance might be beneficial for criminal investigation: finding a suspect with two noses and one eye is easier than finding a suspect with one nose and two eyes. The second is that our attention automatically tends to shift to that which is abnormal in contrast to that which is normal, usual and expected. Witnesses have difficulties recalling the face of a 'normal' looking individual (Mancusi, 2010: 29).

Let us go back to the field notes Ryanne made during the composite drawing sessions. Here she had initially overlooked the frequent use of the word "normal." Why? What made her focus on all that is different? What made her take words such as "normal beard" for granted? Reflecting on her role as an ethnographer studying race and differences, she had to recognize that she did not make the normal a matter of concern. She never questioned what the "normal beard" was made to look like. That is, until she started to analyze the transcript. It was through contrasting the written notes with the transcription of the audiovisual recordings, that this became observable and a point of attention. What happens then, if we shift from a focus on what stands out, to that which is the same, normal, usual, unquestioned, expected?

In one of the composite sessions the drawer points out that the witness has not yet mentioned any "racial characteristics" in his description (Clip 5 [00:06–00:14]). The witness answers: "just Caucasian, just a normal white man." The



Clip 5. Modes of doing difference: articulating the common. This montage layers excerpts from the verbal interview over the footage of the sorting of the reference images that came out of the envelope "white, middle, 30-40." Emphasizing the variety of faces complicates the description "just a normal white man" given by the witness.

composite drawer selects the envelope for the witness to work with: "white, middle 30–40." A little bit further in the interview he struggles to describe the nose of the suspect (Clip 5 [00:16–01:00]). Now watch Clip 5.

But what does a "white Dutch male" look like? The forensic artist knows very well that there is no such singular thing as a 'white' or a 'Dutch' appearance. This is where the reference pictures come in as we see these laid out on the table throughout Clip 5. Although the envelope "white middle 30–40" reifies the category, the facial images in it destabilize its presumed singularity. As the forensic artist Bailey comments in her handbook: "in a composite session, a picture is really worth a thousand words" (Bailey, 2014: 33). The drawer therefore asks the witness to attune to differences in skin tone while sorting through the pictures and to look for a hair color that the witness considers "dark blond" "...because what one person considers to be dark blond, another person thinks is something completely different" the drawer adds.

Articulations of the normal are always local and contextual. For example, Nieves Delgado (2020) shows that in the case of the Mexican facial composite system Caramex, the 'brown *mestizo*' is configured as the normal. In the context of our experiment, the 'normal' was articulated to be a "Dutch white male." Interestingly, in the reference material 'Dutchness' figures as the unmarked category as there is no envelope with the label 'Dutch.' However, it operates as a standard against which the other categories take shape, for example "Foreign diverse." While being constitutive of the classification system in the Tupper Ware box, 'Dutchness' does not explicitly manifest itself as a racial category. There is no labelled collection of facial images that connects a range of physical characteristics to this national category in the reference material.

In the interview, the figure of the "Dutch white male" as the 'normal' initially left its traces in the struggle of the witness to describe the specificities of the suspect's face. The suspect's perceived Dutchness and whiteness is only articulated when the drawer probes the witness for "racial characteristics." Subsequently, the witness explicates Dutchness as being "white" and associates the suspect's appearance with the stereotypical image of the "Dutch farmer boy." Such descriptions mobilize the artist to draw the envelop "white middle 30-40" out of the box. Thus while absent as a category in the Tupper Ware box, in this interview, Dutchness becomes racialized in the relation between the witness description, the labels on the envelopes and the reference images.

In both the making of the facial composite and the analysis of the recordings, it took a move of making the familiar strange to articulate the implicit assumption of the 'normal' as being the "Dutch white male." In both cases it required a realignment of materials: verbal or written words, sound, images and categories. The composition or mode of togetherness of these objects changed the shape of what the "Dutch white male" in the experiment was made to be. As a racial category it figured as an absent presence (Law, 2004; M'charek et al., 2014a), alternately probed, articulated, reified and destabilized in the making of the composite drawing.

It is important to note that race is not *in* the reference materials or for that matter *in* the composite drawing itself. Race is brought about as a material-semiotic object in particular configurations (M'charek, 2013). Race endures as these configurations remain in place but there may be interferences that make it change shape, for example when the envelopes are opened and the images of individual faces spread over the table.

Discussion: co-laboration and joint reflexive moments

The aim of our experimental co-laboration (Niewöhner, 2016) with the forensic artists was not to produce an accurate representation of an external reality in order to extrapolate our findings, but rather to create a space that generated moments and materials for creative exploration and different articulations. As such, the experimental set-up allowed for joint reflexive moments.

On several occasions, the forensic artists brought in stories of forensic facial composite cases to contrast with what was happening in the current session, or to explicate the procedure in the moment. In one of the drawing sessions, the artist was particularly eager to reflect on her actions in the experimental space. The fact that

Lisette performed as the witness in this case and was known by the artist as a researcher of the RaceFaceID project team, contributed to the articulation of this reflection as well. As the forensic artist herself noted: "I do say things to you now that I would normally not say to a witness." At this moment, she explained her way of probing Lisette's initial answer of "Southern Europe" to her question.

> The forensic artist asked her to be more specific: "What do you mean with Southern Europe? What countries are you thinking about?" Lisette listed Spain, Portugal, Italy and the ambiguous addition of "in that area" in response. The artist pointed out that she very purposefully asked an indirect question, rather than the direct question of where the suspect came from. "This makes you think in a different way," the artist continued, "and then you tell me things like Southern Europe and you mention three countries instead of one… And I'll let you explain [what you mean by] Southern Europe because, let's say you then mention Morocco, then we are actually talking about a different continent."

In this vignette, not only the researchers, but also the artist actively engaged in and thought with the experiment, crafting a space for reflection. This is where we saw the ethnographic experiment unfold as a 'collective epistemic activity' (Niewöhner, 2016).

The experimental setting also allowed the forensic artists to compare their drawings with the picture of the 'suspect' right after the composite was finished. This provided a rare opportunity for the artist as the everyday reality of crime scene investigation is not likely to provide such a moment for reflection.

> After being shown the picture the witness had to describe, the facial composite artist responds: "You accentuated his jaw but he doesn't have it! It is rounder, you told me to broaden this [points to the drawing] but he doesn't have a square shape at all!" The witness, somewhat disconcerted, expresses that he felt the reference images he was presented with showed mainly square faces. The artist then wonders out loud if she should reconsider the use of reference images in her practice.

The moment of comparison was not merely an afterthought but present throughout the process. For example, one of the composite artists noted that she was taking more time than usual, drawing the features in more detail. This was mentioned in relation to both the moment of the 'big reveal' and the fact that the process was being recorded. In addition, the artist for whom Ildikó edited the clip requested to end the video with a still of the composite drawing and the picture that the witness had seen beforehand, placed next to each other for comparison. With the clip she aims to show the potential of doing composite drawings for police practice.

For the researchers it did not matter whether the drawing looked like the photograph or not. We were interested in studying the absent presence of race in the drawing process. Importantly, these different concerns could co-exist in the experiment and would sometimes meet as happened in the unpacking of 'the normal' through the probing questions posed by the artist.

Our co-laborative experiment thus opened up a space for disciplinary reflexivity, enabling both the researchers and the forensic artists to engage critically, although not necessarily in the same way, with their own research and drawing practices. The reflexive moments created in the experimental setting also allowed for social and material articulations, such as the forensic artist's additional explanation about probing Lisette's initial answer and the artists comparing the witness description with the picture of the 'suspect.' In addition, the audio-visual exploration enabled the researchers to reflect on their research practices and to attune to different ways of doing difference, to touching as describing, layering and surfacing and articulating the normal. These reflexive moments would not (likely) have been produced in the questioning room while observing the drawing of a facial composite in an actual criminal case.

The three modes that resulted from the experiment shaped Ryanne's ongoing fieldwork about the absent presence of race in facial composite drawing. She was able to bring these insights back to the questioning room at the police, broadening her observation to include bodies, movements and gestures that might indicate touching, pointing and layering. She also carefully noted

references to the common and the taken for granted, aware that in doing sameness also lays the potential to enact race in practice. Through the experiment she was able to relate to the field in a different way.

Endnote on composite method

We took a mundane problem, namely the restrictions to the use of visual material from our field site, and transformed it into a productive ethnographic experiment. Tinkering with different materialities and technologies, working together with the forensic artists, recording, jotting, filming, observing, writing and experiencing we created or rather, we composed, an ethnographic experiment that allowed us to study absences and presences that would have remained hidden when staying in the corner of the questioning room at the police station. The aim was not to disentangle the different materials as a way of cutting the practice into manageable and separable chunks to simplify analysis but rather to add layers and complexities.

In this methodographic paper, we demonstrated the promising possibilities of experimental film and montage, co-laboration and ethnographic experimentation for STS research practice and, in particular, for the study of slippery objects, such as race, in forensic practices. Engaging with the experiment through audio-visual materials allowed us to carefully attend to how race comes to matter in facial composite drawing by different means and in various ways. The three modes of doing difference that we distilled from the experiment sensitized us to the enactment of race in the continuous oscillation between the population and the individual that is ingrained in the drawing practice. This oscillation materializes not only in the verbal interview. As we saw in the process of layering and surfacing, it also materializes in the equipment and techniques, for example in the specific texture of the drawing paper used by the artist, the process of building the face layer by layer on paper, highlighting some facial features while backgrounding others, and the organization and use of the reference materials. Furthermore, in the unpacking of the category of the 'normal Dutch white male,' it became visible how the material and the discursive can both reinforce and destabilize one another. Materializations of faces and race thus happened in words, images, sounds and in between all these media.

As we addressed in this methodographic paper, different technologies produce different versions of the event. This is an awareness that we share with the forensic artists. We reflected on how attending to the complexity of the facial composite drawing practice through ethnographic experimentation and audiovisual methods, allowed us to study the absent presence of race and we built on this complexity in composing this multimodal paper. This effort in bringing together methodographic reflections on STS research practice, ethnographic experimentation and audiovisual methodology, was importantly guided by our research question on the absent presence of race in forensic identification. Thereby shedding light on the valuable insights that can be gained from attending to mundane practices, such as facial composite drawing, and what this can contribute to understanding the (re-)surfacing of race in forensic practices, opening up venues for future research.

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References

Bailey L (2014) *Ask a Forensic Artist. Skulls, Suspects, and the Art of Solving Crime*. Fredericksburg, VA: Honeybee Media.

Balkenhol M and Schramm K (2019) Doing Race in Europe: Contested Pasts and Contemporary Practices. *Social Anthropology* 27: 585–593.

Banks M (2007) *Using Visual Data in Qualitative Research*. London: Sage.

Cole SA and Lynch M (2006) The Social and Legal Construction of Suspects. *Annual Review of Law and Social Science* 2: 39–60.

Collins SG, Durington M and Gill H (2017) Multimodality: An Invitation. *American Anthropologist* 119(1): 142–146.

De la Cadena M (2015) *Earth Beings: Ecologies of Practice across Andean Worlds*. Chapel Hill, NC: Duke University Press.

Fortun K (2012) Ethnography in Late Industrialism. *Current Anthropology* 27(3): 446–464.

Gilman SL (1999) The Racial Nose. In: *Making the Body Beautiful: A Cultural History of Aesthetic Surgery*. Princeton, NJ: Princeton University Press, pp. 85–118.

Grasseni C (ed) (2007) *Skilled Visions: Between Apprenticeship and Standards* (Vol. 6). Berghahn Books.

Greiffenhagen, C, Mair M and Sharrock W (2011) From Methodology to Methodography: A Study of Qualitative and Quantitative Reasoning in Practice. *Methodological Innovations Online* 6(3) 93–107.

Hacking I (1983) *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science.* Cambridge, MA: Cambridge University Press.

Haraway D (1988) Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14(3): 575–599.

Hopman R and M'charek A (2020) Facing the Unknown Suspect: Forensic DNA Phenotyping and the Oscillation between the Individual and the Collective. *BioSocieties*, 1–25.

Jong L and M'charek A (2018) The High-Profile Case as 'Fire Object': Following the Marianne Vaatstra Murder Case through the Media. *Crime Media Culture* 14(3): 347–363.

Latour B (1999) *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.

Law J (2004) *After Method: Mess in Social Science Research*. London: Routledge.

Lippert I and Douglas-Jones R (2019) "Doing Data": Methodography in and of STS. *EASST Review*, 38(1). Available at: https://easst.net/article/doing-data-methodography-in-and-of-sts/ (accessed 29.3.2019).

Lippert I (2020) In, with and of STS. In: *Wie forschen mit den 'Science and Technology Studies'? Interdisziplinäre Perspektiven.* In: Wiedmann A, Wagenknecht K, Goll P and Wagenknecht A (eds) Bielefeld: Transcript, pp. 301–318.

Lucassen J and Penninx R (1994) *Nieuwkomers, Nakomelingen, Nederlanders: Immigranten in Nederland 1550–1993*. Amsterdam: Spinhuis.

MacDougall D (1998) *Transcultural Cinema*. Princeton, NJ: Princeton University Press.

MacDougall D (2005) *The Corporeal Image: Film, Ethnography, and the Senses*. Princeton, NJ: Princeton University Press.

Mann A, Mol A, Satalkar P, et al. (2011) Mixing Methods, Tasting Fingers: Notes on an Ethnographic Experiment. *HAU: Journal of Ethnographic Theory* 1(1): 221–243.

Mancusi S (2010) *The Police Composite Sketch*. New York, NY: Humana Press.

M'charek A (2000) Technologies of Population: Forensic DNA Testing Practices and the Making of Differences and Similarities. *Configurations* 8(1): 121–158.

M'charek A (2013) Beyond Fact or Fiction: On the Materiality of Race in Practice. *Cultural Anthropology* 28(3): 420–442.

M'charek A (2014) Race, Time and Folded Objects: The HeLa Error. Theory, Culture and Society 31(6): 29–56.

M'charek A, Schramm K and Skinner D (2014a) Technologies of Belonging: The Absent Presence of Race in Europe. Science, Technology, and Human Values 39(4): 459–467.

M'charek A, Schramm K and Skinner D (2014b) Topologies of Race: Doing Territory, Population and Identity in Europe. *Science, Technology, and Human Values* 39(4): 468–487.

M'charek A, Toom V and Jong L (2020) The Trouble with Race in Forensic Identification. *Science, Technology, and Human Values* 45(5): 804-828.

Meissner CA and Brigham JC (2001) A Meta-analysis of the Verbal Overshadowing Effect in Face Identification. *Applied Cognitive Psychology*: *The Official Journal of the Society for Applied Research in Memory and Cognition* 15(6): 603–616.

Minh-ha TT (1982) *Reassemblage*, 40 mins.

Myers N and Dumit J (2011). Haptic Creativity and the Mid-Embodiments of Experimental Life. In: Mascia-Lees FE (ed) *A Companion to the Anthropology of the Body and Embodiment*. Chichester, West Sussex, UK: Wiley-Blackwell, pp. 239–61.

Nieves Delgado A (2020) The Face of the Mexican: Race, Nation, and Criminal Identification in Mexico. *American Anthropologist* 122(2): 356–368.

Niewöhner J (2016) Co-laborative Anthropology: Crafting Reflexivities Experimentally. [Finnish translation]. In: Jouhki J and Steel T (eds) *Etnologinen tulkinta ja analyysi. Kohti avoimempaa tutkimusprosessia*. Helsinki: Ethnos, pp. 81–124.

Ossorio PN (2006) About Face: Forensic Genetic Testing for Race and Visible Traits. *The Journal of Law, Medicine & Ethics* 34(2): 277–292.

Penry J (1971) *Looking at Faces and Remembering Them. A Guide to Facial Identification*. London: Elek Books.

Puig de la Bellacasa M (2009) Touching Technologies, Touching Visions. The Reclaiming of Sensorial Experience and the Politics of Speculative Thinking. *Subjectivity* 28: 297–315.

Rheinberger HJ (1997) *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*. Stanford, CA: Stanford University Press.

Sánchez Criado T and Estalella A (2018) Introduction: Experimental Collaborations. In: A Estalella A and Sánchez Criado T (eds) *Experimental Collaborations: Ethnography through Fieldwork Devices*. Oxford: Berghahn, pp. 1–30).

Sankar P (2012) Forensic DNA Phenotyping: Continuity and Change in the History of Race, Genetics, and Policing. In: Wailoo K, Nelson A and Lee C (eds) *Genetics and the Unsettled Past: The Collision of DNA*. Piscataway: Rutgers University Press, pp. 104–113.

Schneider A and Pasqualino C (eds) (2014) *Experimental Film and Anthropology*. London: Bloomsbury Academic.

Schwartz-Marín E, Wade P, Cruz-Santiago A and Cardenas R (2015) Colombian Forensic Genetics as a Form of Public Science: The Role of Race, Nation and Common Sense in the Stabilization of DNA Populations. *Social Studies of Science* 45(6): 862–885.

Skinner D (2018) Forensic Genetics and the Prediction of Race: what is the Problem? *BioSocieties* 15: 1-21.

Star SL and Griesemer JR (1989) Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science* 19(3): 387–420.

Suhr C and Willerslev R (eds) (2013) *Transcultural Montage*. New York, NY: Berghahn Books.

Taylor KT (2000) *Forensic Art and Illustration*. Boca Raton, FL: CRC Press.

Van Koppen PJ and Lochun SK (2010) Signalementen. In: Van Koppen PJ, Merckelbach HLGJ, Jelicic M and De Keijser JW (eds) *Reizen met Mijn Rechter: Psychologie van het Recht*. Deventer: Kluwer, pp. 623–637.

Van Koppen PJ and Wagenaar WA (2010) Herkennen van Gezichten. In: Van Koppen PJ, Merckelbach HLGJ, Jelicic M and De Keijser JW (eds) *Reizen met Mijn Rechter: Psychologie van het Recht*. Deventer: Kluwer, pp. 269–304.

Veenman J (2001) *Molukse Jongeren in Nederland: Integratie met de Rem erop*. Assen: Uitgeverij Van Gorcum.

Westmoreland M (2017) Multimodal Anthropology? In: *Media, Visual and Material Culture*, 27 November. Available at: http://www.leidenanthropologyblog.nl/articles/multimodal-anthropology (accessed 26.3.2019).

Notes

1 In this paper we choose to use our first names to address the different individual experiences we bring into the research when this is relevant. In instances where we consider these differences irrelevant, we use 'we' to emphasize the collective authorship of this paper. See Mann et al. (2011) for a more elaborate discussion on how to address different authors and voices in academic texts.

2 The authors of this paper are part of the RaceFaceID project. This project studies the enactment of race in different forensic identification practices. In particular, technologies through which a face is given to an unknown individual suspect or victim. These technologies include genetic facial phenotyping, craniofacial reconstruction and the classic facial composite drawing where a facial image of a suspect's face is made with a forensic artist and witness. For more information about the RaceFaceID project see: https://race-face-id.eu/.

3 In the context of facial composite drawing, the questioning room at the police is often referred to as an 'interview room' to emphasize that the communication process while drawing is not an interrogation, as if the witness is a suspect, but more open and reciprocal. However, in this paper we use the term questioning room to address that the interview takes place at a police station.

4 In a forensic setting the forensic artist draws the facial depiction either by hand or with the help of computer software. In the Netherlands, during Ryanne's fieldwork period in 2016–2017, some police officers worked with computer software like FACETTE Face Design system or PROFit Facial Composite System to make the facial composite. They are referred to as 'forensic operators' in contrast to 'forensic artists.' For this paper we only worked with and focus on forensic artists drawing by hand, we therefore use the term 'forensic artist.'

5 From 2019, the Dutch police force has taken steps towards standardization of the practice.

6 A facial composite drawing cannot be rehearsed or repeated. Not only will the facial composite be different the second time, also the mental image of the witness will have changed. In the field of forensic psychology, the verbal description interfering with the initial mental image in the witness' mind is referred to as the 'overshadowing effect' (Meissner and Brigham, 2001).

7 In the context of criminal investigation, the image does not travel alone. Ryanne analyzes this in detail in other work. For the purpose of this paper we stay with the drawing process itself.

8 In that sense it resonates with the use of the term 'co-labouring' by De la Cadena (2015).

9 'Eastern Bloc,' in Dutch '*Oostblok*', is sometimes used by witnesses in the Netherlands to refer to any individual or group that is believed to originate from Central or Eastern Europe.

10 How populations are differentiated, what differences are made relevant in forensic identification practices and by whom, varies from case to case, from location to location and from technique to technique. Schwartz-Marín et al. (2015) demonstrate this situatedness in the case of Colombian forensic genetics. The standard set of four reference populations used in forensic genetic technologies, known as 'la Tabla,' corresponds to four different regions in Colombia thereby reproducing the common-sense notion of Colombia as a country of racialized regions.

11 For example, the background of the category 'Moluccan' is the relocation to the Netherlands of a group of 12.500 Moluccans in 1951 following Indonesian independence. In the subsequent decades conflicts between 'Moluccans' and the Dutch state received a lot of media coverage (Veenman 2001). Also the history of the so-called 'guest workers' is implicated in the categorization system. From the 1960s the Dutch government actively attracted migrant workers from Southern Europe, Morocco and Turkey (Lucassen and Penninx, 1994). The Tupperware boxes emphasize minority populations while the category 'Dutch' is marked by its absence.

12 Penry PHOTO-FIT Kit, 1972.

13 In this methodographic paper we emphasize how the ethnographic experiment enabled us to attune to these three modes of doing difference. Touching, layering and articulating the common in relation to the absent presence of race are explored and conceptualized in further detail by the different authors in forthcoming papers.

14 The drawing process encompasses a multi-sensorial 'education of attention' (Grasseni, 2007) in which the body becomes a tool for articulating differences and similarities. In the situated practice of facial composite drawing this has a rather improvisational and exploratory character, similar to what Myers and Dumit (2011) capture with their notion of 'haptic creativity' in experimental settings. In the acts of pointing, touching and specifying, the bodies of the witness and artist and the suspect's face are not stable but continuously negotiated as parts of shifting collectives.

15 The nose as a facial feature has for example a long and explicit history of being racialized (Gilman, 1999).

16 The artist requested us to emphasize that the light table was used for the experiment to provide contrast and make the composite drawing more visible *on* the video. She does not use the light table when she draws for criminal investigation thus this exceptional use formed another moment of 'collective epistemic activity.'

17 In Dutch "*normaal*" means according to the norm, average, common, ordinary and '*gewoon*' means just, ordinary, the everyday.

Embodiment work in Ethnographic Collaborations: Composition, Movement, and Pausing within the Multiple Sclerosis Society in Russia

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Abstract

This article – grounded in ethnographic fieldwork within the organization of chronic patients with multiple sclerosis in Russia – empiricizes and problematizes the work it takes to craft ethnographic collaborations with care. We attend to the notion of collaboration 'from a body', or, rather, from bodies-in-movement. By scrutinizing three turning points of our ethnographic fieldwork along with our relations with partners in the field, we specify how movement matters in ethnographic collaborations. Attention to the embodiment work allows us to specify the energy and resources such collaborations ask for and that are otherwise silenced or neglected. We distinguish three instances of embodiment work in such collaborations – composition, moving with and being moved by, as well as pausing. By attending to how 'we know' through crafting and maintaining ethnographic collaborations, this article contributes to a broader question of how to care for differences in ethnographic collaborations.

Keywords: care, composition work, embodiment work, ethnographic collaboration, moving and being moved, pausing

> To move is to create (with) sense. A body perceives through difference. A change in environment provokes a sensory event. (Manning, 2009: 66)

In this article we attend to the work of crafting ethnographic collaborations while puzzling with the question of how to do so with care (Puig de la Bellacasa, 2017). We approach the notion of collaboration by attending to the invisible work which moves through and in between the multiple *we1* in ethnographic happenings. To do so, we explore embodied instances of collaborations 'methodographically' (Lippert and Douglas-Jones, 2019; Lippert and Mewes, 2021 (this SI)), i.e., with attention to how our research practices get into

the research accounts. By whom and by what are *we* moved (not least, moved to collaborate) in our ethnographic accounts, and how? And whom and what do *we* move with and without, and how? How do we embody "different ways of figuring (not) knowing and (not) moving/being moved by an 'other' and how does this matter for the question of 'how to care' for scholarly accounts" (Jerak-Zuiderent 2020: 190; see also Coopmans 2020; Davies 2021)?

Our approach is prompted by three concerns: a. relationships of care embedded in (or not) and emerging from collaborations; b. the kind and amount of energy and resources which move collaborations; and c. transformative and 'monstrous' (Star, 1991) effects and affects of being "in the action, (…) finite and dirty, not transcendent and clean" (Haraway, 2004: 236). We, therefore, ask what doings and feelings are put together, and how, in the messy labor for instigating and maintaining collaborations with partners in the field, and what could this imply for the "epistemology and politics of engaged, accountable positioning" for the "better accounts of the world" (Haraway, 1988: 590).

To explore these questions, we ground our methodographic analysis in fieldwork related to the study of the social movement of patients with multiple sclerosis in Russia; and start by positioning our work in between the work on collaboration in ethnography and Science and Technology Studies and the literature on embodiment and 'view from a body' (Haraway, 1988). We explore what this positioning suggests for alternative epistemologies and thinking with care. We then work with this analytical quest when attending to the ethnographic work within the patient organization Russian Multiple Sclerosis Society (RuMSS); analysing three moments of the fieldwork, we explore how ethnographic collaborations are crafted 'from a body'. The first moment discusses the work of composition; the second deals with effects of 'moving and being moved'; and the third one attends to pausing, suspending the movement as an imperative but often neglected instance of embodiment work in collaborations. We conclude by discussing what embodied sensitivity suggests for knowing with care when crafting (space for) ethnographic collaborations.

Ethnographic collaboration 'from a body'

Our quest for articulating invisible work in ethnographic collaborations finds its place in between the body of work on collaborations in STS and ethnography (Blaikie et al., 2015; De la Cadena et al., 2015; Sánchez Criado and Estalella, 2018; Zuiderent-Jerak et al., 2015) and that on embodiment (Myers, 2005, 2008, 2012; Myers and Dumit, 2011), feminist embodiment in particular (Haraway, 1985, 1988,1997; Harding, 1991). The latter, as Haraway (1988: 588) articulates, creates "nods in the fields, inflections in orientations, and responsibility for difference in material-semiotic fields of meaning". This placement in between leads us to explore ethnographic collaborations 'from a body' (Haraway, 1988) with ethico-political implications, accentuating such collaborations as 'sensory events' (Manning, 2009). Ethnographic collaborations 'from a body' are in a sense not only 'epistemic collaborations' (Sánchez Criado and Estalella, 2018), emphasising the establishment of horizontal relations with research counterparts. Ethnographic collaborations are also a sensory, embodied, affective, and kinaesthetic movement away from a modern figure of 'modest knower' – i.e., away from a figure of the knower who strips knowledge from its place (Haraway, 1997). In this sense, embodiment work can be approached as a research practice and as 'method' of collaboration for knowledge that expands epistemic practices through attention to what is embodied – i.e., situated, partial, 'affect-full', and grounded in place. Inspired by the ethnography of embodiment or sensory ethnography (Feld, 1982; Mascia-Lees, 2011; Myers, 2012, 2010; Myers and Dumit, 2011; Pink, 2015), we focus on the invisible body-grounded work of 'laboring together' during the fieldwork within the organization of chronic patients with multiple sclerosis in Russia. Our puzzling with ethnographic collaboration 'from a body' invites us to "start to ask better questions, not just about the conditions of possibility that shape relations of power among bodies, but also the regimes of perceptions that conceal as much as they reveal about these bodies" (Myers, 2020: 98). We propose thereby to infuse the notion of ethnographic collaboration with a

very specific kinaesthetic and affective modality imprinted in embodied senses and sensations.

This study of ethnographic collaborations 'from a body' is also close to articulations of non-idealised and practice-oriented notions of care (Martin et al., 2015). Exploring what we put into collaborative relationships, on an invisible and still very practical level, we are disciplined to instantiate where attention falls at a specific moment, taking seriously Spinozist warning that we just do not know what a body can do. This is kin to asking 'how to care for our scholarly accounts' (Jerak-Zuiderent, 2020) as

> Care is a selective mode of attention: it circumscribes and cherishes some things, lives, or phenomena as its objects. In the process, it excludes others. Practices of care are always shot through with asymmetrical power relations: who has the power to care? Who has the power to define what counts as care and how it should be administered? (Martin et al., 2015: 627).

Vivifying the instances and embodied senses of ethnographic collaborations moves into action a feminist commitment to 'thinking with care' (Puig de la Bellacasa, 2012) and accounting for the world-making effects of (re)searches and representations (Puig de la Bellacasa, 2011). In this respect, this article also shapes the notion and practice of methodography as an embodiment of 'care troubles' in the relations of knowing. As *we*, the multiple 'we-s' (Star, 1991) who compose the figure of the knower, engage each other in the labor of collaboration to compose a common world, this inevitably crafts asymmetrical relations of care (De la Cadena et al., 2015; Puig de la Bellacasa, 2011, 2012).

What we touch upon here is body-, place- and moment-specific; it is 'situated' (Haraway, 1988). The invisible work in ethnographic collaboration manifests in glimpses, in sensory imprints, in traces on the ground as we make steps in the field, in body postures, and movements of thought. It gazes silently from behind the lines of clean 'executive' accounts (Star, 1991) and it is always on the move to escape executive prosecution.

As Star and Strauss (1999) have shown from the various ethnographic fields, the invisibility of work is contextual and fluid. The process of collaboration, in this sense, supposes movement back and forth from making work visible to silencing it – in specific places and in specific times. And, therefore, it supposes sensitivity – first, to movement; second, to the relations which make up this movement; third, to a 'motile' (Jerak-Zuiderent, 2020; Munro, 2012) craft of putting and heterogenous places and relations together. "'Motile' refers to moving/being moved by an 'other' [in the broadest sense; however,] not like mobile in the sense of crossing boundaries. It rather refers to a flickering, a shifting back and forth" that transforms, "changes all and everything involved irreversibly: [Including r]esearch practice" (Jerak-Zuiderent, 2020: 194-195 drawing on Munro, 2012). This has consequences for the figure of the knower.

Let us now specify this approach to ethnographic collaborations 'from a body' by moving into the context of social movement of chronic patients (Epstein, 1996); i.e., the context where activist discontent with 'who is allowed to know' has been changing the standards of good science, the notions of credibility, and the value of experiential knowledge. What follows is a drawing of a methodographic landscape through which we puzzle with the question of how to care 'from a body', as well as possible, in ethnographic collaborations.

Moving within the Russian Multiple Sclerosis Society

From 2016 until the end of 2019 Alex was engaged in fieldwork within the Moscow regional chapter of the Russian Multiple Sclerosis Society (RuMSS).[2] It took many journeys back-and-forth to Moscow between April and September 2017, November 29 until December 1, 2017, and June until August 2018 while keeping continuous exchanges of video calls, emails, messages in between. This going back-and-forth in and out of the field was eventually logged as 15, combined online and in-person interviews with key interlocutors, spread out through multiple encounters, field observations, and memos. Beyond the ethnographic logs there were impressions, practical arrangements, learning from patients how to 'care well' for Mul-

tiple Sclerosis (MS), 3 where to put attention, and amazement with the life of ethnographic movement itself. This epistemic journey into a patient organization, a living and breathing instance of a social movement of chronic patients, kept escaping our fixation on Moscow – where the Moscow chapter of the Russian Multiple Sclerosis society would predictably find its place. It required Alex not to put her self into the field, but to put, unput and reput people and things together while moving with the field.

Consider, for instance, that the Moscow RuMSS chapter, as the RuMSS itself, does not have a physical office or set place of work (although one appears on the official web resources). This organization appears and disappears in the meeting rooms of the Ministry of Health, in rehabilitation locations, in congress halls hosting conferences and workshops, in open browser tabs, infinite emails and video calls, etc. The ethnographic movement on which we base our explorations of what is put into ethnographic collaborations, thus, was constantly creating epistemic spaces – field sites and 'para-sites' (Myers, 2020; Marcus, 2000). The latter refer to "experimental sites that take shape alongside 'fieldwork', feeding off of and feeding into ethnographic research and writing (…) in which ethnographers can improvise, alter, and reorient their theories and methods through collaborations and experimental practices" (Myers, 2020: 101 drawing on Marcus, 2000). 'Para-sites' in our case manifested in a volunteering as an interpreter for the Russian delegation during the London International MS Federation meeting or multiple trips or co-organizing the 4th International Conference "Social Sciences & Health Innovations: Multiplicities" in Tomsk, Russia (among others). It is this space-creating capacity of ethnographic movement within a social movement of chronic patients that prompted us to focus our methodographic analysis on 'para', fluid, un-official moments which became turning points of moving our multi-sited fieldwork further.

Moving within a social movement of chronic patients multiplied field sites, 'messed with the method' (Law, 2004), and made us 'finite and dirty' (Haraway, 1997) by revealing the in-betweens of our research methods and patients' improvisatory life. It invited Alex to engage with the concerns of chronic patients in Russia practically: volunteering as an interpreter, co-organizing artistic and academic events, doing yoga, riding horses, and celebrating the International MS Day at a long communal table full with sweets and fats 'our neurologists do not need to know about'.4 We propose that attending to the instances of such movements within a social movement is a *methodographic practice* of keeping the question of 'how to care' as well as possible in scholarly accounts alive (Jerak-Zuiderent, 2020).

The social movement of chronic patients in Russia generates *and* maintains space for multiple entangled moves and movements by and with many: Rolling on a wheelchair through the inaccessible urban jungles, moving forward legislation, doing rehabilitative exercises, pressing a button on a voice recorder, pointing to a disturbing voice recorder, eating, driving, dressing for a presentation at the All-Russian Patient Congress – just a few examples to instantiate the scope we are referring to. The social movement which we encountered within the RuMSS is beyond identity politics, but rather refers to the literal and heterogeneous work to compose 'evidence-based activism' (Rabeharisoa et al., 2014). It comprises the experience of illness, documenting and sharing these experiences (through sociological research and patient schools), transforming these experiences into solutions (legislation clauses, guidelines for socio-medical expertise), and advocating for these solutions (writing petitions, lobbying, creating public councils to the ministries and medical institution) (Endaltseva, 2020). Still differently, it also comprises putting together the maintenance of a body with MS, the maintenance of communal interests, the weaving of solidarity ties through online communities, 'how do you do' calls, yoga classes, and collective celebrations of the International MS day.

Our ethnographic journey constantly moved back-and forth, beginning with reaching out to the RuMSS as a PhD student in France and responding to a student's request for an ethnographic study. It required the becoming of *us* which starts from, drawing on Puig de la Bellacasa (2017), the ethical-speculative imagination to why collaboration is needed and how to put together what the multiple *we* care for. The embodiment work in

this collaboration started with the very moment of being moved by each other in many ways and with manifold ways of relating to MS. It is in this sense that collaboration requires care for energy and resources: bodily and emotional resources for asking questions, telling and learning to listen to stories; financial resources for travels; cultural resources to be responsive; and social resources to find the right people and be in the right place at the right time.

Energy to collaborate

Collaboration, especially in asymmetrical relationships of knowing (Puig de la Bellacasa, 2017), is a relationship which demands energy, both kinetic or potential (i.e., generated by movement as well as stored in things at places), and resources which go into the movement (physically-materially, affectively, or symbolically). This is not any kind of energy, as Latour (2010) also emphasised. Energy to collaborate cannot be harvested from 'a gigantic steam engine' of epistemic competitions and hierarchies, which moves relationships of critique. It seems not enough and not the right kind of energy. Instead, relationships of collaboration call for a heterogeneous and collective "slow process of composition and compromise, not by the revelation of the world of beyond" (Latour, 2010: 478). 'Slow' is one of the key moments here – it allows for going back and forth, rerouting, getting lost and found as the field sites move and multiply. Keeping it slow requires bodily, kinaesthetic, financial, and emotive resources: taking a plane to Russia over and over; adjusting the passage from one step to another; waiting for collaborations without imposing their necessity.

The energy it takes to collaborate, we suggest, is generated through invisible, embodied work: listening emotively to MS stories, finding place in a busy schedule for a meeting, choosing a right moment for a question, overcoming fatigue and pain during the interview. Relationships of collaboration require time and space for back-and-forth movement – physically, emotionally, and epistemically. They are not necessarily symmetrically reciprocated, and smooth (Puig de la Bellacasa 2017: 121). This we will see further in a story of Alex's ride in a grey Renault Megane, and it also appears in Sánchez Criado and Estalella's (2018) moments of 'frictions' with their interlocutors in the field.

'Frictions' here do not refer to competition or hierarchies. Rather it is a way of relating to place which disciplines to keep it slow5 when we compose and recompose the field. We suggest that methodographic attention to how bodies energize epistemic collaborations is a way to slow down our knowledge-making process. The need for latter, drawing on Puig de la Bellacasa (2011: 85), might be crucial for doing science and technology while "our beautiful planet is sore". This promise of slow methodography for the relationships of knowing is vivid on a mundane level when small moments here and now are taken seriously as mattering for 'our planet'. Imagine, for instance, eating to still the hunger vs eating while at the same time paying attention to every micro movement in the physical eating process, and in addition - to every thought connected to the choice of attending to eating instead of thinking and doing something else. As we suggest and specify more in depth in the examples further below, ethnographic collaborations 'from a body' are not much different when we cherish Tess Lea's warning that

> when we (re)present coherence we deny fragmented realities, and in so doing, ignore the way governing hierarchies are recharged when we misleadingly affirm the idea of correction through ethnographic exposure and evaluation, rather than conveying the coursing of power through the most banal and neglected moments." (De la Cadena et al., 2015: 452).

In "An Attempt at a 'Compositionist Manifesto'" Latour (2010) argues for 'manifesting' or making visible the need to slow down, pause and reconsider the ways of 'processing forward'. This need comes around as 'compositionism' – "the task of building a common world" with "certainty that this common world has to be built from utterly heterogeneous parts that will never make a whole, but at best a fragile, revisable, and diverse composite material" (Latour, 2010: 474). Latour (2010) considers 'compositionism' as rooted in performative practices, as something not to take for granted and not a destination point (Zuiderent-Jerak et

al., 2015). His manifest points to the limit of critique in knowledge-making; of the opposition between what is 'natural' and 'constructed', scientific and political. The question for Latour (2010) is in differentiating between the 'good' composition and not (see also Zuiderent-Jerak et al., 2015); in "where (...) we get the energy to act" (Latour, 2010: 477). Our methodographic quest for embodied ethnographic collaboration, thus, is a 'compositionist' quest; an articulation of a performative, fragile, never complete generation of a common world while maintaining its fragmentation pre-, during- and after ethnographic fieldwork. And not least, while attending to the flow of energy in collaborations (also, in a very material and embodied sense: taking a plane to get to a place fast and with less effort, walking slowly because inability to lift a foot – a common MS trouble – creates friction with the ground). Composition work of collaborations, as we account for our ethnographic journeys further below, is in that sense emergent, grounded in what is embodied, 'in place to place with' and is done *with care* for "our accounts in the composition of things" (Puig de la Bellacasa, 2011: 88).

Let us explain this methodographically through the three vignettes of what we perceive as turning points in our fieldwork. We start from a moment from an international conference Social Science and Health Innovations: Multiplicities in Tomsk, where Alex was a member of the organizing committee. What would a mundane and unavoidable act of walking as a group between different conference locations suggest for our analytical attention to the relationships of care embedded in (or not) and emerging from collaborations? And how does this relate to caring for energy and resources?

Composition

> Let us invite you to a Siberian city of Tomsk in Russia. It is late May 2019, 15 degrees Centigrade and sunny. A group of people is walking from the Tomsk State University (the conference venue) to the Stroganina Restaurant featuring traditional Siberian gastronomic wonders after the first day of the international conference 'Social Sciences and Health Innovations: Multiplicities'. The walkers are key-note speakers, some organizers (including Alex) and advisory board members, and students volunteering as guides, mediators, and interpreters. They are walking as a guided group. The guide's movements offer a frame for the bodies' attention, showing the path and local wonders; yet walkers' bodies keep twisting occasionally sideways and backwards, and towards fellow co-walkers, like ripples from curious gazes. First time tourist gazes, time-to-time visitor gazes, local hospitality driven gazes. English-speaking polyphony makes this group an object of locals' curious gazes. Sounds, features, clothing, manner of walking compose these walking bodies in mutual twists and turns with passing by Russian-speaking representatives of about 500 000 Tomsk inhabitants. Each step composes with Tomsk landscape, history, culture, and everyday rhythms. The walkers' feet form connections with the ground, a relationship more or less certain or pleasant, depending on the quality of ground at each step, different health states and habitual time zones, and the amount of our familiarity with Tomsk weather. The ground has been here before the walk, and it will stay after the walk, imprinted by the size of the walking feet, individual and collective weight, the relief of the soils or shoe brands, the resonance of breaths and voices. Here a bit to the side, the pavement will be better in a moment. Turn left, that street is less noisy; actually, wait – there is more to see here. Did you sleep well? Here is a sculpture of a policeman, a protagonist of a diligent character from a well-known children's tale. Careful, watch your step. Are you still okay to walk? Not tired? (Fieldnotes)

This walk in Tomsk in late May 2019 is a very specific collaborative movement in our ethnographic fieldwork– it changes time and space for the social movement of chronic patients in Russia, particularly those with MS. It recomposes the *we* and crafts relations with Tomsk among 'key' conference participants invited to a hospitality dinner, along with research curiosities this conference is infused with. Appreciating this walk as an important part of ethnographic knowledge making, reminding of what a dancer and philosopher Erin Manning (2009) articulates for thinking of movement always in relation to something and someone:

> Walking is all about taking the next step. Walking is never one-off: the momentum of the last step feeds the advance into the next one. To take the

> next step is to step with the feeling of walking. To step with the feeling of how we are already moving is to move-with the immanent activation of the senses spacing. This means that we walk with, as well as within, the environment perceived relationally (Manning, 2009: 49).

Those who are walking as a group in Tomsk are not rushing directly to the restaurant at that moment. Eating is not the destination or objective. Rather, *we* who are walking that night as a group are walking through and with Tomsk, putting together quiet and equipped rooms of the Tomsk State University, different physical, cultural, and epistemic departure places, and local concepts of good dining. This walk does not only *take place* in Tomsk; it places those who walk together *in relationship* with Tomsk, and it places the multiplicity of Tomsk at the moment of this walk within and in between the bodies, our memories, beliefs, and social worlds. This walk is a together-placement, a *composition* – from *com* - "with, together" and *pose* - "to place," "to cease, lay down" (from Latin *pausare*).

According to the Cambridge dictionary, (Cambridge Dictionary, 2020), composition is something that someone has created or written (text, artwork, music piece); the process of creating or writing something; an arrangement, a choreography or scenography. In performative practices, such as Real Time Composition, composition points also to the aligning of space, temporality, action, and relationship between the audience and performers. Walking in Tomsk at that moment becomes in a sense a composition, as it is literally guided by the conference organizers' (including Alex) experiences and knowledge of place. At the same time, it is a process of establishing relationships and a part of a conference organization. Approaching composition as a process, a product, and a practice of pausing, slowing down to put things together "while retaining their heterogeneity" (Latour, 2010: 474) requires work – 'composition work'. It is this work that we need to re-fragment again methodographically to emphasise how it matters for ethnographic collaborations which keep asking the question of how to care as well as possible.

The walk in Tomsk composes a specific *we* and crafts the space for this specific *us* together with Tomsk – researchers, students, and health professionals who take a pause from daily routines to share reflections on the multiplicities of health and illness. Each here is accompanied by different interests, commitments, institutional requirements, or behind-the-scenes collaborators. One of *us* in Tomsk is a president of Russian Multiple Sclerosis Society Yan Vlasov, Professor of Neurology and Neurosurgery at the Samara State Medical University, a carer for a person with MS, a charismatic leader, and one of the most influential figures in the Russian patient movement. Yan is invited as a keynote speaker in a plenary with Vololona Rabeharisoa, a professor of sociology specializing in patient organizations at the Center for the Sociology of Innovation, Mines-ParisTech, Paris. This is the first time that a non-academic knower is opening "Social Sciences and Health Innovations' conference, and it manifests this year's topic "Multiplicity" – of knowledges, evidence, health states, and innovation ontologies. Putting Yan and Vololona in one plenary is the conference organising team's position to nourish local relationships between the social sciences, medicine, and 'social changers', and to craft – at the same time - the position of Tomsk as a place where such relationships are possible.

This small "student city" of Tomsk – as Russians call it, due to its many universities crammed on a small territory and its historic fame for hosting repressed intellectuals – hosts the 'Social Sciences and Health Innovations' conference for the fourth time. This is a result of a collaborative endeavour between the PAST center (studying intersections of science, technology, and society) at the Tomsk State University, the Siberian State Medical University, and Maastricht University in the Netherlands. The only regular collaboration place for a small community of Russian scholars working on the intersection of medical anthropology and STS. For Yan, meanwhile, moving to Tomsk in late May 2019, instead of attending his regular lobby meeting to improve the quality of life of Russian MS patients, or instead of seeing the patients of his own, is a compromise. It is not a taken-for-granted 'yes' to establish collaborative ties and not a 'status quo' move. Yan puts together his curiosities and his previous commitment to share best-practices of patients with the public counsellors,

to the Tomsk regional office of the Service for Surveillance on Consumer Rights Protection and Human Wellbeing. Yan is moved not only by an abstract curiosity for collaborations between the patient community and social scientists (although he mentions at the dinner table that this curiosity indeed exists). He is also moved by Alex's previous engagements in the of work of the RuMSS which fed this curiosity (volunteering as an interpreter, sharing her preliminary observations at the collective events). And – not least – Yan is moved by the paid travel and accommodation which would allow him to fulfil previous commitments made towards activists in Tomsk, working 2234 kilometres from Yan's usual place of work.

Arriving to Tomsk from all over the world to attend the 'Social Sciences and Health Innovations: Multiplicities' conference in different roles (as organizers and advisers, as volunteering students or renown keynote speakers) does not impose our ethnographic and others' work on Tomsk life and it doesn't impose Tomsk on our (not only research) quests. From what we learn with Yan, it is a composition. By drawing methodographically on this walk in Tomsk, we craft space and time for a slow, non-abstract, sensory, and embodied composition with and within Tomsk and each other in ethnographic happenings. Here we move "not to populate space, not to extend it or to embody it, but to create it" (Manning, 2009: 12); a composition sensitive to what is in place to place *with*.

This walk in Tomsk, as we account for it, is also nurtured by months and even years of invisible organizing work and by a long-term relationship between the Tomsk State University and Maastricht University in the Netherlands. It took many walks to compose the relationships we step into in May 2019 (meetings, funding applications, Russian-Dutch sociological fieldwork on Tomsk ground). And it will take many more to maintain them and do so with care for Tomsk and those who are invited, and – more importantly – who are not invited to Tomsk. In that sense, we consider the composition of the walk in Tomsk as a 'matter of care' (Puig de la Bellacasa, 2011) – i.e., a slow crafting of a common world with care for what is there and not there to place with.

The way we move methodographically through the account of this specific walk gives enough time to perceive who and what do not have enough resources to walk, and to imagine how to re-compose next time to be more careful to the neglected and marginal experiences. As Alex was sensing the flexing and stretching of muscles while stepping up and down the stairs on the way to Stroganina, she arrived to know through experience that no MS patient, no one suffering from this chronic illness were – and could be - there to place with in this particular moment. This absence was not only a matter of finances. It is also not a sudden revelation but rather a "going along with things to see where they lead" (Jerak-Zuiderent, 2020: 194 drawing on Garfinkel, 1967) and, perhaps, what Tim Ingold (2010) calls 'becoming knowledgeable', "an improvisatory movement – of 'going along' or wayfaring – that is open-ended and knows no final destination. (...)[A] sense of knowledge-making, which is equally knowledge-growing" (Ingold, 2010: 122).

Our account of the composition work allows us to attend to marginalisation and care in a specific way: The experience of Multiple Sclerosis could not be composed through this walk; due to the fatigue, which puts a body with MS on pause; due to the discriminations which push MS patients into concealing their illness; or due to the financial lack many chronic patients in Russia live with. However, this very limitation of our account, of not including those who live with MS in Russia directly in this walk, we suggest, is not a forever-so constraint. It becomes through the re-fragmentation, a sensory commitment to slowly re-compose, and an embodied provocation of the "political and ethical imagination in the present" (Puig de la Bellacasa, 2017: 7). This absence, this limitation fosters through the methodographic re-fragmentation relationships of care and reparation of 'energy overconsumption' in ethnographic composition.

Empiricizing and problematizing the embodiment work it takes to attend to the invisible kinaesthetic and affective work becomes thereby a way of acknowledging responsibility in a shared world where "phenomena remain unseen, intangible, or otherwise imperceptible, not because of the biological limits of our perceptions, but as a

result of ongoing and active forms of disavowal, denial, and forgetting" (Myers, 2020: 99). What is usually taken for granted in collaborations - bodily movement, emotional labor, relationship maintenance, technical support - are 'matters of care', material, affective, embodied work and "productive doings that support liveable relationalities" (Puig de la Bellacasa, 2011: 93). Insisting on asking what and how we put into ethnographic collaborations, we believe, fosters compositions which "re-affect an objectified world" (Puig de la Bellacasa, 2011: 99). And it also sensitizes us to the rendering of the figure of the knower through the work of "(not) moving and being moved by the other" (Jerak-Zuiderent, 2020: 190) in ethnographic collaborations in the broadest sense; to the composition of *we*.

Let us slow down even more in the following vignette. Keeping close what we have learned about the relations of care, this time our analytical attention will travel into the transformative and 'monstrous' (Star, 1991) effects and affects of being "in the action, (…) finite and dirty, not transcendent and clean" (Haraway, 2004: 236). Still with care for the energy and resources it takes.

Moving with and being moved by

> It is September 2017. Igor Tsikorin [at the time, the president of the Russian Multiple Sclerosis Society] and Alex are on the back seat of a grey Renault Megane, a taxicab arranged by a polite woman attentive to details. Her email signature revealed her as "Olga" – a travel manager for the Moscow office of an international pharmaceutical company. Igor and Alex are moving towards the Gatwick International Airport after spending four days at the Multiple Sclerosis International Federation (MSIF) annual congress in London. Olga was helpful not only with arranging this taxi ride, but also with supporting all the movements Igor and Alex were to exercise. She has dealt with Igor's and Alex's visa applications, booked their flights and Alex's hotel reservation. Igor's hotel was arranged by MSIF within the framework of aid to the representatives from the developing countries; this aid also included waiving our registration fees. Olga's work is subtly woven into the composition of movings and knowings in London in September 2017 and, at the same time, it is to be discovered only in the invisible space in between email boxes, phone calls, and daily schedules. (Fieldnotes)

Olga's work is placed in between – between bodies, societal institutions, private and public spaces, and it moves with Alex and Igor in London. This placement in between and on-the-move (coming to life only through doings, makings, movings, and storymakings) also hosts the work of other team members of the RuMSS. Such as the work of Yan Vlasov who strategized this trip and convinced Olga's employers to support international MS knowledge exchange for Russian patients. Or that of Olga Matviyevskaya, the Moscow MSS president who asked Alex to serve as an interpreter for Igor's trip to London, since professional translation services were too expensive. Or also the work of Pavel Zlobin – the head of the RuMSS international department who due to his MS progression could not participate, and instead of that briefed Igor and Alex on the state of affairs and the RuMSS' strategic vision.

As we craft back and forth our ethnographic collaborations with attention to how they transform *us*, we take seriously the kind of work that *moves with us* in a grey Renault Megane, whether it is visible or not. This points also to the work which *we* are *being moved by,* both in a sense of who makes practical arrangements (and on the bases of what and whose resources) and in a sense of being affected by the 'invisible work' (Star and Strauss, 1999) (consider Pavel's not presence in London due to exacerbation). What interlaces with the work of composing, and composing with MS, in our ethnographic collaboration in a grey Renault Megane is that we are *moving with* and we are *being moved* by an emergence of an ethnographic *we*. This emergence is transformative, motile, in the sense that moving/being moved transforms all those involved in the composition through and with an 'other' (Jerak-Zuiderent, 2020). The *we* we refer to here is "at once heterogeneous, split apart, multiple - and through living in multiple worlds *without* delegation, we have experience of a self unified only through action, work and the patchwork of collective biography" (Star, 1991: 29). What we propose, drawing on Star (1991), is that bodies are imperative and unavoidable in crafting collaborations (consider how Pavel

could not go to London or how Alex was accompanying Igor as an interpreter).

Movement – in the broadest sense – instantiates and is experienced through bodies, and always in relation to something or someone (Manning, 2009). What we learn from the invisible work riding in between Igor and Alex in London, drawing on Manning (2009), is that *we*

> (…) always happen[s] in the middle. Not first a thought, then an action, then a result, but a middling, "we" the result of a pull that captures, for an instant, how the thought was already action-like, how the body was always also a world. Not first a body then a world, but a worlding through which bodyings emerge (Manning, 2019: 1).

Thinking methodographically of how we compose while moving with and being moved by Olga's, Pavel's, Yan's, Olga Matviyavskaya's work sensitizes us to the way most of patients' work is done within the RuMSS - in the middle, with bodies which are fragmented and improvised, entailing a motile craft of moving with and being moved by each other. Charismatic leaders (mostly male and sometimes not having MS), such as Yan or Igor, represent the RuMSS' victories and demands in a visible way, by lobbying at official institutions, forging connections with governmental officials or pharmaceutical companies, leading regular sociological surveys on the quality of life with MS. Their movements are traceable through media articles, through references in the conference programs and invitations to the official events. Meanwhile, such representations are maintained by an extensive net of local groups and relationships within RuMSS.

The RuMSS is an umbrella organization uniting the work of 47 regional MS organizations (in their majority without physical offices), mostly through online spaces, national surveys, and regular practice-sharing events. Each regional organization is a world of its own where people suffering from MS share and invent artefacts (books or recorded DVDs of 'good' rehabilitative exercises), body maintenance practices, emotional support, collective festivities, petitions to fix inaccessible sidewalks or old hospital facilities, and more. On the regional level, a lot of work stays 'invisible work' (Star and Strauss, 1999), appearing and disappearing as it moves through times and places. This work is not documented in the 'best practices' or organizational guides of the RuMSS. Some of this is because it is not considered to be worthy of documentation time and effort – local networking, emotional support, work specific to the region (snow cleaning services). And some is not documented because invisible work must stay invisible, such as semi-legal exchange of medicaments among patients, which repairs bureaucratic delays in the official care provision (Endaltseva, 2020).

Let us move back into a grey Renault Megane and explore through Alex's memos what else transforms us and makes us "finite and dirty" (Haraway, 2004: 236) in ethnographic collaboration.

> It is September 2017. Our movement in a grey Renault Megane is composed with my old-fashioned voice recorder laying between us; the Russian language that we speak, excluding our driver from our meaning making. The road; the petrol; the RUB to GBP ratio which was discomforting for many Russians that year. My voice recorder's intake of Igor's hesitant explanations of the RUMSS budgets, friendships with pharmaceuticals, and current difficulties. Igor and I do not know each other that well yet – in fact, this trip is our first face-to-face encounter; our journey into knowing each other through MS. On the fifth day of this journey Igor starts sharing less official accounts of the Russian patient movement.
>
> (…) I am quickly travelling with my eyes from Igor's face to my notebook, where his reflections on the 4 days in London take shape in the form of sentences. The sentences under a star sign indicate what is sensed like a movement of previously still, unclear points. Meanwhile, the sentences under an exclamation mark are memos with emerging memories/reactions/sensations in this particular moment. This kind of taking notes allows me to catch the turning points in the RuMSS story making and, at the same time, to attend to how I am being moved by it or how, as it seems to me, Igor is being moved. At the same time, this kind of notes compose my body into a posture oscillating between notes and Igor, head down and head up, hands working and hands waiting.

> (…) Igor notices this back-and-forth movement and confesses that it's not easy to have a comfortable and open conversation in such a setup. London, silent driver, fast running hands after each explanation. I apologize and laugh that we are negotiating our comfort zones. I point to the driver and comment that he must also be uncomfortable with so much Russian and a voice recorder in his car.
>
> (…) Igor tells me about the importance of a friendly drink with this or that governmental official at least once in a fortnight. I take a note with a star sign. I raise my eyes from time to time to nod and make visible that I am attentive, and I am with him. The cab driver is driving, he doesn't speak Russian and cannot relate to our conversation. At one moment Igor pauses and smiles, "I see you are always taking notes". I smile back – "well, it's a part of all that ethnography trouble I got myself into". "I know only two professions that are so good in keeping track: CEO's secretary and secret services...and you definitely don't look like a secretary. Are you not telling me something about your research?" I smile once more and draw an exclamation mark with a memo "third time I am being asked something similar. September 2017. Economic sanctions and purging of foreign capital in Russia". (Fieldnotes)

Moving with and being moved by, as we infer from what note-taking instigated in a grey Renault Megane, is a kinaesthetic, affective, and compositional collaboration embodied 'with sense'. Natasha Myers (2005;2012) argues that such back-and-forth becoming together move us away from 'modest knowing' (Haraway, 1997) into the ethico-political embodiment. Moving with and being moved by in ethnographic collaborations, when taking notes in a grey Renault Megane or growing suspicion to note-taking practice, crafts space for ethnographic collaboration 'from a body' (Haraway, 1988). It sensitizes us to composition; to re-fragmenting space, temporalities, actions, relationships, and body postures between researcher and researched.

As we learn with Sánchez Criado and Estalella's (2018), moments of 'friction', such as the one we encountered in a grey Renault Megane, are needed to slow down, and notice what is at place to place with. How to place complex note taking as a car moves through London with a voice recorder in between the movers? How to place non-ordered ethnographic work, not meant for surveillance but done with care for solidarity, in a social movement of chronic patients in Russia? Drawing on Manning (2009) while going back methodographically to the space of Renault Megane we propose that "we move not to populate space, not to extend it or to embody it, but to create it" (Manning, 2009: 12).

Myers (2020: 99) specifies that affective co-mattering of bodies "are not just happy associations or consensual relations", like care enactments in ethnography (and beyond) may suppose misalignment and frictions (Atkinson-Graham, 2015). Moved by Igor's comment, Alex puts together that starting with 2015, Russian geopolitics has been marked with a strategy of separating from economic relationships with the western countries. She puts together with this grey Renault Megane readings about repressive measures towards those who collaborated with foreign NGOs and cultural organizations, nationalist ideological slogans in Russian mass media, and sanctions regime established after the Ukrainian conflict in 2015. Moving with Igor, notes, sanctions, Renault Megane, and also being moved by them, provokes a 'sensory event' (Manning, 2009). As *we* become transformed through back-and-forth movement with frictions we engage in ethnographic collaborations 'from a body'.

Let us slow down even more, going back to Alex's notes and observations. As we pause to take tea after a yoga class with MS patients, we attend to the kind and amount of energy and resources which move collaborations: how else is it possible to move with and be moved by?

Pausing

> We sit around a tea table after a rehabilitative yoga class. It is June 2018. Eight people sipping on herbal tea and sharing sensations, stories, and reflections which come to mind after hanging upside down, finding stability in bendings and planks, and anticipating this final savasana meltdown. Natalia [a person with MS and a former vice-president of the Moscow chapter of the RuMSS] teaches the art of movement. My phone's voice recorder, placed on a table next to a big teapot, around which the eight of us are trying

> to keep our backs straight on tiny tabourets. Face down, my phone holds space for Natalia's teaching while I chat with a married artist couple, both with MS, about their innovative material for long-lasting candles, recently presented at some regional Art Salon. Turned screen down, to pose as little signalling as possible, my phone welcomes Natalia's story as I allow my body to be in its presence. I slightly hear the story of Natalia on the background of my learning about candle alloys, knowing that I will go back to this place when listening to the recording back at my writing desk.
>
> (…) In a conversation with a woman with MS, not a Moscow MS Society member, Natalia explains: When I first started to take classes in 2016, they [instructors] made these complex structures with chairs, ropes, supports just to put me in one position. After the first class, I came home and cried. How could I arrive to neglect my body so much? How could I become so reckless with my own wellbeing?
>
> A woman with MS: Hard to believe now – what was the reason for you arriving in this state?
> Natalia: My activism, or rather that style of activism which I followed in the Moscow MS Society. I was doing so much public work and never linking it with the imperative work of maintaining my wellbeing: caring for my body, spending time with my grandson.6 (Fieldnotes)

In June 2018 we encounter a different composition and a different mode of collaboration than that of September 2017. Instead of moving back and forth from note taking to listening, Alex suspends the movement. Putting her voice recorder in the middle of a tea table, as eight people with MS pause after the yoga class, Alex ceases, lays down engaging fellow movers in collaboration. The voice recorder and body fatigue after the class forefront slowing down, attuning to senses and affects, composing with what is at place in a Yoga Studio, and not imposing ethnographic collaborations. What is also known 'from a body' in a Moscow Yoga studio is that collaborative action with care for heterogeneity demands moments of pausing and questioning where 'do we get the energy to act' (Latour, 2010) from. Suspending movement around the tiny tea table makes us sense – like when walking in Tomsk or sitting in a pre-ordered Renault Megane – that movement requires energy and resources. This is relevant both to the social movement of chronic patients and to the ethnographic movement within it. Through composing slowly and moving with and being moved by each other we 'become knowledgeable' (Ingold, 2010) that movement is not an innocent endeavour. Moving, whether it is a bodily displacement or (not) pulling out a notebook, requires energy and is full of supporting 'invisible work' (Star and Strauss, 1999) of maintaining the movement.

For many people with MS movement – the 'mundane' act of moving we do each moment of our lives – comes with (a lot) of invisible work and resources. This is not different from Olga's behind-the-scenes work of arranging our London trip or the burning of fuel in a grey Renault Megane. As we come to sense how energy-consuming our practices of movement are, we wonder what the work of pausing, suspending a movement in attention to 'what's in place' would suggest for knowing with care and with 'less of us' (Puig de la Bellacasa and Papadopoulos, 2018). 'Good composition' (Latour, 2010) for ethnographic collaborations 'from a body', we suggest therefore, requires an embodied sense for *pausing*.

Pausing doesn't mean absence of movement; it implies sense-full suspension of acting – not taking notes or not acting as a vice president. It is a particular mode of movement, which does not impose, provoke, or analyse the situation; but rather refines the resources and energy which nourish the movement. Natalia's pausing recomposed her relation to the RuMSS and activism 'from a body'. By suspending her 'activism' Natalia arrived to caring for '*the imperative work of maintaining wellbeing*' while still caring for the social movement of chronic patients, but differently. Natalia is no longer a vice-president, yet she organizes rehabilitative yoga classes, gives supportive phone calls to the society's members, participates in conferences and events. She does all this, when there is enough energy and resources; and she encourages her patient-collaborators in a yoga group to do the same. In the case of Alex, suspending active movement of note-taking did not remove ethnographic movement from the movement of chronic patients; rather,

it rearranged what kind of movements Alex puts energy into.

Through a methodographic journey into our ethnographic movements within the social movement of chronic patients we propose, therefore, that pausing requires work of crafting space for ethnographic collaborations. These collaborations may (or may not) happen when there is 'good composition' (Latour, 2010) and enough energy for it. This is both the case in a sense, with Natalia's pausing with the movement of chronic patients in Russian, and with suspension of a habitual research practice. To appreciate the challenging work required to pause, we find it helpful to think with Manning's (2009) specifications in the "Mover's Guide to Standing Still":

> "It is more difficult to stand than to move" (Feldenkrais, 1981:44). Standing still is a metastable activity: the stillness demands precise adaptation to the micromovements of a shifting equilibrium. To stand still you have to move.
>
> Everyone sways. You may think you're standing still, but actually you're drifting, shifting slightly to the left, your ankle twitching as your weight moves to the ball of your foot, your knee bending slightly as you take in a breath (…). Standing still requires constant correction. (…)
>
> Stillness is always on its way to movement. When you stand still, you don't feel the "how" of movement stilling unless you're asked to feel the stillness. Then you find you can't stop thinking about how you're moving. (Manning, 2009: 43).

When we cannot stop thinking of how we move in ethnographic collaborations; when we compose, when we move with and are being moved by, and when we slow down and pause (for example, to take a cup of tea in a yoga studio while learning about candle alloys) – we move closer to knowing with care. Pausing and working towards stillness, we sense, allows enough energy to question "the effects of our accounts in the composition of things" (Puig de la Bellacasa, 2011: 88).

For care in epistemic collaborations

In this article we explored methodographically how embodiment work in 'epistemic collaborations' (Sánchez Criado and Estalella, 2018) could instantiate a 'method' of knowing with care and a source of 'energy' to slowly compose a common world with appreciation for (ontological) differences of the social movement of people living with MS in Russia. We lean analytically on an emergent approach of 'methodography' (Lippert and Douglas-Jones, 2019; Lippert and Mewes, 2021 (this SI)), a generative moving back and forth between research practices and accounts, proposing that such analytical nexus disciplines to question the presence of care work in scholarly doings and non-doings. The research and analyses above, therefore, do not lead to more or less of patient participation; they do not hope for more or better evidence-based guidelines or policies on MS. What we are hopeful about – also in terms of methodographic scholarship – is the importance of embodiment work in different epistemic collaborations for nourishing postcolonial sensitivity to the emergent constitution of 'worlds'. Such methodographic attention to the embodiment work is hope-full in questioning taken-for-granted realities. There is a speculative-ethical move we engage with when moving methodographically within a social movement of chronic patients with MS in Russia. It seems 'fleetingly subtle' (Verran, 1999) but ontologically generative and makes all the difference for embodiment work in ethnographic collaborations. This move

> "starts from the obligations that we have to a certain field. We do stuff, because we are obliged by the situation, the occasions in which we are engaged. (…) ['Do it with less of yourself'] becomes then thinking carefully about interdependencies, relations, positions within a certain field, a certain ecology and what you produce, what you leave behind and how not to be harmful through what you leave behind. In many cases also how you can be beneficial, but in most cases how you can live a life or practice a life in which you will allow others to share the stuff that you do by retracting yourself. (Puig de la Bellacasa and Papadopoulos, 2018: n.p.).

Ethnographic collaborations are not necessarily symmetrically reciprocated or smooth; however, paying attention to embodiment work in such collaborations helps to 'start from the obligations one has to a certain field' - in our case, the social

movement of people living with MS in Russia. The embodiment work when 'doing with less of ourselves' in ethnographic collaborations also helps to attend to the energy and resources such collaborations ask for and which are otherwise silenced or neglected. This can happen by making evident 'what is in place to place with' in a certain field, like noticing that there is no place for MS patients in the walk in Tomsk. It may also happen through taking seriously what kind of resources it takes to collaborate. From whom/what and at what cost to place in place people and things while not resolving 'away' such differences through our scholarly accounts (consider Olga's, Pavel's, Yan's silent presence in a grey Renault Megane)? By attending to how 'we know' through ethnographic collaborations, this article contributes thereby to a broader question of how to care for differences as we shape an ethnographic *we*. Let us slow down and pause once more:

We expanded the notion of 'epistemic collaborations' with a sensitivity to what is invisible, petty, and out of place when people and things are put together in ethnographic accounts. We have done so through three analytical anchors: a. relationships of care embedded in (or not) and emerging from collaborations; b. the kind and amount of energy and resources which move collaborations; and c. transformative and 'monstrous' (Star, 1991) effects and affects of being "in the action, (…) finite and dirty, not transcendent and clean" (Haraway, 2004: 236). Each one was grounded in three instances from our ethnographic fieldwork.

The sensitivity to the invisible and neglected comes with responsibilities for and responsiveness to the forces which keep a common world alive, with the work of maintaining solidarity and ethico-affective relations. It comes with 'becoming knowledgeable' (Ingold, 2010), in a sensory and embodied way, of 'what are *we* encouraging caring for' (Puig de la Bellacasa, 2011: 92) as we commit to collaboration. Our attention to the embodied and often invisible instances of collaborations – the work of composition, of moving with and being moved by, and of pausing and slowing down – is thus an invitation to not take for granted what we put and what we do not put into a figure of the knower when crafting ethnographic accounts.

As an ongoing strategic quest for responsible research and innovation (Burget et al., 2016; Von Schomberg, 2013) grows exponentially the desires for collaborations in funded research proposals, we argue for the importance of not taking for granted the energy and resources required for epistemic collaborations. Appreciating embodied work in this sense generates hopes which are not to 'produce [just] more research'. Rather, this is a hope to nurture care for the interdependencies within a certain field through collaborations without imposing or neglecting what is brought into and what is left behind *after* retracting from this field.

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References

Atkinson-Graham M, Kenney M, Ladd K, Murray C M and Simmonds EA-J (2015) Narratives of Care in Context: Becoming an STS Researcher. *Social Studies of Science* 45(5): 738–748.

Blaikie C, Craig S, Gerke B and Hofer T (2015) Coproducing Efficacious Medicines: Collaborative Event Ethnography with Himalayan and Tibetan Sowa Rigpa Practitioners. *Current Anthropology* 56 (2): 178-204.

Burget M, Bardone E and Pedaste M (2016) Definitions and Conceptual Dimensions of Responsible Research and Innovation: A Literature Review. *Science and Engineering Ethics* 23(1): 1–19. http://doi.org/10.1007/s11948-016-9782-1.

Cambridge Dictionary (2020) Composition. Available at: https://dictionary.cambridge.org/dictionary/english/composition.

Coopmans, C (2020). Caring for Past Research: Singapore, Eye Health Care, STS, and Me. *East Asian Science, Technology and Society: An International Journal* 14(1): 145-152.

Davies, SR (2021) Atmospheres of Science: Experiencing Scientific Mobility. *Social Studies of Science* 51(2): 214–232.

De la Cadena M, Lien ME, Blaser M et al. (2015) Anthropology and STS: Generative Interfaces, Multiple Locations. *HAU: Journal of Ethnographic Theory 5*(1): 437-475. http://doi.org/10.14318/hau5.1.020.

Epstein S (1996) Introduction Controversy, Credibility and the Public Character of AIDS Research. In: Epstein S (ed) *Impure Science: AIDS, Activism, and the Politics of Knowledge*. Berkeley, Los Angeles, London: University of California Press, pp. 1-25.

Endaltseva A (2020) *Chronic Com-position Work: Embodying Patient Organization and Patient Improvisation within Russian Multiple Sclerosis Society*. PhD thesis. Paris/Linköping: Centre d'Etude des Mouvements Sociaux (CEMS), École des Hautes Études en Sciences Sociales EHESS / University of Linköping.

Feld S (1982) *Sound and Sentiment: Birds, Weeping, Poetics, and Song in Kaluli Expression*. Philadelphia: University of Pennsylvania Press.

Feldenkrais M (1981) *The Elusive Obvious; or, Basic Feldenkrais*. Cupertino, CA: Meta Publications.

Feys P, Giovannoni G, Dijsselbloem N, Centonze D, Eelen P and Andersen SK (2016) The Importance of a Multi-Disciplinary Perspective and Patient Activation Programmes in MS Management. *Multiple Sclerosis* 22 (2 Suppl): 34-46. doi: 10.1177/1352458516650741.

Garfinkel H (1967) *Studies in Ethnomethodology*. Englewood Cliffs, NJ: Prentice Hall.

Haraway DJ (1985) Manifesto for Cyborgs: Science, Technology, and Socialist Feminism in the 1980s. *Socialist Review* 80: 65–108.

Haraway DJ (1988) Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14(3): 575–599. http://doi.org/10.2307/3178066.

Haraway DJ (1997) *Modest Witness@Second Millenium Female Man © Meets Oncomouse™: Feminism and Technoscience*. New York: Routledge.

Haraway DJ (2004) *The Haraway Reader*. New York: Routledge.

Harding S (1991) *Whose Science? Whose Knowledge! Thinking From Women's Lives*. Ithaca, NY: Cornell University Press.

Ingold T (2010) Footprints through the Weather-World: Walking, Breathing, Knowing. *Journal of the Royal Anthropological Institute* 16: S121-S139. doi:10.1111/j.1467-9655.2010.01613.x.

Jerak-Zuiderent S (2020) How to Care for Our Accounts? In: Blok A, Farías I and Roberts C (eds) *The Routledge Companion to Actor-Network Theory*. London: Routledge, pp. 190-199. doi: 10.4324/9781315111667-21.

Latour B (2010) An Attempt at a 'Compositionist Manifesto'. *New Literary History* 41 (3): 471–90.

Law J (2004) *After Method: Mess in Social Science Research*. London: Routledge.

Lippert I and Douglas-Jones R (2019) "Doing Data": Methodography in and of STS. *EASST Review* 38(1). Available at: https://easst.net/article/doing-data-methodography-in-and-of-sts/.

Lippert I and Mewes J (2021) Data, Methods and Writing: Methodographies of STS Ethnographic Collaboration in Practice. *Science & Technology Studies*, 34(3): 2-16.

Manning E (2009) *Relationscapes: Movement, Art, Philosophy*. Cambridge, MA: The MIT Press.

Manning E (2019) Toward a Politics of Immediation. *Frontiers in Sociology*, 3 (42). doi: 10.3389/fsoc.2018.00042.

Marcus G (2000) *Para-Sites: A Casebook against Cynical Reason*. Chicago, IL: University of Chicago Press.

Martin A, Myers N and Viseu A (2015) The Politics of Care in Technoscience. *Social Studies of Science* 45(5): 625–641.doi: https://doi.org/10.1177/0306312715602073.

Mascia-Lees FE (ed) *A Companion to the Anthropology of the Body and Embodiment*. Malden and Oxford: Wiley-Blackwell.

Munro R (2012) Agency and "Worlds" of Accounts: Erasing the Trace or Rephrasing Action? In: Passoth JH, Peuker B and Schillmeier M (eds) *Agency without Actors? New Approaches to Collective Action*. New York: Routledge, pp. 67-86.

Myers N (2005) Visions for Embodiment in Technoscience. In: Tripp P and Muzzin L (eds) *Teaching as Activism: Equity Meets Environmentalism*. Montreal: McGill-Queen's University Press, pp. 255-267.

Myers N (2008) Molecular Embodiments and the Body-work of Modeling in Protein Crystallography. *Social Studies of Science* 38(2):163-199 doi:10.1177/0306312707082969.

Myers N (2010) Pedagogy and Performativity: Rendering Laboratory Lives in the Documentary Naturally Obsessed: The Making of a Scientist. *Isis: Focus Section on Performing Science* 101 (4): 817–828.

Myers N (2012) Dance Your PhD: Embodied Animations, Body Experiments, and the Affective Entanglements of Life Science Research. *Body & Society* 18(1): 151–189. doi: 10.1177/1357034X11430965.

Myers N (2020) Anthropologist as Transducer in a Field of Affects. In: Loveless N (ed) *Knowings and Knots: Methodologies and Ecologies of Research-creation*. University of Alberta Press, pp. 97-125.

Myers N and Dumit J (2011) Haptics. Haptic Creativity and the Mid-Embodiments of Experimental Life. In: Mascia-Lees FE (ed) *A Companion to the Anthropology of the Body and Embodiment.* Malden and Oxford: Wiley-Blackwell, pp. 239-261.

Pink S (2008) An Urban Tour: The Sensory Sociality of Ethnographic Place-Making. *Ethnography* 9 (2): 175–196. doi: 10.1177/1466138108089467.

Puig de la Bellacasa M (2011) Matters of Care in Technoscience: Assembling Neglected Things. *Social Studies of Science 41*(1): 85–106.

Puig de la Bellacasa M (2012) 'Nothing comes without its world': Thinking with care. *The Sociological Review* 60: 197–216.

Puig de la Bellacasa M (2017) *Matters of Care: Speculative Ethics in More than Human Worlds*. Minneapolis & London: University of Minnesota Press.

Puig de la Bellacasa M and Papadopoulos D (2018) *Decenter the Human: Interview with M. Puig de la Bellacasa and D. Papadopoulos*. Venice Architecture Biennale. Venice, Italy.

Rabeharisoa V, Moreira T and Akrich M (2014) Evidence-Based Activism: Patients', Users' and Activists' Groups in Knowledge Society. *BioSocieties* 9(2): 111–128. doi:10.1057/biosoc.2014.2

Sánchez Criado T and Estalella A (2018) Introduction: Experimental Collaborations. In: Estalella A and Sánchez Criado T (eds) *Experimental collaborations: Ethnography through Fieldwork Devices*. Oxford: Berghahn, pp. 1-30.

Star SL (1991) Power, Technology and the Phenomenology of Conventions: On Being Allergic to Onions. In: Law J (ed) *A sociology of Monsters: Essays on Power, Technology and Domination*. London: Routledge, pp. 26–56.

Star SL and Strauss A (1999) Layers of Silence, Arenas of Voice: The Ecology of Visible and Invisible Work. *Computer Supported Cooperative Work 8:* 9–30.

Verran H (1999) Staying True to the Laughter in Nigerian Classrooms. In: Law J and

Hassard J (eds) *Actor Network Theory and After*. Oxford: Blackwell Publishers, pp. 136–155.

Von Schomberg R (2013) A Vision of Responsible Research and Innovation. *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*: 51–74. http://doi.org/10.1002/9781118551424.ch3.

Zuiderent-Jerak T, Grit K and van der Grinten T (2015) Critical Composition of Public Values: On the Enactment and Disarticulation of What Counts in Health-Care Markets. In: Dussauge I, Helgesson CF and Lee F (eds) *Value Practices in the Life Sciences and Medicine*. USA: Oxford University Press, pp. 119-135.

Notes

1 Our usage of 'we' in this article goes back and forth from the literate 'we' – Alex and Sonja – to a conceptual *we* – relations of mutual belonging, emergence of solidarity position and genuine interest in each other and each other's work, which nurture collaborations. Whenever we refer to a conceptual *we* (in italics) we do so with interrogation, curiosity and puzzling, not as a statement of assertion.

2 This fieldwork was a part of Alex's PhD project (EHESS, France-Linköping University, Sweden). Sonja has served as a supervisor for Alex's dissertation together with Isabelle Ville.

3 MS is "a chronic and progressive immune-mediated disorder of the central nervous system (CNS), characterized by inflammation, demyelination, and neuronal degeneration" (Feys et al., 2016: 34) with physical, cognitive, and psychological symptoms, as well as visible effects on the social lives, such as decrease in employability or disempowerment?

4 Quote from the fieldwork.

5 We invite the reader to take 'energy' as more than a metaphor or a figure of speech, but rather as a resource which is ruled by laws of interdependency/relatedness reminding us of what we learned in physics classes. The same goes for the relationship between friction and slowing down.

6 Fieldnotes 2018 June 2018.

Visualizing Devices for Configuring Complex Phenomena in-the-Making

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Abstract

STS scholars are engaging in collaborative research in order to study extended socio-technical phenomena. This article participates in discussions on methodography and inventive methods by reflecting on visualizations used both internally by a team of researchers and together with study participants. We describe how these devices for generating and transforming data were brought to our ethnographic inquiry into the formation of research infrastructures which we found to involve unwieldy and evolving phenomena. The visualizations are partial renderings of the object of inquiry, crafted and informed by 'configuration' as a method of assemblage that supports ethnographic study of contemporary socio-technical phenomena. We scrutinize our interdisciplinary bringing together of visualizing devices - timelines, collages, and sketches - and position them in the STS methods toolbox for inquiry and invention. These devices are key to investigating and engaging with the dynamics of configuring infrastructures intended to support scientific knowledge production. We conclude by observing how our three kinds of visualizing devices provide flexibility, comprehension and in(ter)-ventive opportunities for study of and engagement with complex phenomena in-the-making.

Keywords: Visualizing devices, configuration, configuring, visualization practices of arts and design, collaborative ethnography, data generation and transformation, complex phenomena in-the-making

Introduction

In this paper we describe, analyze and reflect on how we crafted a variety of visualizations with which we brought together and transformed ethnographic data and insight generated while investigating a complex phenomenon in-the-making. Our use of these devices is framed by an ethnographic interest, but it was also brought forward as an explicit focus on interventive engagement and inventiveness throughout. In doing this, the paper contributes to the discussion on methodography (Greiffenhagen et al., 2011; Lippert and Douglas-Jones, 2019) and inventive methods (Estalella and Criado, 2018; Lury and Wakeford, 2012; Marres et al., 2018).

The phenomenon we studied was the formation of research infrastructures (RI) to support ecological and environmental research. The ecological sciences study biomes with an interest in interactions between organisms and their biophysical environments while the environmental sciences introduce a focus on human influences. Research for these sciences, historically based on data collected at designated locations, consists of two natural science components: biotic (living organisms, such as flora and fauna) and abiotic (physical factors, such as temperature and nitrogen), that reflect the characteristics of each particular biome. Both the idea and the challenge of environmental research infrastructures (ERIs), is to assemble, connect and make comparable heterogeneous data collected at various times and at widely distributed ecological locations. ERIs are intended to bring together data across multiple spatiotemporal scales for collaborative research efforts relating to urgent global problems such as climate change, biodiversity loss, management of natural resources, and sustainability of ecosystems.

The process of forming ERIs, we learned, could hardly be described as being developed through evolutionary trajectories with clear directionality (Pollock and Williams, 2009). Rather their formation appeared only partly materialized and wildly incoherent at times such that their stability and ability to connect could not be assumed (Jensen and Winthereik, 2013). The definition of complexity by Mol and Law (2002) befits ERIs in-formation. They explain, "[T]here is complexity if things relate but don't add up, if events occur but not within the processes of linear time, and if phenomena share a space but cannot be mapped in terms of a single set of three-dimensional coordinates." (Mol and Law, 2002: 1). In our efforts to understand what it takes to form ERIs, we followed their recommendation to pay careful attention to scaling processes, unpredictabilities, multiplicities and emergence. Furthermore, in order to problematize the reductive contrasting of simplicity and complexity (Mol and Law, 2002), we aimed to ask what happens to complexity when simplifications are made.

In our study, one obvious way to contrast simplicity and complexity would be to focus on the tension between simplification and complexity. We encountered simplification in terms of standardization and harmonization instituted by the European Strategy Forum on Research Infrastructures (ESFRI) policy, yet observed researchers coping with the complexity of ecological and environmental sciences, engendered by the diverseness in biomes, sites, temporalities, instruments, methods, units, procedures, practices, etc. resulting in extremely heterogeneous environmental data. We chose to problematize the tension by inquiring into ERI participants' practices with an interest in their practical orientation as they engaged and re-engaged (or not) with RI policy concerns. We also dug into how ESFRI policy - currently the main policy and funding program regulating RIs in the European Research Area - has evolved over the years, as it is also in-formation. With enough understanding of both, we started to speculate about potential alternative encounters and eventually to create explorative opportunities where standardization and complexity could meet care-fully and inventively.

For making sense of ERIs in-formation, we have drawn on Star and colleagues' notion of information infrastructure (Star and Ruhleder, 1996; Star, 1999; Bowker and Star, 1999). This early work puts forth a set of characteristics through which information infrastructures emerge as socio-technically imbricated, relational, (at least partially) invisible, political, and situated - and yet with wide reach. In addition, Karasti and Blomberg (2018) put forward the connected, accreting and emerging qualities

as well as the variety of intentions and interventions at play in the formation of information infrastructures. From this foundation, we began our study – collaboratively and ethnographically – of a shape-shifting, socio-technically and institutionally diverse and spatio-temporally distributed phenomenon that evolves together with the ways of doing science amidst partnerships, standards, data and policies that are changing over time and affecting how knowledge is produced. We use the term 'ERIs in-formation' for the phenomenon we engaged with in the field together with the study participants and the more ontologically flavored 'complex phenomena in-the-making' for the object of inquiry we researchers created for our investigation.

Given our observations of ERIs in-formation configuring and reconfiguring themselves, we explored ways of looking at and recording some of their different states and shapes through a variety of what we came to call *visualizing devices*. Some of us were accustomed to drawing and working with pictorials. We began to notice how little-by-little these graphic renderings became an approach that we used frequently. As a result of our own experiences, we also experimented with ways to use them to generate, share and render available what we learned for and with our participants. We used these visualizations as invitations as well as explicit provocations and interventions in the field.

Drawing on methodography (Greiffenhagen et al., 2011; Lippert and Douglas-Jones, 2019), which invites researchers to reflexively examine their own research practices and methods, we frame this paper by asking the following questions:

1) How did we, as researchers, meet and make sense of what we were researching - in this case ERIs in-formation that we characterize as complex phenomena in-the-making - by drawing on Suchman's (2012) configuration?
2) How has our enactment of different visualizations constructed and structured our ethnographic data of the phenomenon? How have they facilitated collaboration in inquiry and in(ter)vention?

In the following section, we introduce the notion of configuration that informs our methodographical reflection, and visualizations from the traditions of arts and design that we mobilized in our research. We then describe our approach to collaborative ethnography. We go on to reflect on how our exploration and wondering about ERI configurations, shaped the generation and transformation of our ethnographic data into a variety of visualizations (timelines, collages and sketches) that rendered visible partial 'cuts' into the object of inquiry and revealed how they were (re)configured as our understanding of the phenomena grew and in(ter)ventive opportunities arose. In the Discussion section, we address our two research questions by deliberating on visualizing devices for making sense of complex phenomena in-the-making in collaborative research. We conclude by positioning visualizing devices in the methods toolbox for scholars interested in use of flexible research designs to study complex phenomena in-the-making.

Configuration and visualization

Here we introduce our take on Suchman's (2012) notion of configuration, drawing parallels to the ethnographic approach of 'constructing the field'. We then move to the practice of visualizing, which we borrow from art, design, and engineering, as a way of learning about ERIs in-formation and articulating them as complex phenomena in-the-making.

Encountering configuration

Suchman's (2012) notion of 'configuration' informs and inspires our methodographical reflection. Configuration is a concept for bringing things together into socio-material assemblages for analysis. For us it has two broad uses. First, it aids in delineating what comprises an object of analysis and how it is bound. It provides a vocabulary to understand and question our continuous bounding of the phenomena, drawing parallels to the notion of 'constructing the field' in ethnography (Blomberg and Karasti, 2013). The ethnographic field cannot be taken for granted, as Amit reminds us:

> In a world of infinite interconnections and overlapping contexts, the ethnographic field cannot simply exist, awaiting discovery. It has to be laboriously constructed, prised apart from all the other possibilities for contextualization to which its constituent relationships and connections could also be referred. (Amit, 2000: 6)

Second, the notion of configuration helps draw attention to how imaginaries and materialities are entangled in technologies and their development projects. It supports us in exploring socio-material assemblages as action and effect by directing attention both to the modes of ordering things and to the arrangements of elements in particular combinations. It alerts us to inquiring how things are – over time and through encounters – figured into meaningful existence, "fixing them through reiteration but also always engaged in 'the perpetuity of coming to be' that characterizes the biographies of objects as well as subjects" (Suchman, 2012: 50, citing Daston, 2000). With reference to Law's 'method assemblage' (Law, 2004), configuration can be understood as a device for articulating the relation between what counts as the 'insides' of a socio-technical system and what is considered the 'outsides'. It acknowledges the enacted rather than any given nature of delineations of inside(r)s and outside(r)s. With further relevance to infrastructure development at the core of ERIs in-formation, configuration recognizes the contingency and incompleteness of artifacts, both in terms of a system's description (presupposing 'hinterlands' exist given that full specification of the system is not possible) and its implementation (presupposing design always continues as design-in-use).

In our work, we have enacted configuration both "as a tool to think with about the work of drawing the boundaries that reflexively delineate technological objects, and as a conceptual frame for recovering the heterogeneous relations that technologies fold together" (Suchman, 2012: 48). Configuration underscores the question of differential capacities for the articulation and movement of technological imaginaries and enabling resources, as well as for the complex relationship between the scale(s) of projects and their effects.

Drawing from visualization traditions in the arts and design

As we have mentioned, and will elaborate in the next sections, visualizations and visualizing practices became one of the biggest 'traces' left by our attempts to understand the phenomena and document our collaboration within the team and with our participants. Thus, in comparison with other methodographical reflections that concentrate on revisiting textual transcriptions (e.g. Greiffenhagen et al., 2011), we take a close look at a set of 'visual designs' in the form of timelines, collages and sketches. These practices are not just the prerogative of the so-called creative professions but are part and parcel of the way science and technology operate (Latour, 1986). Our use of visuals, however, comes with particular customs stemming from design, art, architecture and engineering fields that have long traditions of resorting to a variety of visualizations to render their objects of inquiry and creation (Pollio, 1914; Klee, 1973). For example, in art and design studios, practitioners constantly use different media to explore design alternatives, change viewpoints, make decisions and communicate with different stakeholders (e.g. Retelny and Hinds, 2016). In these traditions, visual and other material representations, including sketches, doodles, technical drawings and 3D models, function as network-organizing devices and receptacles for knowledge that articulate the thought processes of their creators and of those with whom they need to interact (Henderson, 1991, 1998).

Moreover, such pictorials provide not only provide analytical traction (as tools to think with) and interpretative flexibility, they are at the same time purposefully constructed with a variety of interventive and generative intentions. Lynch (1960), for example, developed what he called mental maps of cities based on verbal interviews, sketch maps and field reconnaissance trips in the city, in an effort to better understand cities. Based on the maps, Lynch proposed key elements of the built environment that could be used by urban designers. In this way, the practice reached out to capture people's understanding of "the complexity of the modern city" (Lynch, 1960: 109) and provided generative tools for further design. In the participatory design tradition, the

creation and use of various visualizations, e.g. 2-D collages and mappings, 3-D mockups, storyboards, diaries, game boards, props, etc., as tools for collaborative design is widespread (e.g. Brandt et al., 2013) and inclusive of joint thinking and drawing both with other participants as well as with the materials themselves (Henderson, 1991; Latour, 2008; Schoffelen, 2015). The 'making' gives the participants pause to reflect, learn and teach one another as they move development towards making joint decisions (e.g. Botero Cabrera et al., 2008; Donovan and Baker, 2011; Baker, 2017) or while articulating issues of mutual care and concern (Lindström and Ståhl, 2014; Schoffelen et al., 2015). Because of the pragmatic orientation of many pictorials and visual models in design, it is also important to note how they often ignore, omit and delete details and relations that allow the designers to move on (Agid and Akama, 2018), despite running the risk of presenting things as 'fixed'.

Collaborative ethnography of ERIs in-formation

In this section we outline aspects of our collaborative research approach with a flexible study design that enabled our explorations with visualizing devices.

Our team and research practices

Our interdisciplinary team consisted of five researchers from different backgrounds, including environmental sciences, engineering, design, social sciences and STS. We, the four authors of this paper, had varied levels of experience in ethnographic and interventive research approaches as well as in studying ERIs. We created joint workspaces on university servers and used file sharing services to support our collaborative sessions, both face-to-face and virtual, which were instrumental for the ongoing sharing, analyses, and decision-making about constructing the field, delineating our object of inquiry, and strategizing about our research design.

With regard to data generation, our approach was inclusive; we were open to all methods that seemed applicable. While participant observation and interviews, in various forms, were an integral part of our fieldwork, we also generated data through other methods, such as perusing our own and the study participants' archives when they were shared with us, returning to old surveys, and organizing a workshop with our study participants including conducting surveys with workshop participants before and after the event. Desk ethnography played an important part in following ethnographic cues and leads, such as names, acronyms, places, diagrams, events or RIs mentioned in interviews and documents. Our multi-modal data came to be made up of field notes, audio and video recordings and their transcripts, websites (documents from past ones and links to contemporary ones), a vast variety of documents and artifacts, survey data/responses as well as photographs and video clips. Over time, we collected an increasing number of scribbles, diagrams and sketches drawn on paper as well as in digital formats created by us and by our study participants. We juggled and juxtaposed these visualizations as part of the processes of data generation, constructing the field, delineating the object of inquiry and as a way to understand ERI configurations. We produced an assortment of visualizations for and during our joint analyses and discussions, and also for a number of purposes beyond our team, including as interventions at events we organized.

We were acutely aware that many of our study participants were practitioners tangling with the challenging realization of the ERI(s) in-formation. Therefore, we tried to make available our own tentative insights along the way in the hope they would be useful for them, thus extending collaborative activities beyond our team. Furthermore, we were interested in the possibilities to engage with participants in critical, yet also caring and creative interactions that might intervene in the phenomena, and allow for inventing together (Marres et al., 2018), thereby aligning also with an ethical orientation of 'standing with', rather than solely 'giving back' (TallBear, 2014).

The unfolding process of studying ERIs in-formation

We initially set out to study the Finnish Long Term Socio-Ecological Research Network (FinLTSER), whose first decade had been characterized by

funding uncertainty, false starts and dead ends. We soon started to question our focus starting with our first visit to one of the FinLTSER sites as we learned that a subset of FinLTSER member sites had reorganized to become a 'research stations' component in a new consortium for upgrading and coordinating ERIs nationally, an effort called INAR RI Ecosystems (see Table 1 with some key actors and their acronyms for our study). The study participants pulled us into their lives including their interests and anticipations with new ERI developments.

Tracing the leads we were gathering, we sought to understand transitions taking place in the national ERI landscape. In addition to people from the FinLTSER Network and the new INAR RI Ecosystems Consortium, we interviewed several stakeholder groups involved in RI policy making. The ERI in-formation was embedded nationally both in the transitioning field of environmental research and in the RI policy landscape actively in development. While collaboratively mapping out this ERI in-formation, we became convinced that we should extend our ethnographic field again. Tight connections were apparent with the European LTER Network (Müller et al., 2010; Singh et al., 2013), where preparations for submitting a RI proposal, called eLTER RI, to the European ESFRI Roadmap were ongoing. This was of obvious interest to FinLTSER/INAR RI Ecosystems Consortium since getting accepted as part of the larger European ESFRI Roadmap would promote a place in Finland's national RI roadmap (FIRI) and thus funding, making the ERI more viable in Finland.

Crafting visualizing devices for ERIs in-formation

In this section we reflect on the visualizations we have crafted while generating and transforming our ethnographic data. We describe three kinds of visualizing devices: *timelines*, *collages,* and *sketches,* examples of which are presented below. We recount our initial intentions and the processes of crafting the visuals together with our reflections on the curiosity, wonder, readjustment and creative care experienced in relation to the ever-changing events, alignments, uncertainties, ambiguities, frictions and surprises provided to us by the ERIs in-formation that we studied and with which we engaged.

Devising timelines for looking backwards and considering intertwined processes

In the beginning we wanted to share the first author's knowledge of FinLTSER within our team because Helena had investigated and participated in the FinLTSER network between 2006 and 2014 through previous research efforts. As a way of starting work in our current research project, Joanna interviewed Helena over a period of two days. During planning for the interview, the idea of using a timeline surfaced. While timelines are widely used for scheduling, budgeting and project management in organizations (Yakura, 2002), we were inspired by Bowker's musings on the need for mapping the temporalities of an infrastructure and that some kind of visualization tool would help show the shape and nature of an infra-

Table 1. List of abbreviations and definitions of institutional entities that are a mix of consortia, networks, research infrastructures and policy programs.

Acronym	Unabbreviated definition
eLTER RI	Integrated European Long-Term Ecosystem, Critical Zone & Socio-Ecological Research Infrastructure, a RI proposed by LTER-Europe Network and accepted on ESFRI Roadmap in 2018
ESFRI	European Strategy Forum on Research Infrastructures, the strategic initiative formed in 2002 to make policy and fund RIs for European Research Area
FinLTSER	Finnish Long-Term Socio-Ecological Research Network, established in 2006
FIRI	Finnish Research Infrastructure, the national RI policy and roadmap of Finland, FIRI Committee established in 2012
INAR RI Ecosystems	INAR RI Ecosystems Research Infrastructure Consortium, a project funded for 2017-2021 to develop ecosystem RI capacity in Finland
LTER-Europe	Long-Term Ecosystem Research Network in Europe, launched in 2003

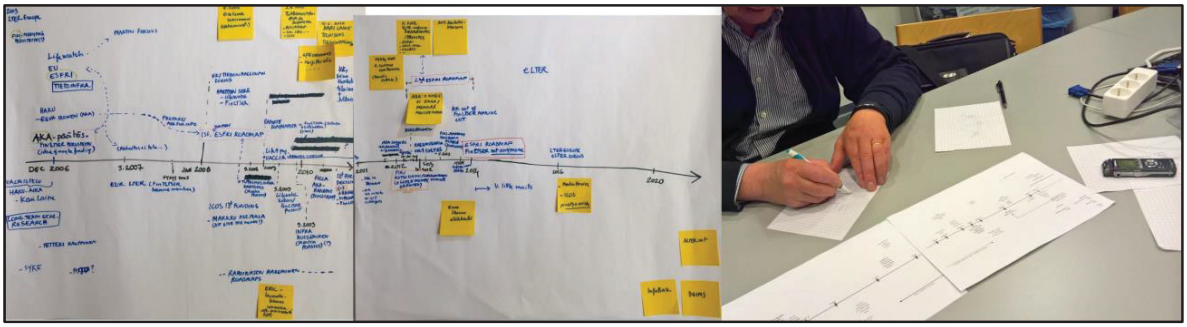

Figure 1. The first version of a timeline hand-drawn during Helena's interview (left) and a cleaned up, digitized version used with another interviewee (right).

structure at different moments (Bowker, 2015). We also drew from our previous work on collaborative mapping to visualize complex settings (Botero Cabrera et al., 2008; Baker, 2017; Bødker et al., 2017).

During the interview, Helena reflected back on the formation of the FinLTSER, prompted by questions and the timeline that Joanna was drawing on a big sheet of paper (Figure 1, left) as well as by digging into her own computer archives of emails and documents. Helena later said that she felt constrained at times by having to think chronologically during these sessions, while Joanna, in turn, was eagerly trying to pin down information on the timeline. Joanna found herself overwhelmed by the amount of information as well as the multitude of acronyms being used. However, working together on the timeline provided a shared point of reference which we updated continuously with input from our subsequent study participants. Grappling together with the dates, key actors, organizations, events and milestones was one way to construct an initial, shared understanding of the "rocky road of FinLTSER", as Helena called it. Discussing the retrospective interview and the resultant timeline with the other members of our team allowed for a 'fast backwards' look. This prompted initial discussion and reflection on what FinLTSER was and how we understood ERIs and their formation.

We used a streamlined version of the timeline in ensuing interviews with key FinLTSER participants as a tool to think together and to help the interviewees recall past events (Figure 1, right). In some cases, it was clear that the timelines were useful for the study participants. Some suggested amendments, bringing in their own history and understanding of certain aspects or facets of what we were trying to map. Others asked us if they could keep a copy of the printed timeline, because they thought it might be useful for their own work. The timelines became concrete devices to invite our study participants to join in our quest. In other cases, some interviewees simply glanced at them and we were left wondering whether it was worth the effort to edit and print the timelines.

We crafted the timelines when preparing for and carrying out interviews, and then during debriefing afterwards. While editing the timelines, Joanna also resorted to desk research, sometimes creating links to online documents for the digital versions of the timeline. She saved each version with its own name, so that each timeline was preserved and could be checked at any time. For her, the timelines offered a sense of grounding in the project and helped her get past the uncertainty associated with trying to navigate unknown territories. The timelines became a kind of map to keep in one's pocket for easy reference when facing new information or analyzing existing data such as the interview transcripts. Later, when Andrea joined the project, she also used the timelines to help catch up with the rest of the team and get an overall understanding of the phenomenon being studied and of the data available.

The initial FinLTSER timeline was focused in its visualization on the unfolding of only one research network, with scattered indications of key moments and events that were related in some way or another to FinLTSER. Prompted by interviewees, we added other events to the FinLTSER trajectory, mostly denoting national and international RI policy and funding activities. We included

additional LTER related developments such as major transformations occurring in approaches to environmental research in Finland and Europe. When we later brought the timeline to interviews with INAR RI Ecosystems Consortium participants, we added other national and European ERI formations as study participants shared their experiential knowledge of them, thereby helping us understand how relations with these entities were unfolding.

As the visualization kept expanding, along with our perspectives, we started seeing more clearly how the 'rocky road' trajectory of the FinLTSER was embedded within a multitude of related processes taking place simultaneously. Our work on subsequent renderings of the timelines allowed us to better understand and bring forward, in a visual form, the intricate webs of relations and interdependencies reaching across national and European arenas, exemplified by the RI roadmap processes with which the ERIs need to align.

Almost three years after making the first timeline, we decided to produce reworked versions of the timeline(s), to use for wider dissemination. We wanted to more clearly separate into different layers the various chronological events identified by our participants. Figure 2 shows how we added dynamic elements (arrows), in an attempt to move beyond the rigidity of the chronological delineation and make visible relations between events. We also removed some events and simplified dates and side interactions depicted in other versions of the timelines. The aim was to communicate how the European and national road map processes impacted the 'rhythm' of various developments. The interrelations between European processes relating to policy and funding seemed to multiply and were in turn influenced by and interacted with increasingly dense national developments.

The many parallels depicted in the timelines, reminded us of the steep learning curves associated with collaborative research efforts, RI development, and RI policy making that the many actors were experiencing while facing pressures from various directions. It suddenly didn't appear so surprising anymore that FinLTSER had early on experienced difficulties getting funded. While working on the timeline compilation, with the benefit of our retrospective point of view, Helena wondered whether having had earlier such an overview of all the intertwined processes, would have alleviated FinLTSER participants' frustrations while they were trying to establish continuity for FinLTSER.

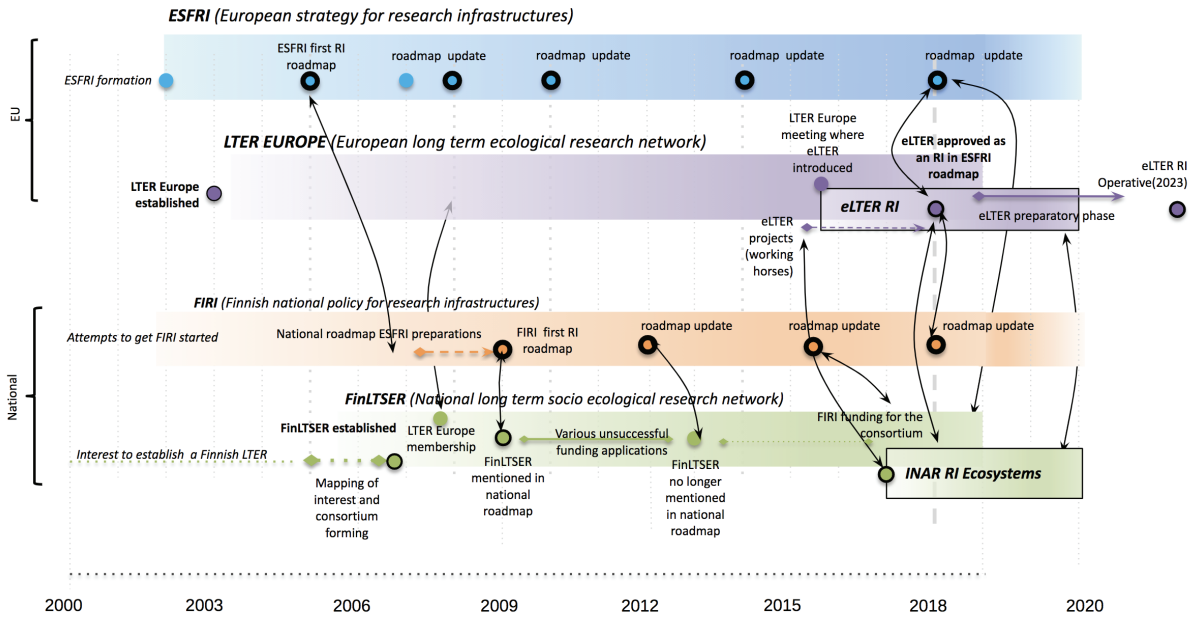

Figure 2. One of the reworked versions of a timeline, showing some milestones and interrelations of ERIs in-formation such as the dots that highlight roadmap activities. Redrawn from hand drawn and annotated timelines constructed within the team and with our study participants.

These visualizations made it possible (perhaps too easily) to depict the European ESFRI as a layer 'overseeing' all the developments (at the top of Figure 2) and the European LTER-Europe (shown immediately below the ESFRI layer) morphing gradually into an emerging eLTER RI. The timelines pinned these developments down, but they certainly lacked granularity in other important dimensions that are not bound to events, e.g. becoming an international entity; making a community; inquiring about key moments rather than missed opportunities.

The timelines have been our constant companions in our own quest - offering different kinds of support to each of us - and have also provided a much-needed concrete artifact to think with as a team as well as together with our study participants. The timelines as we have drawn them, however, also caused frustration because the chronological dimension dominated, making it difficult to incorporate related threads and other dimensions. Furthermore, as with Helena's initial reaction to the first timeline, such devices often force us to pin things down, thereby hindering us from attempting more flexible and fluid visualizations.

Collaging to relate and juxtapose for pursuing and speculating (dis)connects

During our fieldwork, we learned that ESFRI became essentially the only policy and funding opportunity available for creating pan-European domain-specific RIs (Papon, 2004; Gübitz et al., 2012). Consequently, the ESFRI Roadmap - one of the key mechanisms of the hierarchical regulatory approach of ESFRI policy - became an obligatory passage point to which several of our study participants devoted much attention. To understand this relationship, we found it useful to work with some visualizations.

We started looking closely at visualizations created by some of our participants. We came across many graphical representations that focused on the local context. For example, the more established 'installed base' of FinLTSER made up of the research stations, often would have a photo of their biome type as well as a description of their physical facilities and instrumentation. FinLTSER Network, in turn, had a map and descriptions of the member sites, while INAR RI Ecosystems Consortium did not have any diagrams as their organization was so recent. In addition, visualizations were often created with manage-

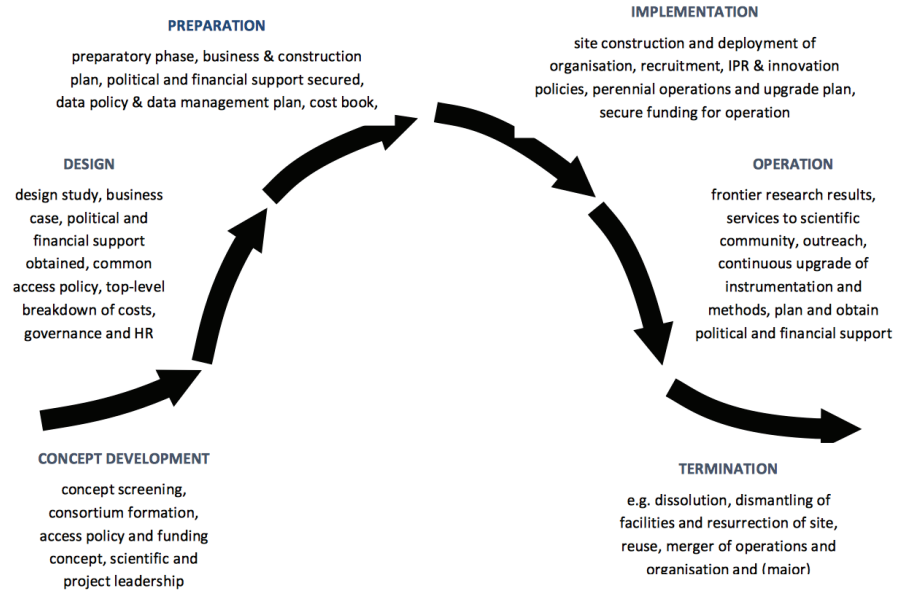

Figure 3. ESFRI's rendering of the lifecycle model to follow for the development of all RIs in Europe. The diagram is taken from the ESFRI manual for applicants to the 2018 roadmap (ESFRI, 2016:11) and does not label the x or y axes. We assumed the x-axis represents time, and the y-axis resources, as that is the general depiction used in project life cycle management models (see e.g. Carayannis et al., 2005).

rial interest and/or by those participating in the RI policy-related activities, such as proposal preparations. These figures, tables and illustrations - quite understandably - were steered by and oriented towards the ESFRI policy. From the point of view of ERI(s) in-formation, they depicted a variety of aspects relating to "how to become a RI". In order to be recognized as an ESFRI RI and obtain funding for construction, ERIs in-formation need to be first approved for the ESFRI Roadmap. ESFRI follows a 'lifecycle model' for the development of all RIs accepted to its Roadmap (ESFRI, 2016). The ESFRI documents depicted this lifecycle with an abstract and orderly diagram (see Figure 3) in the form of a six-stage arc depicting the stages of a RI from 'concept development' to 'termination' (ESFRI, 2016: 11). Such an orderly depiction of an RI process, however, did not capture the dynamics we were seeing in the field with ERIs in-formation.

During our analytic and speculative discussions, we took some RI development diagrams we had collected and, based on them, created a variety of collages to explore relations associated with ERIs. Doing this brought ESFRI policy models as well as the large-scale ERIs and their extended formation processes together. We found ourselves annotating them, highlighting what was missing, asking questions prompted by them, and trying to identify the hidden assumptions that undergirded them. We made annotations and juxtapositions in a free association mode (as an artist will do). We were often frustrated by the impossibility of accommodating all the details and possible comparisons in the collages. Decisions had to be made about what to include and what to exclude.

Through making sketches and building collages, we started articulating a variety of tensions between the top-down, standardizing, and unifying aspects of the ESFRI Roadmap and the heterogeneous technoscientific practices of environmental field research. Would the ERI(s) in-formation aim to be inclusive of ecology's tradition of small science, including heterogeneities in study objects, instruments, methods, categories, typologies, etc. (Borgman, 2015; Bowker, 2000), that result in extremely heterogeneous ecological data (Karasti and Baker, 2004, 2008)? How would the different national ERI formation

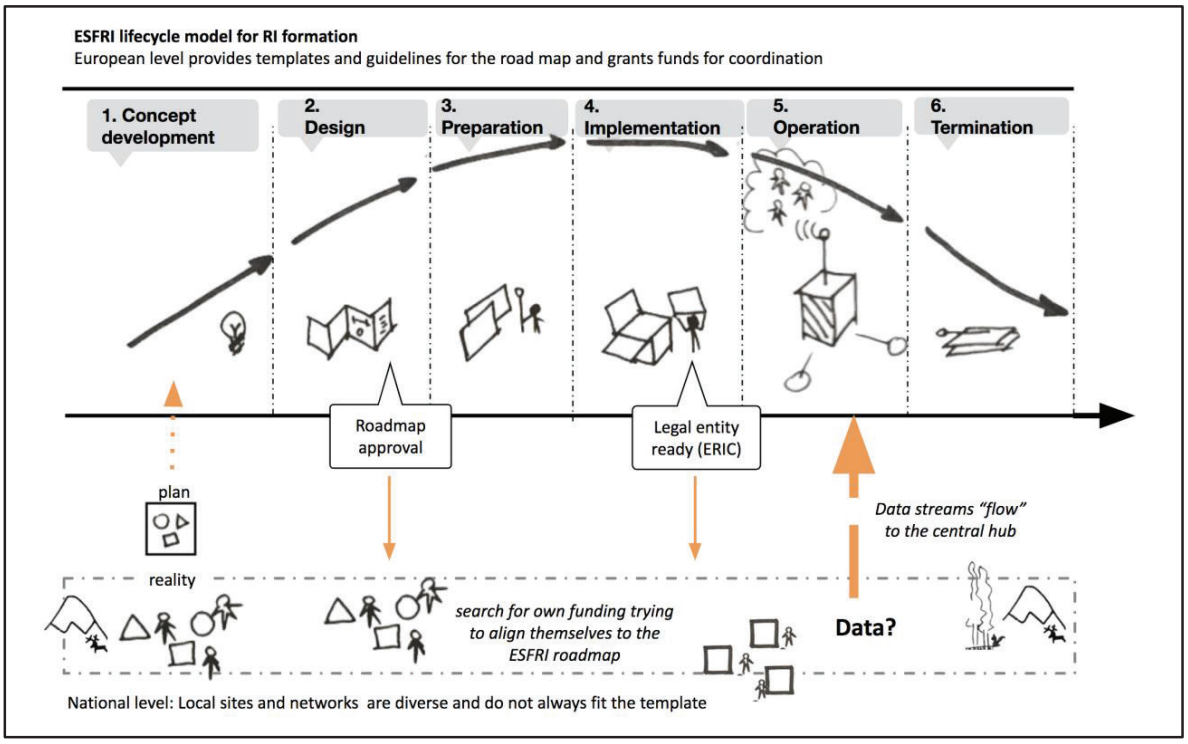

Figure 4. This collage depicts in the upper panel a version of the lifecycle model created by us for constructing RIs according to ESFRI. The lower panel, in parallel, depicts the national and/or local activities of member networks of the European LTER Network. These local/national actors are supposed to obtain national RI funding in order to provide 'good quality data' to the planned eLTER RI during its phase of operation.

processes be aligned with ESFRI's 'one size fits all' development model?

To help us think about the eLTER RI formation process, we reused the ESFRI lifecycle model for constructing RIs (Figure 3) and augmented it (Figure 4, top panel) with drawing annotations and 'little people' doing things and with our own evolving view of a layer depicting the RI formation processes of the national member networks (Figure 4, bottom panel). In the ESFRI process, the local and national RIs become recognized when the need for data to flow into the central hub of the RI becomes imminent at the operational stage of the life cycle. This is a level-spanning activity, depicted in the Figure 4 collage by a thick upward arrow linking the bottom and top panels. The flow of data between layers indicates an assumption (made by the ESFRI model), an expectation that data management procedures are in place at national and local levels such that they are able to produce good quality data for the pan-European RI. However, despite the crucial role local ecological/environmental data gathering and data management play in ERIs, activities in the lower part of the figure that we added to the collage have been overlooked and/or underappreciated in the original 'top-heavy' ESFRI model. Existing local and national data management and infrastructure efforts often, as exemplified by Finland (Karasti, 2009), are very heterogeneous and distributed and, as yet, frequently lacking in coordination both with local LTER sites and across them. They are 'bottom-heavy' enterprises.

In bringing the two panels together in Figure 4, we wanted to create a provocative juxtapositioning. By making visible the gap between the European and national spheres and by allocating the few connections expected to 'happen' in certain phases, we were thinking out loud: How could they connect? How to create in-between processes? We have used different versions of this figure in various interventions, including workshops at conferences (Baker et al., 2018; Botero et al., 2019), a field guide to ERI formation (Botero et al., in preparation) and other dissemination outputs (Parmiggiani et al., 2019; Botero et al., 2019). We also used this collage in kicking off a workshop we organized for the INAR RI Ecosystems Consortium that is described in the following section.

Sketching the conceptual, the existing, and the imagined

The data management workshop we organized with and for the INAR RI Ecosystems Consortium brought together research station staff and associated researchers. For the Consortium, the workshop was a contribution to their capacity building activities related to data management. For us, it was an opportunity to interact further with Consortium members, provide them insights into our ongoing research as well as continue our inquiry (Karasti et al., 2018a).

We planned the workshop with the idea of building bridges to the larger ERI landscape that confronted INAR RI Ecosystems Consortium members. As many of the participants were unfamiliar with both ESFRI and eLTER RI, our aim was to heighten their awareness of the increasing influence of ESFRI policy in steering the formation of both the eLTER RI and national RIs. We decided to start by contextualizing some of the data issues of European RIs by presenting Figure 4. We hoped it would seed discussion on how the policy might manifest in their future data management practices. In response to the figure, there was some consternation regarding the expectations for local and national data management as well as about the need to connect up with the ongoing formation of eLTER RI. Some participants even joked about the 'gap' between the European and national spheres being "as wide as the Grand Canyon". Conversely for some of the participants familiar with ESFRI and eLTER RI who were already fluent with navigating across the extended geographical, organizational and institutional aspects of LTER-Europe, this gap was not easy to recognize.

We wanted to move - collaboratively - beyond the dichotomic 'top-down' and 'bottom-up' stances often depicted. Consequently, we repurposed Karen's earlier definition and conceptual sketch (Baker, 2017; Millerand and Baker, 2020) of a 'data landscape'. This offered us a way to introduce some basic ideas about data management in the ecological and environmental sciences as well as about how data management could create needed bridges. Figure 5 was to present the data landscape notion by depicting three flexible categories as a continuum: a circle on the left

standing for 'field' where data is collected, a cloud in the middle depicting the 'local' where data are collectively managed and stored, and a square on the right called 'remote' where aggregated data are archived. The sketch was meant to encourage participants to think and discuss about their own data management work (or lack thereof) using this simple, shared conceptual schema. And, indeed, the participants at the workshop talked about data landscape components and their relations, disconnects and arrangements involved in creating RIs, often realizing that there was more involved than they had anticipated in doing 'data management'.

Towards the end of the workshop, we invited participants to sketch with felt pens on large paper sheets their own data activities and arrangements using some of the concepts in the sketch (Figure 5) as a starting point. Our intention was to encourage generation of a collection of participants' heterogeneous data practices and to probe the diversity that existed. For the second part of the sketching exercise, we asked participants to extend their drawing to include other systems, interactions and the connections they imagined could be part of their near future, considering also options they had learned about from the workshop presentations.

The data landscape sketch in Figure 6 was drawn by a research station participant. It shows not only her local data management arrangements but also the connections within the landscape. On the left, the drawing details 'random data' as distinct from long-term instrument stations' data. It lays out how data collected in the field is sent to a local data repository. The repository is labeled as a university database project where an approaching meteor signals the uncertainty of its short-term funding. The right side depicts how data from this database had already been provided to DEIMS (the Dynamic Ecological Information Management System supporting LTER-Europe's site information repository). In addition, the sketch reveals some ways in which its creator was imagining being in a position to send data to a number of other remote, large-scale data facilities in the future.

We asked participants to share their sketches for collective review. During the exchange, we heard data-centric accounts of a wide range of practices, specimens, products, technical systems and fragmented arrangements at the different sites. Participants began to realize there were many potential ways that things could be 'connected up'. The absence of a single 'right' or 'permanent' solution was often an unexpected realization. This spurred a number of participants (like the author of Figure 6) to begin thinking innovatively and strategically about the connections they might choose to make in creating their place in the data

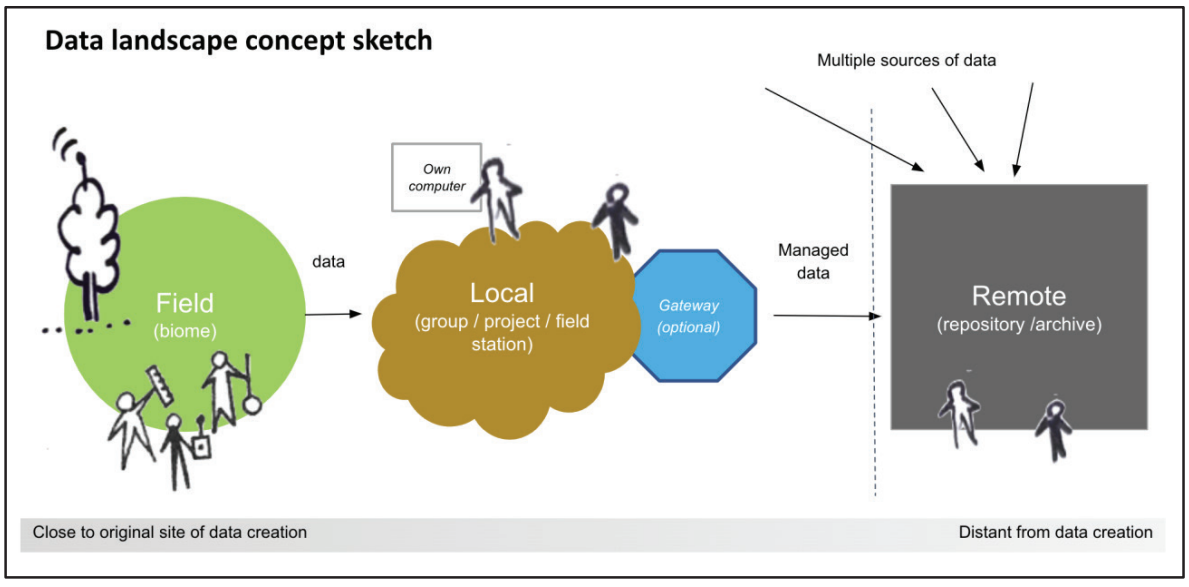

Figure 5. A conceptual sketch with three categories - field, local, remote - introduces the notion of data landscape. This is a slightly simplified version of the one shown and explained during the workshop.

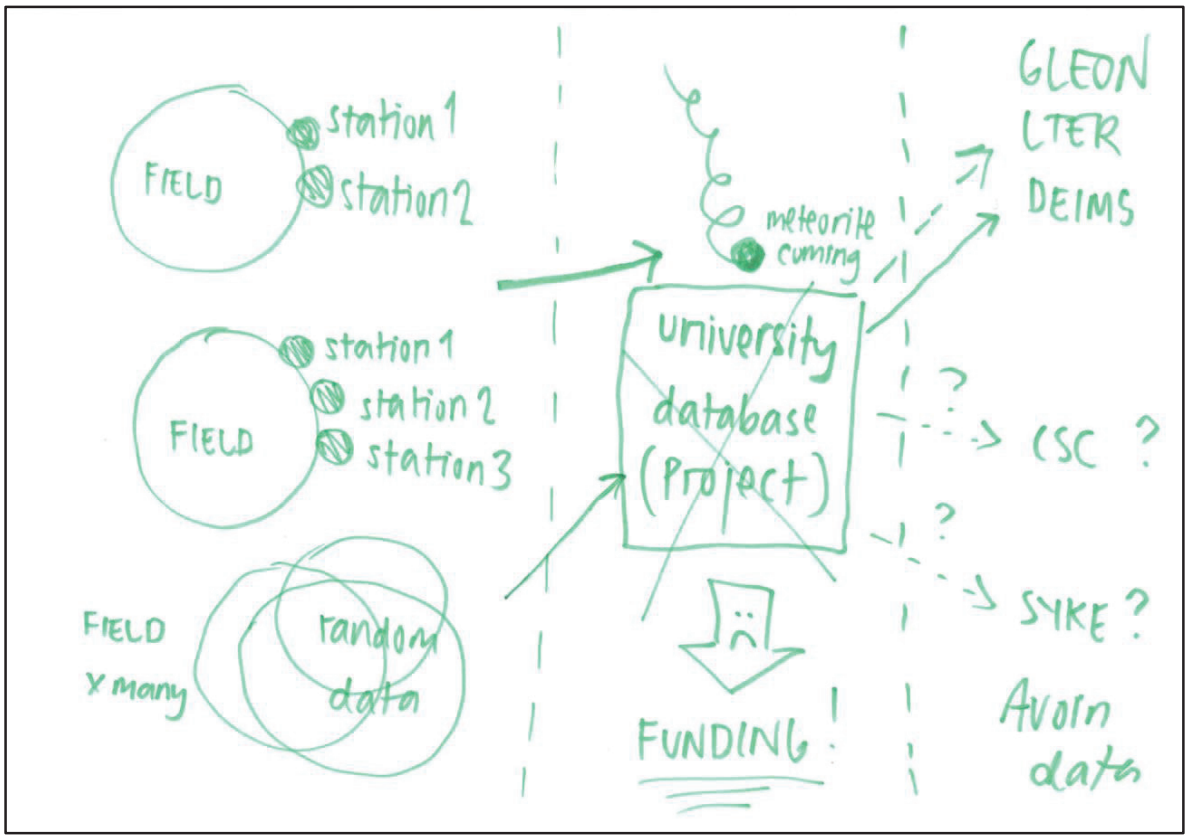

Figure 6. A sketch drawn by one of the research station participants in response to our invitation to present their station's current (solid arrows) and imagined (dashed arrows) data arrangements. Note, the word 'station' in the sketch refers to the research station's several instrument installations in the field. The sketch uses some of the conventions of the field-local-remote continuum we introduced (see Figure 5).

landscape. The exercise allowed some participants to create a variety of 'connected' data landscapes by imagining how to bridge the gap in Figure 4 and for others it made more visible existing disconnects. Overall, it seemed that data concerns had been growing in participants' minds though rarely articulated, and rarely in the presence of others having similar concerns.

We found it a major challenge to create conditions for 'mutual learning' (Simonsen and Robertson, 2013) about data management in ERIs. The concepts were so foreign to many of the workshop participants that we worked at 'taming' them by streamlining and presenting them as simplified definitions relating both to the participants' particular situations as well as the distant world of ERIs. Our designing of materials required many iterations, first to develop and clarify our own ideas and then to consider how to develop a simple and flexible, yet also conceptually sound, guide for participant sketches. We aimed to foster an attitude toward the changing data landscape as not only obscure, abstract, and remote ("on the other side of the gaping gap") but also as inclusive of everyday, familiar, and ongoing. We wanted to avoid staying with the dichotomic interpretation of the two sides separated by a gap (Figure 4), i.e. the upper panel denoting the standardization-bound RI policy poised to iron out the heterogeneities in the lower panel depicting LTER sites and national networks. Instead, we framed the question of connecting up by thinking about embracing the two sides of the gap into a data landscape (as shown in Figure 5). With this approach participants were able to position themselves wherever they saw fit, to be at liberty to sketch their own data landscapes (e.g. Figure 6). These sketches constituted a varied collection of local and sometimes expanded data management arrangements that fostered collaborative learning, reflection, and ideation in and around the complex ERIs in-formation.

Reflections on the visualizing devices

Our three devices - timelines, collages, and sketches - became links to different but related aspects of the RIs. We drew the timelines, by ourselves and with our study participants, in attempts at making sense of a chronology of events and situations. The timelines (Figures 1 and 2) accumulated and juxtaposed mainly administrative, management, and policy information that was generated starting with our initial interviews about previous or ongoing efforts. As we initiated discussions with study participants, work on the timelines facilitated communications. It served as more than a historical chronology, where missing entries would prompt memories of related happenings and illustrate their interconnectedness. Timelines brought together accounts as participants built upon existing versions. As these devices were developed, they accompanied us to subsequent conversations, thereby providing exposure to previously unrecognized aspects of ERIs in-formation in addition to reiterating certain themes at the expense of others.

With collaging, we took study participants' diagrams, which in ethnography are typically used for the purposes of analysis, and continued annotating them and reworking them into diagrams of our own. This helped us question assumptions, inquire about unrepresented elements while inviting imagination, and to bring forward our own insight as researchers. Our collages (Figure 4) started as a simplified timeline of the proposed multi-year development and use trajectories of the ongoing ERI efforts. As we discussed the participants' diagrams, our own sketches allowed us to assemble elements and to create a 'multi-view' visualization. Having made research station visits and attended LTER network meetings, we juxtaposed these different views to make visible and emphasize the role of these infrastructuring efforts vis-a-vis a process defined from the top-down. Indeed, we carefully included tiny people, documents, and instruments in our visuals as reminders of the liveliness and the intricateness being visualized.

Finally, sketches, created for and during the data workshop, highlighted data management embedded within the larger data landscape of ERIs in-formation. We designed a three-panel template (Figure 5) to guide participants in thinking about the data they gathered and that which passed through their hands. Our workshop aimed to raise participant awareness about the many choices that arise in the handling and creating of paths for the movement or flow of data (Leonelli, 2020). We emphasized that considering how the data was moved from the field to its destinations would present them with a variety of opportunities. Indeed, visualizing devices allowed us to prompt participants grappling with notions of data management and research infrastructure to consider depicting in their own sketches (Figure 6) both existing as well as potential ways of configuring their ERIs in-formation.

Visualizations were brought into our research collaboration by members of our team with a more design-oriented background. We found working with these devises was useful in dealing with the unruly phenomena we were investigating. We recognize that we might not have turned to visuals in the same way, had we been working together in the same office, or had each one of us been doing fieldwork alone. Deprived of many visual clues, body language, and a common physical site when working at-a-distance, it was helpful to have a shared object for pointing, annotating and drawing. As our collaborative analyses were more relations-oriented and associative than close readings of transcribed data, shared objects helped in keeping focus but also in thinking broadly in meaningful ways. Visualizing devices were useful both for our exploration of the phenomena and befitting our circumstances.

Discussion

In our study of the making of RIs that aim to support scientific knowledge production in ecological and environmental research, visualizing devices proved invaluable in capturing for display and discussion the multiple aspects of data, projects, networks and policy landscapes. The composing of visualizing devices was directly related to the generation, analyzing and transformation of our ethnographic data. It was through working with the visualizations that we were able to articulate our findings and mull over the complexities and emergence involved in our object of

inquiry. In the following, we first weigh in on how we, as researchers, have met and made sense of the complex phenomena in-the-making that we were researching. We then move to a discussion of how our enactment of the different visualizations constructed and structured our ethnographic data while facilitating collaboration in inquiry and in(ter)vention.

Making sense of complex phenomena in-the-making via 'configuring'

In working with and reflecting on the visualizing devices, it has been helpful to distinguish between the ERIs in-formation as something we engaged with in the field, the ethnographic field as constructed, and the object of inquiry as delineated. The difference between them is to some extent analytic; for the researcher they are all ongoing and intertwined during an investigation. The work of crafting visualizing devices moves between these empirical-analytic ways while paying attention to what is being investigated, hence the devices are positioned in relation to the phenomena, the constructed ethnographic field, and the delineated object of inquiry.

Informed by Suchman's configuration as an aid for delineating the composition of an object of inquiry (Suchman, 2012), visualizing devices are crafted to bring together, relate and bound 'things' (elements of the studied phenomena) into assemblages, which is particularly helpful when things did not always add up in ERIs in-formation (Mol and Law, 2002). The researcher, in the process of pursuing the phenomenon, follows relations and connections, identifies disconnects while continuously making decisions about what to include and what to leave out. Bounding the field and the object of inquiry in relation to the phenomenon is the active reflexive accomplishment of the researcher. At the same time, the visualizing devices allow us to explore (with) different framings of the object of inquiry as suggested by Winthereik et al. (2002), where each of the pictorials produced with visualizing devices is a rendering of an experimentation with a different, partial way of constituting the object of inquiry. In fact, some of the potential of visualizing devices resides in the researchers' skill and vision to bring together and establish relations with(in) data, materials and visualizations in varied ways for different purposes. The process introduces a specific accountability to the phenomenon. This is not a straightforward task, accomplished in a single movement but rather an ongoing activity closely related to constructing the field and delineating the object of inquiry. In this way, visualizing devices stay tuned to the 'happening' of the sociomaterial world, "its ongoingness, relationality, contingency..." (Lury and Wakeford, 2012: 2).

Each of our visualizing devices opened a particular 'cut' into our object of inquiry, as they attend to the impossibility of mapping ERIs in-formation once and for all on a single set of coordinates (Mol and Law, 2002). Taken together, as a collection, they nonetheless offer a partial take on the object, glimpses of the many complex configurations that all those involved (us included) were attempting to grasp and convey. Even if there were many more of these devices, they would still not necessarily create a comprehensive, let alone complete picture of the complex phenomena. A strategy of multiplication of visualizing devices could never 'add up' to a whole, nor would they necessarily create an exhaustive or unified picture of the object of inquiry. As Strathern explains, the problem is that the more attempts are made to fill in empirical or analytical 'gaps', the more other gaps become visible, as "the perception and filling of a gap lead to awareness of the 'gaps'" (Strathern, 1989: 63).

As we followed Suchman's configuration (2012) by attending to the materialities of ERIs in-formation and exploring their existing imaginaries as well as creating possibilities for alternative inventiveness, we became increasingly aware of how continuity and change were constantly intertwining within the processes of 'becoming a RI'. The ERIs were (based on) already existing research networks, thus they were both transforming their installed bases and simultaneously becoming something entirely new. Our study participants were actively balancing the intricate (non)-existence of FinLTSER, due to its unfunded yet formally recognized status and its partial merging into INAR RI Ecosystems Consortium at the time of our study. An equally convoluted reconciliation was taking place with the ongoing morphing occurring alongside co-existence with the long-

lived LTER-Europe and the planned eLTER RI. The ERIs in-formation required, from all of us and our devices, some degree of flexibility, attentiveness and responsiveness to the phenomena in-the-making as well as an appreciation of their evolving and emerging nature.

With regard to Suchman's notion of configuration, our suggestion relates in particular to heightened attention to the pervasiveness of (re)-configuring and thus consideration of temporality. Although the temporal dimension is definitely manifold and something that should be explored further, at this point for us it relates largely to 'unfolding', 'emerging' and 'becoming'. These temporalities were apparent in our visualizing devices: timelines both reaching to the past where installed bases have started to accrue, recognizing 'the historical anteriority' (Suchman, 2012) as well as expanding to multiple different temporalities of parallel unfolding processes; collages showing the actual emerging processes in relation to the planned RI formation lifecycles; and sketches of data landscapes providing a temporal movement forward from the existing via dashed lines that identify potential future connections marking likely spaces for change. Together the examples draw attention to the continuity of change, to the multi-dimensional emergence, and to "the perpetuity of coming to be" (Daston, 2000: 1). Exploring these visualizations as 'visualizing devices', we focus on and lift up the use of 'configuring' to capture the processual, to highlight the continuing emergence of phenomena in-the-making, similar to the movement from 'infrastructure' to emphasize 'infrastructuring' as an active process (Star and Bowker, 2002; Karasti and Syrjänen, 2004; Karasti and Baker, 2004; Karasti, 2014; Karasti et al., 2018b). The ontology of 'emergence' or 'becoming', we suggest, is crucial for alternative ways of engagement with the formation of technologies and infrastructures.

With visualizing devices, we were able to bring attention to the emergence of ERIs in-formation, as iterations of snapshots. As snapshots, our visualizing devices were not meant to be final or 'ready', not when they were first created, nor throughout their iterations. In reviewing our use of visualizing devices, we see how they have a sketchy aspect, akin to the ways low fidelity prototypes are discussed by design professionals (Rudd et al., 1996; Erickson, 1995), where the unfinished nature of these prototypes allows for discussion and further modification (Schoffelen et al., 2015). Since visualizing devices typically evolve with each iteration as nuance is added to the understanding of the phenomenon, they routinely result in a series of visualizations. By following the continuous construction of the field and enabling emergence of new collaborations (Estalella and Criado, 2018), these series become traces that record the research and thought processes of those engaged in thinking together and who are collaboratively exploring complex phenomena in-the-making. They are only useful insofar as they are read as snapshots that 'freeze' particular configurings (Agid and Akama, 2018).

Enacting visualizing devices in collaborative research

Suchman reminded us that configuration is "both a method through which things are made, and a resource for their analysis and unmaking or remaking" (Suchman, 2012: 49). For us that means that crafting a visualizing device, reflexively, can be an analytic accomplishment 'capturing what is' but it can also be experimental, exploratory and even generative. It appears as an invitation 'inspiring what might be'. Visualizing devices provide a means to bring into relation chosen aspects of the studied phenomenon, e.g. connection, juxtaposition, alignment, comparison, resonance, tension, and disconnect. Thus, the devices may bring together – even momentarily as the phenomenon is evolving – a variety of views of the configurings(s). Because devices can also be created with a variety of inquiring and in(ter)ventive intentions, they provide opportunities for thinking and making together, thus adding strong participative possibilities (Estalella and Criado, 2018). Enactments with visualizations are acts of configuring.

For example, the different 'cuts' present in the devices could be composed in ways that research interest(s) of those involved are incorporated in varied ways, or framed (visually) to productively render surprise(s) to the researcher (Winthereik et al., 2002), or arranged to reveal a troubling circumstance. Their collective enactment can

also remind or nudge study participants to consider collectively issues of concern, or care (Lindström and Ståhl, 2014). Moreover, by allowing visualizing devices to be collaboratively shaped and reshaped, it is possible to trigger exchange between researchers and participants, and between participants themselves. On such occasions, they can also "*invite, persuade* or (to put it more strongly) *provoke* actors and situations to generate accounts, and to produce expressions and articulations of social reality" (Marres et al., 2018: 28, italics original).

The three visualizing devices presented above illustrate these possibilities. The temporal or chronological composition of the timelines allows for analysis and exploration of the past trajectory of the rocky road of FinLTSER on the RI roadmaps. The juxtaposing composition in the collage contrasts the generic, highly structured, and planned European ESFRI lifecycle vis-a-vis the unfolding and unexplored national RI formation processes, thereby creating an in-between space to make a critical point about power imbalances (Star, 1999; Baker and Karasti, 2018). However, the gap also marks a space potentially fruitful for anticipation, imagination and invention. The sketches in turn illustrate how alignment with a conceptual schema can seed both articulation and generative thinking starting from everyday data arrangements at research stations and creating spaces for imagination of environmental data management in the era of RIs. The visualizations bring together heterogeneous details - from heterogeneous sources - to explore, or play with different takes on the complexities of the ERIs in-formation. With our own simplifying visualizations of ERIs in-formation, all of us involved could reflect about what happens to complexities in general when simplifications are made (Mol and Law, 2002). Enactments with visualizing devices contribute to understandings of and opportunities for configuring complex phenomena in-the-making.

Visualizing devices benefit from visual language conventions, notations and principles used in art and design traditions, but they have less ambitious visual goals. Just as sketches and drawings can provide analytical traction and interpretative flexibility to creative practitioners (Retelny and Hinds, 2016; Henderson, 1991), visualizing devices provide both researchers and participants with material elements to think with and make decisions about their object of inquiry as they compose the devices and understand possible new configurations (Lindström and Ståhl, 2014; Schoffelen et al., 2015). In doing so, they help in understanding 'insides' and 'outsides' of socio-technical systems (Law, 2004). Researchers thus have an active and reflexive role in identifying options. They make decisions about inclusion and exclusion, about how to draw the relations while bounding the arrangements by creating visualizing devices, and about how to craft invitations for imagination and invention into them. The active role of researchers in creating and eliciting visualizing devices sets these devices apart from other materials and other devices that are collected from the study participants themselves for analysis and scrutiny by the ethnographer. In our case they are the outcome of the relational invention (Estalella and Criado, 2018) we constructed collaboratively.

Conclusion

In this paper we have described and analyzed our practices with visualizing devices that became our constant companions in our engagement with the studied phenomenon, across a range of our purposes, for inquiring, intervening and inventing. We have started a methodographical account of how we have generated and transformed data in our research collaboration by using visualizing devices that capture some of the elements and dynamics associated with complex phenomena in-the-making: the temporal unfolding and relating of multiple processes (timelines), the bringing into relation multiple viewpoints (collages), and the communication across multiple positions and diverse participants (sketches). These visualizing devices were key to working collaboratively both within our interdisciplinary team as well as in interacting, making sense, and imagining together with participants.

The visualizing devices afforded the creation of a series of 'cuts' of the phenomenon - in a manner similar to how the more standardized conventions of plans, sections, and elevations would for

a building or a terrain. However, for configuring complex phenomena in-the-making, the 'cuts' need to be reflexively created to account for the phenomena investigated, the ethnographic field constructed, and the object of inquiry informed by research interests. In answering Suchman's invitation to think of how to bound a phenomenon and Law's call to consider inclusion and exclusion, we reflect on how we are engaging in, but also critically questioning, simplification by creating presences and absences, and even Otherness. We learned it is important to approach our devices not as fixed but rather to insist on their openness for further revising and re-shaping (see also Callon, 2002). Visualizing devices can help researchers and participants 1) to orient with openness and curiosity towards the studied phenomena, 2) to continuously (re)organize observations in relation to the studied phenomena, and 3) to gain more understanding of how researchers and/or participants are configuring complex phenomena in-the-making. Therefore, it is important to keep in mind that visualizing devices are methods in-the-making as are the phenomena their crafters investigate.

Ruppert et al. (2013: 36) have recently pointed out that "[T]he re-emergence of visualization as key to social analysis is striking". They identify the contemporary need for social science methods to handle quantities of data from digital devices and highlight the power of digital visualization to reduce "'excessive' information" to a more meaningful form. Our own work shows how other types of (non-digital) data and intentions also benefit from translation via visualization. Unlike the examples from Ruppert et al., we used hand drawn pictorials for making visible and making sense of the messy details as well as the potential configurations of infrastructure. When crafting pictorials, various iterations were needed to attain visual artifacts that made some of the "patterns, circulation, flows, and boundary maintenance and leakage" (Ruppert et al., 2013: 36) more graspable, but also are illustrative of the agency of those creating the visualizations. These iterations required continuous analysis and discussion together with study participants, in order to negotiate similarities, differences, and incommensurabilities. Although with roots in design, we see this work akin to the recent discussions in social science around inventive methods (Lury and Wakeford, 2012), the need to engage with the invention of the social (Marres et al., 2018), and to be well aligned with collaborative understandings of ethnography as an inventive practice (Estalella and Criado, 2018).

And last, we already know that methods are performative (Law, 2004) as are research designs (Hyysalo et al., 2019). ERIs in-formation, like any other phenomena researchers address with sensitivity to both complexity and continuous becoming, call for research designs that are geared towards concern for heterogeneities and responsiveness to ongoing change. Consequently, there is a need for method devices that are both agile and flexible enough to be able to deal with configuring, multiplicities, open-endedness, unpredictabilities, and emergence as well as with relations across multiple boundaries. Such devices include capabilities to trace and keep in focus a large assembly of sites, disciplines, institutional hierarchies, centers, hinterlands, and nations as both digital capacity and policy push RIs towards 'connecting up'. Configuring includes (re)alignments that alter the landscape in which environmental knowledge production takes place. We discovered visualizing devices were a way to gather together and work with some of the changing circumstances as well as the diverse insights we encountered; a way of thinking together and with participants in order to consider the shape and ever-changing configurations associated with ERIs in-formation. While simply doing and/or adding visualizations is not enough, in(ter)ventions with visualizing devices that are co-created in the field can create interesting openings for those involved. Our experiences suggest that iteration, circulation and constant questioning with visualizing devices unleashes the potential for both configuring and collaborative insights.

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References

Agid S and Akama Y (2018) Dance of designing: Rethinking position, relation and movement in service design. *ServDes 2018 Proceedings*. Milan, Italy, 18-20 June 2018: 800-811. Milan, Italy: POLIMI.

Amit V (ed) (2000) *Constructing the Field: Ethnographic Fieldwork in the Contemporary World*. London: Routledge.

Baker KS (2017) *Data Work Configurations in the Field-Based Natural Sciences: Mesoscale Infrastructures, Project Collectives, and Data Gateways*. PhD Thesis, University of Illinois Urbana-Champaign, United States. Available at: https://www.ideals.illinois.edu/handle/2142/98131 (accessed 18.11.2020).

Baker KS, Botero A, Geirbo HC, Karasti H, Marttila S and Saad-Sulonen J (2018) *What does infrastructuring look like in STS? When? Workshop Report*. In: EASST Review 37(4). Available at: https://easst.net/article/what-does-infrastructuring-look-like-in-sts-when-workshop-report/ (accessed 18.11.2020).

Baker KS and Karasti H (2018) Data care and its politics: Designing for a neglected thing. In: Huybrechts L, Teli M, Light A et al. (eds) *15th Participatory Design Conference Proceedings* Hasselt and Genk, Belgium, 20-24 August 2018: 1-10. New York, USA: ACM.

Blomberg J and Karasti H (2013) Reflections on 25 years of ethnography in CSCW. *Computer Supported Cooperative Work* (CSCW) 22: 373-423.

Borgman CL (2015) *Big Data, Little Data, No Data: Scholarship in the Networked World*. Cambridge, MA: MIT Press.

Botero Cabrera A, Naukkarinen A and Saad-Sulonen J (2008) Mapping Social Practices through Collaborative Exercises and Visualizations. In: *5th Nordic Conference on Human-Computer Interaction: Building bridges Proceedings,* Lund, Sweden October, 2008: 419-422. New York, USA: ACM.

Botero A, Baker KS and Karasti H (in preparation) *Field Guide to Environmental Research Infrastructures*.

Botero A, Karasti H, Saad-Sulonen J et al. (2019) *Drawing Together: Infrastructuring and Politics for Participatory Design - a Visual Collection of Cases, Issues, Questions, and Relevant Literature*. University of Oulu. Available at: http://urn.fi/urn:isbn:9789526222042 (accessed 18.11.2020).

Bowker GC (2000) Biodiversity Datadiversity. *Social Studies of Science* 30(5): 643-683.

Bowker GC (2015) Temporality, the infrastructure toolbox, theorizing the contemporary. *Fieldsights* 24. Available at: https://culanth.org/fieldsights/temporality (accessed 18.11.2020).

Bowker GC and Star SL (1999) *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA: MIT Press.

Bødker S, Lyle P and Saad-Sulonen J (2017) Untangling the Mess of Technological Artefacts: Investigating Community Artefact Ecologies. In *8th International Conference on Communities and Technologies Proceedings,* Troyes, France, June 26-30 2017: 246–255. New York, USA: ACM.

Brandt W, Binder T and Sanders EB-N (2013) Tools and Techniques: Ways to Engage Telling, Making, and Enacting. In: Simonsen J and Robertson T (eds) *Routledge International Handbook of Participatory Design*. New York, NY: Routledge, pp.145-181.

Callon M (2002) Writing and (re)writing devices as tools for managing complexity. In: Law J and Mol A (eds) *Science and Cultural Theory*. Durham, NC: Duke University Press, pp.191-217.

Carayannis EG, Kwak Y-H and Anbari FT (2005) *The Story of Managing Projects: An Interdisciplinary Approach*. Westport, CT: Greenwood Publishing Group.

Daston LJ (2000) *Biographies of Scientific Objects*. Chicago, IL: University of Chicago Press.

Donovan JM and Baker KS (2011) The Shape of Information Management: Fostering Collaboration Across Data, Science, and Technology in a Design Studio. Scripps Institution of Oceanography Technical Report, June 2011. Available at: http://escholarship.org/uc/item/42s1q6mt (accessed 18.11.2020).

Estalella A and Criado TS (eds) (2018) *Experimental Collaborations: Ethnography through Fieldwork Devices*. New York: Berghahn.

Erickson T (1995) Notes on Design Practice: Stories and Prototypes as Catalysts for Communication. In: Carroll JM (ed) *Scenario-Based Design: Envisioning Work and Technology in System Development*. New York, NY: John Wiley & Sons, pp. 37-58.

ESFRI (2016) Public Roadmap 2018 Guide. European Strategy Forum on Research Infrastructures. Available at: http://www.esfri.eu/sites/default/files/docs/ESFRI_Roadmap_2018_public_guide_f.pdf (accessed 18.11.2020).

Greiffenhagen C, Mair M and Sharrock W (2011) From methodology to methodography: A study of qualitative and quantitative reasoning in practice. *Methodological Innovations Online* 6(3): 93-107.

Gübitz T, Janssen J and Renner C (2012) Development of Research Infrastructures in Europe. Bonn, Germany: ERA-Instruments. Available at: https://www.dfg.de/download/pdf/foerderung/programme/wgi/era_instruments_paper_part_iii.pdf (accessed 18.11.2020).

Henderson K (1991) Flexible sketches and inflexible data bases: Visual communication, conscription devices, and boundary objects in design engineering. *Science, Technology & Human Values* 16(4): 448–473.

Henderson K (1998) The role of material objects in the design process: A comparison of two design cultures and how they contend with automation. *Science, Technology & Human Values* 23(2): 139-174.

Hyysalo S, Pollock N and Williams R (2019) Method matters in the social study of technology: Investigating the biographies of artifacts and practices. *Science & Technology Studies* 32(3):2-25.

Jensen CB and Winthereik BR (2013) *Monitoring Movements in Development Aid: Recursive Partnerships and Infrastructures*. Cambridge, USA: MIT Press.

Karasti H (2009) FinLTSER Network formation and the state of information management. *Ecological Circuits - Eco-informatics in Action* 2: 15-18.

Karasti H (2014) Infrastructuring in Participatory Design. In: *13th Participatory Design Conference Proceedings*, Research Papers - Volume 1, Windhoek, Namibia, 6-10 October 2014: 141-150. New York, USA: ACM.

Karasti H and Baker KS (2004) Infrastructuring for the long-term: Ecological information management. In: *37th Annual Hawaii International Conference on System Sciences Proceedings*, Big Island, HI, 5-8 January 2004. IEEE.

Karasti H and Baker KS (2008) Digital data practices and the Long Term Ecological Research Program growing global. *International Journal of Digital Curation* 3(2): 42-58.

Karasti H and Blomberg J (2018) Studying infrastructuring ethnographically. *Computer Supported Cooperative Work* (CSCW) 27(2): 233-265.

Karasti H and Syrjänen A-L (2004) Artful infrastructuring in two cases of community PD. In: Clement A, de Cindio F, Oostveen A-M, Schuler D and van den Besselaar P (eds) *8th Conference on Participatory Design Proceedings* , Volume 1,Toronto, Canada, 27-31 July 2004: 20-30. New York: ACM Press.

Karasti H, Botero A, Baker KS and Parmiggiani E (2018a) *Little Data, Big Data, No Data? Data Management in the Era of Research Infrastructures, Workshop Report. Hyytiälä Forestry Field Station, Finland, 26-27 April 2018.* Available at: http://urn.fi/urn:isbn:9789526220062 (accessed 18.11.2020).

Karasti H, Pipek V and Bowker GC (2018b) An afterword to 'Infrastructuring and Collaborative Design'. *Computer Supported Cooperative Work* (CSCW) 27(2):267-289.

Klee P (1973) *Pedagogical Sketchbook*. London: Faber and Faber.

Latour B (1986) Visualisation and cognition: Drawing things together. *Jai Press* 6: 19-68.

Latour B (2008) *What is the Style of Matters of Concern*? Amsterdam: Van Gorcum.

Law J (2004) *After Method: Mess in Social Science Research*. London: Routledge.

Leonelli S and Tempini N (eds) (2020) Data Journeys in the Sciences. Cham: Springer Open.

Lindström K and Ståhl Å (2014) *Patchworking Publics-in-the-Making: Design, Media and Public Engagement*. PhD Thesis, Malmö University, Sweden.

Lippert I and Douglas-Jones R (2019) Doing data: Methodography in and of STS. *EASST Review* 38(1): 35-39.

Lury C and Wakeford N (2012) *Inventive Methods: The Happening of the Social*. London: Routledge.

Lynch K (1960) *The Image of the City*. Cambridge, MA: The MIT Press.

Marres N, Guggenheim M and Wilkie A (eds) (2018) *Inventing the Social*. Manchester, UK: Mattering Press.

Millerand F and Baker KS (2020) Data infrastructures in ecology: An infrastructure studies perspective. In: *Oxford Research Encyclopedia of Environmental Science.* Oxford: Oxford University Press. Available at: http://hdl.handle.net/2142/109229 (accessed 28.01.2021).

Mol A and Law J (2002) Complexities: An introduction. In: Law J and Mol A (eds) *Science and Cultural Theory*. Durham, NC: Duke University Press, pp.1-22.

Müller F, Baessler C, Schubert H and Klotz S (eds) (2010) *Long-Term Ecological Research: Between Theory and Application*. Dordrecht: Springer.

Papon P (2004) European scientific cooperation and research infrastructures: Past tendencies and future prospects. *Minerva* 42(1): 61–76.

Parmiggiani E, Karasti H, Baker KS and Botero A (2018) Politics in environmental research infrastructure formation: When top-down policy-making meets bottom-up fragmentation. *Platypus*. Available at: http://blog.castac.org/2018/06/research-infrastructure/ (accessed 18.11.2020).

Pollio V (1914) *Vitruvius: The Ten Books on Architecture*. Cambridge, MA: Harvard University Press.

Pollock N and Williams R (2009) *Software and Organisations: The Biography of the Enterprise Wide System or How SAP Conquered the World*. London: Routledge.

Retelny D and Hinds P (2016) Embedding intentions in drawings: How architects craft and curate drawings to achieve their goals. In: *19th ACM Conference on Computer-Supported Cooperative Work and Social Computing Proceedings,* San Francisco, CA, 27 Feb-02 Mar 2016: 1310–1322. New York: ACM Press.

Rudd J, Stern K and Isense S (1996) Low vs. high fidelity prototyping debate. *Interactions* January 1996:76-85.

Ruppert E, Law J and Savage M (2013) Reassembling social science methods: The challenge of digital devices. *Theory, Culture & Society* 30(4): 22-46.

Schoffelen J, Claes S, Huybrechts L, Martens S, Chua A, and Moere AV (2015) Visualising things. Perspectives on how to make things public through visualization. *CoDesign 11*(3-4): 1-14.

Singh SJ, Haberl H, Chertow M, Mirtl M and Schmid M (eds) (2013) *Long Term Socio-Ecological Research: Studies in Society-Nature Interactions Across Spatial and Temporal Scales*. Dordrecht: Springer.

Simonsen J and Robertson T (eds) (2013) *Routledge International Handbook of Participatory Design*. New York: Routledge.

Star SL (1999) The ethnography of infrastructure. *American Behavioral Scientist* 43(3): 377-391.

Star SL and Bowker GC (2002) How to infrastructure? In: Lievrouw LA and Livingstone SL (eds) *The Handbook of New Media. Social Shaping and Consequences of ICTs*. London: Sage, pp.151–162.

Star SL and Ruhleder K (1996) Steps toward an ecology of infrastructure: Design and access for large information spaces. *Information Systems Research* 7(1): 111–134.

Strathern M (1989) Between a melanesianist and a deconstructive feminist. *Australian Feminist Studies* 4(10): 49-69.

Suchman L (2012) Configuration. In: Lury C and Wakeford N (eds) *Inventive Methods: The Happening of the Social*. London: Routledge, pp.48-60.

TallBear K (2014) Standing with and speaking as faith: A feminist indigenous approach to inquiry [Research note]. *Journal of Research Practice* 10(2): Article N17.

Winthereik BR, de Bont A and Berg M (2002) Accessing the world of doctors and their computers: 'Making available' objects of study and the research site through ethnographic engagement. *Scandinavian Journal of Information Systems* 14(2): 47-58.

Yakura EK (2002) Charting time: Timelines as temporal boundary objects. *Academy Management Journal* 45(5): 956-970.

Moving Ethnography: Infrastructuring Doubletakes and Switchbacks in Experimental Collaborative Methods

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Abstract

In this article, we describe how our work at a particular nexus of STS, ethnography, and critical theory—informed by experimental sensibilities in both the arts and sciences—transformed as we built and learned to use collaborative workflows and supporting digital infrastructure. Responding to the call of this special issue to be "ethnographic about ethnography," we describe what we have learned about our own methods and collaborative practices through building digital infrastructure to support them. Supporting and accounting for how experimental ethnographic projects *move*—through different points in a research workflow, with many switchbacks, with project designs constantly changing as the research develops—was a key challenge. Addressing it depended on understanding creative data practices and analytic workflows, redesigning and building technological infrastructure, and constant attention to collaboration ethics. We refer to this as the need for doubletakes on method. We focus on the development of The Asthma Files, a collaborative ethnography project to understand the cultural dimensions of environmental health, and on the Platform for Experimental Collaborative Ethnography, digital infrastructure first built to support The Asthma Files but now available as a community resource for archiving, analyzing, and publishing ethnographic data and writing. A key finding is that different traditions and practices of ethnography require different infrastructures.

Keywords: ethnography, ethnographic methods, infrastructure, the Asthma Files, digital platforms, collaboration

Ethnography as cultural critique and experiment

> What sociotechnical systems can support collaborative ethnography and how does their design make a difference?
>
> What kinds of data—found, created, multimodal, big data and small—can ethnographers draw into their projects? What data can ethnographers give back, contributing to open ethnographic research commons?
>
> Where in an ethnographic workflow does analysis happen? Where are there ethical decisions? How might these, too, be made visible and openly shared?
>
> What are the assumptions and ends of different forms of ethnography?

We are a group of STS scholars, styled within a particular strand of North American anthropology, that has stuck close to these questions in our collaborative ethnographic research projects and, conjointly, in our design and building of new open-source digital infrastructure to support the archiving of ethnographic data, its sharing, and its use and reuse in collaborative ethnographic analysis. We have also learned that such questions can only be answered through methodographical analysis of our own experimental practices, including the practice of software design and production. Experimental for us denotes carefully structured yet underdetermined and open-ended attempts to produce new forms of ethnographic expression responsive to ever-changing situations. Here we respond to Lippert and Douglas-Jones's (2019) call for methodography on data infrastructures and practices by reflecting on our work to develop the Platform for Experimental Collaborative Ethnography (PECE), an open-source software that provides digital space for sharing, collaborative analysis, and creative presentation of ethnographic data and writing.

Reporting on a series of workshops that became the motivation for the present special issue, Lippert and Douglas-Jones (2019) characterize their interest in methodography in and of STS as a way to understand "how methods [shape] the STS analysts' practices" or, paraphrasing John Law's keynote address during one of these workshops, "being ethnographic about ethnography." The reflexivity they seek to cultivate goes beyond introspective questions about the responsibilities of researchers, anxieties of description, and positionality to include "extrospection" that allows for "attention to performativity and materiality," accounting for what researchers actually do in the field (Lippert and Douglas-Jones, 2019). The 'field' for us is a doubled one, and the data practices we discuss here developed both through collaborative engagement with asthma and environmental health governance, and through studying digital infrastructures and data practices in the natural and human sciences; together these provided materials and motivations for designing and building digital infrastructure tailored to share ethnographic data and drive collaborative interpretive analysis. In our work, a key methodographic insight has been about the need to design research infrastructure that supports how experimental ethnographic projects *move,* changing as both research and worlds develop in twists and turns. Done collaboratively, this becomes especially messy; ethnography and infrastructure development become coupled experiments. Collaborating researchers need workflows and infrastructure to assess the multiple discursive terrains in which they operate together, constantly questioning what they are seeing, what questions extend from these insights, what additional data can be produced and drawn in, and how these data open more questions as well as possibilities for reframing and rearticulating questions posed previously. Questions—as we have foregrounded at the beginning of this article—are always at the fore. They are not answered sequentially but are continually returned to. The workflow involves many switchbacks, and constant double takes are important.

In this article we use *doubletakes* and *switchbacks* as analytics, developed out of collaborative research, that describe some of the movements of collaborative, experimental ethnography. Doubletakes are iterative analyzes of problems or data, the ongoing addition of new perspectives that are consequential and sometimes surprising. These takes, often generated by collaborative workflows and necessitated by the multiplicitous nature of

Figure 1. Switchbacks are often designed into steep terrain to make an ascent easier. Often seen in hiking trails or roadways, such as this image from Patratu, Jharkhand, India. (https://commons.wikimedia.org/w/index.php?curid=59833771)

any data or problem, may pull a project in new theoretical or empirical directions.

Switchbacks are built into our research infrastructure, much like they are built into trails or railroads traversing steep or difficult terrain. Switchbacks demand their own doubletakes as well. In one take, our platform design and development involved numerous switchbacks as we encountered limits or constraints that required us to shift our visions or goals and redirect our software development maze. In another take, we built switchbacks into the design of PECE to encourage researchers to zigzag in their workflows rather than follow a pre-planned direct path forward, to deflect a researcher's analytic gaze slightly off center from an initial intent (Fortun et al., 2021).[1] Questions, such as the ones that open this essay and those shared in the pages to come, drive ethnographic moves in these different directions. They are not just central to individual research projects and methodologies; as we detail below, we have come to see (partially) shared questions as a way to develop connectivity between researchers with different backgrounds, answers, motivations, commitments, and interests. Switchbacks and doubletakes (or triple, or quadruple takes for that matter) turn out to be much more common—even unavoidable—when working with diverse collaborators.

Our analysis of these movements is anchored in years of collective work on The Asthma Files using the infrastructures and workflows described in the following sections. This included focused meta-discussion on research practices, the development of workflow protocols, and collaborative research activities themselves. This analysis centers on the activities of The Asthma Files and PECE research communities between 2009 and 2020 and draws

on the weekly and monthly meetings of different working groups; group members' conference presentations and publications; ad hoc workshops hosted by members of the research community; and the different data sets specific to individual researchers or research collectives. Meetings, workshops, and presentations are recorded and archived along with collectively authored notes and sometimes further analyzed using 'structured analytics' of the kind we describe later in this essay.

In what follows, we first tell backstories about The Asthma Files and PECE, describing how their design and development extended from both critical theory and ethnographic study of the environmental health sciences. We then describe different stages and practices in a collaborative ethnographic workflow; the web science researchers we sometimes collaborated with taught us to think of these as 'use cases,' so that we too could design technical support for them. These stages and practices flow one from another, but with many switchbacks and constant double-takes. Support for continual movement between data collection, analysis, visualization, and project (re)design is built into our research infrastructure, scaffolding constant attention to the switch-backing, double-taking, and non-linear structure of ethnographic work and its movements and flow. In the final section, we briefly point to the ways collaborative, experimental ethnographic projects call for scientific selves largely at odds with conventional academic socialization. Suitably designed research infrastructure helps produce ethnographers for whom collaboration comes first, rather than a secondary interest or stage, and for whom analytical or topical changes are a given rather than a distraction or deterrent. The orientation we espouse, following Leandro Rodriguez Medina (2018), is 'transcendental' rather than 'strategic,' aiming to produce new research relations instead of seeking to better already existing ones. We also describe some of the challenges in sustaining such collaborations and some preliminary socio-technical protocols that we have developed to better move through and sustain these.

Backstories

Engendering explanatory pluralism

Central to both our research and infrastructural efforts has been a commitment to explanatory pluralism (Keller, 2002) and 'the multiple' (Mol, 2002). Noncommittal about locating multiplicity in either the epistemic register or the ontological, we have nevertheless worked with the clear sense that *one*—one explanation, one perspective, one world—is inadequate for the complex technoscientific challenges we want to analyze and address. Interdisciplinarity and collaboration are buzzwords for a reason—the worlds we work in demand them—and we wanted infrastructure that not only supported ethnography's tolerance and talent for difference in its many forms, but also furthered it.

Our work extends from what is variously referred to as the language, reflexive, or literary turn of the 1980s in anthropological ethnography, often condensed to the 'Writing Culture turn' in reference to a key text (Clifford and Marcus, 1986). This lineage itself extends from the critical knowledge experiments of figures like Theodor Adorno (Adorno et al.,1984), Walter Benjamin (1968), Gregory Bateson (1936, 1972), Margaret Mead (1928), and Zora Neale Hurston (1935). This lineage of ethnography foregrounds the significance of the discursive and literary forms through which knowledge takes shape, attentive to the play of form with/in content, in both the worlds researched and in scholars' own articulations.[2] In the 1980s, vibrant work in literary and language theory, semiotics, and feminist and poststructuralist theory drove this line of work forward, foregrounding the durability of colonial and patriarchal constructs of the world, drawing history and time into the present (Clifford and Marcus, 1986; Daniel, 1987; Ebron, 2001; Geertz, 1973; Kondo, 1990; Lamphere, 2004; Marcus and Fischer, 1986; Traweek, 1988). Key theoretical insights were drawn from the works of Gayatri Spivak (1987, 2012), Homi Bhabha (1994), Gilles Deleuze (1990), and Jacques Derrida (1978, 1998), among others, in a lively field of critical theory reference that crossed disciplines. The critique of universalized Enlightenment reason was central. This, in turn, opened pathways to STS focused on

how knowledge is situated, partial, often hierarchically organized, and has socio-political effects (Haraway, 1988; Harding, 1986; Keller, 1992; Martin, 1998; Traweek, 1988).[3] Our commitment to collaboration stems from this experimental, interdisciplinary anthropological tradition, striving to move beyond the world as currently ordered (conceptually, socially, geopolitically) and toward more just but as yet unknowable futures. Experimentalism, here, is like that explicated by Hans-Jörg Rheinberger (1997) in his studies of the biological sciences, involving partial-visioned movements through a self-projected emergent labyrinth, toward unknown truths and unprecedented entities (see Fortun 2003; Boyer and Marcus, 2021; Estalella and Criado, 2018; Fischer, 2007).

Our collaborative challenges began with The Asthma Files, a research effort begun around 2005 when we were students and teachers in the Department of Science and Technology Studies at Rensselaer Polytechnic Institute in Troy, New York, USA. The idea for The Asthma Files stemmed from a workshop that Mike Fortun and Kim Fortun helped organize, in part as fieldwork for ethnographic research on changing data imaginaries and practices in the environmental health sciences. The workshop brought together scientists from different disciplines to delineate new study designs for gene-environment interaction research that could best capture and explain persistent health disparities in complex conditions like asthma and obesity. The time was ripe: asthma rates were escalating, for reasons that escaped any unifying biological or sociopolitical causal logics, garnering increased attention in the media and national and international agencies like the American Lung Association and the World Health Organization. Understanding gene-environment interactions was a new scientific frontier, promising new ways to understand health from both the outside in and inside out. The Fortuns were impressed by many of the scientists involved and wrote about ways scientists working to develop new methods for understanding gene-environment interfaces could be cast as 'civic scientists' engaged with the political implications of their work (Fortun and Fortun, 2005).

It was also clear that what counted as 'the environment' in gene-environment interaction studies would be dramatically and predictably delimited. In one early scientific review article, for example, 'the environment' was almost entirely limited to measurable dietary influences like cholesterol or alcohol; ambient air pollution was literally nowhere on the horizon (Hunter, 2005).[4] The Fortuns wanted to be in the deliberations about how 'the environment' would be figured in genetic studies of asthma.

The 2005 workshop included geneticists, epidemiologists, and air quality scientists, among others, from both US universities and government agencies. Each presented their approach to understanding asthma or environmental health more generally. Quickly, it became clear how hierarchies of knowledge operate *within* the sciences. The geneticists defined and, in many ways, dominated the space. Available air pollution data sets (from community monitors, for the most part) were dismissed as too noisy or imprecise to use. The geneticists wanted much more controlled, close-to-the-body data, collected by expensive, wearable monitors. The fact that massive investment of public funds in genomic data and infrastructure was responsible for the well-controlled and well-characterized data geneticists had come to value and rely on, went unspoken. Approaches to asthma that were notably complex—with many stressors and end points, some very difficult to characterize (the immunological effects of economic and security threats in poor communities, for example, or the effects of neighborhood violence on cortisol levels)—also took hits for being too complex to control. Researchers developing such approaches were both epidemiologists and clinicians; most were women.

The contentious, at times condescending, exchanges between scientists of different fields at the workshop was palpable to the Fortuns as anthropologically observant participants. Nonetheless, the stated goal of the meeting was achieving consensus rather than exploring meaningful differences. By the end of these sessions, participants were supposed to agree on recommended best practices for study designs that could help explain disparities in asthma outcomes across diverse communities.

The Fortuns came away from the 2005 workshop impressed by the need and desire for collaboration in the environmental health sciences, but also struck by the quick tendency to hierarchically order different forms of expertise and the privileging of consensus as an almost naturalized organizing principle. They were reminded of anthropologist Laura Nader's (1990) work on how 'harmony ideology' operated in Mexican legal cultures, casting difference and conflict as necessarily unhealthy and dysfunctional. Some general agreements were certainly necessary to create a shared space of work. But it also seemed important to proactively acknowledge, value, and leverage different perspectives—anchored in different data types and infrastructures, in different ways of thinking about correlation and evidence, in different ways of thinking about what makes research findings robust, in different ways researchers 'perform' asthma (Mol, 2002).

Some health and pollution scientists in the mix seemed to agree with this, emphasizing the need to develop new ways of both organizing and talking about research. One senior scientist from the US Environmental Protection Agency's (EPA) Office of Research and Development, for example, pointed to the problems with evaluating research in generalized terms of 'accuracy' rather than 'requisite precision,' arguing that different levels of precision were needed for different purposes, and that strict *a priori* designation of the kind of knowledge needed would defer urgently needed environmental regulation and public health programming. It was hard for many geneticists not to hear this as secondary, and lesser, science.

The Fortuns thus began thinking about how collaboration could be configured differently, and how different knowledge forms (from different disciplines, from different lineages within disciplines, from different geopolitical positions, from different generations) could be proactively leveraged.[5] As the limits of established ways of conceptualizing and enacting collaboration began to preoccupy them, collaboration itself became an ethnographic concern, both in their studies of environmental health researchers and in their own practice.

Growing collaboration without consensus: the Asthma Files

From these origins in gene-environment interaction research and collaboration, The Asthma Files began as an ethnographic project to understand how differently situated people—scientists in different disciplines and geographies, clinicians and public health officials, environmental activists, individuals living with asthma and their caregivers—understood and acted on asthma. The Fortuns and a growing group of collaborators (including many students, some of whom are now faculty and co-authors here) began documenting and explicating asthma knowledges in all their variation. It wasn't long, however, before the research also became oriented around different asthmatic spaces (Houston, say, or rural Bavaria), and then around subjectivities, communications, and governance (and the thematic list continued to grow). Focusing on asthma expansively, the group began to collect many different kinds of data (audio recordings of ethnographic interviews, YouTube videos and other found media, pharmaceutical advertising, health education materials, government reports from different agencies, from different periods, etc.). In short, the project evolved to include multiple different researchers, studying environmental health from multiple different angles, generating multiple different data sets to be analyzed through multiple different theoretical apparatuses—"modeling the data in different ways," in the language of the data scientists that we were talking to and thinking with more and more frequently.

Drawing out different knowledge formations, in different settings, entailed working together, often side-by-side, but with separate interests and from different perspectives: collaboration without consensus. This in turn entailed paying more and closer attention to the workflows that make ethnographic research projects move, and especially those with such diverse aspects, goals, and users. As the diversity of projects and approaches within the Asthma Files grew, we had to attend to our own methods so that we could explain them to each other and build infrastructure to keep up with them. We learned about the forms and purposes of metadata, about the many kinds of 'data' ethnographers produce (including

analytic frameworks, interview protocols, found documents and images, annotations), and about the many moments of analysis, selection, interpretation, and ethical judgement that occur as ethnography unfolds.

Three very differently focused dissertations were written in the early years of The Asthma Files: Alison Kenner's (2011) dissertation focused on modes of asthma care (and became *Breath-taking: Asthma Care in a Time of Climate Change* (2018)); Brandon Costelloe-Kuehn's (2012) dissertation focused on two environmental modeling and mapping projects developed by the US EPA to help characterize air pollution and associated health effects; Tahereh Saheb (2015) focused on public perceptions of and responses to air pollution in Tehran. We did many of the interviews for these projects together, learning to share roles and responsibilities in the conduct of the interviews themselves. Sometimes we hosted groups of people to facilitate discussions; in these larger group meetings, we (selectively) presented what we were learning in the research to elicit further interpretation and dialogue among all participating. Each collaborator made their own notes, focused in ways keyed to their projects and interests, but these notes were routinely shared with others. The diversity of foci and approaches within our research group was animating and very generative. Everyone was free to use material produced both by the group as a whole and by individuals within it. It quickly became apparent that we would need to invent ways to credit each others' contributions—data, questions, nascent analyses—and also credit the overall collaboration. As was the case for the scientific communities whose changing data practices and complicated collaborations we were studying, standard protocols and infrastructures for such work were not yet available.

The award of a US National Science Foundation (NSF) grant in 2015, "Environmental Health Governance in Six Cities: How Scientific Cultures, Practices and Infrastructure Shape Governance Styles,"—later expanded into the 'Six+ Cities Study'—took The Asthma Files collaboration to a new level, and in multiple new directions. We borrowed the name from the influential 'Harvard Six Cities Study,' a longitudinal study started in the 1970s that connected air pollution to increased mortality (Dockery et al., 1993). The study was the basis of clean air regulation passed in the United States in the 1990s, sparking intense pushback from the fossil fuel industry through lobbying organizations like the American Petroleum Institute. The data, methods, and findings of the study and associated later studies have all continued to garner sustained collaborative attention among epidemiologists, pollution scientists, and economists. We wanted to explore what an analogous collaboration at the nexus of anthropology and STS would look like, how it would sustain its data collection and analysis over time, and how this collaborative work could be done as openly as possible.

The goal of our ongoing Six+ Cities study is to document and conceptualize different 'styles' of environmental health governance in different cities, accounting for the mix of actors involved, how they understand and act on the problem of air pollution, and how they work separately and together to improve air quality and access to appropriate health care and public health resources. Our conception of governance styles extends from Ludwig Fleck's (1979) conceptions of ways distinctive 'thought styles' characterize scientific communities, largely in positive, productive, but always limiting ways. Like Fleck and the many scholars who have been inspired by his work (e.g. Gaudillière, 2004), we work to understand how multiple actors in different communities identify problems, produce and use relevant data, interpret and think creatively about that data, and are moved to action. And we work to understand how distinctive thought styles also pose challenges for collaboration across these communities. We aim to characterize a city's air pollution governance style as an effect of how different communities (local and beyond, including city, state and national government actors, residents, environmental activists, and scientists in various disciplines) come together, prioritizing some lines of research and action while discounting others.

Funding from the Azim Premji Foundation in India allowed us to expand our work to four more cities (Hyderabad, Chennai, Pune, and Delhi) in addition to the original six cities of Albany, Beijing, Bengaluru, Houston, New York, and Philadel-

phia. Groups from Los Angeles and Ecuador and researchers in Germany and Paris have also joined on. The group includes researchers situated in vastly different geographies, at different career stages, in different disciplines, and both inside and outside the academy proper. Vinay Baindur, our lead researcher for Bengaluru, is a career activist with a wealth of knowledge about politics in the city, the state of Karnataka, and India writ large. Dan Price is a philosopher (of knowledge) with little inclination for empirical documentation but exceptionally astute understanding of what is wrong with 'the system,' which he puts into practice by putting students in the University of Houston Honors College in partnership with community health workers in nearby public housing. Price also led development of a web-based map of real-time ozone levels in Houston, designed to make air pollution a topic of everyday conversation and driver of cultural change. Aalok Khandekar, who leads our research in India, is an STS researcher specializing in Engineering Studies—with special interest in transnational flows of people, technologies, and ideas—including those focused on air pollution. Many of the undergraduate students who have worked on the project also have backgrounds in and special interests in engineering. At one point, we had about fifteen undergraduate research collaborators working alongside us, coming from many different engineering fields. The questions they contributed to the group as civil, mechanical, and biomedical engineers were critical, directing our attention to comparisons and variables that we had not previously considered.[6]

In these collaborations, there have been many challenges: the need to share extremely heterogeneous primary material in a manner that makes sense to diverse researchers; the need for analytic annotation of these materials and archiving of these annotations along with associated data; the need for new genres of writing through which interpretive scholars can share their analyses in the process of development; the need to constantly shift, as with a 'jeweler's eye,' between fine-grained and systems levels analyses (Marcus and Fischer, 1986); the need to describe a complex scholarly project and its findings to diverse audiences, articulated by researchers in different contexts and at different career stages; the need to figure out how to think and talk about collaboration so that we could infrastructure it. These needs became apparent to us through our shared work over time, some immediately obvious—such as the need to think together about what we mean by collaboration—others much later, including the need for analytic structures so that the archive is legible, more open, and in motion. As findings from our collaborative work, these insights have taken time. They have been coaxed out of the workflows—research analytics, archiving protocols, presentation formats—that we describe in the following section.

While the 'backstories' offered here may read as somewhat linear narratives, the paths to where we are today were far from straightforward, moving from the gene-environment interaction workshop, to the Asthma Files, and later to the Six+ Cities project involved frequent backtracking, problem circling, contradictory views and divergent analyses, dramatic shifts in interests and thinking, and the creation of experimental offshoots that sometimes came to blunt endings. Most importantly, we realized there was no available research infrastructure that not only tolerated these dynamics, but also encouraged them.

In one early research trip in 2008, for example, four of us (with two young kids in tow) conducted almost thirty interviews over a few days at the US EPA's Office of Research and Development in North Carolina. Driving down from New York, we sidetracked to witness the immediate aftermath of the Kingston coal ash spill, which had rolled over and washed away houses and filled Tennessee's Emory River with black sludge just a few months earlier. Asthma Files researcher Alison Kenner was based for six months in Knoxville—one of the American Lung Association's 'Asthma Capitals' for its high incidence of respiratory conditions due to burning coal for generating power and the lack of smoke-free laws—and began to study the response. For various reasons she, and thus our research effort, soon moved on.

Asthma Files researchers have not conducted field research in Tennessee since 2008, but the disastrous ash spill of four million yards of toxic coal ash (moved eventually from this mostly white

community to a strikingly poor Black community in a different state) still figures as a prominent case within the project as an early sign of a broad need for new digital infrastructures. These kinds of research switchbacks—sudden changes in research directions—happen frequently in ethnographic projects, and the materials collected and analyses begun usually get tossed in a file cabinet drawer or box, forgotten by the initial researcher and lost to potential collaborators. While our project design and ethnographic sensibilities encouraged such switchbacks, we still needed to build infrastructure that would support such halts and swerves in projects with variable and often unknown timelines.

Now, after designing and building the PECE platform described in the next section, multiple researchers can still keep their eyes on the Kingston coal sludge disaster, accessing related materials—news stories, documentaries, and environmental studies—and preliminary analyzes more than a decade later. The archiving of Kingston materials also supports teaching the case, helping us stay with the story, updating it and bringing in different kinds of analysis in keeping with the focus of different courses. At the outset, the Kingston coal ash could be cast as an 'extreme event;' over time it has become a slow disaster, productive of on-going, slow violence (Nixon 2013). The clean-up effort in Kingston eventually mobilized over 900 workers; today, many are sick and cannot pay their medical bills. Few wore protective respiratory equipment during the clean-up.[7] Recently, the region has also struggled with high COVID rates. The Asthma Files are designed to keep track of this kind of compound vulnerability, how it accumulates over time, and how it can be reinterpreted in light of new theories and new questions. Like our colleagues in the environmental health sciences (who we both study and learn from for our own practice), we have learned the value of returning to old data with updates, new analytic tools, and insight from other studies.

From flash drives to the Platform for Experimental Collaborative Ethnography

In the early years of The Asthma Files (2006-2010), we built 'files' in Microsoft PowerPoint, with every slide harboring a cluster of images and quotes that together indicated how a particular person (often some kind of asthma scientist) or organization (like the American Lung Association) articulated the etiology of asthma. Although proprietary, PowerPoint was a widely used software that allowed distributed collaborators to present collective work in a wide range of spaces independent of internet access. One slide presented the map by West Harlem Environmental Action, Inc. (WE ACT) demonstrating connections between bus refueling depots in Manhattan, emergency room visits for acute asthma episodes, and communities of color. Another slide depicted asthma scientist and physician Rosalind Wright, with a diagram from one of her grant proposals outlining her efforts to use biomarkers to link asthma to stress in low-income communities. Links to Wright's paper were in the notes. We interviewed many of the people we 'filed' like this and shared those recordings on flash drives along with the slide shows. But the image-heavy PowerPoint files soon grew so large they became very unstable, and we could not keep up with all the circulating flash drives and attachments (the files were too large for emailing at the time; cloud-based file-sharing services, if available, were still in their nascent stages). For some time, the group shifted its work to a wiki, which gave the project its first public face, but that platform, too, soon showed its limits: it did not handle large files well, and the benefit of its completely open editing capacity was also a fatal flaw when it came to handling materials that needed to be protected, and for security overall. We needed better infrastructure.

Of course, we also knew, from experience and as STS scholars, that infrastructure was anything but neutral. Thus began the saga of developing what would become the Platform for Experimental, Collaborative Ethnography (PECE), a digital research environment and publication platform, now freely available as an open-source download.[8] The platform still wobbles and squeaks a bit, but is reliable and available as a community resource. Today, there are about ten instances of PECE, supporting diverse STS projects.

PECE took a while to be named as such, and by then had its own collaborative research and design group—people with very different skills

that we had to learn to name so that we could credit them and apportion responsibility and decision-making authority among them. For example, Lindsay Poirier, trained in both ethnographic methods and information technology project management, became the lead 'Platform Architect,' with clear authority in software development decisions. With a background in OpenBSD software development and an education in STS, Brian Callahan (eventually) became PECE's lead 'Open Source Developer'—responsible for implementing evolving ideas about open source best practice as well as system administration. Alli Morgan and Kim Fortun continued leading The Asthma Files research and brought that experience and the problems they encountered back to the PECE Design Group; they took on the role of 'Project Coordinators.' Mike Fortun and Kim Fortun managed grant writing, budgets, and constant traffic between platform development and critical theory, acting as 'Research Director' and 'Development Director' of the overall effort.

A particularly formative influence on PECE was our involvement in the Research Data Alliance (RDA), an international organization "building the social and technical bridges to enable open sharing and re-use of data" (Research Data Alliance, 2016).[9] RDA was at first a fieldsite for our research on collaboration in the sciences, and the associated changes and challenges to data sharing practices and data infrastructures. Soon, however, we became active participants in the RDA, with our own commitments to more open sharing and re-use of qualitative data. We established and for many years led RDA's Digital Practices in History and Ethnography Interest Group. We also established and ran an 'output' oriented RDA Working Group focused on the special metadata needs of ethnography. Through our RDA involvement, we met and worked alongside people involved in a diverse array of digital humanities and social science projects; we also met people building data infrastructure in other 'domains' (from wheat science to transportation engineering) and with a wide range of technical expertise (in data standards, provenance, rescue, preservation, discoverability, and so on).

In the section that follows, we describe ways in which we have infrastructured and supported experimental and collaborative workflows and their subject effects in the Six+ Cities research project, in part through the design of PECE. PECE was first imagined, designed, and remains bound to particular kinds of ethnographic projects—projects especially concerned with phenomena involving tangles of scales (from the nano to the micro, meso, macro, meta, and deutero) and systems (ecological, biochemical, social, political economic, and cultural), thus calling for especially complex accounting, analysis, and accountability—usually beyond what established systems can support—while also calling for particularly complex interventions.[10]

Switchbacks and doubletakes in experimental collaborative ethnographic workflows

We often characterize the design of the PECE infrastructure as a triptych: three tightly linked digital spaces for collaborative archiving, interpretive analysis, and new forms of ethnographic expression. Here we highlight these three moments in the ethnographic workflow, and how we have come to understand them. We describe the building of ethnographic archives and the importance of thinking in terms of an economy of surplus; we also describe the 'light structures' necessary to build such archives and how 'structured analytics' produce, read, and undergird the expression of ethnography. Our descriptions of PECE genres—including photo essays, timeline essays, and what we call 'PECE essays'—point to the way genre formations have effects at many stages in ethnographic workflows. These genres in turn open up new possibilities of linking to source data in traditional publication formats (the journal article) thus extending back across the triptych and stitching them together. We close this section by reflecting on the (collaborative) subject effects that drive researchers to PECE, in turn producing a need for discursive, analytic, and ethical as well as technical support. Switchbacks and doubletakes, as we describe in the sections below, animate our work at every stage.

Building open ethnographic archives

> Social anthropology has one trick up its sleeve: the deliberate attempt to generate more data than the investigator is aware of at the time of collection. Anthropologists deploy open-ended, non-linear methods of data collection which they call ethnography…Rather than devising protocols that will purify the data in advance of analysis, the anthropologist embarks on a participatory exercise which yields materials for which analytic protocols are often devised after the fact. In the field the ethnographer may work by indirection, creating tangents from which the principal subject can be observed (through the 'wider social context'). But what is tangent at one stage may become central at the next (Strathern, 2004: 5–6).

Data collection for experimental ethnography needs to be assertively expansive, archiving much more than mandated by any particular focus. As argued by anthropologist Marilyn Strathern (in a kindred lineage of anthropology), a key trick is to generate more data than one knows one needs, "creating tangents from which the principal subject can be observed" (Strathern, 2004: 6). PECE is designed to support this expansive and ever-diversifying effort to create, through tangents and switchbacks, more and more data beyond any current project frameworks and goals. Our story above about the coal ash disaster in Kingston is one example of such a switchback, where Asthma Files researchers went off on a tangent, archiving those materials as data to be returned to, by the same or by other researchers, before setting off in a new research direction.[11]

Not everything becomes data, however; data collection results from a process of constant selection, and thus has been subjected to analysis even before analysis has properly begun. In experimental ethnography, the 'object' or data in many ways *is* the context; it is context that has to be (interpretively) documented; what constitutes the figure has to be drawn forward from its ground. This analysis *within* data collection usually happens tacitly; making that 'drawing forward' more explicit and documenting it keeps the productive ethnographic workflow visible while keeping it open to question (Fortun, 2009).

In PECE, it is documented when an artifact is uploaded in a field for 'critical commentary.' In this space, researchers are *required* to say why a given artifact—a government document, a found image or oral history, or an interview collected by the researcher—is, for them, significant. Why did they consider it to be data? What context, empirical and/or theoretical, made it meaningful? This documentation both personalizes the data and opens it up for use by others (who can work better with found data if given a sense of its origins). We stress again the *required* aspect of this: we knew from examining our own workflows and turning them into an ethnographic 'use case' that this process usually goes unnoticed and undocumented, so *why* a researcher thought this text or image should count or qualify as 'qualitative data,' is lost. PECE forces its users to make this process of making meaningful data more explicit by taking the Dublin Core metadata field named 'description,' re-naming it 'critical commentary,' and re-coding the user interface to make this a required field rather than an optional one. A researcher cannot contribute data unless they do this.

Figure 2 exemplifies the results of this ethnographic workflow.[12] Prerna Srigyan, an Asthma Files researcher working at the time in Delhi, contributed a graphic drawn from a (non-digitized) report from a Delhi-based NGO showing how they mobilized scientific data comparing the contributions to air pollution of compressed natural gas versus diesel fuel, for a public education campaign and for court proceedings. In addition to the standard metadata (format, date, etc.) both visible and undisplayed, the additional metadata in the 'critical commentary' field here provides information about the provenance and context of the document and image, including Prerna's recollection of stories told by an uncle about these events and air pollution in the 1990s. Qualitative data is made more qualitative from the bottom up, in effect, by further qualifying it with this added metadata.

PECE also infrastructures *comparative* generation of data. In some instances, collaborating researchers task each other to build, for example, a collection of media articles about air pollution for a delimited period, planning to analyze these

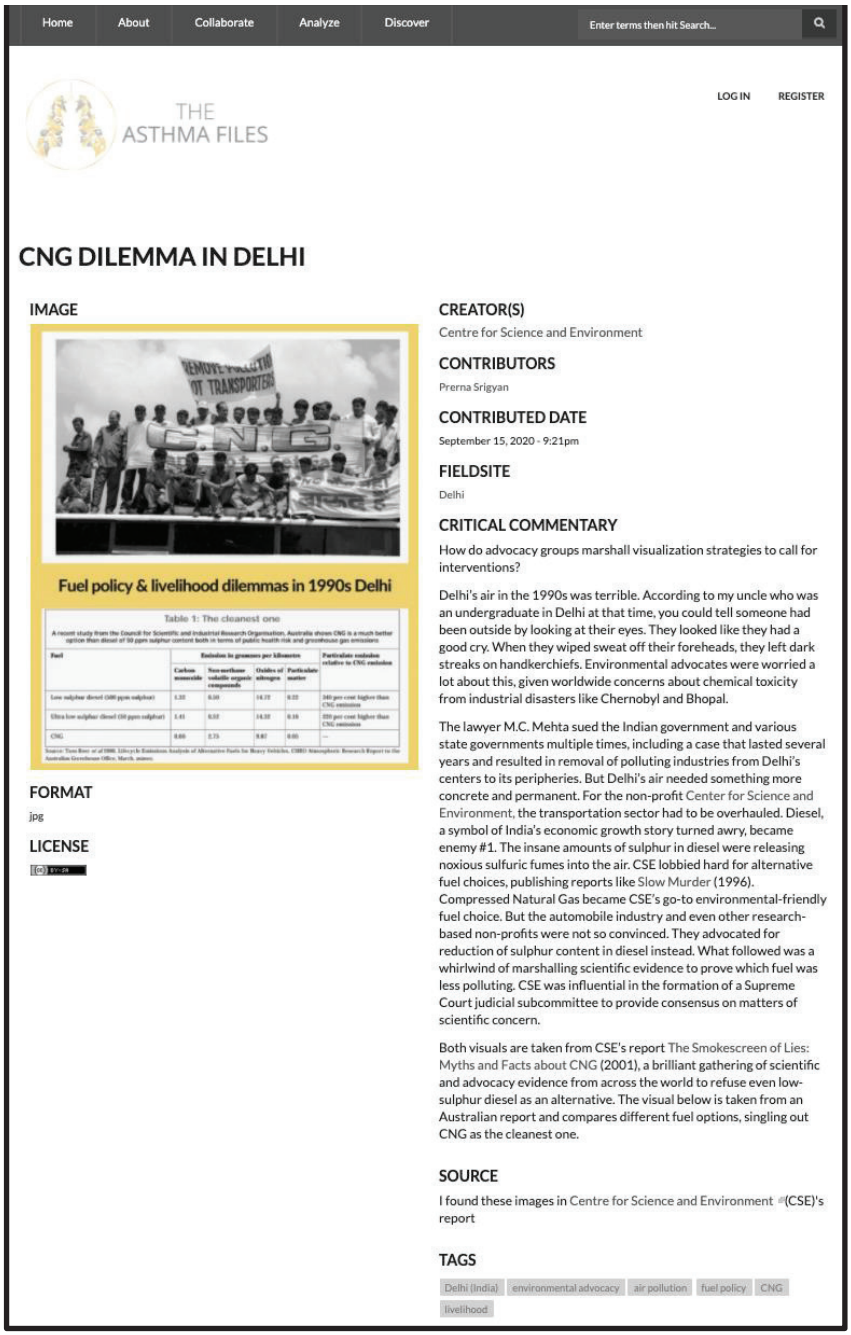

Figure 2. "How do advocacy groups marshal visualization strategies to call for intervention?" is the question opening this critical commentary added as metadata, and so creating new ethnographic data out of a 2001 NGO report.

both to compare discursive formations in different sites and to elicit feedback in subsequent interviews. Collaborating researchers are also encouraged to bring forward critical points of reference from their particular sites—to share what they have learned, but also to prompt consideration of dynamics in other sites. Sometimes this kind of analysis is achieved in the 'critical commentary' for an artifact, but it more often occurs through responses to 'structured analytics.'

Questions at every turn

Ethnography generates new questions at every turn: about how to draw figure from ground, about how to redirect data collection, and about ways to guide the writing and expression of ethnographic knowledge. On one hand, this is not surprising; it is routine ethnography. It becomes less routine when you try to infrastructure this generativity, capturing and codifying it so that it can be leveraged collaboratively.

In The Asthma Files, infrastructured by PECE, questions produced and responded to by different researchers at many stages in an ethnographic workflow are archived, like data, as 'analytic structures.' In The Asthma Files, this collection of analytic structures—to which any user can add—has become dizzyingly extensive; we have learned just how many different kinds of questions ethnographers ask through building technical means to preserve and display them. We are still working to understand how to name and categorize them in ways that keep them proliferating yet navigable. It is these questions that produce connections (another kind of metadata) between data artifacts. They are rhizomatic, working like the lungs of the system to continually breathe life into every data object and each expression of ethnographic knowledge. The last thing we want to do is close them down or cut them out.

'Analytic structures' are sets of questions used to collaboratively examine and interpret data artifacts in the platform (Figure 3)—an image, a recorded interview, a grey document produced by a community organization, a scientific publication, even a 'PECE essay' (see below) about a whole project. Importantly, these question sets can be continually amended and extended, and users can read how others have responded to the same question that they are addressing. Interpretations are not bound by a coding schema; responses to an analytic can be in sync or divergent, shaped by interaction among researchers within the interpretive process, leveraging their differences.[13] The goal is not saturation, but to multiply and juxtapose interpretations, producing what we have come to call kaleidoscopics: the capacity to see the phenomena we are concerned with in many different ways, re-patterning objects by changing analytic frames.

PECE analytic structures expose routine moments in an ethnographic workflow that usually go unmarked, and scaffold analysis at different points in the research process. Some structures—sets of questions for interviewing differently positioned social actors, for example—help a researcher *produce* data. Other analytic structures scaffold researchers (individually or collaboratively) as they analyze and interpret an interview, found document, image, or other artifact. Still other analytic structures guide data *connection*, helping researchers pull from many sources to characterize a person, organization, or place; "Thinking With a Neighborhood," for example, is an analytic set used in The Asthma Files to compare asthmatic spaces (Figure 3).

Analytic structures also allow researchers to collaborate during (rather than after) the process of interpretation. And they continually decenter both data and project, nudging researchers to develop new angles on what they study, pose new questions, and build new relations to other researchers. These movements are not only tolerated but encouraged, animating the platform as a whole.

"This is an interesting question," reflects one Asthma Files researcher in her annotation of a map (Figure 4); beginning with a question not of her own making sparks an unexpected reading. By continually exposing researchers to long lists of questions they had not thought to ask—and encouraging them to add yet another one to the list—PECE infrastructure promotes doubletakes and switchbacking analysis, keeping both research and researcher moving in new directions, re-questioning and re-reading data rather than trying to

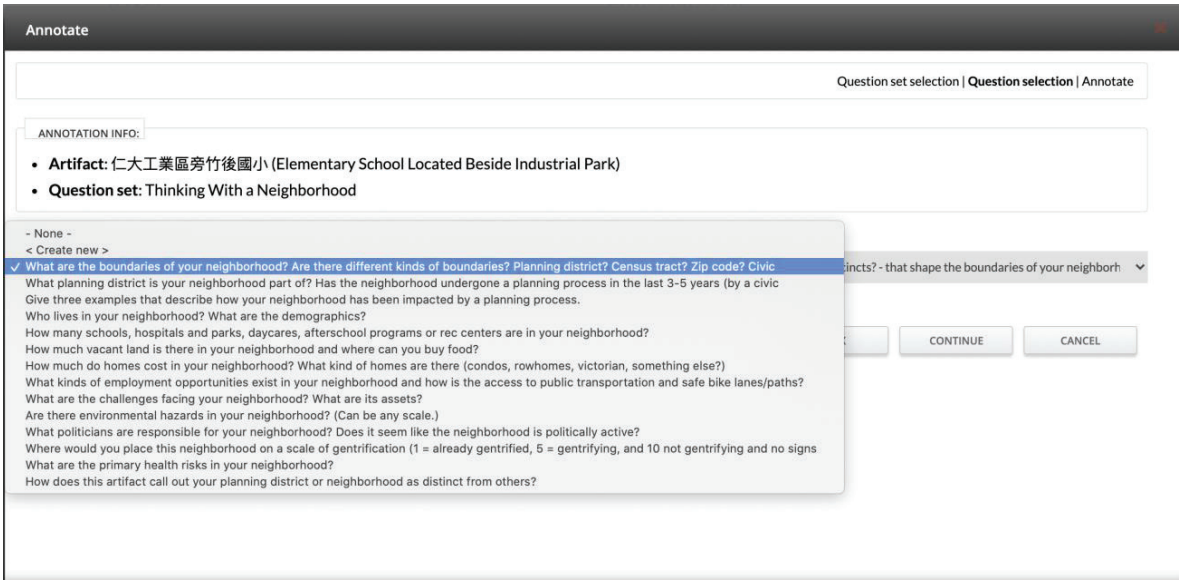

Figure 3. This screenshot shows an Asthma Files researcher going through the process of annotating an artifact. The researcher selected the "Thinking With a Neighborhood" question set and is now selecting a specific question to structure the artifact annotation (note, also, that the "<Create new>" question option appears at top). The researcher's annotation will then appear in a collection of all the annotations for this specific question, for this artifact and for all others. See Figure 4 below for an example.

place them into an established coding schema. Clicking on the question itself leads to further potential switchbacks, calling up all responses to this question by all researchers writing in response to other maps (Figure 4). Different researchers and their different readings of different data artifacts in

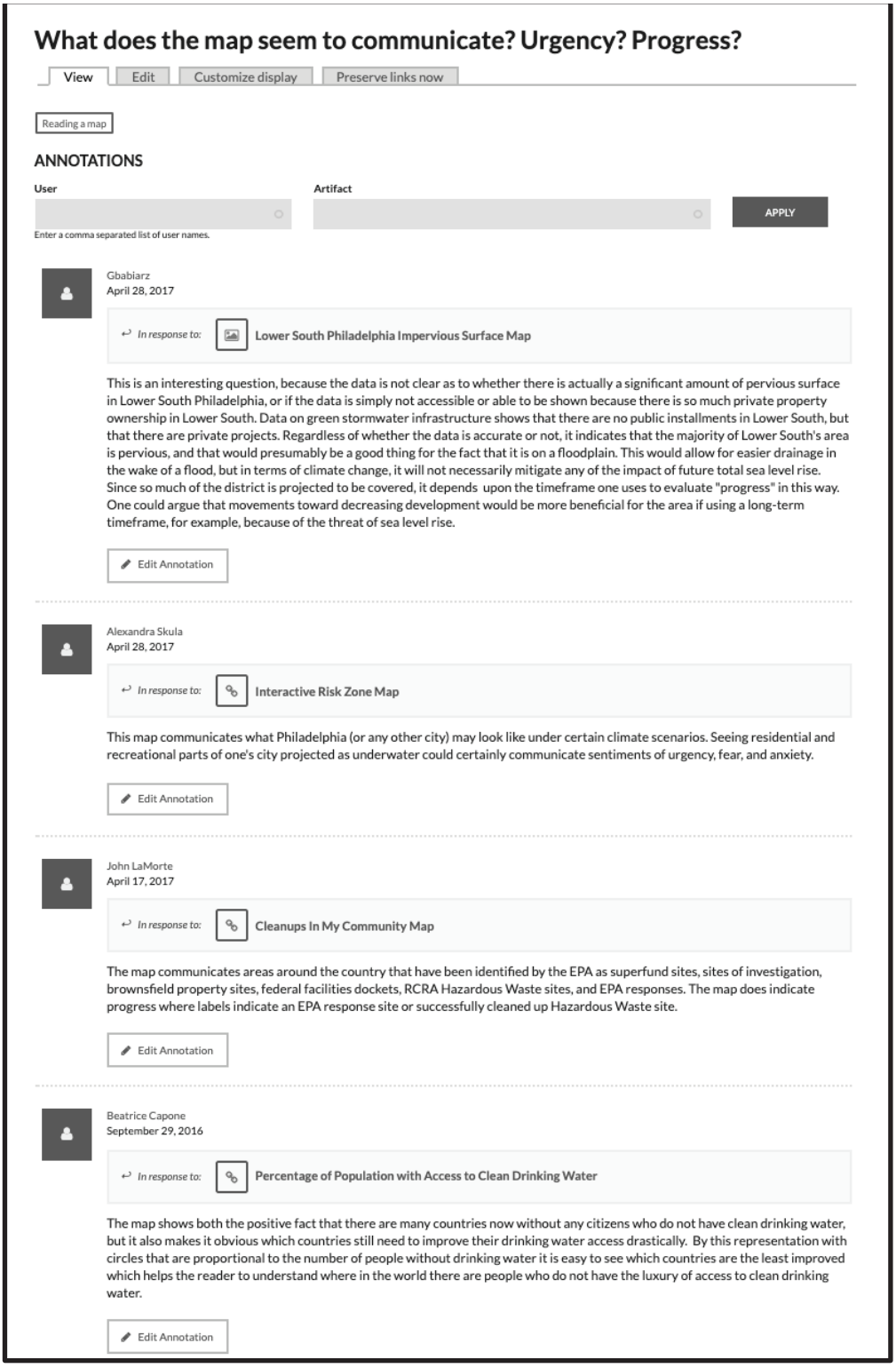

Figure 4. The above analytic question, "What does the map seem to communicate? Urgency? Progress?" is part of the "Reading a Map" analytic. The screenshot shows how different researchers have taken up the question to analyze different map artifacts.
(https://theasthmafiles.org/content/what-does-map-seem-communicate-urgency-progress)

response to different questions are handled by the system as forms of metadata for each other, able to be reorganized around each node, creating an emergent rhizome of questions, researchers, and data that switchbacks analysis.

Structured analytics have been a gathering place and generative apparatus for Asthma Files researchers. In our work on Houston, for example, we learned about the pressing significance of legal jurisdiction and the way it splits across the city and surrounding municipalities—many of which are home to and politically captured by petrochemical plants. These petrochemical plants of course pollute and pose explosive risks across jurisdictional boundaries. Power-laden play across jurisdiction is thus key to Houston's environmental governance style. Learning about this in Houston prompted the creation of new structured analytic about the significance of jurisdiction to ask in other sites. This, in turn, prompted questions about the key organizations in environmental governance in different sites, adding to the "Analyzing an Organization" question set. What came to the fore in Houston moved analysis at other sites.

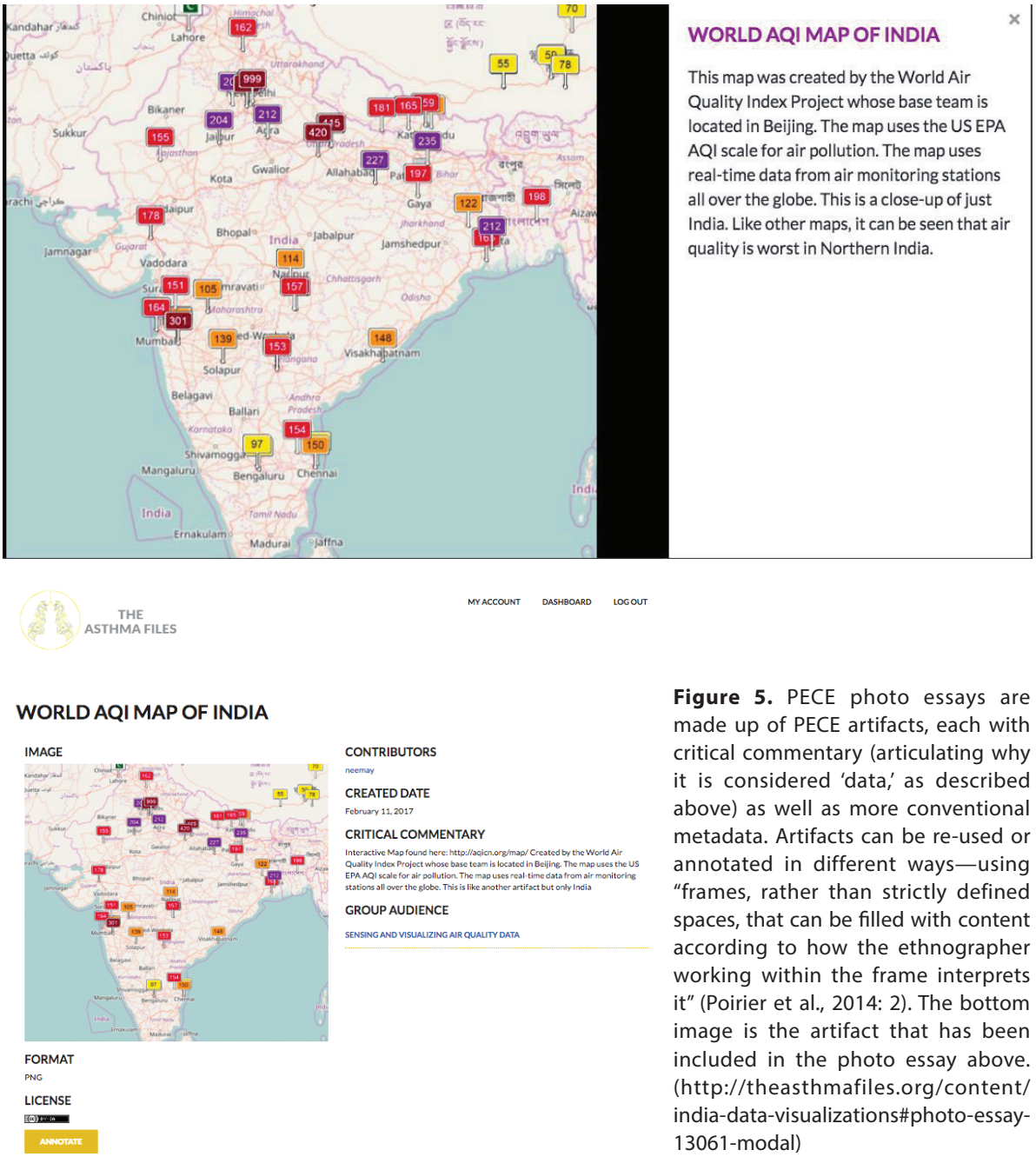

Figure 5. PECE photo essays are made up of PECE artifacts, each with critical commentary (articulating why it is considered 'data,' as described above) as well as more conventional metadata. Artifacts can be re-used or annotated in different ways—using "frames, rather than strictly defined spaces, that can be filled with content according to how the ethnographer working within the frame interprets it" (Poirier et al., 2014: 2). The bottom image is the artifact that has been included in the photo essay above. (http://theasthmafiles.org/content/india-data-visualizations#photo-essay-13061-modal)

Working on and through PECE has also keyed our attention to the ways data practices and infrastructure are part of environmental health governance. Across the cities we have studied, we have traced how people have created, accessed, and used air pollution data, debated its significance, and found ways to act on it. Collecting visualizations of air pollution has thus been an important part of our work, noting how the data was created, accessed, used, compared, acted on, and rendered into political claims. Some visualizations cast air pollution as leveling, impacting everyone; other visualizations draw out different impacts across neighborhoods, regions, and social groups. We pursue these differences in our effort to characterize distinctive styles of environmental health governance.

PECE's photo essay tool has helped keep up with and share these data visualizations. Researchers curate photo essays by pulling image artifacts from the platform, all with metadata, but add extended captions to contextualize and interpret each image (see Figure 2 for an example of captions). Readers of a photo essay can annotate it and the annotations are archived with the essay, or they can click through to the artifact itself and annotate it. In the essay in Figure 5, Prerna Srigyan compares visualizations of air pollution data in India produced by different organizations (the World Health Organization, Indian newspapers, etc.). Another photo essay by Srigyan is built around photographs she took at "Breathless," a popular 2019 gallery exhibition in Delhi.[14]

PECE's photo essays—and other genres, including a timeline and collage-like PECE essay—allow collaborating researchers to pull their data into forms that can be shared, analyzed and interpreted collectively and comparatively *early* in a research workflow, too. The data in these forms is neither raw nor cooked, so to speak, but 'lightly structured' (Poirier et al., 2014). Putting photo essays side by side, researchers from different universities, working on distinct projects can leverage contextual and visual details to suss out more general claims about environmental health governance. This work can also serve as a type of research protocol and analytic model for other researchers. The photo essays produced by researchers working in India, for example,

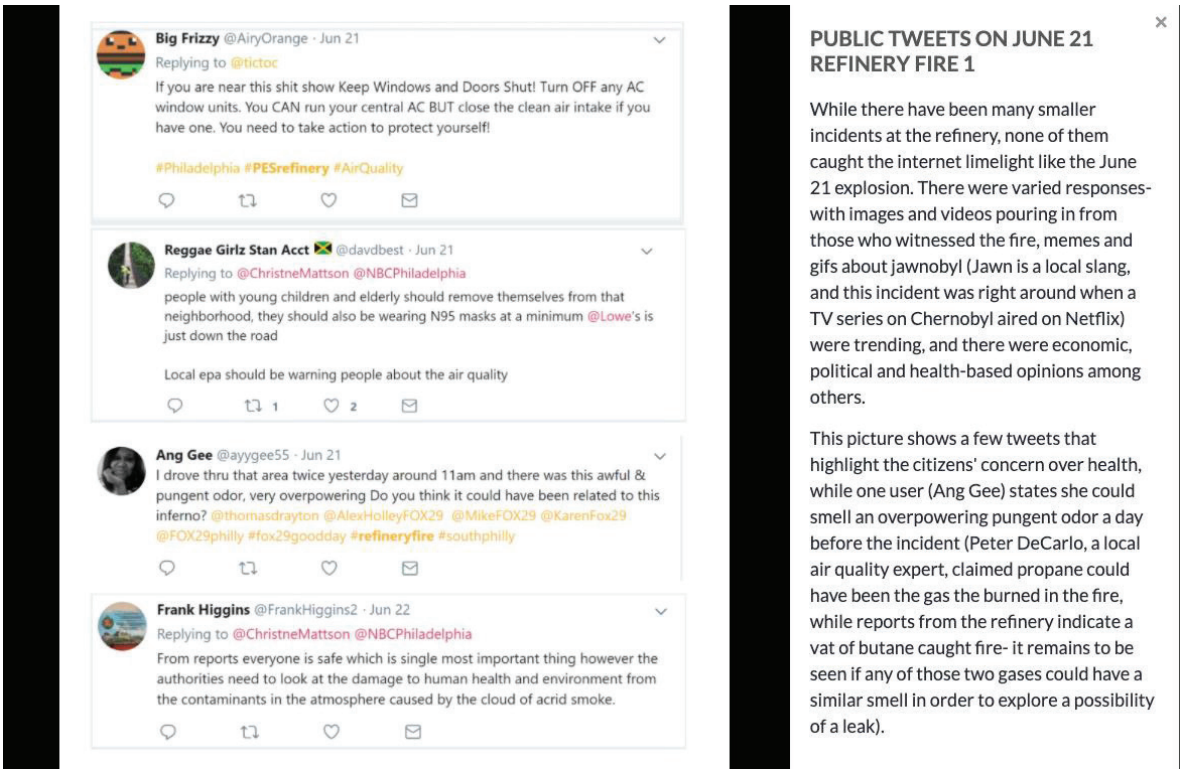

Figure 6. This slide from the photo essay "PES Refinery: Public Opinion on Tweets" shows Twitter users discussing how to stay protected from the unknown atmospheric harm. (https://theasthmafiles.org/content/pes-refinery-public-opinion-tweets#)

inspired the Philadelphia Six+ Cities team to attend to how various publics share experiences with air pollution when regulatory agencies are silent on the matter. The PECE photo essay became the model used to collect data and analyze public response to the 2019 Philadelphia Energy Solutions (PES) refinery explosion. Thinking with representations of air pollution in India using the photo essay in Figure 5, Philadelphia researcher Atharva Bhagwat looked to additional media outlets—Twitter and Facebook—to analyze public discourse around the explosion and its after-effects. Atharva collected dozens of tweets that documented different experiences with and perspectives on refinery air pollution, curating them as the event unfolded over several weeks in a photo essay modeled after the work of researchers working in India (Figure 6). The photo essay tool, in other words, provided a frame for researchers to quickly gather media responses, offer critical commentary, and share with the larger Six+ Cities research community.

PECE is designed to support this, helping move unstructured, largely inchoate data into spaces with just enough structure to be available to collaboration. The work done at this point in an ethnographic workflow is rarely conclusive; researchers constantly switch back to it, working simultaneously in a very empirically granular way and at many other scales.

Experimental expressions

The heart of The Asthma Files and the collaborations it supports is its continually growing, at this point overly unstructured, archive. This archive includes many kinds of data, from many stages of the research process, from many different projects. It feels excessive and beyond grasp—and this is its strength and promise. It is the surplus that makes experimental ethnography creative, interrupting obvious or habitual connections and continually offering unanticipated materials. It is not an economy of scarcity. Projects, interpretations, and arguments have to be drawn out, and can be evidenced in creative ways.

We are aware of the limits and often exclusionary politics of demands for evidence-based knowledge (Adams, 2016; Hodžić, 2013) while at the same time interested in how ethnographers can better show and share their data. The challenge is as much infrastructural as it is political or epistemological. To make a long discussion too brief: valuable projects like the Qualitative Data Repository support data sharing for the qualitative social sciences, but by design their infrastructure is purposed towards reproducibility, or the validation of existing hypotheses or knowledge.[15] PECE is designed to privilege the iteration of questions and knowledge, sharing data so that they are open to collective re-evaluation and reinterpretation. The data and analytic structures described above support this desire for iteration through collaborative analysis that runs by switchbacks and encourages doubletakes.

In experimental ethnography, objects of study and concern are not known in advance; they have to emerge through the research process through constant traffic between figure and ground (Fortun, 2015)—and then re-emerge again. The process is question driven, not hypothesis driven; it creates many partial knowledges and keeps them all in play; it is densely empirical but also discursive. We have called this the 'depositivist style'—a mode of research and style of thinking marked by the trace of scientific positivism but destabilized by the play of deconstruction (Fortun et al., 2021). It is a research style that privileges the depositing of data exceeding, in quantity and interpretability, what any one researcher or even collaboration needs or knows what to do with; it depends on infrastructure that endures, while ensuring openness to analytic switchbacks and interpretive doubletakes, movement and changeability.

Digital forms thus add considerably to the expression of ethnographic knowledge—saying much more than can be said on a printed page and depositing new materials to allow others to say even more. The Asthma Files and other PECE platforms and projects experiment with what this can look like, leveraging PECE functionalities. Text artifacts, photo essays, timelines, and PECE essays can be well used within a research process—to bring things together for collective consideration. They can also be considered finished products—publications in themselves (see Figure 7). We are currently extending PECE infrastructure to formalize their peer review, offer standardized

citations, and assign persistent identifiers (like Digital Object Identifiers (DOIs)) that will make them visible in the same register as academic journal articles.

The point is not to work around but to weave in and out of established modes of academic publishing. Digital forms open up new publication possibilities. Digitally infrastructured ethnography creates rich archives of shared source material from which interpretations and arguments can be built, evidenced, re-analyzed, and pushed further in multiple directions. Established forms of STS publication—the journal article, especially—can link to these archives, further substantiating the claims made in them. Equally important, however, is the way links to source material opens pathways for reuse and re-interpretation of materials in later projects, carried out by researchers in varied settings today and into the future. PECE sets up *future* collaboration.

Linking to source material in STS journal articles can help unsettle uneven access to and control over research data among scholars. The advantages of linking STS publications to source material are thus multiple: it would enable STS as a field to better *advance* knowledge, literally building on and extending the claims of prior publications. It also would create a research commons supporting a more diverse STS community. Perhaps most importantly, sharing and linking to source materials would upset the propertied figuration of the proper academic subject—the way academic authors are themselves cast as colonial figures: as masters of bodies of knowledge, as owners of their data, as entitled to hand over their (usually publicly funded) publications to commercial publishers, who put them behind a paywall.[16] Academic publication thus becomes a radicalizing rather than reproductive move.

Figure 7. A PECE essay has a shadow box-like structure, inspired by the art of Joseph Cornell. In each of any number of boxes within the essay, a creator can embed original text, found documents (as pdfs), audio and video recordings, and still images (displayed individually or in a photo essay). Creators can also embed another PECE essay within a PECE essay, rather like nesting dolls.__(http://theasthmafiles.org/content/hygiene-hypotheses-and-toll-receptors)

Conclusion: Designing for ethnographic differences

In *After Method,* John Law (2004) argued that conventional research methods can only ever partially account for the messy social realities that they seek to describe. Research methods, Law suggests, are also *performative*: they not only capture but also *produce* their realities. Methods, therefore, are never innocent, and necessarily generate

"truths and non-truths, realities and non-realities, presences and absences, but also arrangements with political implications" (Law, 2004: 143). For Law, such "ontological methodology" points to the insufficiency of extant social science research methods to account for the worlds we inhabit, and instead calls for "broader, looser, more generous [ways of thinking about methods]" in which multiplicities of truths, goods, and the worlds that they summon can be enabled (Law, 2004: 143).

As we have described here, we recognize the specificity of the intellectual lineage in which we work as STS ethnographers. In building infrastructure to support our collaborations and their inherent multiplicities, we had to express this specificity in technical terms. Tacit knowledge had to be rendered overt in both language and code. We have had to figure out collaborative workflows and infrastructure that would repeatedly unsettle ethnographic projects, keeping them open ended. And we had to invest considerable resources of time and money through long periods in which these resources were scarcer than we would have liked.

A key insight from our work is that there are many modes of both ethnography and collaboration, and the design of their supporting infrastructure matters. In some lineages of ethnography, often more sociological than anthropological, the challenge of collaboration is conceived in terms of stabilization and alignment: delimiting research domains, agreeing on problem characterization, developing shared vocabularies, building "shared data collection protocols" that "can and should yield data that are directly comparable" (Wutich and Brewis, 2019: 184), eventually arriving together "to produce an agreed interpretation" (Cornish et al., 2013: 79). These approaches often use computer assisted qualitative data analysis software (CAQDAS) like MaxQDA or Atlas.ti to meet these particular collaborative and infrastructural challenges.

Our approach and its challenges have been different, extending from a lineage of ethnography that encourages changes in ethnographic focus over time, responsive to continual re-readings of the discursive fields in which ethnography is carried out. Ethnography, in this vein, keeps beginning anew as it moves, its focus and questions continually shift in response to changing readings of context; by design, it generates a surplus of both data and project possibilities (Marcus, 2013). Challenging enough when done alone (because of pressures to advance through degree programs, obtain funding, publish in indexed journals, and so on); it is even more challenging when done collaboratively: the 'mess' of methods in social science research, as described by John Law (2004), becomes a technical problem. Collaborating researchers need ways to express, archive, share, and push many moments of analysis and interpretation, moving with their projects, chasing an expansive holism and semiotic density rather than settlement and focus.

A signature aspect of the experimental ethnographic lineage in which we work, we have learned, is that it *moves:* research questions, methods, and what is seen as relevant data changes as a project develops; what a collaboration learns continually redirects and recalibrates its projects. This is quite different in theory, practice, and comportment from many other fields and traditions of ethnography, where 'staying focused' and true to original research questions and protocols is a key criterion of the good researcher and research project. It takes a different kind of sensibility, different infrastructure, and different ways of writing about one's methodology to work ethnographically in an experimental vein.

The Asthma Files and associated collaborative projects have not been without social friction. But they have attracted people ready to be generous with their time and imagination, interested in both the critical promise of collaborative knowledge production and the making of a vital, inclusive, world-reordering ethnographic research commons. We both appreciate and worry about this. The Asthma Files has been largely self-organizing—growing informally with few formal MoUs or other overt collaboration agreements. We both cherish this, and know it veers toward the naïve and is not sustainable. We also know that the dominant order does not organically produce good collaborators. So, we are working harder to establish nomenclature around roles and workflows, writing short statements of 'collaboration ethics' on each instance of PECE,

and asking people to sign brief 'collaboration agreements' when joining a project. Such organizational design is a switchback of our own, adding more social structures and protocols to the infrastructure we have worked to keep open, requiring researchers to locate themselves in relation to others and other projects in our community.

But much more remains to be done. Some of the work is technical: making sure people understand the logic and rules of creative commons licenses, for example, and the ways the permissions structures in PECE allow users to create restricted spaces for a very delimited set of collaborators. Other aspects of PECE education are more overtly ethical, political, and cultural, calling people into concern about open access to scholarly publications, the promise of open data and collaborative knowledge production, and new kinds of research relations across generation and geography. Our workflows are thus rife with switchbacks and doubletakes. Switchbacks allow researchers to move between data, analysis, and expression iteratively. Doubletakes keep all in question. Experimental ethnographic workflows are indeed 'messy,' and even more so when collaborative—but they can be infrastructured. The work is both laborious and creative, conceptual and technical, affective and (we hope) effective, building capacity for addressing the many complex challenges that confront us today.

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References

Adams V (2016) Metrics of the Global Sovereign: Numbers and Stories in Global Health. In: Adams V (ed) *Metrics: What Counts in Global Health*. Durham, NC: Duke University Press, pp. 19–54. Available at: https://read.dukeupress.edu/books/book/78/chapter/100626/Metrics-of-the-Global-SovereignNumbers-and-Stories (accessed 15 March 2021).

Adorno TW, Hullot-Kentor B and Will F (1984) The Essay as Form. *New German Critique* (32): 151–171. DOI: 10.2307/488160.

Bateson G (1936) *Naven: A Survey of the Problems Suggested by a Composite Picture of the Culture of a New Guinea Tribe Drawn from Three Points of View*. Cambridge, UK: Cambridge University Press.

Bateson G (1972) *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. Chicago, IL: University of Chicago Press.

Benjamin W (1968) *Illuminations: Essays and Reflections*. New York: Schocken Books.

Bhabha HK (1994) *The Location of Culture*. New York, NY: Routledge.

Boyer D and Marcus GE (2021) *Collaborative Anthropology Today: A Collection of Exceptions*. Ithaca, NY: Cornell University Press.

Clifford J and Marcus GE (1986) *Writing Culture: The Poetics and Politics of Ethnography*. Berkeley, CA: University of California Press.

Cornish F, Gillespie A and Zittoun T (2013) Collaborative Analysis of Qualitative Data. In: Flick U (ed) *The SAGE Handbook of Qualitative Data Analysis*. Los Angeles: SAGE, pp. 79–93.

Costelloe-Kuehn B (2012) *Environmental Media Systems: Innovations at the U.S. Environmental Protection Agency's National Exposure Research Laboratory*. Ph.D. Rensselaer Polytechnic Institute, Troy, NY, USA. Available at: http://search.proquest.com/docview/1222928604/abstract/AE2366C697BA4034PQ/1 (accessed 15 March 2021).

Daniel EV (1987) *Fluid Signs: Being a Person the Tamil Way*. Berkeley and Los Angeles: University of California Press.

Deleuze G (1990) *Logic of Sense*. New York, NY: Columbia University Press.

Derrida J (1978) *Writing and Difference*. Chicago, IL: University of Chicago Press.

Derrida J (1998) *Archive Fever: A Freudian Impression*. Chicago, IL: University of Chicago Press.

Dockery DW, Pope CA, Xu X, et al. (1993) An Association between Air Pollution and Mortality in Six U.S. Cities. *New England Journal of Medicine* 329(24): 1753–1759. DOI: 10.1056/NEJM199312093292401.

Ebron P (2001) Contingent Stories: Anthropology, Race, and Feminism. In: McClaurin I (ed) *Black Feminist Anthropology: Theory, Politics, Praxis, and Poetics*. New Brunswick, NJ: Rutgers University Press, pp. 211–232.

Estalella A and Criado TS (2018) *Experimental Collaborations: Ethnography Through Fieldwork Devices*. New York, NY: Berghahn Books.

Fischer MMJ (2007) Four Genealogies for a Recombinant Anthropology of Science and Technology. *Cultural Anthropology* 22(4): 539–615.

Fleck L (1979) *Genesis and Development of a Scientific Fact* (eds TJ Trenn and RK Merton). Chicago, IL: University of Chicago Press.

Fortun K (2003) Ethnography In/Of/As Open Systems. *Reviews in Anthropology* 32(2): 171–190. DOI: 10.1080/00988150390197695.

Fortun K (2009) Figuring Out Ethnography. In: Faubian JD and Marcus GE (eds) *Fieldwork Is Not What It Used to Be: Learning Anthropology's Method in a Time of Transition*. Ithaca, NY: Cornell University Press, pp. 167–183.

Fortun K (2015) Figuring Out Theory: Ethnographic Sketches. In: Boyer D, Faubian JD and Marcuse GE (eds) *Theory Can Be More Than It Used to Be: Learning Anthropology's Method in a Time of Transition*. Ithaca, NY: Cornell University Press, pp. 147–168.

Fortun K and Fortun M (2005) Scientific Imaginaries and Ethical Plateaus in Contemporary U.S. Toxicology. *American Anthropologist* 107(1): 43–54.

Fortun M, Fortun K and Marcus GE (2017) Computers in/and Anthropology. In: Hjorth L, Horst H, Galloway A, et al. (eds) *The Routledge Companion to Digital Ethnography*. New York and London: Taylor & Francis, pp. 11–20.

Fortun M, Poirier L, Morgan A, et al. (2021) What's so Funny 'bout PECE, TAF, and Data Sharing? In: Boyer D and Marcus G (eds) *Collaborative Anthropology Today: A Collection of Exceptions*. Ithaca, NY: Cornell University Press, pp. 115-139.

Gaudillière J-P (2004) Genesis and Development of a Biomedical Object: Styles of Thought, Styles of Work and the History of the Sex Steroids. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* 35(3): 525–543. DOI: 10.1016/j.shpsc.2004.06.003.

Geertz C (1973) *The Interpretation of Cultures*. New York, NY: Basic Books.

Haraway D (1988) Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14(3): 575–599. DOI: 10.2307/3178066.

Harding SG (1986) *The Science Question in Feminism*. Ithaca, NY: Cornell University Press.

Harpring P (2017) Introduction to Metadata: Crosswalk (Getty Research Institute). Available at: https://www.getty.edu/research/publications/electronic_publications/intrometadata/crosswalks.html (accessed 15 March 2021).

Hodžić S (2013) Ascertaining Deadly Harms: Aesthetics and Politics of Global Evidence. *Cultural Anthropology* 28(1): 86–109. DOI: https://doi.org/10.1111/j.1548-1360.2012.01174.x.

Hunter DJ (2005) Gene–Environment Interactions in Human Diseases. *Nature Reviews Genetics* 6: 287–298.

Hurston ZN (1935) *Mules and Men*. Philadelphia, PA: Lippincott.

Keller EF (1992) *Secrets of Life, Secrets of Death: Essays on Science and Culture*. New York, NY: Routledge.

Keller EF (2002) *Making Sense of Life: Explaining Biological Development with Models, Metaphors, and Machines*. Cambridge, MA: Harvard University Press.

Kenner A (2012) *Breathtaking: Contemporary Figures of U.S. Asthma Care*. Ph.D. Rensselaer Polytechnic Institute, Troy, NY, USA. Available at: http://search.proquest.com/docview/921504852/abstract/EAA20A974E2C4C66PQ/1 (accessed 15 March 2021).

Kenner A (2018) *Breathtaking: Asthma Care in a Time of Climate Change*. Minneapolis, MN: University of Minnesota Press.

Kondo DK (1990) *Crafting Selves: Power, Gender, and Discourses of Identity in a Japanese Workplace*. Chicago. IL: University of Chicago Press.

Lamphere L (2004) Unofficial Histories: A Vision of Anthropology from the Margins. *American Anthropologist* 106(1): 126–139.

Law J (2004) *After Method: Mess in Social Science Research*. New York, NY: Routledge.

Lippert I and Douglas-Jones R (2019) "Doing Data": Methodography in and of STS. *EASST Review* 38(1). Available at: https://easst.net/article/doing-data-methodography-in-and-of-sts/ (accessed 15 March 2021).

Marcus GE (2013) Experimental Forms for the Expression of Norms in the Ethnography of the Contemporary. *HAU: Journal of Ethnographic Theory* 3(2): 197–217. DOI: 10.14318/hau3.2.011.

Marcus GE and Fischer MMJ (1986) *Anthropology as Cultural Critique: An Experimental Moment in the Human Sciences*. Chicago, IL: University of Chicago Press.

Martin E (1998) Anthropology and the Cultural Study of Science. *Science, Technology, & Human Values* 23(1): 24–44. DOI: 10.1177/016224399802300102.

Mead M (1928) *Coming of Age in Samoa: A Psychological Study of Primitive Youth for Western Civilisation*. William Morrow and Company.

Meadows D (1999) Leverage Points: Places to Intervene in a System. *The Sustainability Institute*. Available at: http://donellameadows.org/wp-content/userfiles/Leverage_Points.pdf (accessed 15 March 2021).

Miller E and Gibson-Graham JK (2019) Thinking with Interdependence: From Economy/Environment to Ecological Livelihoods. In: Bennett J and Zournazi M (eds) *Thinking in the World: A Reader*. London and New York: Bloomsbury Publishing, pp. 313–340.

Mol A (2002) *The Body Multiple: Ontology in Medical Practice*. Durham, NC: Duke University Press.

Nader L (1990) *Harmony Ideology: Justice and Control in a Zapotec Mountain Village*. Stanford, CA: Stanford University Press.

Nixon R (2011) *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press.

Poirier L and Costelloe-Kuehn B (2019) Data Sharing at Scale: A Heuristic for Affirming Data Cultures. *Data Science Journal* 18(1): 48. DOI: 10.5334/dsj-2019-048.

Poirier L, DiFranzo D and Gloria M (2014) Light Structures in the Platform for Experimental Collaborative Ethnography. In: *Websci '14*, Bloomington, IN, 2014. Available at: http://tw.rpi.edu/media/latest/Light-Structure_WebSci2014_Poirier.pdf (accessed 15 March 2021).

Research Data Alliance (2016) About RDA. Available at: https://www.rd-alliance.org/about-rda (accessed 15 March 2021).

Rheinberger H-J (1997) *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*. Palo Alto, CA: Stanford University Press.

Rodriguez Medina L (2018) *On the Internationalization of the Social Sciences: A View from the South.* School of Education, University of California Los Angeles, USA.

Saheb T (2015) *Air Pollution Governance in Iran: Inhibiting Factors*. Ph.D. Rensselaer Polytechnic Institute, Troy, NY, USA. Available at: http://search.proquest.com/docview/1728799376/abstract/CAB1311AAA8F448BPQ/1 (accessed 15 March 2021).

Spivak GC (1987) *In Other Worlds: Essays in Cultural Politics*. New York, NY: Routledge.

Spivak GC (2012) *An Aesthetic Education in the Era of Globalization*. Cambridge, MA: Harvard University Press.

Strathern M (2004) *Commons and Borderlands: Working Papers on Interdisciplinarity, Accountability and the Flow of Knowledge*. Wantage, Oxfordshire: Sean Kingston Publishing.

Traweek S (1988) *Beamtimes and Lifetimes: The World of High Energy Physicists*. Cambridge, MA: Harvard University Press.

Wutich A and Brewis A (2019) Data Collection in Cross-Cultural Ethnographic Research. *Field Methods* 31(2): 181–189. DOI: 10.1177/1525822X19837397.

Notes

1 Fortun et al. (2017) describe how PECE extends a long history of computers in anthropology.

2 Scholars' 'articulations' typically evokes the expressions at the end of the research process (i.e. books, articles, conference talks, etc.). We attend to articulations throughout the full spectrum of research phases that loop, iterate, and feedback on themselves.

3 Some of the socio-political effects of our own choices about how we produce knowledge include: expanding how researchers are credited for myriad (often gendered and racialized) forms of academic labor, reevaluating the basis of ethnographic authority, contributing to broader calls for celebrating (and not just 'tolerating') difference, diversity, and otherness, and opening more spaces for a 'politics of friendship' with more-than-STS researchers and colleagues.

4 The chart of gene-environment interactions from this article became an early reference in The Asthma Files, pointing to the discursive risks in accounting for 'the environment' in gene-environment interaction research, and their connections to technologies of measurement: ultraviolet light, HIV, beryllium, and asthma drugs were the other 'environmental' factors listed, entities which in 2005 could be fairly straightforwardly detected and quantified.

5 In her 'leverage points' article, a classic in the literature on 'systems thinking,' Donella Meadows' initial on-the-fly ranked list of the most effective "places to intervene in a system" is topped by "the mindset or paradigm out of which the system arises." In a later iteration, she concludes that even more powerful than changing a paradigm is developing the capacity to "keep oneself unattached in the arena of paradigms, to stay flexible… to 'get' at a gut level the paradigm that there are paradigms, and to see that itself is a paradigm, and to regard that whole realization as devastatingly funny" (Meadows, 1999:19). This is easier said than done, but we would argue that creatively designed infrastructure populated by diverse researchers (with good senses of humor) certainly can make it easier.

6 We often hear colleagues voice concerns that new student researchers are not yet ready or expert enough to contribute to collaborative knowledge production. We have turned their difference of perspective into an advantage, seeing it as yet another way to multiply perspective on what concerns us.

7 For a recent account of issues in Kingston, see https://www.theguardian.com/us-news/2020/aug/17/coal-spill-workers-sick-dying-tva. For details on the transfer of the toxic ash to Alabama, see https://earthjustice.org/features/campaigns/photos-a-toxic-inheritance.

8 https://pece-project.github.io/drupal-pece/.

9 See https://rd-alliance.org/groups/digital-practices-history-and-ethnography-ig.html.

10 Lindsay Poirier and Brandon Costelloe-Kuehn describe how this tangle of scales and systems can inform analytical approaches, specifically in the context of understanding data cultures and the socio-technical challenges to data sharing (2019).

11 PECE Design Logics articulate the epistemic, theoretical and ethical commitments that have shaped the design of PECE. These Design Logics are packaged within the Drupal distribution that a user downloads from GitHub to install their own instance of PECE—encouraging recognition of PECE as far from value neutral.

12 "CNG Dilemma in Delhi," data artifact contributed by Prerna Srigyan, 15 September 2020, Six+ Cities Research Project, The Asthma Files. https://theasthmafiles.org/content/cng-dilemma-delhi.

13 These analytic structures provide something akin to the 'cross-walks' librarians and archivists use to link different collections and projects (Harpring, 2017). In PECE, these linkages are more discursive than a strict translation.

14 https://theasthmafiles.org/content/breathless-snapshots.

15 As the QDR portal puts it, "increased openness facilitates the replication, reproduction, and assessment of empirically based qualitative analysis." https://qdr.syr.edu/about.

16 It might seem that this call for creating and maintaining a 'research commons' is in opposition to the 'enclosure' of data and knowledge. Instead, playing at the limit of the commons/enclosure binary, we would ask: what kinds of boundaries and enclosures can support a thriving commons? As Ethan Miller and J.K. Gibson Graham put it:

> while some enclosures disrupt and destroy commons… others actually constitute them. A community says: 'the water is ours, we share it. It cannot be privatized!' This is a boundary-drawing. The ethico-political question must, then, shift from its commonly-articulated form as 'commons vs. enclosure' to: what enclosure, for whom, for what purpose, and to what effect?... If commoning is a making-explicit of the negotiations of the common, then uncommoning is an anesthetization of the common, and ethical closure, or a rendering-non-negotiable of habitat relations (Miller and Graham, 2019: 327).

Imagining Citizens as More than Data Subjects: A Methodography of a Collaborative Design Workshop on Co-producing Official Statistics

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Abstract

The article presents a methodography of a collaborative design workshop conducted with national and international statisticians. The workshop was part of an ethnographic research project on innovation in European official statistics. It aimed to bring academic researchers and statisticians together to collaborate on the design of app prototypes that imagine citizens as co-producers of official statistics rather than only data subjects. However, the objective was not to settle on an end product but to see if relations to citizens could be re-imagined. Through a methodography composed of two ethnographic narratives, we analyse whether and how a collaborative design workshop brought about imaginings of citizens as co-producers. To retrospectively analyse the workshop, we draw on feminist and material-semiotic takes on 'friction' as characteristic of collaboration. 'Friction', we suggest, can enlarge the repertoire of collaborative speculative practice beyond notions of rupture or consensus. Finally, we suggest that this analysis demonstrates the potential of methodography for opening up and reflecting on method in STS through eliciting the possibilities of collaboration.

Keywords: co-production; ethnography; methodography; citizen data; official statistics; big data

Introduction

The collaborative design workshop central to this article followed over three years of work on a project broadly concerned with the practical and political implications of new digital technologies and big data sources for official population statistics. As part of a team of six researchers, we ethnographically followed the data practices of EU national and international statisticians as they experimented with new digital technologies and big data sources, such as sensors, smartphones, search engines and social media.[1] During our fieldwork, we became interested in how we might envision different futures for official statistics in a collaborative workshop with statisticians. This interest arose as a result of our critiques of National Statistical Institute (NSI) experiments with digital technologies and big data that imagine people as data subjects rather than as data

citizens who are active participants in the making of data and statistics (we elaborate the meaning of this below).

In this article we retrospectively examine this collaborative workshop. The workshop was attended by academic researchers from different backgrounds, statisticians, and designers. We are particularly interested in the workshop as a method for imagining together. Imaginings are partly the outcomes of the methods we employ (in this case a workshop). Consequently, how a workshop is conceptualised, who participates and how it is practically set up to facilitate collaboration can make a difference for the futures we envision. So how did this collaboration work in practice? This is the question we attend to below by investigating whether and how the collaborative design workshop could bring about imaginings of citizens as co-producers of official statistics.

Our retrospective examination draws from a type of study that Christian Greiffenhagen, Michael Mair and Wes Sharrock refer to as a 'methodography': an "empirical study of research methods in practice" (Greiffenhagen et al., 2011: 94). The concern of methodographies, the authors propose, is to ethnographically study social scientists in their working environments in the same ways as scientists from other disciplines have been studied in laboratories and other sites of scientific and technical practice. This is relevant for addressing how methods are enacted in social science research, and the politics around such enactments. For instance, Greiffenhagen et al. compared the everyday work of qualitative and quantitative social science research groups to demonstrate the shared modes of reasoning that bind rather than divide these research approaches. Their study thus makes an intervention in a social science field that is largely structured around the qualitative-quantitative divide. We take up the concept along these lines: methodography can be considered as part of a large body of concepts and methods to study science in practice. For us, the significance of the concept is not to set it apart as a distinct practice. Nor do we consider it as a programme to evaluate social science research. Rather, we interpret it as a sensibility to engage with social science research in a descriptive and analytical mode and a concern for method development.

In the context of this special issue on ethnographic data generation in STS collaborations (Lippert and Mewes, 2021), we mobilise the concept of methodography to investigate in some detail the operation of a particular kind of collaboration: collaboration in speculative research. In speculative research the aim is to imagine and speculate on possible futures beyond "the impasse of the present" (Stengers, 2010; Wilkie et al., 2017: 2). For social science methods this means applying modes of thought and research techniques that attempt to take part in constituting ideas and practices about the "yet-to-come", not by orienting to the present, but by taking new possibilities seriously (Wilkie et al., 2017: 4). The workshop we describe in this article is of interest to this type of research because of its intention to imagine different futures for official statistics through a practical and material engagement with design. It was structured around prototyping a "citizen data app" that would enable citizens to actively participate in the generation and analysis of statistical data. However, the workshop was not set up to produce a ready-made app, but to collaboratively speculate on the state-citizen relations that technologies can mediate.

Based on the two ethnographic narratives that make up our methodography, we conclude that the workshop brought about imaginings about citizens as co-producers of official statistics by way of 'friction'. Drawing on the work of Marisol de la Cadena, Anna Tsing, Helen Verran and others we develop a relational notion of friction to highlight that it is through the formation of 'partial connections' between imaginings of different participants that new ideas about the future can emerge (Strathern, 2005). This analysis contributes an additional vocabulary to "a catalogue of speculative practice" (Guggenheim et al., 2017: 148). While "rupture" is often used as an analytic for understanding speculative research, it does not cover the dynamics that occur in speculative methods with a collaborative dimension. Yet consensus or sameness, concepts that are often used to characterise successful collaboration, also do not apply to the events in the workshop (cf. Mouffe, 2009). "Friction" may therefore be helpful for reflecting on and developing speculative methods.

The first part of the paper details the background to the conception and execution of the workshop. It demonstrates how the concepts of collaboration, experimentalism and design helped to frame the workshop. It furthermore defines the notion of citizen co-production that we made central to re-imagining citizens as co-producers of statistical data. This section should therefore not be read as a theory section underlying our analysis of the workshop but as the background to the method we developed (the workshop). We elaborate on this, firstly, because it supports the analysis of the workshop-in-practice. Second, it can be informative for readers interested in working and experimenting at the intersections of data and citizenship.

Next, we elaborate on how we conducted our methodography and how we inductively developed our notion of friction as part of this collaborative and speculative practice. While most of the paper is dedicated to this methodography, in the conclusion we reflect on one possible role of methodography in STS. In our case, we suggest that conducting a methodography helped to retrospectively explore difference, not by erasing it, but by opening up stories of discordance and apparent miscommunication and learning to understand them as frictions (De la Cadena, 2015; Viveiros de Castro, 2004). Through this process of retrospection, opening up, and creating narratives, methodographies can support method development in STS and help researchers reflect on their position in a collaboration. In our case, this position concerned how to work with inevitable differences in worldviews and interests concerning the role of citizens in official statistics.

Conceptualising and organising the workshop

A workshop on designing a citizen data app

As noted in the introduction, the idea for the workshop followed from critiques we developed during our ethnography of the production of official statistics regarding assumptions about the subjects of statistical methods.[2] One critique we developed concerned how statisticians focus on securing privacy, confidentiality and data protection rights in ways that position citizens as passive respondents or data subjects who need protection, or whose impressions and confidence need to be managed. A related critique was what we identified as a growing gap between citizens' actions that are part of the production of big data, the interpretation of that data for statistics, and citizens' roles in the production of and then identification with the results (cf. Ruppert et al., 2018). This issue is especially applicable to data generated by people's actions, interactions and transactions on digital platforms. Unlike long established methods of data collection such as surveys and questionnaires, methods of repurposing data generated by social media, mobile phones and browsers constitute various forms of increasing detachment: between citizens and states; and between citizens' actions, identifications and experiences and how they are categorised, included and excluded in statistics.

In developing the workshop, one objective was to attempt to move beyond the tradition of critique; i.e. opening up the 'black boxes' of situated practices to account for the techniques, materials and actors that make statistics by revealing their values, normativities and politics. Our intention was not only to make statistics a subject of critique but to think speculatively on what statistics might be. In particular, we wanted to think with others about the roles and interests of citizens in the production of data for official statistics, including those whose interests are usually not made present (Latour, 2004; Puig de la Bellacasa, 2017; Wilkie et al., 2017). To reposition our relation to our object of research (the making of data for official statistics) and our research subjects (statisticians), we began to think about how we might 'stage' an encounter between their experiments and our critiques. In other words, how might we devise a situation that could be productive of different ways of conceiving of the role of citizens that neither we as academic researchers nor they as statisticians alone could have imagined?

The method we settled on was an exploration of citizen involvement in official statistics through the design of a thing we named a citizen data app. While naming it as such we left its meaning open to the design process, which involved a series of workshop activities co-developed and assisted

by a non-profit organisation specialised in social innovation, which we will refer to as Inov. In brief, we divided participants into four break-out groups of about six people assigned with the task to develop a prototype for a citizen data app by following a series of exercises. The first activity sought to take participants out of their "comfort zones" by considering themselves as citizens in relation to data that is collected daily about them; in this way, conceptions of citizen rights in relation to data were made reflexively and experimentally present. Following this, groups were asked to define a set of design principles (e.g. inclusivity), then design a prototype based on these and finally develop a roadmap for implementation.

Collaboration, experimentalism and design

Our approach, which we communicated to our workshop participants through background documents and a working paper, was based on three concepts: collaboration, experimentalism and design. Together, these related concepts helped to develop the rationale for a design workshop based on established STS concepts that could be effectively communicated to professionals from other fields of practice (cf. Ruppert et al., 2018). We discuss them here to offer an insight into how the collaboration was conceived.

First, we drew on approaches at the "interfaces" between anthropology and STS (De la Cadena et al., 2015) to develop a form of collaboration. Collaboration with professionals from other fields has been conceived by some as intrinsic to ethnographies of science and applied research (e.g., research in the natural sciences, statistics, or policy research) because conducting such studies can imply working with research subjects who are equally interested in, and capable of, reflecting on their field (Fischer, 2009; Savage, 2010). In addition, field access increasingly relies on collaboration, and many funders now include collaboration with third parties as a requirement. On the one hand, this has led to concerns about the capacity of researchers to produce insights on their own terms, and for their own disciplines (Faubion and Marcus, 2009). On the other hand, it has resulted in inventive ethnographic repertoires, for instance, the uptake of collaboration as epistemic partnerships with research subjects (Deeb and Marcus, 2011: 51; Estalella and Sánchez Criado, 2018).

The notion of collaboration underlying this workshop was particularly concerned with the generative potential of collaboration that follows from Anthony Stavrianakis' (2015) observation that a "collaboration is one in which two kinds of participants, in their engagement, are able to name a problem or do a practice that in their position as participants (prior to engagement) they would not have been able to do" (Stavrianakis, 2015: 171; cf. Rabinow and Bennet, 2012). For us, collaboration meant reformulating settled problem definitions and reflexively engaging in the ongoing co-production of worlds (Waterton and Tsouvalis, 2015). As Michel Callon et al. phrase it, "through trial and error and progressive reconfiguration of problems and identities" such forums are "not only reacting but reconstructing" (Callon et al., 2011: 35; Latour, 2006).

We referred to the workshop not as an event to produce a ready-made app, but as an opportunity to imagine and try out different futures. It was in this sense that we referred to the workshop as an experiment, our second core concept. We drew on the concept of experimentalism as a method and mode of opening up STS research to a wider range of participants (in this case primarily statisticians) (Lezaun et al., 2017). This is not new; various strands of social science have operated with degrees of experimentalism to this end (Gross and Krohn, 2005; Guggenheim, 2012). One reason to adopt experimentalism is to achieve a degree of democratisation by broadening scientific and technical debates and processes (or rather: transform technical issues into public issues, and generate publics (Marres, 2012)). The second, which is the reasoning we drew on, is to develop and explore new problem formulations, transcend ingrained styles of reasoning, disrupt existing hierarchies and critically examine how objects of study come into being and what they exclude (Rabinow and Bennett, 2012; Ruppert et al., 2015). In this model of a "collaboratory" participants from different expert backgrounds engage in "concept work" through the common exploration of an issue.

We also proposed 'experimentalism' as a work mode to the workshop participants. Rather than

the controlled and scripted procedures of a closed laboratory, we conceived the workshop as an exploratory, trial-and-error format that would accept uncertainty about the outcomes and stay clear from a language of absolute success or failure. Our general intention was to remain open to surprises, whether positive or negative, and enable subjects of our research (i.e., statisticians) to answer back and challenge our framings, interpretations and assumptions. At the same time, we proposed that our experimentation be 'care-full' (Grommé, 2015; Puig de la Bellacasa, 2017), not in terms of strict protocols, but in terms of care and caution as part of risk-taking (Latour, 2006). Ideally, this would involve monitoring and documenting who and what are (unavoidably) in – and excluded; avoiding ambiguity about our terms of evaluation (when do we think something is 'good enough'?); avoiding attributing failure solely to perceived local circumstances; avoiding separating normative elements from scientific fact (Latour, 2006); and producing adequate documentation.

Finally, the third concept we adopted is that of design, by which we mean, paraphrasing Ton Otto and Rachel Charlotte Smith (2013), a process of thought and planning that gives structure to an idea. Designing is a mode of working that is future oriented, aims at intervention, and often involves collaboration (Otto and Smith, 2013). Prototyping, the materialisation of an idea through drawing, making mock-ups, building test sites and more, has become a mode of working at the interface of design, STS and anthropology. Making and testing prototypes helps to attend to the socio-material realignments, and new realities and relationships that can unfold around a new plan or artefact. Our uptake of design practice drew on Binder et al.'s notion of 'thinging'; a form of prototyping that explicitly distances itself from design processes that focus on an end product in ways that obscure how entangled humans and artefacts shape our modes of living (Binder et al., 2015: 154).[3] Instead, thinging is a form of collaboration that aspires to exploring matters of democracy and power. In the words of Janet Vertesi et al., designing together would help to suggest "alternative visions and distributions of power and agency" (Vertesi et al., 2017: 177). Ideally, such issues can be made "experimentally available to such an extent that 'the possible' becomes tangible, formable, and within reach" (Binder et al., 2015: 163; cf. Jungnickel, 2017).

In sum, we drew on the concepts of collaboration, experimentalism and design to conceive of the workshop, and communicate its background to the participants. A workshop involving the design of a thing was a way of exploring different futures together through creative practices. In the next section we will further elaborate on this speculative mode of working. However, we first briefly elaborate on the understanding of co-production that we proposed to the workshop participants.

Imagining citizens as co-producers of data

Building from our critique of the conception of data subjects, we took as a starting point how the dynamic, performative and interactive possibilities of digital technologies have the potential to imagine subjects as active agents in the production of data. How might digital technologies not only produce big data but also provide opportunities to forge new relations between researchers and the researched? Our proposition was that digital technologies make it possible to imagine subjects and their relations to the state in new ways. Rather than conceiving of digital technologies as only allowing for surveillance and control, as they are often talked about, we proposed exploring how they can also enable subjects to exercise rights to be active *co-producers* of data (Ruppert et al., 2019).

Our initial conception of co-production was informed by three understandings. First, we drew on citizen science and civic media initiatives where people are active in the making of different data to that generated by science or the state.[4] However, rather than considering citizens as only capable of generating parallel alternatives as conceived in some versions of citizen science, we considered co-production as a way to break from established approaches of official statistics and imagine a different future somewhere between citizen science and statistical science. Second, and drawing from critical citizenship studies, we understood that being a citizen means having the right to make claims and demands about how data are made about them and the societies

of which they are a part (Isin and Ruppert, 2020). Third, following how co-production is understood in STS, we considered co-production as not only a relation between human actors but also with materials, technologies, things, imaginaries, and conventions (Jasanoff, 2016).

Analysing the workshop: a methodography

Having outlined the background to the workshop, we return to the question we posed in the introduction: how did this collaborative design workshop bring about imaginings of citizens as co-producers? Answering this question, we hope, can contribute to speculative research in STS. Although many different interpretations of speculative research are possible, often it engages with employing inventive methodologies or concepts to conceive of futures that question or intervene with common conceptions of progress. In Isabelle Stengers' words, speculation is to stop carrying on "as if the future had to manage itself" (Stengers, 2018: 135), that is, to accept a notion of the future as path dependent. Obvious and relevant preoccupations of speculative research are social inequality and ecological disaster, but more variations exist. Examples are an experiment with narrating disasters and their responses in a sandbox, or the use of Twitter bots to provoke conversations about the future of energy usage (Guggenheim et al., 2017; Wilkie and Plummer-Fernandez, 2015). In our (rather modest and small-scale) uptake of a speculative sensibility, our preoccupation was the future of citizen participation in increasingly data-intensive modes of government.

One suggestion, often of a prescriptive nature, is that speculation should occur according to a logic of "rupture": through "eruptions of the possible" (Wilkie et al., 2017: 7). An underlying rationale is that without rupture, nothing new can occur: we would be talking about "business as usual" in which newly imagined futures would follow the "logics, rationalities and habits that govern the problematics of the present" (Wilkie et al., 2017: 1). Instead, we should take the impossible seriously and look for different temporalities of emergence. However, such calls have "been almost silent about how speculation works" in practice (Guggenheim et al., 2017: 148). In fact, calls for speculation often ignore that, in many settings, thinking and imagining is situated. In our case of collaboration, especially, it is relevant to understand how the involvement of "stakeholders" (in our case statisticians) affects how we conceive of the future. Even though a collaborative workshop may not be attuned to imagining the impossible, implausible, or unthinkable, it may invoke a different dynamic of speculation. Instead of presenting an unthinkable proposition, our proposition for citizen co-production in the field of official statistics, was recognisable for our collaborators because statistical agencies have historically engaged 'citizen scientists' as data collectors. However, involving citizens as active co-producers was certainly a more radical and unrealistic proposition for most participating statisticians.

We suggest that 'friction' is another dynamic through which speculative research can take place. In collaborative efforts to imagine different futures, it may be inevitable that different realities and constraints become part of thinking together (in the next section we will show how this happened for our workshop with regard to thinking outside existing practices of official statistics). In this sense, rupture as described above may not be attainable. We suggest that friction is another dynamic where the objects of collaboration between actors are not necessarily aligned but nevertheless generative (Tsing, 2004).

We came to this idea by an inductive, thematic analysis (Boyatzis, 1995) of our ethnographic notes of the workshop, through which confusion, friction and uneasiness emerged as relevant themes. For instance, characterizing our field notes were statements such as "it is not working", "we disagree", but also "the information is sinking in" and "we settle on". In short, retrospective analysis suggested a type of friction in terms of a "committed struggle". Because these are familiar themes of collaborative and experimental processes (De la Cadena, 2015; Gaspar, 2018; Guggenheim et al., 2017; Moats, 2021; Stavrianakis, 2015; Tsing, 2004), we continued our analysis by focusing on empirical moments where such frictions occurred. This methodography furthermore came about by moving back-and-forth between empirical moments of friction

in our data and concepts in the literature, and through narrating workshop events (cf. Jensen, 2021). It is through this narration that we came to develop a concept of friction that did not prefigure observation but emerged in relation to the practices we observed and how we came to write about them.

Below, we describe how we came to understand the different ways in which friction operated. Informing our understanding are material-semiotic and feminist STS-inspired accounts of collaboration, including Marisol de la Cadena's account of a collaborative book project with her Andean co-labourer Nazario, Helen Verran's work on collaboration between environmental scientists and Aborigine landowners in Australia and Anna Tsing's research about collaborations between activists, NGOs, corporations and governments. One important starting point that these accounts illuminate is that collaboration does not imply mutual understanding in terms of finding a middle way between divergent perspectives on the same future. Rather connections between different imaginings are always partial: they may be connected, but not added up or merged because they emerge from different relations between the actors and their imagined futures (Strathern, 2005).

By connecting with this work here we do not mean to argue that our case of a collaborative design workshop is directly comparable. De la Cadena's work, for instance, is about actors inhabiting very different worlds or "relational regimes" with the earth (De la Cadena, 2015: 213). However, while frictions may become "superobjectified in the extreme case of so-called interethnic or intercultural relations", they are also "conditions of every social relation" (Viveiros de Castro, 2004: 10). In this article, we further explore this possibility.

We present two ethnographic narratives of emerging imaginings, and how these were characterised by friction in different ways. Each of the narratives presents the observations, interests and lessons drawn by the individual authors, and we largely preserved the differences in style and analysis. At the same time, they are entangled because they follow ethnographic research conducted in a shared field, including several years of conversations leading up to this article (Scheel et al., 2019). Rather than collapsing the two ethnographies into one, we have chosen to present them individually to preserve the richness and integrity of our experiences of friction and the discordances underlying them. Smoothening out these narratives would essentially remove our sensibility to friction. In the following we start with a narrative about how 'feedback' emerged as one of the enactments of co-production during the workshop. This section develops and highlights friction as 'equivocation' (De la Cadena, 2015; Viveiros de Castro, 2004). Next, we narrate friction as a shared space of sameness and difference (Verran, 1998).

Friction as equivocation (Francisca)

After the participants had arrived at a bright workshop space in a South London library, the event started with several presentations and introductory exercises. Anyone who has ever attended design-inspired workshops will be familiar with their dynamics. We were expected to stay active, keep up the pace, to focus on potential rather than on barriers, to produce quick results, to share and design rather than to contemplate problems individually, to be "punchy" and to commit to our ideas.

Inov's guidance in this process proved effective in getting the break-out group I was part of to come up with and commit to a number of 'design principles' we would value in an app, for instance, protecting vulnerable citizens and experimentality. Yet, when it came to developing and agreeing on a "concept", we progressed slowly and laboriously. We referred to "the concept" as the central idea for the citizen data app, for instance, an app that collects data on consumer retail prices. The resulting concept would need to be visualised using materials such as a flip-over sheet with text fields, an outline of a phone screen and stickers representing different parts of an app interface.

> The group members floated various ideas, among which a budgeting app and a time-use app. However, in the words of the Inov moderators, no-one (including myself) was prepared to "take ownership". Practically, this not only meant to settle on an idea and assume responsibility and

leadership, but also to take initiative to draw it on a sheet of paper. A defining moment was, however, when one of the participants, a statistician, pulled a receipt from his wallet. He asked: what if people could record their receipts easily using their smartphones? We taped the receipt on a sheet of paper and started from there.

The concept we agreed on revolved around the Consumer Price Index (CPI), a routinely published and well-known statistic that serves as the basis of inflation measurements. Our idea was to have citizens scan their receipts to record the prices of their groceries (see Figure 1). Normally, the CPI is based on labour intensive diaries and surveys to determine which goods and services residents need to sustain themselves, including rent, groceries, memberships, and so on (the 'basket'). Each of these goods and services needs to be assigned a weight (the percentage of the total spending), so the effects of price changes can be determined. If citizens were able to photograph or scan receipts, we reasoned, data collection would be less work intensive. For some products, pop-ups could be used to ask additional questions about the purchased goods. In return, and this was the design principle we applied most, the NSIs could give citizens *feedback* on where to shop for the lowest prices, budgeting, their carbon footprint, or healthier products.

The receipt was relevant because it helped to imagine citizens like ourselves doing common routines of shopping, comparing supermarkets, neighbourhoods, and products. However, as an organiser-participant, I was not satisfied with the notion of co-production emerging with this design.

Upon coming home from day one, I was still thinking about the workshop. I was at the same time relieved that we came up with a concept and dissatisfied with how our designs imagined citizens. Citizens were not included as co-producers, but as consumers and data collectors. Furthermore, some group members had argued that statisticians could not take the needs of economically vulnerable groups into consideration because their small size would cause sampling issues. The 'feedback

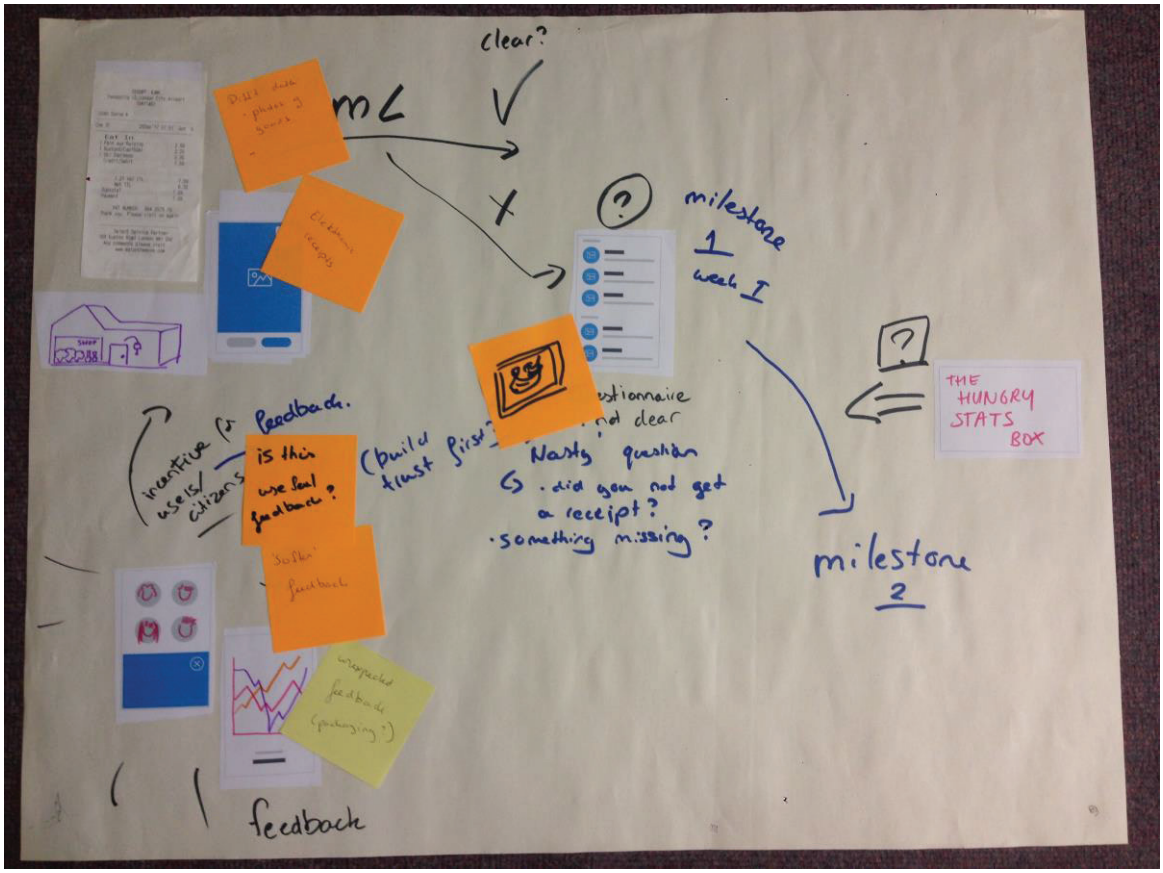

Figure 1. Prototyping citizen data app to complement the CPI (receipt in the upper left corner)

> mechanism for advising citizens on their lifestyle or consumption patterns, moreover, risked patronising citizens instead of empowering them, or so I thought. I did some quick research into critiques of the CPI and came up with the following question: what if citizens could influence the weighting of the goods?

I introduced these ideas on day two, when we continued to work in the same groups. Our first assignment was to review our concepts. Having resolved to push the notion of co-production further, I initiated the following conversation:

> F: My question is whether other features can be integrated? First, all responsibility for changing consumption patterns and diminishing people's environmental footprints is placed on the citizen or resident. Second, there have been criticisms on the weighting of categories within the statistical community as well. Perhaps citizens can give feedback on this? Or perhaps they can provide feedback on the categories, and suggest alternatives? I would like to see if we can extend our ideas of co-production from participation in data production to also being involved in other parts of the statistical process.
> Statistician S: [resolutely] this is not possible. The categories and definitions used are part of international regulations and systems. It is impossible to change these.

"International regulation and systems" refer to guidelines and agreements developed and endorsed by international statistical organisations such as Eurostat and the United Nations Economic Commission for Europe (UNECE). Regarding the CPI these include, for instance, twelve main categories of consumption (e.g., health and transport) and guidelines about whether to include goods and services purchased abroad. For many statisticians, 'objectivity' (an important value in official statistics) resides in following these guidelines. Statisticians will often agree that all methods influence how data are produced, so objectivity is sought in standardisation and harmonisation.

Looking back, however, more seems to be happening that is of interest to understanding the possibilities of imagining together. The conversation above was not the only moment when it became clear in my group that co-production would not be imagined as involving citizens in the collection and analysis of data. Statisticians consistently imagined citizens as respondents or users that would take and upload photographs, answer pop-up questions, and more. To return to the quote about international regulations and systems, this seems a puzzling response because, firstly, why would regulations stop one from *imagining*? And why did they travel all the way to the workshop? Did they misunderstand or simply disagree with the workshop's aims? These factors may have played a role, but the time and energy that they and the other participants invested in the exercises suggest that something more was happening.

It seems that underlying these frictions were not only existing methods and standards as defined in regulations but also what Marisol de la Cadena (2015) refers to as unresolvable differences between "co-laborours" from different social worlds, or what Viveiro de Castros refers to as equivocations: "a failure to understand that understandings are necessarily not the same, and that they are not related to imaginary ways of "seeing the world" but to the real worlds that are being seen" (Viveiro de Castros, 2004: 11). Here the 'real world' refers to a difference in how the term 'respondent' is rooted in our, the organisers', practices, and in those of the statisticians. As organisers, we attempted to imagine citizens as more than respondents: as people that claim the right to participate in the production of data about them. However, for statisticians, 'responding', or making oneself legible through the methods of the state (e.g. interviews or scanning your receipts) was *also* a form of citizenship. Responding to the state is exactly what makes them citizens, and what gives people the capacities to receive rights and benefits. In our group, respondents or users were imagined as people to be enrolled in data collection in transactional ways: through "stick-and carrot strategies" or "rewards" such as statistics about their peer group. It is this 'partial connection' around respondents that made collaboration both possible and frustrated it. This is to say that these enactments of citizen-state relations did not so much result from divergent perspectives that could be brought together conceptually in a single, hybrid perspective. Rather, they exist

as situated ways of doing citizenship that can be connected but cannot be added up to realise an overarching form of citizenship (Strathern, 2005).

In relation to the 'transactional' notion of citizen-state relations, feedback was considered as an almost self-evident form of co-production by various members in my break-out group. This was also evident as we further developed our ideas about feedback in one of the final exercises: the creation of a "roadmap" (see Figure 2). The roadmap was to identify relevant steps and milestones in realising the app, such as acquiring support and funding. A few of the groups drew a roundabout, as did mine.

> One of the statisticians in my group argues that the roundabout can represent the design principle of 'experimentality' that we defined on day one. Experimentality, the person argues, 'is where co-production is'. We continued drawing our roadmap, added 'users' and programmers, but I start wondering whether we are not just reproducing our concept. I mention that our drawing does not really seem to represent 'steps' or a process. Co-production is part of the concept – it is not a step. Some agree with me, but most do not, "it can work like this", someone says about the current roadmap.

Co-production, as citizen feedback on the design of the app, thus became part of the roadmap; it was used to refer to the process of app design and evaluation. At the time, I was convinced that co-production was being confused with the notion of experimentality. Only after the workshop did I realise that something new was generated out of these moments of friction: feedback would not only be part of the everyday operation of the app in the sense of 'advice'; citizens would also be involved in reviews of the app as users, for instance, to convey their preferences about the types of feedback they would receive ('feedback on the feedback'). While this understanding of citizens as 'app users' was not part of our initial conception of co-production, it does imagine a citizen-state relation that closely mirrors that between subjects and private sector apps. In this processual notion of feedback, citizens become

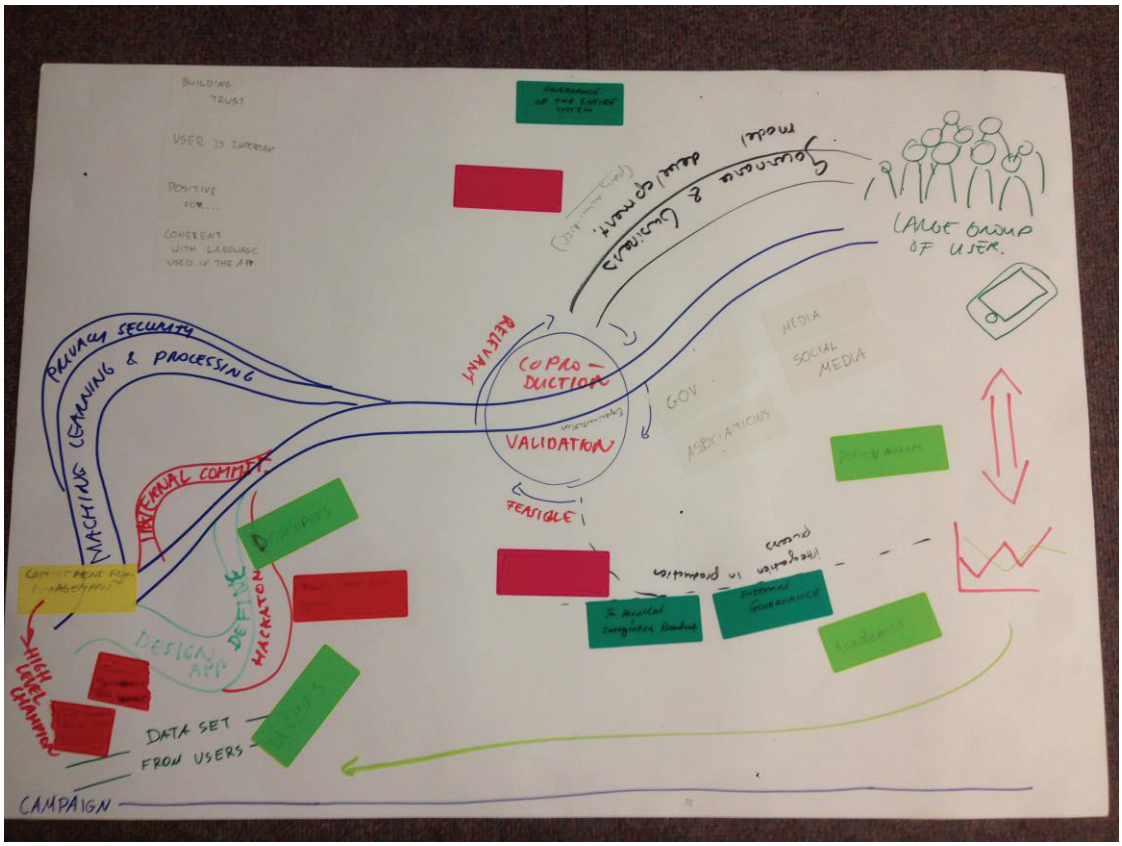

Figure 2. Roadmap for producing citizen data app to complement the CPI

part of reviewing and designing devices for data collection and how they are to be 'rewarded' for their data, similar to the bargain subjects make when using 'free' apps produced by the private sector.

To sum up, a state-citizen relation was imagined within the boundaries of current methods of producing statistics in which citizens are positioned mainly as data subjects; something we as organisers tried to reimagine through a speculative method. Yet something new also emerged through frictions: within these boundaries we were able to imagine together how citizens could be part of decision-making on the design of an app. So, to paraphrase Anna Tsing (2004), while collaborations rarely line up that well, the workshop was generative. Friction, in this sense, was not a clash but seemed to operate through "the awkward, unequal, unstable and creative qualities of interconnection across difference" (Tsing, 2004: 4).

There are limitations to this analysis of equivocations and frictions, since by definition equivocations cannot be fully known or completely

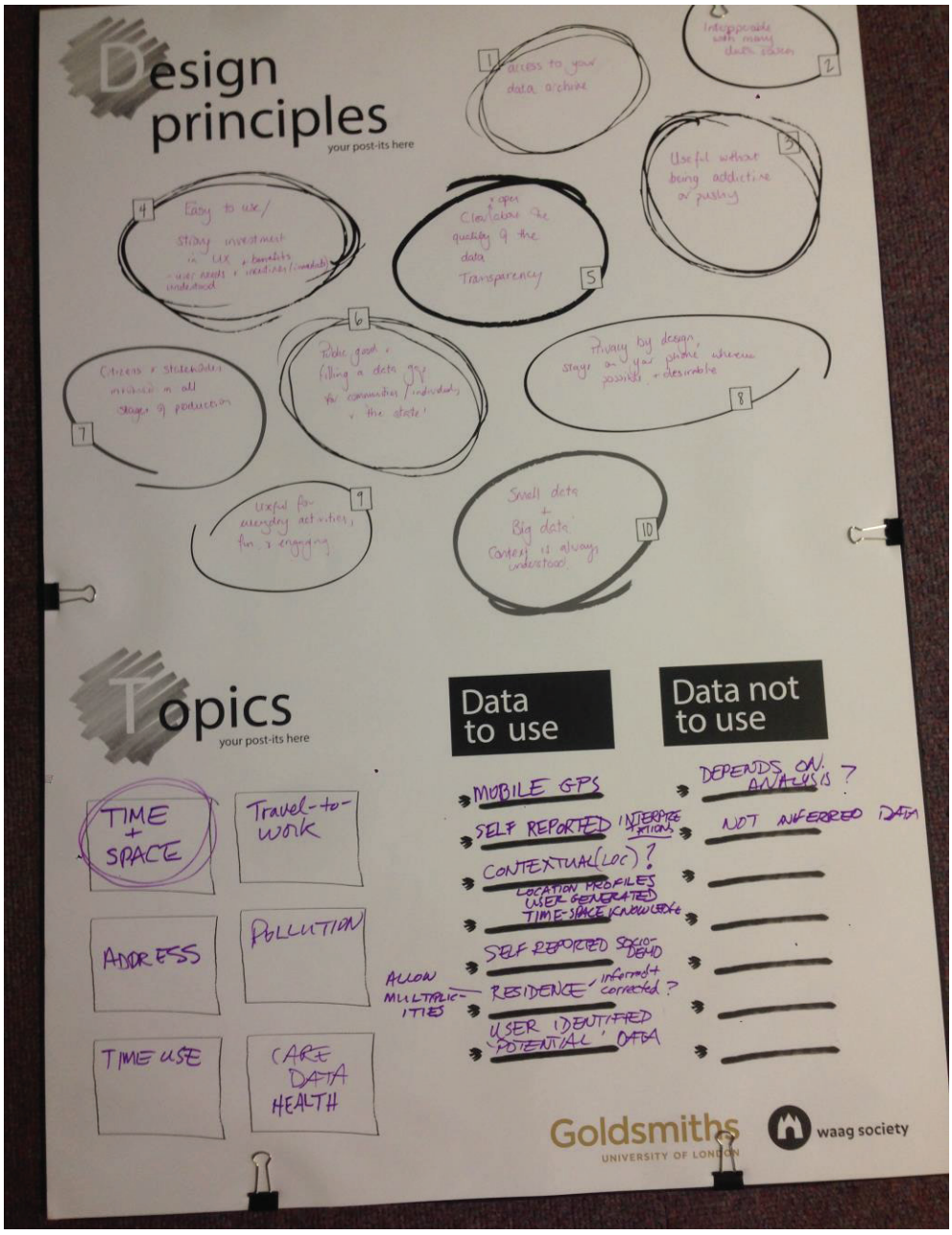

Figure 3. Brainstorming on design principles for the 'How we move' app

explained away (De la Cadena, 2015; Viveiros de Castro, 2004). Furthermore, there were very likely much more profound differences, as well as much more superficial ones, relevant to how this workshop played out. I was perhaps able to at least scratch the surface through designing together or 'thinging'. To draw figures and make mock-ups required a level of detailed engagement that highlights difference (which was perhaps a reason why few people volunteered – to avoid such tensions), and thereby provided more insight about how speculation becomes possible through friction.

To conclude, in this group imagining did not surpass the current possibilities and practices of official statistics. In the next section, we will further analyse how other possibilities for imagining were conceived by imagining 'complementary statistics' as a space alongside existing official statistics.

Frictions as doing difference (Evelyn)

By insisting on the terms 'citizens' and 'co-production' in the organisation and set up of our workshop materials, we established in advance how we wanted to talk about and conceive of the subjects of an app. The power of words to shape imaginaries (Castoriadis, 1997) was evident in how this led to a change in terminology by the end of our second day together. Some statisticians started referring to citizens rather than respondents, and co-production rather than data collection. Though the meaning of these terms was not settled, through their uptake, this change in words contributed to imagining different citizen-state relations. Similarly, it was also relatively easy for my break-out group to come up with shared principles that this change implied such as ensuring an app met public values, that it would be easy to use, that the software would be open, that the data co-owned, and that consent and privacy would be built into its design (Figure 3).

However, while words and principles shaped the imaginaries of the group, translating them into the design of a prototype for an app made visible differences that operate beyond language (Lippert and Douglas-Jones, 2019). Moving beyond words to working with materials, made differences visibly present but also the possibilities of "doing difference" together (Verran, 2002). That is, rather than resolving ontological differences, as I came to realise, design opened the way to something new. This was evident in two frictions that emerged in relation to my group's conception of an app.

The first concerned how the group imagined an app called 'How we move' to explore the different meanings and relations of citizens to mobility that defy usual statistical categories of where people live and work. One proposition was that existing statistical categories about what is called a person's usual place of residence, journey to work, or other movement pattern do not capture the complexity of mobilities and meanings of residence in contemporary cultures.

We imagined how we could rethink these categories through an app that mixed automatically collected data such as GPS, along with citizens' annotations, interpretations, and categorisations of movement patterns. An interesting dynamic emerged whereby non-statisticians generally pushed the design in the direction of citizens intervening in the generation, modification, categorisation and interpretation of data while statisticians worried about quality and needing to control all of these data practices. (Figure 4)

Not a surprising finding perhaps but as one of the co-organisers, participants looked to me to guide the design process towards a resolution. I was also committed to facilitating a design that could resolve the friction between enabling citizen interventions in data and maintaining quality control over data. This created a tension between my role as participant and co-organiser with a particular commitment to the outcome of the workshop. Reflecting on this afterwards, I learned that Francisca had a similar experience. In her field notes she reflected on difficulties getting someone in her group to begin a task and how she often ended up guiding the group work. She started provoking the group lightly by "putting parts of their discussions on paper" and in this way get them to state their agreements or disagreements. Francisca reflected that this helped keep the group on topic and made it possible to move on. She also observed that this had the effect of getting the group to speak more speculatively, by showing them that something was not "set in stone" just because it was committed to paper as it

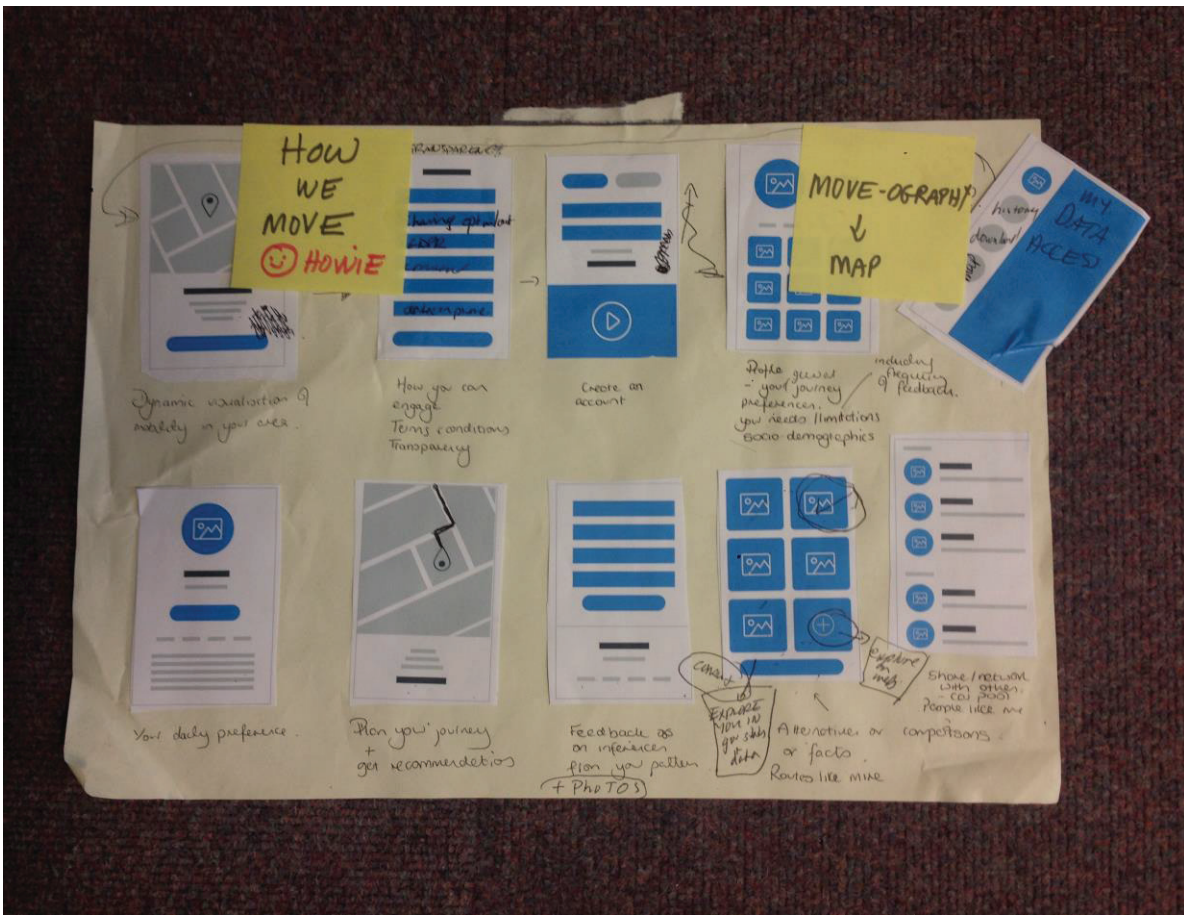

Figure 4. Prototyping the 'How we move' app

could always be modified. The other participating researcher, Funda reflected that the concept for an app that emerged from her group was the product of her and another person's "agenda" with others in the group not in agreement. She indicated in her notes that she felt uncomfortable for having "pushed" their understanding of a citizen data app. Funda speculated that it might have been better to develop a different version that reflected the interests of others in the group who, for example, imagined an app with less involvement of citizens in its design.

In a similar way, at times I insisted that my group stick to a task and engage with the principle of co-production, and at times I appealed to others in my group for support. While design made differences visible it also called for my interventions and sometimes insistence that differences not be resolved but enabled to co-exist. This commitment and sensibility thus contributed to how imagining something new emerged: that co-produced data could be based on different quality standards yet generative of unique and perhaps previously unimagined kinds of statistics. This led to some statisticians suggesting that co-produced data could be treated as complementary rather than a replacement of official statistics, a term they often call forth when a new and unsanctioned statistic is generated. That is, relegating it to a special status was a strategy of both accepting co-production but retaining the authority to ascertain legitimacy. But for me, while not too surprising a move, it was also a way of acknowledging that different modes of producing statistics can be imagined as legitimate and official. That is, complementary data enabled making partial connections between an imaginary of co-production that enables citizen interventions in data and that of statisticians maintaining what they define as quality control over data.

Reflecting now on what I initially called a friction, rather than a compromise, the experiment generated something similar to what Verran (2002: 731) argues is a "sameness" alongside the

enactment of differences through which the "collective imagination" can be expanded. Verran came up with this formulation when she sought to interpret how the different knowledge and experiences of Australian scientists and Aborigines about fire practices are negotiated: it is by finding the "right stories of sameness" that different practices and the claims on which they are based can be enacted (Verran, 2002: 731). But furthermore, and as a consequence, different practices can then be open to being done better. For me, this formulation captures how complementary data could be understood: as a sameness shared alongside differences that may have only been exchanged, but which together led to imagining something otherwise.

It is with this understanding that I also came to interpret a second friction, which concerned the design of the roadmap for taking the principles forward to co-produce a prototype of the 'How we move' app. One statistician repeatedly tried to apply the procedures of what is known as the "Generic Statistical Business Process Model", an international standard for statistical offices to map the steps and processes involved in generating data (UNECE, 2019) (Figure 5). It is a structured and managerialist approach to standardising not simply the procedures but the conditions that must be met for statistics to become official. Similar to Francisca's account of internationally standardised categories, meeting these international conditions are part of what makes statistics objective and credible.

Non-statisticians instead tried to literally draw a road and a map as a journey towards a goal but with cul-de-sacs, dead-ends, shortcuts and roundabouts. As in Francisca's group, their interventions were critically about co-production as processual, that is, not simply a path to data extraction but the multiple activities that a mode of co-production would demand, from initial conception to ownership and long-term maintenance. The roadmap ended up being drawn like a road with all these features and with the statisticians overlaying the steps of the process model along the top and post-its specifying the fit of locations on the map to that process (Figure 6). In other words, through design the roadmap imagined a space between the processual and managerial where sameness and difference exist alongside.

It was through frictions that differences were made more explicit and co-production could be imagined. What struck me is how beyond talk design made relations between citizens, states, and technologies present and open to speculation. That collaborating on a design was productive was especially striking when I compared it to our other experiments with methods. One involved presenting and distributing some of our articles and working papers in-progress to statisticians for comments. We expected possibly negative responses as these critically analysed power relations within their professional field, for example, and how those relations come to shape data and statistics. This, however, led to few responses and did not effectively elicit discussion. A different result occurred when we conducted a workshop that involved concept work with statisticians where we sought to critique their role and provoke them. Rather than research papers and text, we generated visualisations to explore their future relations to the private sector and the big data that platform owners and big tech companies generate (Figure 7).[5] The visualisation showed citizens and other non-government organisations as more distant from statistical institutes with private sector corporations becoming more important intermediaries and moving closer to them. This provoked some defensive responses and criticisms that we got it wrong. However, reflecting now on both methods—critique through text or visualisations—differences were only exchanged, connections were not made and something new did not emerge.

However, rather than separate, these other experiments were present and affected the organisation and impetus of the design workshop. Rather than singular and neatly bounded, the design workshop was part of multiple and temporally discontinuous methods and practices through which we engaged with and related to statisticians.[6] That is, the experimentalism of the design workshop was not isolated or apart from the multiple sites, relations, and other methods that we engaged with during the project. However, its critical difference was to experiment with a collaborative method that sought to

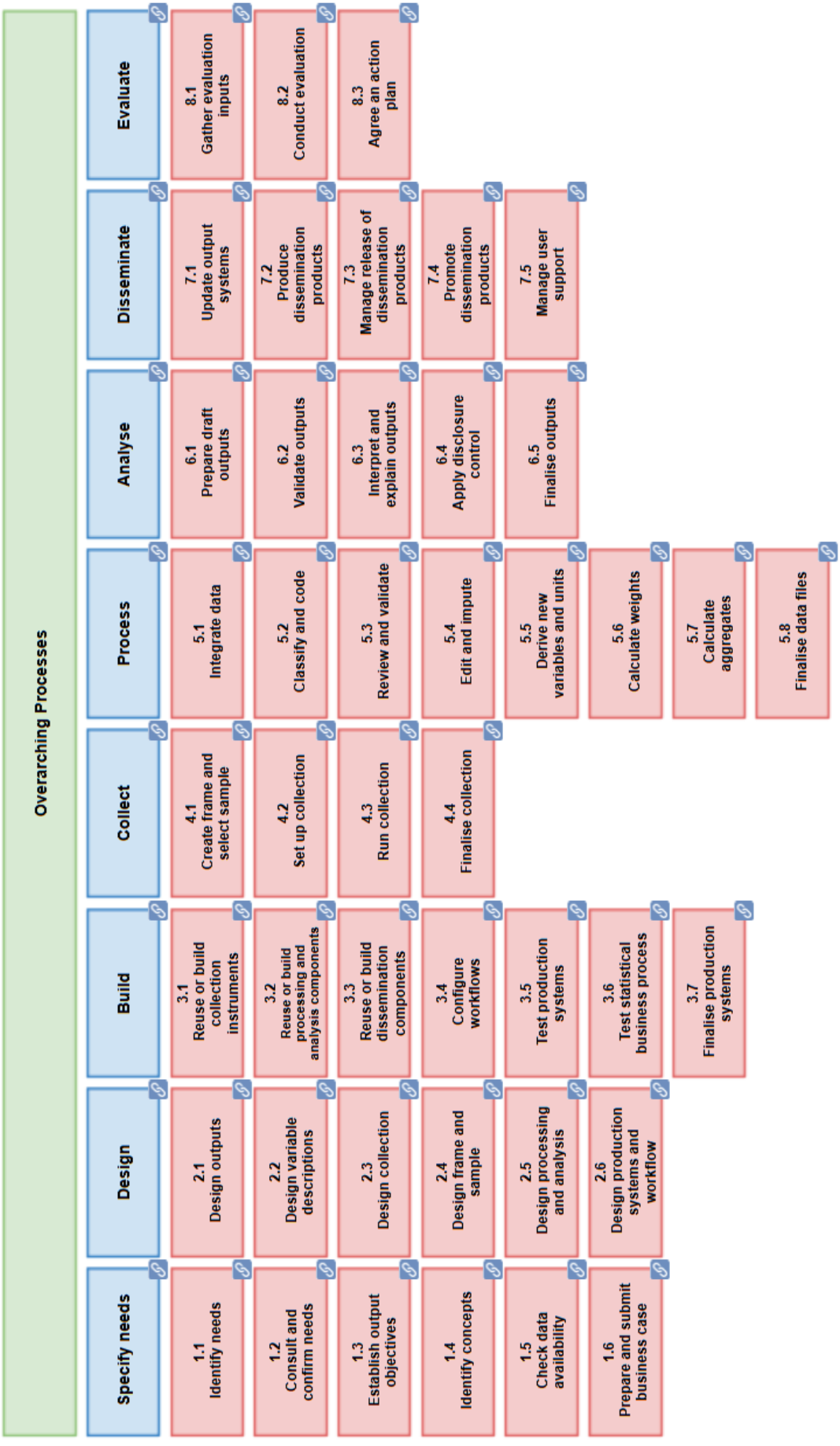

Figure 5. Generic Statistical Business Process Model (UNECE, 2019)

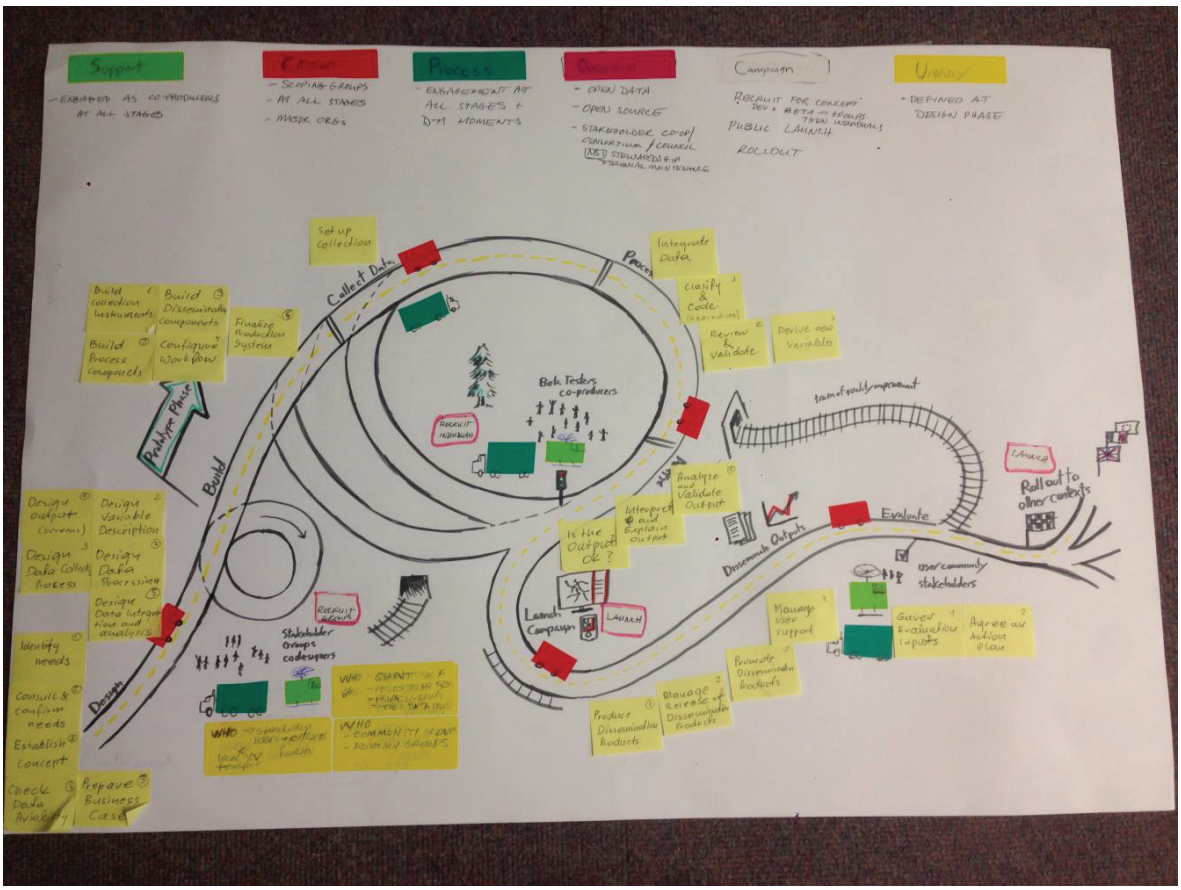

Figure 6. Roadmap for producing 'How we move'

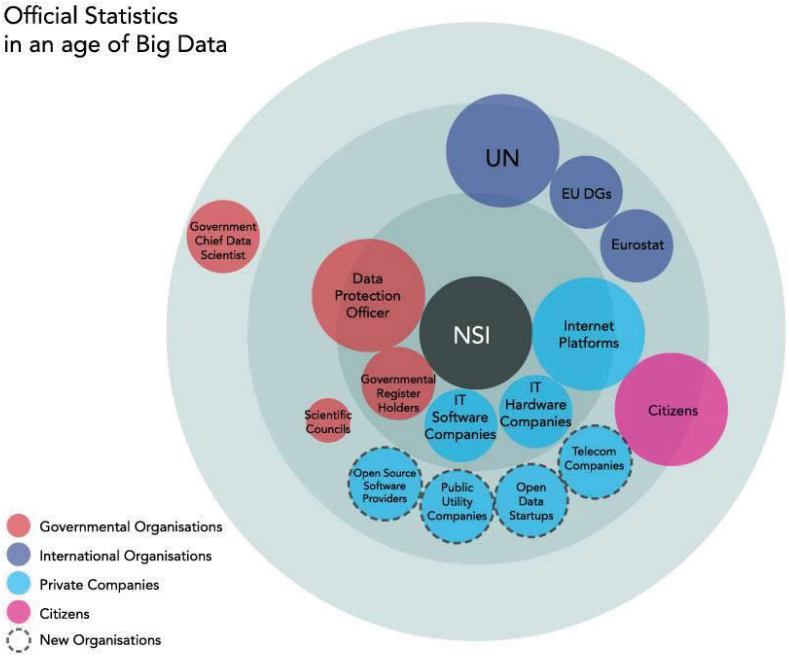

Figure 7. Visualisation of future relations in the production of official statistics

reshape relations between participants, objects of knowledge and imaginaries through designing a thing towards generating something new.

But these imaginings required openness to something other or else, to both sameness and difference. This challenged me as a researcher to be reflexive about and background my interests and, to the extent I could, let the workshop happen and go where it needed to go. That is an awkward way of expressing that other methods put the researcher in control: they observe meetings or read documents and record what they think is important and then interpret and make sense of that data. Or they ask their research subjects questions and provoke and challenge them and then again do the same. The research subject does not have the opportunity to "answer back" or say, "I don't agree." Collaboration, especially through design, forced me as a researcher to confront the making of a thing that materialises the ideas, principles, issues, and concerns of others which, no matter how much I might seek to affect or intervene, tended to take the workshop into directions I could not know or anticipate. For me, this meant experiencing the social interactions and relations involved in the doing of a method and its outcomes. At times, I did not support how my group proceeded, and while I sometimes asserted my ideas and intervened in ways outlined above, I had to let the group dynamic happen. That is, being a participant did not only mean intervening but also stepping back, or pausing, which is an oft-neglected form of embodiment work in collaborations (Endaltseva and Jerak-Zuiderent, 2021).

Conclusions

The foregoing retrospective analysis of the collaborative design workshop made visible how imaginings and speculation can emerge not only through ruptures, sameness, or consensus. In addition, they can emerge through frictions in part due to the dynamics of the different situated modes of thinking and reasoning (in our case, expressed through designing) of participants.

In the first narrative about an app for producing data for CPI measurements, Francisca analysed different conceptions of citizen co-production not as misunderstandings, but as equivocations and frictions, which were generative of imaginings. This was evident in the notion of feedback developed by her group where feedback did not only refer to communicating research results to citizens as data subjects, but also to the inclusion of citizens as active participants in app design processes. That is, inside the boundaries of current methods of producing statistics that conceive of citizens as passive data subjects, a different conception of their role was imagined. Evelyn's narrative on the 'How we move' app design included similar frictions. However, a different imaginary was identified that could work alongside existing statistical processes through the partial connections forged by complementary data. Rather than a compromise, friction involved establishing complementary data as a shared space that could exist alongside international statistical standards on data quality. Finally, both narratives suggest that processes of designing together, 'or thinging', while challenging, are material engagements than can generate such spaces of possibility.

Overall, our findings suggest that friction is a mode of imagining through which new possibilities can emerge not by searching for sameness or consensus but by being attuned to the inevitable complications of working together. This calls for conceiving of how different imaginings can co-exist inside and alongside each other. Methodography is an ethnographic mode through which we were able to sensitise ourselves to these intricacies of collaboration. Recording, analysing, and writing our ethnographic narratives about our method-in-action helped to open up stories and sensibilities that may be lost in standard workshop reports. In particular, conducting a methodography helped to retrospectively explore difference. It captured how collaboration took shape without accomplishing the perfect alignment of collaborators. We learned not to erase difference, but to broaden stories to include discordances and apparent miscommunication (De la Cadena, 2015; Viveiros de Castro, 2004). Moreover, it helped us as researchers to address our own positions in speculative imagining, including our capacities to be reflexive and let a collaboration run its course.

In other words, a methodographical approach taught us to consider the collaborative design workshop as having a social life in the sense that

when put into action, workshop methods and their outcomes are not determined or given. From the technologies and people that make them up to the concepts, interests and power relations that are exercised, myriad contingencies are at work that shape the realities or futures that methods enact.

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References

Binder T, Brandt E, Ehn P and Halse J (2015) Democratic Design Experiments: Between Parliament and Laboratory. *CoDesign* 11(3–4): 152–165.

Boyatzis RE (1995) *Transforming Qualitative Information: Thematic Analysis and Code Development*. Thousand Oaks, CA: Sage Publications, Inc.

Callon M, Lascoumes P and Barthe Y (2011) *Acting in an Uncertain World: An Essay on Technical Democracy*. Cambridge, Mass.: MIT Press.

Candea M (2013) The Fieldsite as Device. *Journal of Cultural Economy* 6(3): 241–258.

Castoriadis C (1997) *The Imaginary Institution of Society*. Cambridge, M.A.: MIT Press.

De la Cadena M (2015) *Earth Beings: Ecologies of Practice across Andean Worlds*. Durham and London: Duke University Press [e-book edition].

De la Cadena M, Lien ME, Blaser M, et al. (2015) Anthropology and STS: Generative Interfaces, Multiple Locations. *HAU: Journal of Ethnographic Theory* 5(1): 437–475.

Deeb HN and Marcus GE (2011) In the Green Room: An Experiment in Ethnographic Method at the WTO. *PoLAR: Political and Legal Anthropology Review* 34(1): 51–76.

Endaltseva A and Jerak-Zuiderent S (2021) Embodiment in Ethnographic Collaborations: Composition, Movement, and Pausing within the Multiple Sclerosis Society in Russia. *Science & Technology Studies* 34(3): 38-54.

Estalella A and Sánchez Criado T (2018) *Experimental Collaborations: Ethnography Through Fieldwork Devices*. Oxford and New York: Berghahn Books.

Faubion JD and Marcus GE (2009) *Fieldwork Is Not What It Used to Be: Learning Anthropology's Method in a Time of Transition*. Ithaca, N.Y.: Cornell University Press.

Fischer MMJ (2009) *Anthropological Futures*. Durham and London: Duke University Press.

Gaspar A (2018) Idiotic Encounters: Experimenting with Collaborations between Ethnography and Design. In: Estalella A and Sánchez Criado T (eds) *Experimental Collaborations: Ethnography Through Fieldwork Devices*. Oxford and New York: Berghahn Books, pp. 94–113.

Greiffenhagen C, Mair M and Sharrock W (2011) From Methodology to Methodography: A Study of Qualitative and Quantitative Reasoning in Practice: *Methodological Innovations Online* 6(3): 93–107.

Grommé F (2015) *Governance by Pilot Projects: Experimenting with Surveillance in Dutch Crime Control*. Doctoral thesis. University of Amsterdam, Amsterdam.

Gross M and Krohn W (2005) Society as Experiment: Sociological Foundations for a Self-Experimental Society. *History of the Human Sciences* 18(2): 63–86.

Guggenheim M (2012) Laboratizing and De-Laboratizing the World Changing Sociological Concepts for Places of Knowledge Production. *History of the Human Sciences* 25(1): 99–118.

Guggenheim M, Kräftner B and Kröll J (2017) Creating Idiotic Spectators. Disaster Cosmopolitics in the Sandbox. In: Wilkie A, Savransky M, and Rosengarten M (eds) *Speculative Research: The Lure of Possible Futures*. London: Routledge, pp. 145–162.

Isin E and Ruppert E (2020) *Being Digital Citizens*. London: Rowman & Littlefield International.

Jasanoff S (2016) Future Imperfect. In: Jasanoff S and Kim S-H (eds) *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Online: University Press Scholarship.

Jensen C B (2021) Say Why You Say It: On Ethnographic Companionship, Scale, and Effect. *Science & Technology Studies* 34(3): 125-137.

Jungnickel K (2017) Making Things to Make Sense of Things: DIY as Research Subject and Practice. In: Sayers J (ed) *The Routledge Companion to Media Studies and Digital Humanities*. ebook. Oxon: Routledge, pp. 492–502.

Karasti H, Botero A, Saad-Sulonen J and Baker K S (2021) Configuring Devices for Phenomena In-The-Making. *Science & Technology Studies* 34(3): 55-77.

Kasperowski D and Kullenberg C (2019) The many modes of citizen science. *Science & Technology Studies* 32(2): 2-7.

Latour B (2004) Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern. *Critical Inquiry* 30(2): 225–248.

Latour B (2006) Which Protocol for the New Collective Experiments? *Boletín CF+S* (32/33). Available at: http://habitat.aq.upm.es/boletin/n32/ablat.en.html (accessed 9 November 2016).

Lezaun J, Marres N and Tironi M (2017) Experiments in Participation. In: Felt U, Fouché R, Miller CA, and Smith-Doerr (eds) *Handbook of Science and Technology Studies*. Cambridge: MIT Press, pp. 195–222.

Lippert I and Douglas-Jones R (2019) "Doing Data": Methodography in and of STS. *EASST Review* 38(1). Available at: https://easst.net/article/doing-data-methodography-in-and-of-sts/ (accessed 6 October 2019).

Lippert I and Mewes J (2021) Data, Methods and Writing: Methodographies of STS Ethnographic Collaboration in Practice. *Science & Technology Studies* 34(3): 2-16.

Lupton D (2017) Towards Design Sociology. *Sociology Compass* (e12546): 1–11.

Marcus G (2014) Prototyping and Contemporary Anthropological Experiments With Ethnographic Method. *Journal of Cultural Economy* 7(4): 399–410.

Marres N (2012) *Material Participation: Technology, the Environment and Everyday Publics*. Basingstoke: Palgrave Macmillan.

Marres N, Cain R, Gross A, Kimbell L and Ulahannan A (2017) Driverless Cars with Creative Methods. Available at: https://warwick.ac.uk/fac/cross_fac/cim/events/driverlesscarswithcreativemethods/ (accessed 12 December 2017).

Moats D (2021) Rethinking the 'Great Divide': Approaching Interdisciplinary Collaborations Around Digital Data with Humour and Irony. *Science & Technology Studies* 34(1): 19–42.

Mouffe C (2009) *The Democratic Paradox*. London: Verso.

Murphy KM (2016) Design and Anthropology. *Annual Review of Anthropology* 45(1): 433–449.

Otto T and Smith RC (2013) Design Anthropology: A Distinct Style of Knowing. In: Gunn W, Otto T, and Smith RC (eds) *Design Anthropology: Theory and Practice*. London and New York: Routledge, pp. 1–29.

Puig de la Bellacasa M (2017) *Matters of Care: Speculative Ethics in More than Human Worlds*. University of Minnesota Press. Available at: https://muse.jhu.edu/book/50528 (accessed 6 February 2018).

Rabinow P and Bennett G (2012) *Designing Human Practices: An Experiment with Synthetic Biology*. University of Chicago Press.

Ruppert E, Harvey P, Lury C, et al. (2015) Socialising Big Data: From Concept to Practice. Available at: http://hummedia.manchester.ac.uk/institutes/cresc/workingpapers/wp138.pdf (accessed 3 November 2015).

Ruppert E, Grommé F, Ustek-Spilda F and Cakici B (2018) Citizen Data and Trust in Official Statistics. *Economie et Statistique / Economics and Statistics* (505–506): 179–193.

Ruppert E, Grommé F, Ustek-Spilda F and Cakici B (2019) Citizen Data and Trust in Official Statistics. *Economie et Statistique* (505): 171–184.

Savage M (2010) *Identities and Social Change in Britain since 1940: The Politics of Method*. Oxford: Oxford University Press.

Scheel S, Grommé F, Ruppert E, Ustek-Spilda F, Cakici B and Takala V (2019) Doing a transversal method: developing an ethics of care in a collaborative research project. *Global Networks* 20(3): 522-543.

Stavrianakis A (2015) From Anthropologist to Actant (and back to Anthropology): Position, Impasse, and Observation in Sociotechnical Collaboration. *Cultural Anthropology* 30(1): 169–189.

Stengers I (2010) *Cosmopolitics*. Posthumanities 9–10. Minneapolis: University of Minnesota Press.

Stengers I (2018) *Another Science Is Possible: A Manifesto for Slow Science*. John Wiley & Sons [E-book edition].

Strathern M (2005) *Partial Connections*. Walnut Creek, CA: Altimera Press.

Tironi M (2020) Prototyping Public Friction: Exploring the Political Effects of Design Testing in Urban Space. *The British Journal of Sociology* 71(3): 503–519.

Tironi M and Hermansen P (2018) Cosmopolitical encounters: Prototyping at the National Zoo in Santiago, Chile. *Journal of Cultural Economy* 11(4): 330–347.

Tsing AL (2004) *Friction: An Ethnography of Global Connection*. Princeton, N.J: Princeton University Press.

UNECE (2019) Generic Statistical Business Process Model (Version 5.1). Statswiki UNECE. Available at: https://statswiki.unece.org/display/GSBPM/Clickable+GSBPM+v5.1 (accessed 2 May 2019).

Verran H (1998) Re-Imagining Land Ownership in Australia. *Postcolonial Studies* 1(2): 237–254.

Verran H (2002) A Postcolonial Moment in Science Studies: Alternative Firing Regimes of Environmental Scientists and Aboriginal Landowners. *Social Studies of Science* 32(5–6): 729–762.

Vertesi J, Ribes D, Forlano L, Loukissas Y and Cohn ML (2017) Engaging, Designing, and Making Digital Systems. In: Felt U, Fouché R, Miller CA, and Smith-Doerr L. (eds) *Handbook of Science and Technology Studies*. Cambridge: MIT Press, pp. 170–221.

Viveiros de Castro E (2004) Perspectival Anthropology and the Method of Controlled Equivocation. *Tipití: Journal of the Society for the Anthropology of Lowland South America* 2(1): 3-22.

Waterton C and Tsouvalis J (2015) On the Political Nature of Cyanobacteria: Intra-Active Collective Politics in Loweswater, the English Lake District. *Environment and Planning D: Society and Space* 33(3): 477–493.

Wilkie A, Savransky M and Rosengarten M (eds) (2017) *Speculative Research: The Lure of Possible Futures*. London: Routledge.

Wilkie A, Michael M and Plummer-Fernandez M (2015) Speculative method and Twitter: Bots, energy and three conceptual characters. *The Sociological Review* 63(1): 79–101.

Notes

1 The research project is ARITHMUS (Peopling Europe: How data make a people) at Goldsmiths, University of London (2014-20). It was ERC funded and included six team members: Evelyn Ruppert (Principal Investigator), Baki Cakici, Francisca Grommé, Stephan Scheel, and Funda Ustek-Spilda (postdoctoral researchers) and Ville Takala (doctoral researcher). The field sites included: the UK Office for National Statistics; Statistics Netherlands; Statistics Estonia; Statistics Finland; Turkstat; Eurostat, the statistical agency for the European Commission; and the Statistical Division of the United Nations Economic Commission for Europe (UNECE).

2 Our fieldwork initially involved multiple and well-known ethnographic methods including observation, participant observation, interviews, shadowing workdays and the analysis of documents. These encompassed following statisticians' practices at various sites such as international and national statistical offices, meetings, conferences, data camps, hackathons and so on. We used techniques such as taking notes, engaging in informal conversations, and conducting in-depth interviews as well as participating in conference calls, following or participating in intranets, wikis, websites, listservs, emails, and webinars, and monitoring, compiling and analysing tweets. These techniques are core to ethnographic methods that conceive of researchers as observers and interpreters of field sites and research subjects as informants. For further elaboration see Scheel et al. (2019).

3 The literature on design at the intersection of the fields of design, STS and related fields is expanding quickly in diverse directions. To illustrate, at the intersections of STS and design, prototyping has been proposed as a research practice, and as a site of research to understand how futures are at the same time constrained and generated (Tironi, 2020; Tironi and Hermansen, 2018). Furthermore, design practices have been proposed as 'creative methods' or an 'in-between' research space to map the challenges introduced by emerging technologies (Marres et al., 2017). In anthropology, prototyping has been marked as a relevant object of research (Murphy, 2016), as well as a notion that can characterize emerging methods of (interventionist and speculative) ethnographic research (Marcus, 2014). Similar moves have been made in sociology, where design has been proposed as a mode of research critically attuned to human-machine entanglements and for play and speculation (Lupton, 2017). We cannot do justice to the diversity and richness of work in this field; which partly is a consequence of the particularities of each field site and research problem bringing forth different variations and applications of design and prototyping (also see Estalella and Sánchez Criado, 2018 for a wide variety of practices). Finally, the particulars of our field site and topic mean that our uptake of thinging is different from Binder et al.'s (2015) proposition, which is attuned more to a concern with contributing to a 'parliament of things'.

4 There is a diversity of epistemological and ontological meanings of citizen science; see discussion in (Kasperowski and Kullenberg, 2019).

5 The visualisations were generated by Francisca Grommé, Ville Takala and Dave Moats. On visualisations, see also Karasti et al. (2021).

6 This is a point that Candea (2013) makes in relation to ethnographic fieldsites.

Say Why You Say It: On Ethnographic Companionship, Scale, and Effect

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Abstract

This paper explores "how ethnographic collaboration configures its data" via examination of three relations: between ethnography as method and writing, between leaky empirical and conceptual sets, and between ethnographic and rhetorical effects. I suggest that writing entails keeping the research imagination alive to two simultaneous processes of scaling—of the empirical within the text, and of diverse sets of literature in mutual relation—always with a specific focus and orientation. What emerges is an image of both 'ethnographer' and 'data' as hybrid and transformable companions.

I illustrate with reference to two quite different texts about emerging Mekong realities. Both are elicited as experimental additions to worlds. In that capacity, they are capable of generating reality effects but those effects cannot be preordained. I conclude that ethnographic collaborations find no other grounds than dic cur hic—why, here, now—or as Isabelle Stengers has formulated it "say why you say it."

Keywords: Ethnographic companions, ethnographic effect, research imagination, rhetorical effect, processes of scaling

> "All the persons in this book are real and none is fictitious even in part"
> Flann O'Brien, epigraph to *The Hard Life: An Exegesis of Squalor*

A central question motivating this special issue is "how ethnographic collaboration configures its data" (Lippert and Mewes, 2021:). The formulation combines several elements. There is ethnography in the dual capacity of a method of inquiry and a writing (-graphy) of people (ethnos). There is collaboration, a term made to encompass both humans and non-humans. Then there is 'data,' which usually designates the empirically observed, recorded, and collected stuff to be written about. But this conventional understanding is destabilized by the description of data as variably 'configured' through contingent collaborations within a 'research assemblage.' In this juxtaposition, the meanings of ethnography, collaboration, data, and their relations, all become uncertain. I highlight these uncertainties because the following reflections will *modify and intensify* them in a particular way.

The editorial introduction suggests that a 'methodographic' interest in social science research methods in practice might shape a new 'reflexive moment' within STS.[1] It would do so by facilitating examination and problematization of "what methods are performative of" (Lippert and

Mewes, 2021; see also Lippert and Douglas-Jones, 2019). The emphasis of the present contribution, in contrast, is on the porous relations between field and writing (see also Grommé and Ruppert, this issue). The focus is on how potentially interesting *problems* are given shape and scale in movements between them. What matters most, from this vantage point, is specificity about the partial connections (Jensen and Lauritsen, 2005) that make up the problem space.

If the actor-network theory premise of generalized symmetry between human and nonhuman actors is recursively applied to the scene of inquiry, both ethnographer and 'data' appear as hybrid actors. This facilitates an image of nonhuman companionship, which I specify, via Marilyn Strathern's (1999) discussion of the ethnographic effect, as heterogeneous sets established 'in the field,' 'at the desk,' and in movements between the two. Along this route, I am led to suggest that writing entails keeping the research imagination alive to two processes of scaling: of the empirical within the text, and of diverse sets of literature in relation to each other. At issue is articulating relations between heterogeneous companions populating the different sets. The effect is to give proportion to, or scale, worlds, a point I illustrate with reference to two quite different texts about emerging Mekong realities. Writing is elicited as experimental additions to, or inventive augmentations of, those realities (Jensen, 2012). But while texts generate reality effects in this manner, those effects are unpredictable and uncontrolled from the point of view of the writer.

I reach the endpoint that ethnographic configurations find no better grounds than *dic cur hic*—why, here, now—or as Isabelle Stengers (2008: 29) has formulated it "say why you say it," just in this way, on just this occasion.

The ethnographic effect

Marilyn Strathern's (1999) depiction of the ethnographic effect takes us to the heart of the matter. Ethnographic practice, she writes, has always had a "double" location in what "the tradition" distinguishes as "the field" and "the desk" (Strathern, 1999: 1). Crucially, each offers a perspective on the other. Since it can't be predicted what "information" will later turn out to be relevant, the ethnographer must in principle be open to collect anything. This turns fieldwork into an anticipatory endeavor. It generates a "'field' of information" (Strathern, 1999: 9), which will be reactivated later, in the very different context of the 'desk.' It is at this point that one seeks to produce an ethnographic effect by recreating scenes from the field in writing.

Despite fieldwork references, Strathern's discussion of the ethnographic effect is characteristically impersonal. She mentions being "dazzled" by mounted displays of pearlshells in Mt. Hagen (Strathern, 1999: 8), for example, but that experience is separate from the question of ethnographic effects that might be induced in readers. After all, they will engage the text in an indefinite future and different contexts.

With the benefit of hindsight, it seems safe to say that many who read Strathern today do so not out of a deep interest in Melanesia but rather because they have come across some of her influential traveling concepts, like partial connections, post-plural societies, or dividual agents (as creatively put to use by e.g. Corsín-Jiménez, 2013; de la Cadena, 2015). Come to think of it, her observation about the acquisition and display of wealth in Mt. Hagen that "relations wither or flourish according to the properties seen to flow alongside them" so that "the *effectiveness* of relations … depends on the form in which certain objects appears" (Strathern, 1999: 16) might also be taken for a description of the fortunes of ethnographic descriptions in the hands of later users (Latour, 1987).

If the effects of writing are relationally specified by such 'later users,' authorial declarations can never be more than aspirational. Proclamations of ambition—to make nuanced descriptions, to be politically relevant or conceptually inventive, or to create generative outcomes—are of course free of charge. But they must be taken with a good pinch of salt since others will decide whether they were actually achieved. And such evaluations might be based on totally discrepant views of what is at stake.

Some provocative remarks written by the anthropologist Alfred Gell (2006) towards the end of his life provide illustration of what such incon-

gruence can look like. As part of a self-introduction, Gell (2006: xiii) observed that the increasingly prevalent critiques of colonialism appeared to him "futile in the absence of some practical activity," which rarely follows. He described his own writing as entirely oriented to the seminar culture of elite English universities; as a form of ethnographic "comedy" that did not shy away from finding "in the Other a source of amusement."

It is quite likely that many readers today will find this problematic. That would mean we are faced with discrepancy or incongruence as regards the motives for writing ethnography, the possible effects, or both. But it is worth slowing down.

If the question is whether Gell's viewpoint was elitist, the answer appears to be "yes." However, he is hardly arrogant or condescending. To the contrary, a quick inspection of the reasons he gives for sidestepping critique brings to light a sense of humility: "I have never understood how bourgeois like myself can consider themselves the class allies of third world peasants, since it seems to me we are all just walking, breathing examples of their exploitation" (Gell, 2006: 7). Against this background, 'comedic anthropology' appears as a strategy for avoiding what Gilles Deleuze (2004: 208) called *the indignity of speaking for others*.[2]

As it happened, Gell's (2006: 9) sense of "amusement" extended outwards, encompassing not only himself and "the Other" but also his esteemed colleague Marilyn Strathern, whose mind, he wrote, "works very differently from mine." "I do not think," he added, "that I have ever written anything which demanded more intellectual effort on my part" (Gell, 2006: 9). Characterizing these efforts at comprehension as "doing fieldwork all over again, but fieldwork on a text" (Gell, 2006: 9), he effectively collapsed the dichotomy between reality and writing, field and desk. And this collapse is highly significant because it facilitates exploration of the relation between ethnographic and rhetorical effects in another key. Texts appear as sites where bits of the world are *given scale* in descriptions and arguments.

Scaling arguments

It is well-known that actor-network theory depicts heterogeneous actors negotiating relations and thereby giving shape to their worlds. Some networks and interests grow stronger and bigger, while others weaken or disappear (e.g. Callon and Latour, 1981). Relatedly, Marilyn Strathern (1991) argued that actors are scaled by their relations with others.

Far from coincidental, the vagueness of these formulations as regards to who or what does the scaling—and what is thereby scaled—is deliberate and indeed pivotal (Jensen, 2007). The premise is the impossibility of mapping and matching a phenomenon to its scale in advance of examining the relations that constitute it and the effects they create. Thus, instead of pre-identifying a topic as 'macro' and assigning 'neoliberalism' or 'settler-colonialism' as the relevant explanatory rubrics, say, or as 'micro' and therefore primarily centered on 'lived experience' or 'situated interactions,' it becomes necessary to explore how phenomena, situations, or problems are *given scale*—inscribed with size and importance—by the relations actors make in various practices and situations.

In one situation, a designer inscribes a door-opener with the capacity to scale the subject, since it allows only those of sufficient size and strength to enter the room. In others, domestic lives are rescaled by changing ideas about gender. In yet others, geopolitics is rescaled by everything from 'Russian online bots' to Chinese infrastructure development. But texts and concepts also give scale to phenomena. Thus, ethnographers find themselves in a dual position. They write about how others scale the world (Tsing, 2005) and, doing so, and [they] contribute scaling it more or less similarly or differently.

To speak of a collapse of field and desk, text and world, then, is not to say that there are no differences. It means that the boundary is permeable and that whatever those differences are, they are *of the same order* as what distinguishes other actors. In terms of scaling capacities, the difference between an STS monograph ('text') and a dredging machine ('field'), say, is neither more fundamental nor inherently more significant than that between a climate policy and a weather station (both 'field').

Now this collapse might seem to loosen all constraint and undermine the very idea of serious ethnographic writing. Aren't we perilously close

to "extreme relativism"? Doesn't it follow that "anything goes"? In practice, however, constraints multiply. It will be very difficult to convince people about a great many things. Among other things, writing is kept in line by a range of genre and disciplinary conventions that delimit what it is possible to say, and how—at least if one wants to be heard.

It should be clear that this re-description conforms neither to the expectation that texts must *explain* empirical materials with theory nor to the inverse idea that they ought to *present* unadorned bits of lived reality. Instead, the double process of scaling works through lateral movements across empirical and conceptual elements, both of which are frequently found in places where they are not supposed to be (the empirical inside theory and the conceptual in the field) (Jensen, 2014).

In later sections, I offer two brief illustrations from my own writing—not because they are privileged (they are not), or particularly successful (I am not sure), or even because I *want to* (being much more disposed to a Strathernian kind of impersonality)—but because, unable to access anybody else's research and writing process, there is no choice. These examples will elicit two simultaneous scaling processes: of the empirical within the text, and of diverse sets of literature in relation to each other. In this movement, ethnographic writing morph into experimental additions to, or augmentations of, worlds.

Leaky sets and transformable relations

In *The Relation*, Marilyn Strathern (1995) made the uncontroversial observation that social anthropologists gather materials pertaining to "social" or "cultural" relations, which they subsequently seek to analyze. However, she added that the act of aligning materials and concepts was itself performative. In writing ethnography, the anthropologist uses all available sets of materials (some "data," some "theory") to produce, through redescription, an image of a world.

As already noted, there is no absolute difference in kind between these sets: they do not have a predefined scale. Accordingly, it is not a matter of social theories and concepts being pulled out of the hat to *explain* reality, but also not one in which ethnographic data is more or less self-explanatory. Instead, the image is relational through and through. The 'ethnographic effect' emerges from creatively interrelating the sets, allowing them mutual expression *through each other* with reference to a gradually emerging field of topics and problems. As "empirical" relations exchange properties with "analytical constructs" both become blended products. The conventional dual relation between theory and data changes, the former unable to explain the latter, since it also lives within it.

If 'the field' has no inherent scale, it might be thought that the task of the ethnographer is to scale it through writing. As I have already hinted at, however, this is not quite precise. Because the problem is not that the field (or world) has *no* scale of its own but rather that it has *too many*. It has too many scales, because all the actors are constantly modifying it in a thousand different ways. As actors among everyone else, STS ethnographers are *also* scaling the world, modifying and performing it.[3] And so, their writings are added to the world.[4]

The situation can be elucidated with Bruno Latour's (1988a: 158) term 'irreductions,' which describes a situation where "nothing is, by itself, either reducible or irreducible to anything else." But anything is *potentially* connectible with anything else. Note that Latour did not write that everything *is* always connected with everything else. He also did not say that everything *will be*, or *should be*, or *must be* connected. He simply observed that it is impossible *to know in advance* what will become related and to which effect. Today, nobody can say with much precision through which relational arrangements like 'artificial intelligence,' the 'alt-right,' or the 'Anthropocene' will continue to affect the world.

Reality is the generic name for relations that have managed to take hold and maintain stability over time. But most things are not linked to most other things, and making relations in the first place is often very difficult. Making them stick – thereby inscribing them with reality—is even harder. Indeed, the more distant, apparently unrelated, or unusual, those relations are from the point of view

of present realities, the harder it is, and the more difficult it will be to make them hold. This goes for bridges, which might be built from many strange materials, but usually are not, but it also goes for texts and arguments.

Sitting before the screen, one is thus always situated within a field shaped by previous conversations and established conventions. If you set out to write laboratory studies today, you will need good reasons to blankly refuse engagement with previous seminal contributions (e.g. Latour and Woolgar, 1986; Traweek, 1988; Knorr-Cetina, 1999). At issue is not simply the empirical materials brought to light by earlier scholarship but "how disciplining operates, how we perform the role of theories, of methods, of concepts" (Lippert, 2020: 302, see also Jensen, 2014; Law, 2004; Lury and Wakeford, 2012). As Jean-François Lyotard (1988: xii) observed, one always writes into a genre of discourse that supplies its own "rules for linking together heterogeneous phrases." Refusal to adhere to those rules means will often mean failure to make one's case.

But this somewhat conservative image can thankfully be rendered more dynamic. For after all genres of discourse *are* open to change. Strathern and Latour are both good examples of scholars who, dissatisfied with existing conventions, took risks that eventually paid off. Thus, Latour (e.g. 1991) and colleagues effectively disrupted the long-lasting and powerful dichotomy between humans and nonhumans, while Strathern (1995) and others changed dominant understandings of 'the relation' itself. Among other things, that is why I am able to write these words today.

But while empirical demonstrations were crucial for these disciplinary translations (Jensen, 2020a), they did not accomplish them single-handedly. The changes were consequent upon the formidable rhetorical skills of these scholars in equal measure.

This raises the question of the relation between giving internal scale to an argument and achieving indeterminate future effects.

Making room for surprising companions

We can call what enables interesting ways of giving scale to arguments and worlds in texts—with a view to producing ethnographic effects—*the research imagination*. This imagination is actively constructed through a process of *moving between sets of materials* in the course of doing research. Empirical inquiry is obviously central to STS, yet it does not guarantee a great contribution to the field. But it is also rare that a great research imagination emerges exclusively from reading theory in a library. Minimally, then, we can talk of empirical or field-data sets and sets of readings.

As Strathern emphasized, there is a two- or many-way relation between such sets. As Latour pointed out, no general rules will tell you what, from a given set, might be related to what, from another. Making these relations, in fact, *is* what it means to write (STS) ethnography, and the way one does so is always informed, one way or another, by some problem, concern, or interest. At the same time, as Lyotard (1988) noted, there are established discourses and genre conventions, conformance to which makes one's arguments more readily acceptable within a discipline.

Close encounters with the varied companions that populate these sets is a way to tickle the research imagination. Placing them side-by-side, and repeatedly going over them, can induce a gradually awakening perception of relations and possible patterns of argument. This sounds quite abstract, so let me be more specific. I offer brief illustration from a study of various scientists and organizations developing hydrological and other models to predict what will happen with the Mekong river basin due to dam development and climate change (Jensen, 2020b).

Now this topic is massive and the relevant empirical and conceptual contexts are numerous. Many kinds of research could be carried out in all kinds of settings, and a variety of fields of knowledge, theories and questions are potentially relevant.

What first caught my attention was that many of the Mekong models seemed somehow related. They appeared to have a comparative dimension, since scientists would often argue that their new models responded to gaps in existing knowledge. So, isn't this an empirical observation, as clear as they come? Well, not quite. The fact is that I had previously read Tim Choy's (2011) *Ecologies of Comparison*, and it is quite possible that my

ability to see what was happening as a comparative ecology of models was first triggered by memories of this book. Moreover, there was an apparent connection with Isabelle Stengers' (2005) 'Ecologies of Practice,' which has long influenced my thinking.

In any case, the general idea of an ecology of models transformed by processes of comparison seemed a *sufficiently* good starting point. I used it to create sets of readings to enhance my research imagination. The sets included background materials on the geography and sociopolitical situation of the Mekong, descriptions of the models themselves, and discussions of models among philosophers and STS scholars. Obviously, empirical materials comprised of interviews and field notes comprised yet another set. All are populated by heterogeneous ethnographic companions.

In my own experience, the size and composition of such sets can vary significantly but they must be substantial and internally varied (for exploration of some different compositions see Bleumink et al., this issue and Endaltseva and Jerak-Zuiderent, this issue). In preparation for writing, I read and take copious notes, which I organize thematically. I usually go over them many times prior to writing a single word. Such notes contain all sorts of things: stuff I already know very well as well as bits of information and kinds of argumentation I am just getting acquainted with. But the most important point is that reading the sets *alongside one another* is a way to stimulate the research imagination, and make it possible to see emerging questions, pressing problems, interesting possibilities, or curious relations in the materials. It is a matter of allowing one's ethnographic companions to speak back to you in a surprising manner.

Crucially, again, this entails no hierarchy. I mention this because of the occasional tendency of STS researchers (and others) to be quite reverent with respect to their 'empirical data,' but somewhat looser in their engagements with 'theory' (sometimes, of course, *vice versa*). But to draw out what is interesting in each set, and to allow those interesting companions to mutually inflect each other, they must be given *the same degree of attentiveness*. This is why Alfred Gell's (2006) description of his attempt to understand Marilyn Strathern is so much on point: reading her *is like doing fieldwork on a written text*. The 'literature' is simply part of the 'empirical materials.' Conversely, those materials are equally part of the 'conceptual resources.' All are companions.

This may sound quite experimental[5] but of little consequence if one aims to write more conventional STS. However, this line does not let you off the hook. Because a bit of attentiveness shows actors and elements that *are supposed to belong* to one set popping up within another with somewhat alarming frequency. Ignoring such surprise appearances or refusing to deal with their implications can be described as a form of deliberate neglect of your ethnographic companions.

To exemplify what such appearances can look like, my loose, initial sense that everyone seemed to be modeling the Mekong was corroborated by reading hydrology papers that described the river basin as *flooded with models* (Johnston and Kummu, 2012; Wild and Loucks, 2014). In turn, this (empirical) characterization turned out to resonate with Ian Hacking's (1983: 219) (philosophical) depiction of models as a "Library of Babel." And that image tied in with the modelers' own (theoretical) intuition that the many hydrological and hydrodynamic models, rather than leading to chaos, created strength in diversity.

With a view to sharpening my analysis of the problematic relations between modeling and policy in the Mekong context, I recalled and dug up Paul Edwards' (1996) discussion of similar difficulties in another context. Among his examples was the systems dynamics modeling conducted by Jay Forrester at MIT in the late 1950s. It then dawned upon me that an ecological modeler I had recently interviewed used an updated version of this exact approach. In other words, while I had looked to Edwards for analytical resources about one kind of problem (models and policy) his text ended up as part of the empirical materials that helped to elucidate another (systems dynamics modeling and its practical uses in Cambodia). Once again, the overarching point is that whatever differences there may be between sets of materials, they will *not map onto* a clean distinction between the empirical and the conceptual, or between theory and data.

As a final illustration of the emergence of a research imagination from reading across sets, let me touch upon my 'empirical' topics, models and modeling. The philosopher Max Black (1962: 241) famously argued that models work by analogical extension of a repertoire of ideas from one domain to another. Without mentioning either Black, the philosopher, or models, the anthropologist Roy Wagner later characterized the invention of culture in practically identical terms. The fieldworker, he wrote, creates analogies that are "extensions of his own notions and those of his culture, transformed by his experiences of the field situation. He uses the latter as a kind of 'lever,' the way a pole vaulter uses his pole, to catapult his comprehension beyond the limitations imposed by earlier viewpoints" (Wagner, 1975: 18).

And if we fast forward another two decades and step into STS, we come across Andrew Pickering's (1995: 19) description of cultural change as an open-ended process of modeling. While modeling is something "empirical" modelers do, in the hands of these diverse scholars it becomes a concept-model for cultural transformation and invention. In which case the practical work of modeling the Mekong recursively instantiates Pickering and Wagner's tantalizing argument that culture extension and reinvention are forms of modeling. As philosophers, social scientists, and modelers provide *mutual illustration of each other's points*, it ceases to be at all clear where the empirical begins and the conceptual starts—or *vice versa*.

Articulating relations across sets, then, is a way of enriching the research imagination. With the help of your diverse companions you (hope to) gradually construct better, more interesting, questions and problems. This happens differently every time, but it almost always involves continuous comparisons to draw out those virtual relations. Some will eventually be actualized in writing, and others can be kept for another occasion. But the majority are simply discarded.

We are not done yet, however. Because, as I will now discuss, writing also entails various process of scaling in its own right. There is a scaling of empirical materials within the argument and, simultaneously, a scaling of diverse literatures both in relation to each other and to those materials.

The world and the text

Writing ethnography entails giving scale to arguments and worlds, and this elicits the difficulties of keeping rhetorical and ethnographic effects apart. Still, STS scholars and anthropologists will understandably feel that something crucial is lost if the two are *simply* collapsed. Since ethnography 'writes people,' it must contain them somewhere. Those who write must, so to speak, find ways to "load" something (people-ish) from the world into the text. And they do find many different ways. But again, this is poorly understood in terms of correct representation. Instead, it is a matter of scaling and re-scaling gestures, words, and acts into different media (here, the text, but it might also be video, say, or anime) for different reasons than what motivated their occurrence in the first place. Since ethnographers hope to create their own effects in the process, we are in a realm of recursion and performativity. But if the ethnographic text does not represent the world, in which way can it be said to relate to it?

Here there is a tension between ethnographic and rhetorical effects, because inseparability notwithstanding, their coexistence tends to generate systems in disequilibrium. Marilyn Strathern's "Binary License" (2011) explores how instability—in consequence of the text pointing in several directions at once—requires running commentary on what is significant at any given moment: an aspect of methodology, an empirical detail, a fine theoretical nuance, a political implication, or something else. At the same time, as previously noted, such commentary confers no ultimate control upon the writer.

Another text, not coincidentally titled "Mekong Scales" (Jensen, 2017) can be used to illustrate some of the resulting instabilities.[6] This piece was originally written for a symposium on the "Uncommons," organized by Marisol de la Cadena at University of California, Davis and later published as a special issue of *Anthropologica* on the same topic (Blaser and de la Cadena, 2017). In it, I aimed to figure out how various 'domains' of the Mekong—community-forestry, climate change, dam development and ecotourism—were incongruously scaled by various more or less incommensurable practices. For example, international policy makers tend to view communities

along the river as small-scale and insignificant relative to their own highly significant and large-scale climate interventions. But from the point of view *of* those communities, global policy barely even registers. The presence of adjacent logging companies or river spirits is far more consequential.

As it happened, I also elaborated on these dynamics as an effect of two kinds of scaling—one generated from within domains and another imposed on them from without—happening at once. Thus, I described community forestry as simultaneously defined by "intra-relations" occurring as villagers plant saplings, patrol forest borders or debate whether these activities are worth their time and effort, and by "inter-relations" between these internal activities and external ones relating to streams of money and discourse from environmental NGOs (cf. Green, 2005). These interwoven relations, I argued (then as now) *generate* the scale of community forestry.

Now this is an exceedingly complex situation because there are multiple domains, very many actors, and heterogeneity both within and across them. Empirically, it is difficult to know exactly what is going on, and the need to reduce complexity in writing makes things look simpler than they are. To tackle this issue, I switched between perspectives and activities internal and external to different domains. I discussed NGOs attempt to scale the domain of community forestry from the outside. Then I considered how conflicting scales are produced internally, by describing bits of what the situation looks like for people living in the village. And then I examined how regional politics interfered with both of these domains.

Textually, the effect was more or less kaleidoscopic. And, in *one sense*, this was simply a consequence of ethnographic encounters with many different practices, perspectives, and attempts to scale the Mekong during fieldwork. But it was *also* kaleidoscopic because it was specifically written to explore the 'uncommons' as an empirical and conceptual alternative to 'the commons.' In this context, ethnographic materials could be activated to suggest that no fixed, common ground exist behind or underneath divergent efforts to scale domains. The Mekong, I concluded, neither adds up to, nor presumes, any whole entity.

"Mekong Scales" drew on various ethnographic materials to describe various "domains" and the effects of their interrelations. In contrast with the present text, it contained little meta-commentary on its own strategies of scaling. However, the relevant difference is not really that the former is more 'empirical' compared with the latter, which is more 'rhetorical,' 'theoretical,' or 'reflexive.' Because both are all of those things at the same time. They simply focus on different elements, which they proportion differently, for different purposes.

This means, as I will now suggest, that the one thing that truly matters—because it remains in the hands of the writer—is to articulate why you put things together in just this way, scale relations just like this, for this particular occasion. That simple dictum is more demanding than it might appear.

Say why you say it

I have discussed how varied ethnographic collaborations and performative engagements come together to scale relations between words and worlds. The text turns into a collaborative "machine for making elements cohere as an event" (Brown, 1997: 165).

There is no escape from this condition. If one writes a down-to-earth ethnography of users caring for their technologies that *will* involve textually scaling of the elements to exhibit care as a crucial feature of the situation. If one writes a critique of how the radical activist potentials of STS have been hollowed out by an in-group of theory bros, the force of that argument too, *will* depend on rhetorically proportioning relations. But if writing—like carpentry, nursing, or electrical engineering—simply names some ways of inhabiting and scaling worlds—then perhaps there is nothing very scandalous about that.

In fact, I will argue that recognizing writing as a subset of collective patterns being woven from diverse sets of materials with diverse companions is *central* to a nonhumanist STS sensitivity. By nourishing an experimental disposition to try out different approaches, styles, and forms of argumentation with an unpredictable range

of companions, it opens pathways to, as they say, 'free your mind.' For the same reason, it has potential implications well beyond the home field. There is little need to worry that realities dissolve in such experiments, since they are given scale and *added* to the world by the text itself. But it is safe to say that some motives for writing find themselves on unstable grounds.

According to a conventional imagination, ethnography writes peoples' lives by making descriptions, by contextualization, and, finally, by analysis guided by theory. Once the dichotomy between the conceptual and the empirical is replaced with a lateral movement of relations (Gad and Jensen, 2016) and a collaborative image of writing ("a machine for making elements cohere as an event"), this scheme ceases to function. But what replaces it? What, according to non-humanist STS, is the *point*?

More than three decades ago, Latour's (1988) "Politics of Explanation" offered a lucid discussion of that issue. There, he argued that all sciences from physics to art history are "defined by the elements they extract from the settings, recombine and display" (Latour, 1988: 159). Only some sciences, however, strive to make *a few* theoretical elements stand in for many empirical ones. They are the ones about which we say that they provide "strong explanations." But for other fields, like STS and anthropology, the aim is rather to *simultaneously* display the empirical elements and the effort by the researcher to "extract" and enliven them (Latour, 1998: 163). This generates "a space that is neither above nor inside those networks" (Latour, 1998: 165): the textual space of rhetorical and ethnographic effects. Latour (1988: 174) concluded that *any* style of writing is fine as long as it exhibits "local and provisional variations of scale" rather than imposing a fixed framework.

We can note, once again, the proximity between Latour's (1988: 165-166) specification of the problem of writing as "how to be at once here and there" and Strathern's (1999) elicitation of the ethnographic effect in movements between field and desk. But their reluctance to provide much more specification is also striking.

As I see it, this shared disinclination speaks to two separate but interrelated issues. The first is *unwillingness*: to represent others, but also to tell other researchers what they must do or why. It is the indignity of speaking for others evoked by Deleuze (2004). As Bartleby famously said: "I would prefer not to." But at the same time, we can recognize acknowledgment of an *inability*. It means: *I can't tell you*, because there is no general rule for how to proceed or why. *It depends*.

Hence, as Ingmar Lippert (2020: 303) notes, we can in practice always expect to encounter "a multiplicity of methods and concepts." But since this is a consequence of the concrete, practical variability of circumstances, contexts, and problems, reflexivity can offer but tenuous handles on the situation. It will simply be added to the mix and stirred. This is why, back in 1988, when Latour (1988b: 176) was quizzed about the "grounds" for his advocacy on behalf of textual spaces "neither above nor inside the networks," he responded by simply turning the tables. "Why does this generation ask for a miraculous sign?" he quoted from the gospel of Mark (8:12) "I tell you the truth, *no sign will be given to it*."

The lack of general advice and bulletproof methods does not mean that one might as well give up and go home. Instead, the point—and it is, again, crucial to a non-humanist STS sensitivity—is just about the opposite: Nothing is lost with the disappearance of generalities (except, obviously, those generalities themselves). In place of *the* point (which is indeed missing) there *any number of excellent reasons* for experimenting with collaborations, textual companionship, and the scaling of ethnographic and rhetorical effects.

Some are driven by insatiable empirical curiosity and others by keen theoretical interests. In STS, many write due to a sense of technology and science-based injustices. A few are seduced by dimly detectable world-historical transformable which they alone feel able to give expression. More broadly, others write for the love of a people, a city, or a place. But in each case, writing is an adventure that scales and rescales relations in order to evoke what matters about *just these things*. Even at their most abstract, the reasons why texts matter are always *relationally concrete*.

Somewhat paradoxically, 'methodography' appears from this perspective simultaneously too narrow and too general. The focus on social research methods in practice is limiting because

ethnographic companionship is far more encompassing and diffuse than what can be elicited as method in specific field encounters (see also Gad and Jensen, 2014). Conversely, the notion that methodography offers a way forward for STS is vague and non-committal as long as the motivating problems, agendas, context, and issues for which it is intended to be generative are not articulated. My bet is that any specific attempt to articulate them would immediately open many divergent paths.

Definitively letting go of the 'god's eye view,'[7] the view of writing and its effects I have presented here can be described as a-critical, which is not at all the same as neutral, or uncritical. Abandoning safeguards and protections—epistemological, methodological, and political—to operate in a minor key, a-critical writing simply designates a pragmatic and experimental orientation to whatever particular problems and situations motivates it. At issue, as Isabelle Stengers (2008: 29) says, is nothing more or less than the demand to clearly articulate why you "choose to say, or do, 'this,' on 'this' precise occasion" without resorting to general reasons or hiding behind abstract justifications.

The effects remain to be seen.

Bibliography

Austin JL (1975) *How to Do Things with Words*. Oxford: Oxford University Press.

Black M (1962) *Models and Metaphors: Studies in Language and Philosophy*. Ithaca, NY: Cornell University Press.

Blaser M and de la Cadena M (2017) The uncommons: An introduction. *Anthropologica* 59(2): 185-193.

Bleumink R, Jong L and Plájás IZ (2021) Composite Method: The Absent Presence of Race in Experimental Film and Facial Composite Drawing. *Science & Technology Studies* 34(3):17-37.

Brown SD (1997) In the wake of disaster: Stress, hysteria and the event. In: Hetherington K (ed) *Ideas of Difference*. Oxford: Blackwell, pp. 64-84.

Callon M and Latour B (1981) Unscrewing the big leviathan: How actors macrostructure reality and how sociologists help them do so. In: Knorr-Cetina K and Cicourel A (eds) *Advances in Social Theory and Methodology: Toward an Integration of Micro and Macro Sociologies*. London: Routledge & Keagan Paul, pp. 277-303.

Choy T (2011) *Ecologies of Comparison: An Ethnography of Endangerment in Hong Kong*. Durham, NC: Duke University Press.

Corsín-Jiménez A (2013) *An Anthropological Trompe L'oeil for a Common World: An Essay on the Economy of Knowledge*. New York & Oxford: Berghahn.

De la Cadena M (2015) *Earth beings: Ecologies of Practice across Andean Worlds*. Durham, NC & London: Duke University Press.

Deleuze G (2004) *Desert Islands and Other Texts, 1953-1974*. New York: Semiotext(e).

Edwards P (1996) Global comprehensive models in politics and policymaking. *Climatic Change* 32 [January]: 149-161.

Endaltseva A and Jerak-Zuiderent S (2021) Embodiment in Ethnographic Collaborations Composition, Movement, and Pausing within the Multiple Sclerosis Society in Russia. *Science & Technology Studies* 34(3): 38-54.

Fish S (1989) *Doing What Comes Naturally: Change, Rhetoric, and the Practice of Theory in Literary and Legal Studies*. Durham, NC: Duke University Press.

Gad C and Jensen CB (2014) The promises of practice. *The Sociological Review* 62(4): 698-718.

Gad C and Jensen CB (2016) Lateral concepts. *Engaging Science, Technology and Society* 2: 3-12.

Gell A (2006 [1999]) *The Art of Anthropology: Essays and Diagrams*. Oxford & New York: Berg.

Green S (2005) *Notes from the Balkans: Locating Marginality and Ambiguity on the Greek-Albanian Border*. Princeton, NJ and Oxford: Princeton University Press.

Grommé F and Ruppert E (2021) Imagining Citizens as More than Data Subjects: A Methodography of a Collaborative Design Workshop on Co-producing Official Statistics. *Science & Technology Studies* 34(3): 103-124.

Hacking I (1983) *Representing and Intervening: Introductory Topics in the Philosophy of the Natural Sciences*. Cambridge: Cambridge University Press.

Jensen CB (2007) Infrastructural fractals: Revisiting the micro-macro distinction in social theory. Environment and Planning D: Society and Space. 25(5) 832-850.

Jensen CB (2012) The task of anthropology is to invent relations: Proposing the motion. *Critique of Anthropology* 32(1): 47-53.

Jensen CB (2014) Continuous variations: The conceptual and the empirical in STS. *Science, Technology, & Human Values* 39(2): 192-213.

Jensen CB (2017) Mekong scales: Domains, test-sites, and the uncommons. *Anthropologica* 59(2) 204-215.

Jensen CB (2020a) Disciplinary translations: Latour in literary studies and anthropology. *Common Knowledge* 26(2): 230-50.

Jensen CB (2020b) A flood of models: Mekong ecologies of comparison. *Social Studies of Science* 50(1): 76-93.

Jensen CB and Lauritsen P (2005) Qualitative research as partial connection: Bypassing the power-knowledge nexus. *Qualitative Research* 5(1): 59-77.

Johnston R and Kummu M (2012) Water resource models in the Mekong basin: A review. *Water Resource Management* 26: 429-55.

Knorr Cetina K (1999) *Epistemic Cultures: How the Sciences Make Knowledge*. Cambridge & London: Harvard University Press.

Latour B (1987) *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge, MA: Harvard University Press.

Latour B (1988) Irreductions. In: *The Pasteurization of France*. Cambridge, MA: Harvard University Press.

Latour B (1988b) The politics of explanation. In: Woolgar S (ed) *Knowledge and Reflexivity*. London: Sage, pp. 155-177.

Latour B (1991) The impact of science studies on political philosophy. *Science, Technology, & Human Values* 16(1): 3-19.

Latour B and Woolgar S (1986) *Laboratory Life: The Construction of Scientific Facts*. Princeton, NJ: Princeton University Press.

Law J (2004) *After Method: Mess in Social Science Research*. London & New York: Routledge.

Lury C and Wakeford N (eds) (2012) *Inventive Methods*: *The Happening of the Social*. London & New York: Routledge.

Lippert I (2020) In, with and of STS. In: Wiedmann A, Wagenknecht K, Goll P and Wagenknecht A (eds) *Wie forschen mit den 'Science and Technology Studies'? Interdisziplinäre Perspektiven*. Bielefeld: Transcript, pp. 301-318.

Lippert I and Douglas-Jones R (2019) "Doing data"/methodography in and of STS. *EASST Review* 38(1): 35-39.

Lippert I and Mewes J (2021) Data, methods and writing: Methodographies of STS ethnographic collaboration in practice. *Science & Technology Studies* 34(3): 2-16.

Lyotard J-F (1988) *The Differend: Phrases in Dispute*. Minneapolis, MN: University of Minnesota Press.

Maurer B (2005) *Mutual Life, Limited Islamic Banking, Alternative Currencies, Lateral Reason*. Princeton, NJ: Princeton University Press.

Pickering A (1995) *The Mangle of Practice*: *Time, Agency and Science*. Chicago, IL & London: University of Chicago Press.

Stengers I (2005) Introductory notes on an ecology of practices. *Cultural Studies Review* 11(1): 183-196.

Stengers I (2008) Thinking with Deleuze and Whitehead: A Double Test. In: Robinson K (ed) *Deleuze, Whitehead, Bergson: Rhizomatic Connections*. London: Palgrave MacMillan, pp. 28-45.

Strathern M (1991) *Partial Connections*. Lanham, MD: Rowman & Littlefield.

Strathern M (1995) *The Relation: Issues in Complexity and Scale*. Cambridge: Prickly Pear Press.

Strathern M (1999) *Property, Substance and Effect*. London & New Brunswick: Athlone.

Strathern M (2011) Binary license. *Common Knowledge* 17(1): 87-103.

Tsing AL (2005) *Friction: An Ethnography of Global Connection*. Princeton, NJ: Princeton University Press.

Traweek S (1988) *Beamtimes and Lifetimes: The World of High Energy Physicists*. Cambridge & London: Harvard University Press.

Wagner R (1975) *The Invention of Culture*. Englewood Cliffs, NJ: Prentice-Hall.

Wild TB and Loucks DP (2014) Managing flow, sediment, and hydropower regimes in the Sre Pok, Se San, and Se Kong rivers of the Mekong basin. *Water Resources Research* 50: 5141-5157.

Woolgar S (ed) (1988) *Knowledge and Reflexivity*. London: Sage.

Notes

1 The original reflexive moment is performed in Woolgar (1988).

2 By acknowledging his relative privilege while also insisting on relative powerlessness, it can be said that Gell made a virtue of circumstance. But one might also hear a quiet reply to virtual critics. Is a comedic stance really more problematic than the pretense that stinging peer-reviewed rebukes and scathing workshop interventions make any significant difference?

3 This can be taken as part of an ontological argument but need not be. As Stanley Fish (1980: 490) points out, at the end of J. L. Austin's (1975) *How to Do Things with Words* the group of constative terms, which was supposed to be assessable with respect to truth—in contradistinction to performatives, which produced a state of affairs by being said—was "discovered to be a subset of performatives, and with this discovery the formal core of language disappears entirely and is replaced by a world of utterances vulnerable to the sea change of every circumstance, the world, in short, of rhetorical (situated) man."

4 "But writing does not change the reality of what is written about" sounds the inevitable objection. Or, it is so inconsequential that it hardly makes sense to call it performative. But most other things also don't change the world *very much*. Conversely, some texts (Karl Marx, Milton Friedman) have generated quite disproportionate effects. Like everything else, writing *turns out to be* powerful or not.

5 It is one of the key motives in Bill Maurer's (2005) fascinating lateral anthropology.

6 The following paraphrases bits from (Jensen, 2017), rescaling them, as it were, for the present context.

7 Of course, everybody in STS and feminist technoscience abandoned the god's eye view long ago. In principle. In practice, it continues to show whenever situated knowledges, infra-action, cosmopolitics—or methodography—are evoked as *general categories that make the same demands everywhere*. Paradoxically, god's eye view 2.0 reappear in the surprise guise of universal principle for tackling specificity.

Building bridges: About the Reflection Work and Consequences of STS Method Practices in Three Current Publications

Meier zu Verl Christian (2018) Daten-Karrieren und epistemische Materialität: Eine wissenschaftssoziologische Studie zur methodologischen Praxis der Ethnografie. Stuttgart: J.B. Metzler. 288 pages. ISBN: 978-3-476-04603-1

Estalella A and Criado TS (eds) (2018) Experimental Collaborations: Ethnography through Fieldwork Devices. Easa Series. New York: Berghahn Books. 236 pages. ISBN: 978-1-78533-853-3

Wiedmann A, Wagenknecht K, Goll P and Wagenknecht A (eds) (2020) Wie forschen mit den ‚Science and Technology Studies'? Interdisziplinäre Perspektiven. Bielefeld: transcript. 326 pages. ISBN: 978-3-8376-4379-4

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Abstract

This review discusses three recent book publications devoted to a detailed description and reflection of methodology. These are three different contributions that focus on different disciplinary approaches to STS methods: sociology (via Meier zu Verl's monograph "Daten-Karrieren und epistemische Materialität" [Data Careers and Epistemic Materiality]), cultural anthropology (represented by Estalella's and Criado's edited volume "Experimental Collaborations") and, across these discussions, an interdisciplinary lens (brought in by Wiedmann et al.'s "Wie forschen mit den 'Science and Technology Studies'?" [How to do research with 'Science and Technology Studies'?]). Based on these publications, a transformation of STS method reflection can be traced. We have now arrived at the gratifying state that the methods literature aims to build bridges to mediate between methodological ideals on the one hand and research realities on the other. At the same time, the field creatively reflects on the diverse effects of STS method practices.

Introduction

How can publications be put to work, and what kind of work is required to achieve compelling scholarship? One of the critical suggestions from professional book editors such as William Germano (2013) is that a publication should not block its success with methods discussions, especially when lengthy literature reviews are in play. Scholars of Science and Technology Studies (STS), however, have a distinctive position in this.

The present special issue puts to the practice an extreme variant of the "methods chapter", one could argue: a systematic description and analysis of STS method practices. The issue works in tandem with an emerging trend in STS represented by related publications (e.g., Deville et al., 2016; Law and Ruppert, 2013; Lippert and Mewes, 2021) and a generally increased desire and convic-

tion to be aware of the use and effects of methodological work (cf. the reviews: Alberti, 2016, Algarra, 2019, Brown, 2016).

With this review essay, I engage with three recent publications, in which methodological work is reflected and performed: Meier zu Verl's monograph *Daten-Karrieren und epistemische Materialität* [Data Careers and Epistemic Materiality] (Meier zu Verl, 2018), Estalella's and Criado's edited volume *Experimental Collaborations* (Estalella and Criado, 2018), and Wiedmann et al.'s edited volume *Wie forschen mit den 'Science and Technology Studies'*? [How to do research with 'Science and Technology Studies'?] (Wiedmann et al., 2020) These three contributions focus on different disciplinary approaches to and translations of STS literature: sociology, cultural anthropology and, across these, an interdisciplinary lens. What constellations do the texts put readers in? And what can be learned from the discussions about the development of STS?

I begin with a brief introduction of the three books in question, carving out their innovative lens. Then I will argue that the authors set up constellations that help stabilise bridges between methodological expectations and lived challenges, yet they engage in diverse forms of bridge-building.

Qualitative social science research in introspection

Meier zu Verl has filled a research gap with his publication (a dissertation thesis) that was apparent since the science studies literature emerged. The author's monograph *Data Careers and Epistemic Materiality* provides detailed observation, analysis, and reflection of a qualitative research team's research practices. Drawing on ethnomethodology with a sensitivity for STS approaches, he traces the emergence of ethnographic data. Meier zu Verl's study lays out the flow of materials and the necessary work during the "career" of data. The observation reminds me of science studies publications in so as far the career metaphor fits well, for example, with Latour's pertinent concept of 'circulating reference' (Latour, 1999). However, Meier zu Verl emphasises the peculiarities of qualitative social science research endeavours, the situated and embodied practices at the heart of an ethnographic research project. Following the analysis is demanding though as the reader is forced to think across meta-levels while Meier zu Verl reflects on the reflection.

The study examines the exploration of everyday life in educational institutions (for details on this, check Sormani's (2020) review of the book). The collective dimension of the project under investigation stands out, even if it is not explored in detail (cf. Meinhoff's (2019) review). Of particular value is Meier zu Verl's classification of data in transition, "provisionally" being selected by ethnographers. It is about data that are assumed to be relevant – in short, "proto-data". According to the author, convincing analyses depend on marking and translation field site experiences; on selecting, breaking, testing, preparing, polishing and then stabilising such proto-data. Closure procedures following from the stabilisation work are contingent. But justification practices are elaborate and matters of scrutiny. Many exciting things are going on here. It is somewhat surprising, for example, that occasionally positivist, quasi-naturalist understandings of ethnographic data help produce persuasive arguments. Yet, Meier zu Verl's conclusion goes beyond such sociological interpretations insofar as general challenges for quality criteria, basics of data reflection and normative registers of social science are derived.

Meier zu Verl mediates elegantly between expectation and realisation. The author spells out the work done by researchers to "bridge the gap between methodologically formulated criterion and lived methodological practice […] in a practical way" (Meier zu Verl, 2018: 264; translation by SL). His achievement is to make this work tangible.

Experimental Collaborations, edited by Estalella and Sánchez Criado, is dedicated to the collective dimension of research and can be read in relation to Meier zu Verl, where this aspect remains rather implicit. Due to its location in anthropology, and the discipline's long history of controversial reflection, in contrast, the volume is more open and direct in its engagement with research partners. In 8 chapters, plus the foreword by Marcus, the editors' introduction and the afterword by Pink, the volume's authors develop conceptual themes in close interaction with thick empirical material.

They normalise collaboration as a fundamental mode of ethnographic research, with the key contribution to put experimental approaches at the centre of the discussion.

The volume proposes devices for attuning researchers to field sites, moving in and with them, or making sense of specific encounters after the fact. For example, the introduction explicitly proposes the term "fieldwork device" as a strategic influence on research; Garnet's chapter on air pollution data explores the performance of interdisciplinary forms of meeting and co-laborating while reflecting on the precarious achievement an interdisciplinary group is; Ramella's contribution follows a music band and shows how the mobility of a tour bus shapes the actors and her position in a multi-layered way; Kasatkina et al. posit the materiality of transcripts, using the example of the ethos of a local Soviet scientific elite, hence exploring the troubling responses of interview interlocutors in the process of transcript authorisation. The potential shape of fieldwork devices is difficult to convey in a purely conceptual or textbook format – this volume uses powerful examples to help readers out. Consider Schiller's chapter about a traineeship where she was able to work in three different municipal organisations and at the same time had to adjust to actors, affordances and cooperation in three different ways. What follows from this case is a valuable differentiation of the concept of "para-site" (Holmes and Marcus, 2008), which is important for the entire volume.

In sum, this edited volume lets me, as a reader, focus on both deeply practical and care-fully designed settings. The humanity of ethnographic research projects emerges, with its "methodological anxieties" and the often required "creative inventiveness emanating from fieldwork practices," as Criado and Estalello put it (2018: 1).

How to do research with 'Science and Technology Studies', an edited volume by Wiedmann, Wagenknecht, Goll and Wagenknecht, sets out to overcome latent prejudices, especially in the German-speaking context, about the methodological inadequacy of STS methods. Like the other two publications discussed above, the volume is sensitive to STS studies' distinctive theoretical explorations. The editors decided to consistently put 'STS' in quotation marks, honouring the field's diversity. Indeed, a variety of disciplines, and German as well as English contributions, feature in this volume. The book is at the same time unravelling the effects of STS methodological practices (see the afterword by Lippert). It focuses on STS research practices and how selected research projects juggle the routines, oddities, hurdles, and scholars' research aspirations. In this sense, the book's title carries a double meaning as well (which my translation into English does not convey), since "forschen mit den 'STS'" implies being in the field *amidst* STS method devices.

Like Meier zu Verl (having his own contribution in this volume), who uses the notion of data careers, Wiedmann et al. mobilise a procedural understanding of research to make relations tangible. Nine research contributions, plus the introduction and afterword, are included in this book. The volume succeeds in breaking down the already familiar formulation that STS methodology is above all an "attitude" characterised by sensitivity and a close engagement with actors. In her chapter contribution, Astrid Wiedmann follows and deciphers the im/possibility of the infamous ANT maxim of "following the actors" while illustrating how she enacted her permaculture research site; Marguin, Rabe and Schmidgall develop hybrid methods to acknowledge the production of knowledge in spatial arrangements, which invokes registers of design science; Kocksch's chapter looks at the role of emergency exercises at an energy company's IT department and addresses the part of an ethnographer involved in such a process, which exposes potential turning points in STS's positioning in an emerging research field; and, to pick a final example, Boersma and Willkomm ask how – in the course of negotiating a workshop format via e-mail – STS concepts are used to justify proceedings (spoiler alert: this text reveals the power of STS staples like "black box" to establish authority).

The contributions speak to specific audiences and help organise and align research practices. They provide hints on how to move in and through field sites comfortably. The editors sum it up beautifully while considering a crucial fieldwork device of an ethnographer: "The maxims for action are not thickly printed prompts in field diaries. They

are reminders drawn in thin pencil for one's own research, which require a permanent adaptation to the field, a forgetting and re-remembering, an insertion of the maxims in the field and an indispensable observation of their actions." (Wiedmann et al., 2020: 21; translation SL)

Building bridges

STS discusses methodological guidelines and quality criteria on the one hand (embedded in concepts such as symmetry, non-reductionism, multiplicity, equity) and the need for creative openness on the other. The tendency is to focus on the latter, while many guiding concepts suggest helping foster one's openness toward field sites. As Pink insinuates in her afterword to *Experimental Collaborations*, established STS scholars' methodological claims have become a problem, for their wisdom seemed at time to be the central force in bridging practical issues. In other words, STS is frustrating when it comes across as science with seemingly secret expertise. It is this tendency that the contributions collected here work against. In other words, the books are devices of empowerment.

So what constellations are the researchers assembled here put readers into? The authors are building bridges that offer ways to link methodologically formulated criteria and fruitful research practice. Taking a cue from Suchman's (2000) canonical observation about literal bridges – these infrastructural entities we walk or roll on –, methodological work is about alignment work that brings together story-telling with fine-grained material compositions. If we understand the installed arrangements as bridges, however, a closer look at the texts reveals different types of construction and routes to be taken. Lessons can be learned from this. The assembled texts offer three valuable interventions, I suggest.

First there is direct didactic value. Tricks of the trade of doing qualitative research with and through STS are illuminated by the publications discussed here, which can guide building processes, indeed make approaches "applicable", as in: indicating what is in/appropriate. The procedures described are concrete, the authors meet the readers at eye level. With their contributions, the authors show stabilisation work and alternative forms of construction that may make up bridges.

Yet, the engagement goes beyond a merely prescriptive understanding of methods. Here the didactic level aligns with a second valuable contribution. The editors and authors address the importance of interactive and experimental techniques, suggesting multiple – and competing – ways to make concepts tangible in specific settings. I have recognised myself here at various points – based on my multi-sited, global ethnographic research on e-waste (Laser, 2020) – rethinking my research encounters and interpretative labour. Particularly convincing were those contributions and reflections that, without many cross-references, elaborated and classified their respective research process with precision, passion and verve. Thus I was able to put myself in the interpretive session of a research team in action, relive the interventions of the widow of a local Russian science celebrity in her interventions in interview authorisation or felt an urge to help designers reset a room and experiment with architecture.

Lastly, the contributions show a deep appreciation for the diverse visible and sometimes unseen actors that enable (and hinder) a research process. They thus help to learn from and attune to maintainers' and repair actors' competences. This third aspect emphasises how researchers can attune to material affordances and situated knowledges.

The genre, which is being consolidated here, is still characterised by uncertainties and roadblocks. Inspired by an editor like Germano, I have asked myself at various points to what extent a specific detour I had to follow advances an argument. On the one hand, the contributions are shaped by a critical lens on the added value of STS concepts. On the other hand, I would have liked more courage, also from the volume's and book series' editors, by suggesting to delete digressions in favour of the methodological problem at stake (this holds true in particular for some of the German texts discussed here and is an artefact, I think, of a still secondary handling of rhetoric and accessible language in German-speaking social science). STS has convincingly made the turn from the "why" to the "how" of knowledge creation but must not forget to tie its own claims back to a

"why" and "so what" for the readers. Just gathering more "complexity" and "nuance" is not enough. This perspective risks losing the interventional capacity of STS, in particular on the conceptual level. I understand this as a search process though, in which the exploration of boundaries is part of the process.

References

Alberti B (2016) John Law & Evelyn Ruppert (eds) (Forthcoming, 2016) Modes of Knowing: Resources from the Baroque. Manchester: Mattering Press. *Science & Technology Studies* 29(2): 77–79.

Algarra SPI (2019) John Law and Evelyn Ruppert (eds) (2016) Modes of Knowing: Resources from the Baroque. Manchester: Mattering Press. *Science & Technology Studies* 32(3): 91–93.

Brown SD (2016) Joe Deville, Michael Guggenheim, & Zuzana Hrdličková (eds) (Forthcoming, 2016) Practicing Comparison: Logics, Relations, Collaborations. Manchester: Mattering Press. *Science & Technology Studies* 29(2): 74–76.

Deville J, Guggenheim M and Hrdličková Z (eds) (2016*) Practising Comparison: Logics, Relations, Collaborations.* Manchester: Mattering Press.

Estalella A and Criado TS (eds) (2018) *Experimental Collaborations: Ethnography through Fieldwork Devices*. Easa Series. New York: Berghahn Books.

Germano WP (2013) From Dissertation to Book. Chicago, London: University of Chicago Press.

Holmes DR, Marcus GE (2008) Collaboration Today and the Re-Imagination of the Classic Scene of Fieldwork Encounter. *Collaborative Anthropologies* 1(1): 81–101.

Laser S (2020) *Hightech Am Ende. Über das Globale Recycling von Elektroschrott und Die Entstehung neuer Werte*. Wiesbaden: Springer VS. https://hightech-am-ende.de/en

Latour B (1999) *Pandora's Hope: Essays on the Reality of Science Studies.* Cambridge, Mass.: Harvard University Press.

Lippert I and Mewes J (2021) Data, Methods and Writing: Methodographies of STS Ethnographic Collaboration in Practice. *Science & Technology Studies* 34(3): 2-16.

Law J and Ruppert E (2013) The Social Life of Methods. *Journal of Cultural Economy* 6(3): 229–240.

Meier zu Verl C (2018) *Daten-Karrieren und epistemische Materialität: Eine wissenschaftssoziologische Studie zur methodologischen Praxis der Ethnografie*. Stuttgart: J.B. Metzler.

Meinhoff M (2019) Wie Entstehen Ethnographische Daten? *Zeitschrift Für Qualitative Forschung* 20(2): 371–374.

Sormani P (2020) Reflexive Ethnography as "Data Science"? A Sociological Contribution to Praxeology: Book Review. *Symbolic Interaction* 44(1): 260—263.

Suchman L (2000) Organising Alignment: A Case of Bridge-Building. *Organisation* 7(2): 311–327.

Wiedmann A, Wagenknecht K, Goll P and Wagenknecht A (eds) (2020) *Wie forschen mit den ‚Science and Technology Studies'? Interdisziplinäre Perspektiven.* Bielefeld: transcript.

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Guest Editorial

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