ETHNOGRAPHIES OF OBJECTS IN STS

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INFORMATION ON CONTRIBUTING AUTHORS

As a trained computer scientist (Humboldt University of Berlin) and a PhD student in Social Sciences (University of Cologne) GÖDE BOTH seeks to combine sensitivities from both worlds to understand what is going on when computational enhanced cars are moved from the laboratory to real-life traffic.

ALEV COBAN conducts her PhD "Places and Practices of Innovation in Nairobi" at the Department of Human Geography (Goethe-University Frankfurt). Inspired by Science and Technology Studies, postcolonial and ethnographic approaches focusing on Global 'North-South' relations, she looks at various socio-material practices of knowledge production at places of innovation. By focusing on the global phenomenon of makerspaces, she highlights the techno-politics in engineering and hardware projects.

DARA IVANOVA is trained as a cultural anthropologist and is currently working on a PhD project about the role of place in the governance of healthcare in the *Healthcare Governance* research group at the Erasmus University Rotterdam. She is particularly interested in odd places that defy expectations, infrastructural assemblages and caring as a way(s) of doing.

MALVE JACOBSEN is a human geographer who works in the fields of Science and Technology Studies, Critical Policy Mobility Studies, and Postcolonial Studies. Currently, she is doing ethnographic research for her PhD at Goethe University Frankfurt on the global circulation and materialisation of transport policies and ideals.

JULIE SASCIA MEWES is a PhD candidate at the Institute for European Ethnology at Humboldt University Berlin (Germany) with a study on the making of the everyday within psychiatric occupational therapy. She is particularly interested in how patients are supposed to (re-) gain their ability for an autonomous and self-sufficient life through the crafting of objects and how 'the everyday' is thereby negotiated by both practitioners and patients.

JESSAMY PERRIAM is a PhD candidate at the Centre for Invention and Social Process, Goldsmiths, University of London. Her work takes an STS perspective on social media's role in demonstrations of disruption in everyday life. In particular, she is interested in how social media changes notions of publics, respondents and participation in everyday disruptive events. Outside of academia, she is a user researcher working with public sector organisations to improve digital services.

ESTRID SØRENSEN is Professor for Cultural Psychology and Anthropology of Knowledge at the Ruhr-University Bochum (Germany) and the co-leader of the Centre for Anthropological Knowledge in Scientific and Technological Cultures – CAST.

FRANZISKA WEIDLE is a PhD candidate at Göttingen University's Department of Cultural Anthropology, Germany and a research fellow at the German Research Foundation (DFG) Research Training Group "Literature and Dissemination of Literature in the Digital Age". She is interested in creative forms of knowledge production and dissemination and is currently studying the role of digital technology in evolving documentary practices.

NATHAN WITTOCK works under the guidance of Lesley Hustinx and Michiel De Krom on the project 'Giving Blood, Doing Blood: Performances and politics of blood in the blood economy' since November 2015. Through an ethnographic study of blood in a specific European Blood Establishment they attempt to unveil the complexities involved in blood's ontology, which tend to get minimalized by the way in which organizations, scientists and institutional actors such as the EU concomitantly shape the understanding of blood. Working in the interplay between the research groups 'Centre for Social Theory' and 'Health and Demographic Research' at the Department of Sociology of the University of Ghent, his wider interests are in the fields of Political Sociology, Science and Technology Studies, Bio-Objects, Biological Citizenship and the Sociology of Health and Illness.

Holding a postdoctoral fellowship of the Research Foundation – Flanders (Belgium), MICHIEL DE KROM is affiliated to Ghent University (Department of Sociology & Centre for Sustainable Development) and to the Flanders Research Institute for Agriculture, Fisheries and Food (Social Sciences Unit). Previously, he worked at the Environmental Policy Group of Wageningen University (the Netherlands), where he obtained his PhD in 2010 with a study into 'Food Risks and Consumer Trust: European Governance of Avian Influenza'. Michiel's main research interests are at the intersection of rural sociology, science and

technology studies, and human-animal studies. His work principally focuses on analyzing the roles of science and technology, public and policy discourses, and on-farm practices and human-animal relations in governing animal welfare and sustainable food transformations.

LESLEY HUSTINX is associate professor at the Department of Sociology at Ghent University. She earned her Ph.D. in 2003 from the University of Leuven, and was granted a doctoral and postdoctoral fellowship of the Research Foundation Flanders (FWO). She was a visiting fellow at the Centre for Civil Society at London School of Economics, the School of Social Policy and Practice at the University of Pennsylvania, and the College of Letters, Arts and Sciences at the University of Southern California. Her major research interests include societies in transition, and the consequences of recent social change for the nature of citizenship and citizen-based solidarity. Lesley Hustinx is a board member of the International Society for Third Sector Research (ISTR) and serves on the editorial board of Voluntas and the Journal of Civil Society.

THE THINGS TO COME – ETHNOGRAPHIES OF OBJECTS

DESCRIPTIVE AND ANALYTICAL APPROACHES IN SCIENCE & TECHNOLOGY STUDIES

Objects are central to all of our means of social interaction. Over the past decades Science and Technology Studies have been virtuous in developing methods for studying objects from a social science perspective. The literature often presents results pointing to the social lives of objects along with conceptual discussions of objects and materiality. It rarely discusses in detail the methodological techniques of how to go about actually studying objects.

Objects, artefacts or materiality were early on central and even defining for Science and Technology Studies. STS study science together with technology due to the basic insight that science and indeed any knowledge are produced by way of technologies (Latour & Woolgar, 1979). But technology also soon came to be a study in its own terms as it was pointed out that shaping technologies implies building society (Bijker et al., 1987). From the beginning the methods for studying technology were historical, but also ethnographic. Ethnography seemed particularly useful for reaching beyond understandings of technology as passive tools over which humans have control, and who in themselves lack agency.

As it has been shown over and over again, objects and human agency may be separate in discourse and analytics. However when attending to, and particularly when being involved in technological practices, it becomes clear that in practice any definite boundaries between humans and objects often vanish. With its principle of general symmetry (Latour, 1993) Actor-Network Theory even came to emphasize the need to treat social and material phenomena on the same terms in empirical research. With his notion of network and hybridity Latour (1993) emphasised the need to study the entanglements of social and material processes, just as Haraway (1988) with her notion of the cyborg emphasised the always already technical character of the human being. Star and Griesemer's (1989) notion of boundary objects points to the coordinating function objects may gain, just as Star and Strauss (1999), with inspiration from feminist technoscience, pointed to the invisible work done not only by women but also by objects and other members of society that tend rather to be granted the role of serving than of being served. It was also Star together with Ruhleder (1994) who suggested the notion of infrastructure and thus pointed to how objects melt into their environments and become transparent through continuous work is done to keep the infrastructure stable and the objects transparent.

Mol and de Laet (2000) pointed to how an object such as a Zimbabwe bush pump may be stable in a different way than by keeping all its elements the same and together. They suggested that objects may

take a fluid shape in which their stability is characterized by stepwise modifications and plasticity. From Mol (2002) we furthermore learn that objects may, like bodies and other phenomena, be multiple. Following postcolonial and feminist analyses decentering the subject, Law aims at decentering the object in Euro-American knowledge traditions (2002). Outside the Euro-American sphere Verran and Cristie (2012) discuss how different material objects enable and hinder indigenous memory practices, and Holbraad, Wastell and Henare (2007) nicely demonstrate how helpful things are to think through when trying to understand distant cultures. Reviving a theme in STS that at least goes back to Winner's (1980) "Do Artifacts have Politics?". Nootje Marres (2012) analyses how politics is done through materiality. In recent years the much discussed "turn to ontology" in STS (Sismondo, 2015 or Woolgar & Lezaun, 2015) is founded on an emphasis on materiality and on the crucial importance of taking objects into account in any social science research.

Despite the increasing attention given to objects in Science and Technology Studies and the vast amounts of concepts available for studying objects, methodological discussions of how to do research on objects in STS are mainly conceptual and rarely engage with the practical challenges emerging when actually doing ethnography of and with objects.

CONCEPT OF THE ONLINE PUBLICATION

From June 6th until June 10th 2016 the PhD summer school "Ethnographies of Objects – Descriptive and analytical approaches in Science & Technology Studies" took place at the Ruhr-University Bochum. It was organized by the authors of this introduction together with Josefine Raasch. The guest lecturers of the Summer School were Jeannette Pols (Amsterdam), Helen Verran (Darwin) and Lars Bluma (Bochum). Focusing on ethnographic approaches, the aim of the summer school was to improve observational, descriptive and analytical tools of young researchers to interrogate the manifold ways in which objects are entangled in our everyday lives. There was a strong emphasis on working on the participants' own research objects and finding ways to think through them collectively.

The collection of articles presented in this online publication was worked on at the Summer School. This publication is an attempt to provide insights into this collective analytic work mode. It does so through its twofold focus on the practicalities of doing ethnography with objects and highlighting the diversity of possible approaches. This diversity is reached through the commentaries to the papers of this collection to be found after each respective paper. Every author and two additional participants of the summer school wrote a commentary on another author's paper. With the permission of the original author these are now standing side-by-side with the articles as traces of the cooperative work mode connecting thoughts, analytic and theoretical approaches in the ethnographic study of objects. They link and relate the papers like a thread in the publication, and in the process of writing a dynamic interaction between

authors and commentators took place, improving the character of the contributions. Instead of simulating a peer review, only leading to an author changing his or her paper and thereby returning into a single-voiced result, we want to stress the processual nature and collectiveness of knowledge production that allows ambiguity and heterogeneity of approaches to our object[ive]s.

SUMMARY OF THE CONTRIBUTIONS

The contributions may be divided into two sections: the first three papers by Ivanova, Perriam and Both are of essayist nature, engaging with the practicalities of finding, following and analyzing their ethnographic research objects. In the second part, Jacobsen and Wittock present a theoretical approach to studying their research objects.

DARA IVANOVA'S essay on *Losing and Finding: On the curious Life of ethnographic Objects* deals with how a researcher's emotions towards his or her research object can be turned into an epistemological tool when working ethnographically with an object. Drawing on her work on a foundling room for infants to be left safely and anonymously for adoption, she describes how researcher and research object form a relationship throughout different phases. Following an object means here to find the relationship one builds with the research object: first becoming attached through curiosity, then thinking through the normativities it provokes in the researcher, follow it into the infrastructures in which it is embedded and embrace the researchers' emotions towards it by finally turning these emotions into a reflexive ground of making, un-making and re-making an object within the research process.

DARA IVANOVA's paper is discussed by NATHAN WITTOCK who points out how he and Ivanova ask "similar methodological questions with almost the opposite answer". He underlines how Ivanova´s contribution focuses on her emotions as a starting point to a witty and rich personal reflection on how doing an ethnography of an object means to constantly search for its boundaries and yet always be prepared to go beyond them whereas he and his colleagues take a more theoretically informed and rather conceptual perspective on the European blood bank as a Social Topology. Interestingly enough, Wittock concludes, that besides the different turns in their argumentation and their different ways to include their theoretical standpoints both papers make sense of their objects in quite similar ways.

In her paper on *Ethnography, Objects and Reflexivity: A Case Study of the Selfie Stick* JESSAMY PERRIAM focuses on how objects of a rather faddish nature such as the selfie-stick might be observed from a Science and Technology Studies perspective with the concept of disconcertment and an autoethnographic and ethnomethodological approach. The latter in terms of doing a breaching experiment. Perriam argues for the co-existence of discourses on the selfie-stick from strong rejection by journalists and the public to broad attention and wide use in everyday life. The former relate its use to narcissism and potential harm and the latter to its representations for social media platforms such as

Instagram and Twitter. The selfie-stick and the specific images it produces may be understood as enabling a multi-layered socio-technical assemblage of (non-)human relations, existing in both material and digital field sites.

In response to JESSAMY PERRIAM's paper FRANZISKA WEIDLE describes the selfie-stick as an object that is as complicated, variable and entangled within its sociotechnical assemblage(s) than any other object commonly examined in Science and Technology Studies. What is interesting about the selfie-stick to her are the multiple appropriations it provokes, namely the gap between the strong rejection by the public and its extensive use in everyday life. She also emphasises the fascinating ways in which Perriam gains insight through these processes of appropriation and through the diverse uses of the selfie-stick. Through her breaching experiment in which she used a selfie-stick in a gallery Perriam was able to transform her own disconcertment within her research object. She could thus analyze the discrepancies between users and commentators due to their "varying experience and levels of literacy as the object is being inserted in roles and narratives constitutive for and disruptive of underpinning standards, values and ideologies."

In his contribution on *Accomplishing Autonomous Driving: An unfinished Description* GÖDE BOTH stresses the multiplicity of possible answers to what his research object might be: an autonomous or self-driving car and its related practices. Drawing on ethnographic descriptions Both questions the definition of autonomy in this context in which there is a constant oscillation between manual and autonomous driving. This leads to a conceptualization of autonomous driving as a collective achievement of heterogeneous elements. Both thus argues for the multitude of spatial, temporal and personal configurations and distributions across related objects, humans and practices.

NATHAN WITTOCK discusses *Accomplishing Autonomous Driving* by GÖDE BOTH as a relevant contribution to the ethnographic study of objects within STS "that are characterized by an entanglement between multiple epistemological fields". He highlights how the author understands to depict the complex and fragmented nature of his research object "oscillating between 'a good old-fashioned automobile and an experimental driverless car'" with an accordingly multiple and 'unfinished description'.

Temporalities of Assembling Transport Systems: Presences and Absences in a Planning Process is based on MALVE JACOBSEN'S ethnographic work on the Dar es Salaam Rapid Transit (DART) system in Tanzania. She understands DART as an infrastructure in constant (re-)making and highlights its (non-) human actors and their contribution of spatial and temporal assemblages to its socio-political dimensions. Objects such as technical descriptions for the manufacturer or materialised bus prototypes are defined as 'scripts' inscribing and de-scribing the possible practices, changing over time while being

adapted to the entire process of implementation. Jacobsen stresses the co-existence of several scripts, both in material and discursive shapes and in their varying absences, presences and absent-presences over the process of the implementation process. She argues how the absence of registering the busses' number plates for instance, then might be read as a political interference or materialisation of the state in an infrastructure delaying DARTs implementation over months. Presences or absences of object's scripts or objects themselves have the agency to modify the entire script of an assemblage as much as the modification of its use by the human actors.

GÖDE BOTH stresses the compelling and rich descriptions offered by MALVE JACOBSEN on the "realities of implementing Dar es Salaam Rapid Transit (DART)". He discusses the advantages and disadvantages of the author´s decision to analyse her research object through the notion of "assemblage" instead of "network" and invites Jacobsen to elaborate on the underlying meanings of the terms 'infrastructure' and 'system' and the temporalities of its implementation as a non-linear process even further.

As a response to his commentary MALVE JACOBSEN presents a revised version on *Temporalities of Assembling Transport Systems: Presences and Absences in an Intermittent Process* of her paper underlining our collective approach by linking to multiple temporalities, objects being multiple and changing over space and time or by interacting with other actors even further.

NATHAN WITTOCK, MICHIEL DE KROM and LESLEY HUSTINX contribute to this volume with a theoretical and methodological essay on *Making Sense of a Messy Object: How to use Social Topology as an analytic Tool for Ethnography of Objects* Drawing on the social topology framework by John Law and Vicky Singleton they specify analytic points of departure in understanding and re-imagining the spatiality of their research object: the European blood economy. Following Law and Singleton they describe its 'messy' enactments as regions, networks, fluids and fire space. In their conclusion, they aim to transpose social topology from being an interpretive tool to becoming an analytic tool for the ethnography of objects.

ALEV COBAN underlines how WITTOCK ET AL. depict the theoretical approach of Social Topology and the manifold possibilities of further analysis of their research object. In her commentary on WITTOCK ET AL.'S contribution JESSAMY PERRIAM stresses how the article inspired her to follow three questions: how much theorising is necessary in order to "strike an abductive middle ground" between induction and deduction? What are the possibilities of mobilising an approach such as the social topology framework? And does this or any theoretical framework serve to domesticate a messy object?

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DARA IVANOVA

LOSING AND FINDING: ON THE CURIOUS LIFE OF ETHNOGRAPHIC OBJECTS
AN ESSAY[1]

A ROOM FOR ABANDONMENT

There is a room in the Netherlands, where one may anonymously abandon a baby and walk away. According to Dutch law, anonymous abandonment is illegal and punishable, yet the room exists as an attempt by the NGO 'Beschermde Wieg'[2] to prevent the few (see NIDAA), but devastating deaths of unsafely abandoned infants. Facilities for child abandonment have long existed all over the world in one form or another. In the middle ages in Europe unwanted babies were left in public spaces, such as the steps of a church, where they would be easily found (Boswell, 1988). A modern version of child abandonment is the baby hatch. In Germany it is called Babyklappe and it is a place inside of a wall (usually that of a hospital) with a warm bed and an alarm system. In South Africa, such a hatch is called a "door of hope". In the U.S.A. some states have laws permitting the legal abandonment of infants in the so-called "safe havens" – places like fire stations or hospitals. The peculiarity of the Dutch case is the fact that the abandonment place is a room, which one may enter, as opposed to simply leaving a baby inside an object and walking away. According to the room's creators, this spatial adjustment to the traditional abandonment site is a game-changer, because it provides the possibility for exchange, yet it does not insist on it. Once having entered the room, one is directed by a pictogram on the wall that they may decide to press a button on the wall, which would result in a volunteer joining them in the room within 10 minutes. The volunteer will then speak with the abandoner, trying to help them and discourage them from anonymously abandoning a child. Yet, if they do not wish to speak to a volunteer, they may leave the baby in the crib, where a camera will quickly alert the volunteers. I learned about the existence of this room through an interview with the NGO's founder in the morning paper. After reading the interview, I tore the page out and hurried to work.

A ROOM OF CURIOSITY

I shove the plate with cake away excitedly and hold the torn newspaper article up for my supervisor to see. "This is what I want to do!" It is the group's usual Monday lunch meeting. Through knives, forks and

[1] This essay is based on ethnographic work (observations, interviews, document analysis) between December 2015 and October 2016. It is not meant to be an exhaustive analysis of the case of the foundling room – such analysis is done elsewhere – but a personal reflection on working with objects ethnographically.

[2] From Dutch: literally 'protected cradle'.

the buzzing sound of voices, I hold the paper higher, stealing his attention. He looks at the interview with the 'Beschermde Wieg' distractedly. I am asked to forward some napkins, but manage to say in a breath what the room is about. After mentioning 'dead babies' and 'illegal', a couple of colleagues seem to have overheard and are interested in learning more. "A room for abandoning babies, really?"

My first reaction was similar. There was surprise and a strong curiosity. I wanted to find out more: how does this work, who does it, where are the babies placed, why is it il/legal? Yet more importantly, this story was about a room – a place – which made it a matter of scientific interest for me as well. Having started work on a PhD project on the importance of place for the governance of healthcare, I thought this to be a perfect fit, an interesting case, a great story for me to write about. Why is that? Thinking of places and the governance of healthcare, one may imagine hospitals, clinics, dentist practices, health policy, etc. A foundling room for anonymous abandonment is not the first thing that comes to mind, but I chose it exactly for this reason. I wanted to write about weird, odd, strange, out-of-the-box cases that would challenge the idea of what a place is and what it does. To some extent, the nature of my object had been delineated even before I read that newspaper article. In the broad contours of 'odd' and 'weird', the room's confusing existence started to settle well, the more I read about it. Not only that, but my own admiration (born, no doubt, of the room's controversial 'being') was amplified by others, whom I told about it. Everyone I shared my curiosity with, admired how oddly intriguing it is. This peculiar circle gained speed, the more I went on and on about working with this case and after less than a week I had convinced everyone involved that this was a perfect case for my PhD, that I would do excellent research on it and that it would result in very good work. All of this happened on the basis of the room's peculiarity and controversy and had little to do with actual facts and/or observations. My object at that point consisted of a delightful idea of 'oddity contained'. Armed with this abstract idea and much enthusiasm, I began working on framing the object's ontology. I had to find out what this room *is*. The best way to do that is, of course, by working with it ethnographically. So I wrote down the address on a piece of paper, took the bus and a recorder, and went to meet my object.

A ROOM OF NORMATIVITIES

Ringing the doorbell of the volunteer's home, walking in and finding myself inside the foundling room was all rather underwhelming. The place was stifling and small, clean and orderly, with stuffed animals curiously looking at me from the chairs and crib. I felt as though I was missing something, yet could not pinpoint what that was. Then the volunteer came in – the two of us barely fitting inside the space – and walked me though all the features of the room: the camera, connected to her phone; the black button, which 'women' could press if they wanted to speak to somebody and receive help and advice about

their situation; the always unlocked door; the white envelope, which contained a letter to 'Dear Mommy' and a puzzle piece, which fits perfectly with one that the organization would gift to the abandoned baby (see figure 1 below).

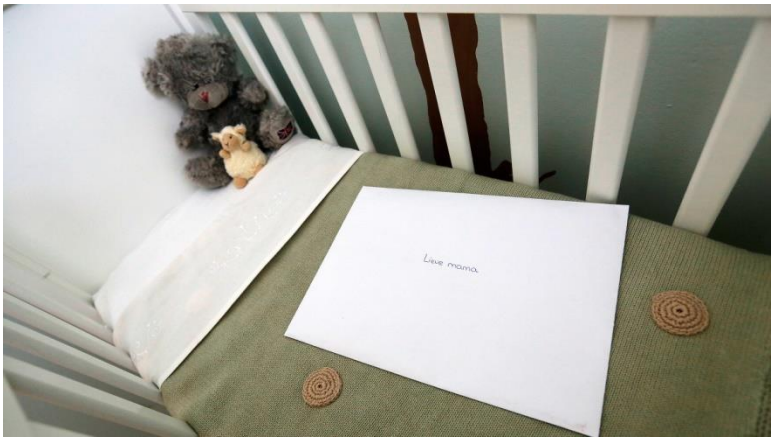

Figure 1: Bed in fundling – equipped with stuffed animals and a letter addressed to the mother.

While she spoke, I started to admire the way the room had been conceived and implemented. A baby would be safe here, I thought. What is more, I regarded the volunteer warmly; she had put so much time and effort into helping strangers. Her house showed that very clearly. In addition to being a volunteer for 'Beschermde Wieg', she and her husband were a foster family for children, who had to be taken away from their parents for safety reasons. In her living room, a special shelf held framed photographs of all the children she had welcomed into her home. Many smiling faces looked back at me, as I sat down with a cup of warm tea. I had a wonderful conversation with a kind woman, who was willing to be responsible for the room and answering her phone 24/7, in order to help unwanted children live. My feelings of admiration had turned into vaguely formulated thoughts about the room being good. Yet, after saying our goodbyes, and as I was walking toward the bus station, I felt uneasy. I suddenly imagined a man inside the small room, pressing the black button, and I wondered where the baby's mother was. Next, the image of the envelope, entitled 'Dear Mommy' added to that strange feeling. Perhaps the woman does not want to be a mother or it is the baby's father who is abandoning it? The way the room is scripted – all the objects that plead for a woman to press the button (including a poster on the wall; see figure 2), so that the volunteers can help her and turn her away from the decision to abandon her baby anonymously, contribute to the room's goodness, yet they can also feel wrong. What if a newborn is indeed abandoned here? The room is actually an old garage adjacent to the house and converted into a nursery. There, a baby's life might take a decisive turn toward anonymity if it is abandoned without any information about its origins. The enormity of that possibility felt pressing and uncomfortable. The words of the volunteer I had just spoken with, were quickly colored in a new light: the people who make this room possible have their agendas and beliefs about mothers, babies, and

what is good. “It is better for a child to be abandoned anonymously and adopted than to live in very bad conditions”, she had said.

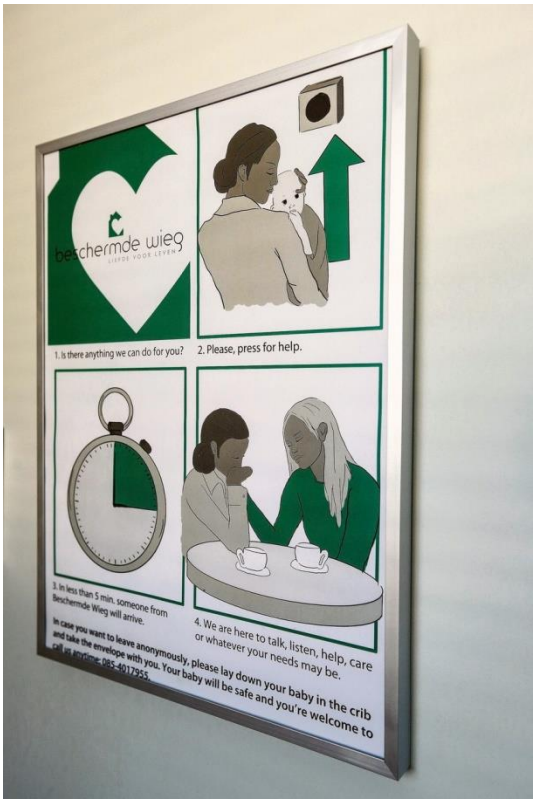

Figure 2: A poster on the wall in the room appeals to the mothers to ask and wait for help.

Once an object becomes real, in the sense that it is not an idea anymore, but a concrete reality, we as researchers must find a way to relate to it. In the case of the foundling room, the emotions ran high and I struggled with relating, because the room was so rife with normativities. What was the ‘right’ way to relate? The normativities I was introduced to in that first visit to the room were widely mirrored in Dutch society and press, as most people were either for or against the room’s existence; it was either good or bad. Struggling with this, I found a way out in reading Pols’ (2006) paper on accounting as a variety of goodness and badness. She analyzes washing of patients with dementia, saying that what is sometimes considered ‘good’ care may be ‘bad’ contextually and depends on a number of elements. Pols then argues for “contextual reflexivity as practice” (2006, p. 426), where judgment is reserved and many possible goodness and badness are assumed to co-exist. This way of thinking helped me go beyond the normativities by becoming open and accepting. It was not that I did not know that staying open is paramount in ethnographic research, but it was the fact that I was *unaware* of the effect the case’s normativities had on me and more importantly – on the constitution of my object. I had become lost in relating to the room and had to move further. Relating, then, is both necessary and dangerous, because, as has been the rule in ethnographic research, proximity and distance are both needed, in

order to be able to understand an analyze. Yet, here I mean something more: in relating to my object, I struggled to feel comfortable with it, especially because of the normative judgments I was expected to have. When I finally let go of that struggle, the object somehow became truly *mine*.

A ROOM OF INFRASTRUCTURES

As I sit down, I immediately regret my choice of seat, realizing I would have my back to the view. Tall buildings are not the norm in the Netherlands, so the Ministry of Justice's 146,5 meters high offices are a visitor's treat. My interviewee, having worked here for some time, seems oblivious to the view of The Hague, spreading spectacularly around us. She carries a big red folder, with metal rings on the side and erupting with plastic pockets. This folder, I am told, is about the foundling room. She opens it to reveal a host of well-organized documents, some with notes on the margins, some sections highlighted with different color markers. Then there were newspaper clippings, just as the one I had torn from my morning paper and brought to work. The Ministry of Justice official patiently explained that the room is not technically illegal, but that there was simply no provision for it in the law. "It does not exist" – she said. Changing the law would be cumbersome and require a lot of work, which is why there were no plans for such a change currently. "However, we follow the case carefully", she said, pointing to the red folder in front of her. "It is a politically sensitive issue." That was definitely true. The conversation about the foundling room mostly happened through the media, as advisory bodies (among them The Netherlands Council of the Rights of the Child; the United Nations Convention on the Rights of the Child, FIOM[3], The International Reference Center for the rights of the children deprived of their family, UNICEF and the UN) urged against the existence of the room, arguing for safer and legal ways for abandonment that did not deprive children of their right to know their origins.

On the other hand, the organization 'Beschermde Wieg' and some politicians argued for the room, as a way to save those, who would otherwise fall through the cracks of the system[4]. The position of the government was therefore tricky, because they could not go against the advice of national and supranational organizations, yet they did not want to seem unfeeling in this emotion-ridden debate. The 'political hot-potato' was best being avoided and delegated to a red folder-status. If or when the topic became an issue, the Ministry would take a stand, but not a minute too early. Until then, the clippings would fill more plastic pockets and the folder will swell. It was then I realized that the room was much more than the garage I had visited. Outside of the room, there was more of it, and possibly the really important parts. The object I was describing was both a room and, crucially, its infrastructures (Star &

[3] FIOM is The Netherlands Organization Specialized in Unwanted Pregnancy and Lineage; see www.fiom.nl

[4] The intricacies of the foundling room's (legal) existence are too complex to describe here and are not the focus of this essay. I do this in detail elsewhere.

Ruhleder, 1996; Bowker & Star, 1998; Star, 1999; Bowker, 1994 & Larkin, 2003). Those parts of it that are hidden, but crucial to how it works. The fact that the room is accessible and I could go there and visit it, is a direct result of the Ministry of Justice *not* declaring it illegal or at least delaying judgement on the matter. It is also a result of the advice given by many national and supranational bodies, which link the issue of child abandonment in the Netherlands to this issue in the rest of Europe and the world. Further, the room is imagined and adjudicated in the media, through the infrastructures not only of journalists and the logic of the news cycle, but through the transmission of aerial and radio waves and the emotional response of the public. To describe an object ethnographically means to follow it and leave behind the contours one had imagined it might fit in; letting it swell and diminish, go back and forth and lead to new objects, which are then devoured and incorporated into it. To do an ethnography of an object, then, is to constantly search for its boundaries and yet always be prepared to go beyond them.

A ROOM OF RESISTANCE[5] (LOSING)

If an object is always changing, how do we grasp it? Where/when does an object/a description end? Following descriptions is uncomfortable, because they can be endless, because their temporalities are fluid and because an object is always part of other objects, links are everywhere and there is nothing natural about an object's boundaries. When a baby was abandoned in the room in May 2016, the room became more than a delightful case, a stifling garage or a red folder: it became too big to grasp. I had been working on an analysis of the room as a place of possibilities, where many futures are made possible, yet curiously - none happen (see Ivanova et al., 2017 for detailed analysis). This analysis, which drew on the room as a place that works by *not working,* became futile when I got a text message from a friend: "Your baby-room finally got a baby!" and a link to a news site. As I felt my analysis tumbling down, I realized I had no thought of the anonymously abandoned newborn that begins a life in a painful and difficult way. This made my object even muddier, forcing me to wonder how to combine all the different objects I had encountered and produced during my ethnography – the imaginary, the 'real', the normative, the infrastructural – into one relatively stable account, which could be gripped, written down and presented to others. I had framed the room in absolute terms – it was legal or illegal, it was good or bad, it was in my imagination and it was real, it worked through its materialities or through its infrastructures. Yet, such an account draws the contours of the object too sharply and defines what goes into the account and what goes out. Pursuing a definitive ontology of an object that one is working with is natural, because by fixing objects, we appropriate them, make them ours and, most importantly, make them knowable. As a result of searching for *what it is*, the foundling room had slipped away. At

[5] The idea of the room as an object of resistance was brought up by Prof. Dr. Estrid Sørensen.

every turn, it had resisted characterization and pinning down; it had resisted my efforts to *place* it and I was left with a feeling of unease, because this object felt familiar – in many ways, it was *I* who had made it. Yet, it also felt vaguely uncomfortable and distant. Not only was it ontologically unfixed, but it had – all of a sudden – become un-relatable.

A ROOM OF ABSENCE (FINDING)

A resisting object is still a workable object and perhaps even more so, because in resisting classification, it leaves clues to a new/different/unfamiliar make-up. Why is my object so difficult to pin down; what part(s) of it have I been missing? The foundling room had become fluid and then it had dissolved into too many parts. At the core of this dissolution, however, was a solid sense of absence. There was an absence of clarity (legal, normative, ontological, etc.), an absence of purpose (what is this room *for*?), an absence of boundaries (where does the room begin/end?) and an absence of existence (the law does not 'see' the room, because it does not yet exist as a legal object). Callon and Law (2004) encourage us to look at processes and multiply concepts – what if presence is absence and absence is presence? Presence and absence are not opposites, but ways of seeing and not seeing. Hetherington's (2004) analysis of consumption and disposal is pertinent here as what he calls *the agency of the absent* (p. 168). If absence can be presence, then what does an object's absence *do* to an ethnographic description? When we write about an object that is present through its absence, we make absence the core of that object's description; we make absent present by putting it into words, giving examples, arguing points. The object, of course, is and is not present/absent as such – it is many things that we (fail to) articulate and work with. Yet, working with objects ethnographically often means working with fluidities that are hard to grasp. When feeling an object is slipping away, it becomes absent – not as such, but as *my* object – and this absence is a hook, a rock, and a stable point, which can lead me back to when the object was familiar. The foundling room had become too big and too abstract, too fluid and indeterminate, yet it was also very concretely absent. It was now a room of absence-presence, which is a place that allows for more paths to be drawn – it is a starting point for more possibilities. This does not mean that every object must be absent, in order to be found and 'captured'. Yet, it does chart a (possible) route through uncertainties. An object's *being* is always a discovery and a process. In analyzing a curious room, I tried to embrace all the ways in which it was absent. Other objects might require a different type of leap. But losing and finding, it seems to me, is what makes an object happen; it is a way of reconciling and accepting its deep complexity and taming it. The ways in which an object is lost and found, struggled with and accepted may differ dramatically, yet the process – one of clash and discord – must always be there.

THE LIFE OUR OBJECTS LEAD

What does it mean to work with an object ethnographically? I have shown above that following an object might mean to find it (within yourself) by choosing and imagining it (curiosity); to accept it and relate to it (normativity); to let it lead you elsewhere (infrastructures); to see it change and slip away (resistance) and to embrace it as anew (finding). Finding an object, then, is not about finding a fixed ontology, but about letting it be. In that sense finding (and in order to find, one must first lose it) is the same as making. Ethnographic data is alive and working with it is like working with a rolling ball. The stability of written words cannot compare with that and so we must make choices and categories and omissions, which makes capturing our object a difficult task. Instead, we may choose to let our objects lead lives of their own and be at ease with the process of discovery being a process of making, un-making and re-making an object.

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NATHAN WITTOCK

A RESPONSE TO DARA IVANOVA'S

LOSING AND FINDING: ON THE CURIOUS LIFE OF ETHNOGRAPHIC OBJECTS

It is not often that a researcher who has been asked to comment on a piece by a colleague has had the pleasure of conversing with the author some months before commenting on the work, as well as between versions of the piece to be commented upon. Nor is it often that authors have the freedom to choose the format with which they would like to work. For her contribution, Ivanova chose to write an essay that "is not meant to be an exhaustive analysis of the case of the foundling room," as this has been done elsewhere, "but a personal reflection on working with objects ethnographically." Contemporary researchers are trained and encouraged to do scientific work in a largely de-personalized fashion. In some cases, therefore, we are likely to forget how – or even why – we should write a personal reflection on our work for people other than our supervisors or ourselves. Nevertheless, Dara Ivanova's style and wit do not reflect any such struggle.

Ivanova's self-acclaimed field of interest is attuned to "odd places that defy expectations, infrastructural assemblages and caring as (a) way(s) of doing." It is not difficult to see how the object of her work in this essay fits that defined field of interest. "There is a room in the Netherlands, where one may anonymously abandon a baby and walk away." Even in the opening sentence, the reader is pulled into an odd place that calls into question moralities and judgments. Ivanova also does not shun the recall of such moral struggle throughout the remainder of her essay. In her writing, there is an explicit tension between judgments of the room as "good" and as "bad." This tension is also present in her own characterization of the observations. In the first half of the essay, Ivanova refers to the process of child abandonment as "simply leaving a baby (…) and walking away" and to the abandoned babies as "unwanted children." In an earlier comment to the author, I communicated the uneasiness that I felt with this wording upon first reading the essay:

> Be careful with the stance you take toward abandonment of the child, (…) sometimes these children are not unwanted, but the circumstances make parents feel that they can't raise a baby, and I expect them to consider the options for a long time and cry their eyes out before they even really consider the option of completely losing it. Because when the mother/father gives up the child in the foundling room, not only does the baby lose his/her right to know his/her origins, but the parents too lose their right to know their offspring. This is just a warning to take caution in such wordings.

In her reply, Ivanova noted that this was precisely the intent of the characterization. It represented the way in which the room had been presented to her, and she wished to capture the morality, using her writing to make the reader think about the matter.

Part of what I find so interesting about Ivanova's contribution to this volume is the same as what I would intuitively say is lacking in it. As I have communicated with the author, it is interesting for me "to see how we ask similar methodological questions with almost opposite answers." In general, ethnographers and other qualitative social scientists are advised to let the data inform their analysis, instead of proceeding from "heavy" theorizing. Whereas Ivanova follows this tendency, my own contribution to the volume does exactly the opposite. As eloquently illustrated in Ivanova's piece, however, it would be a mistake to reprimand ethnographers for relying 'solely" on their gut feelings. As Ivanova demonstrates, although making sense of one's object is a struggle, it is one that can be faced through constant reflection, introspective criticism, and observational sensitivity. Regardless of one's gut feeling, it is hard work (some profanity can be mentally added here in order to reinforce this assertion). Furthermore, regardless of whether it is through theoretical or *open* sensitivity, the aim of an ethnography of an object is always the same, as beautifully captured in Ivanova's essay:

> To describe an object ethnographically means to follow it and leave behind the contours one had imagined it might fit in; letting it swell and diminish, go back and forth and lead to new objects, which are then devoured and incorporated into it. To do an ethnography of an object, then, is to constantly search for its boundaries and yet always be prepared to go beyond them.

As becomes obvious toward the end of the essay, the lenses that we use in making sense of our objects are not that different. Nevertheless, we take different turns at the start of our respective journeys toward our conclusions.

As a final remark, I would like to congratulate Dara Ivanova for her contribution and thank her for allowing me the opportunity to comment on it. As she mentions in the section bearing the heading "A room of curiosity," she found in her object of the foundling room, "a delightful idea of 'oddity contained.'" In this essay, she manages to bring to life that oddity, making it interesting to a public of ethnographic researchers, who may recognize these situations from their own research and find inspiration from the ways she dealt with this, as well as to a general audience, who can effectively go along with the tensions portrayed and the struggles experienced in dealing with them.

JESSAMY PERRIAM

ETHNOGRAPHY, OBJECTS AND REFLEXIVITY: A CASE STUDY OF THE SELFIE STICK

ABSTRACT

While Science and Technology Studies regularly engage with objects that provide serious, useful or mundane value, how are we to observe objects that are considered to have a novelty, faddish or frivolous nature? Strong public opinion about such objects means that observing such objects often places the analyst in an odd position of defending or supporting the object, regardless of whether that is their intention. Drawing on the experience of writing an ethnography of the selfie stick, I describe the disconcertment felt in researching an object that was received with hate, enthusiasm and bemusement in equal measure. Yet, beneath the novelty of objects such as the selfie stick, there are valuable socio-technical insights to be gained. By studying the frivolous we gain insight into what is considered to be serious and accepted. This piece will examine how the public disconcertment around the selfie stick uncovered a disruption to the socio-technical assemblage of image creation and sharing. I also critique the nature of doing an ethnography of an object with an autoethnographic, ethnomethodological (Garfinkel, 1969) approach and how that impacts the object of study. Similarly, how did the methods and the methodology employed hamper the ability to study, describe and analyse the object and its agency?

INTRODUCTION

The selfie stick is a challenging object of which to conduct an ethnography. It is firmly material and yet it is fully implicated in digital practices. It manifests itself in multiple fieldsites - both material and digital - and gains many conflicting attributes from different actors. This presents a challenge for those tasked with researching it. How to account for the object, its differing fieldsites and, opposing actors? More importantly, how to account for where the researcher is situated in amongst this?

This exploratory article will describe my challenges as a researcher in conducting an ethnography of how the selfie stick was demonstrated as a disruptive object. Drawing on empirical work, it will examine the recursive impact of these demonstrations and the need for reflexivity on behalf of the researcher in order to describe the co-existence of these multiple fieldsites and positions on the object. Lastly, it will describe ways in which future research done on similar objects could benefit from a digital ethnographic approach (Pink et al., 2015)

A SIMPLE MATERIAL OBJECT OPERATING IN A DIGITAL CONTEXT

The selfie stick is a rudimentary material object that contributes to digital photographic practices. For all intents and purposes, it is a telescopic metal or plastic pole with a clamp at one end to allow people to attach their smartphone or tablet in order to take a picture from a greater distance than their own arms will allow. The product of this intervention is a form of photography that is digitally captured and/or distributed. The new process of taking and publishing photographs with this object caused varying reactions - bemusement, anger, enthusiasm - and ontologies within varying fieldsites such as Instagram, Twitter and online news articles and blog posts, along with in situ use of the selfie stick.

The research project I conducted along with colleagues[1] sought to understand these varying, conflicting ontologies of the selfie stick across field sites.

On Instagram there was primarily a positive ontology towards the selfie stick: images of people smiling, using the selfie stick to take selfies with friends, family, loved ones, pets and others. There was also occasionally, the odd meme image of makeshift selfie sticks cobbled together in a bricolage fashion from found household objects or, images of popular culture figures using the selfie stick. Additionally, the visual data captured from Instagram[2] showed some instances where the selfie stick was within the image. These instances bifurcated the selfie stick as an actor: it was both simultaneously an object creating an image and a subject of the image itself.

However, online news articles and blog posts presented an entirely different ontology of the selfie stick. These articles put forward an ontology whereby the selfie stick enabled narcissism, they were dangerous to precious objects and other people within the settings they were used. In short, the selfie stick was negative: not just to other objects but to the welfare of those using them. Most of these articles included calls for the selfie stick to be banned from public venues as a kind of object version of a *persona non grata*. And either by coincidence or as a recursive act, many venues (including art galleries, museums, theme parks and sporting arenas) chose to ban the selfie stick (cp. figure below, Foxx, C., 2015; James, R., 2015; Sumanac-Johnson, D., 2015).

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[1] The selfie stick research started its life as a group project at the Centre for Invention and Social Process at Goldsmiths, University of London in early 2015. Many thanks to Noortje Marres, David Moats and Ana-Maria Herman for their input and insights of the selfie stick on Twitter and in-situ practices.

[2] The data for this study was captured before a change in Instagram's API made it difficult for social researchers to search for and analyse posts from the social media platform.

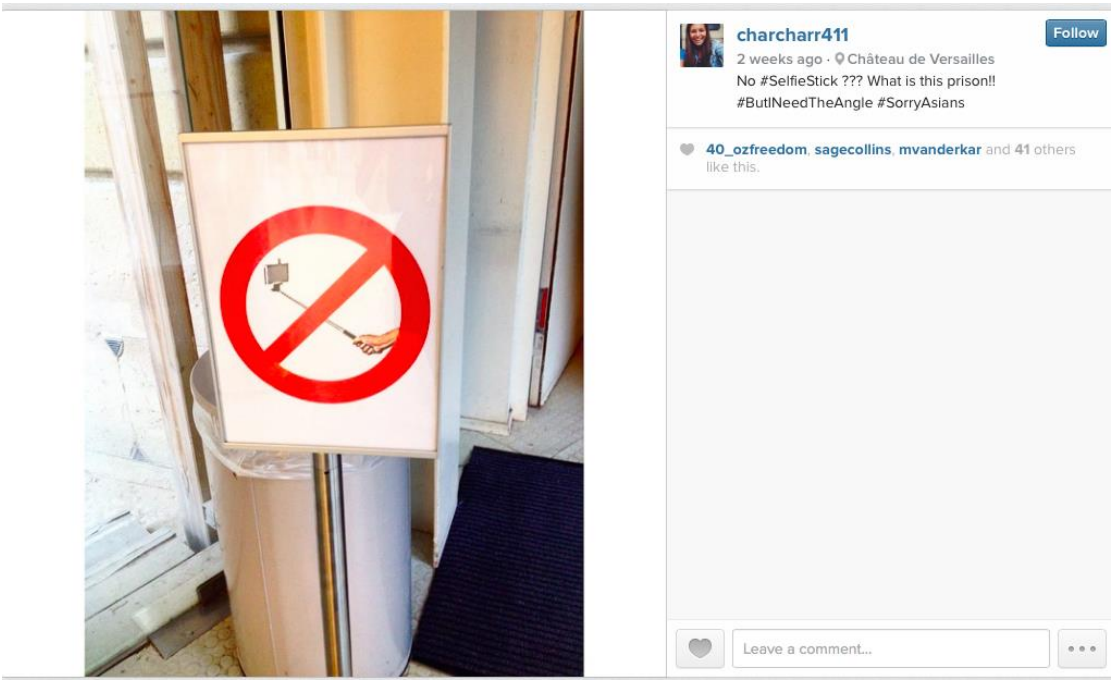

Figure 1: A sign depicting a ban on selfie sticks at Versailles, France. (Instagram, 2015 user: charcharr411)

But Latour (1999) would argue that the selfie stick in isolation does not cause disruption. It does not cause damage when it is tucked away in a bag or placed in a locker. Indeed, it only *becomes* disruptive and damaging when paired with a human operator. Additionally, a similar argument holds true for the assertion of narcissism: the selfie stick in and of itself isn't narcissistic, for it is not a sentient being. It can only be considered to aid someone's narcissism when configured in a very particular way. Could it be considered narcissistic when held back-to-front, upside down, or without a smartphone attached to it? Probably not, as it is mostly considered to be narcissistic when it completes the process of capturing an image with the intent of publishing it online for others' consumption.

But these differing, digital ontologies of the selfie stick in differing fieldsites have a recursive impact in material ontologies and interactions with the selfie stick. Aside from studying the selfie stick in digital settings, there were instances where the object would come up in conversations with friends and colleagues as they asked what I was researching. Their reactions were almost always agreeing with the ontology put forward by the online articles but with a ferocity and certainty that was lacking in the non-verbal, non body-language aided rendition of the narcissism argument. But bizarrely, few of these people raging against the selfie stick and making causal links between selfie stick use and narcissism hadn't picked one up and used it. They had merely seen those using it and been annoyed.

EXPLORING THE SELFIE STICK IN-SITU: A SEMI-FAILED BREACHING EXPERIMENT

I encountered my own recursive, reflexive problems when researching the selfie stick in an autoethnographic, ethnomethodological way. I was taking a selfie stick into The National Gallery as a form of breaching experiment (Garfinkel, 1969) with the intent of deliberately using it somewhere it had been banned. Historically, breaching experiments have been used as a provocation with a rather simple rationale: do something socially unexpected in order to bring to the surface expectations of behaviour within public places. This breaching experiment followed Garfinkel's rationale, however the execution differed. Unlike Garfinkel, I had crafted a breaching experiment that formed part of an autoethnography, while Garfinkel usually observed his students carrying out the experiment. I became a participant observer - only later did this approach seem difficult, even though others had successfully done similar breaching experiments (Woolgar & Neyland, 2014).[3] It was a Saturday afternoon in early Spring 2015. I remember feeling nervous. I remember feeling like a child doing something they knew they shouldn't do. I remember feeling as though this object in this setting was going to say something about me, about my behaviour in a space with very strong ideas about how one should act. I didn't want to do what I was about to do. I was trying to convince myself it was 'serious research' and 'just a game' all at the same time.

I didn't come to the ethnography as a neutral analyst. I mentioned the selfie stick in passing in an early piece of field notes about mobile device use in public spaces, documenting a walk along London's Southbank. I bemoaned the fact that selfie sticks had changed the practice of tourists taking photos in and around London's tourist hotspots. No longer could grumpy Londoners walk through tourists' posed photographs, they were obstructed by the selfie stick jutting out from a group of tourists. In its own mundane way, a rudimentary selfie-taking object had disrupted the way Londoners moved about the city. As a Londoner being obstructed and delayed I hardly felt positive towards the selfie stick. And yet, stepping outside of that context, unbound by those attributes, I found I didn't mind the practice of using a selfie stick one way or the other.

But there was something else that I couldn't quite put my finger on that contributed towards my stance towards the selfie stick - I thought it was uncool. However, I had no discernible reason for feeling this way. I rarely take selfies but I wouldn't say that I strongly object to the practice. At the time I didn't know just how much this would influence my own research. Despite all of my discomfort with the object, the breaching experiment in the gallery was uneventful. Although the selfie stick was banned in the gallery,

[3] Woolgar and Neyland (2014) describe conducting a series of breaching experiments involving taking bottles of liquid that broke restrictions through airport security as a way of inquiring why liquid restrictions are set at 100mL.

nobody told me or my friend off. This lead to us becoming more brazen with our selfie taking as the experiment went on. It seemed to be that we couldn't achieve the purpose of the breaching experiment: to be reprimanded for using something in order to question the rationale behind the ban. We received a few funny stares and a strong feeling of being conspicuous. What does this say? Rules are meant to be broken? Or perhaps British institutions rely on self-regulation of behaviour rather than using staff to proactively police minor rule-breakers. From a human geography perspective, the selfie stick changed the way my friend and I encountered the space. Rather than methodically charting a course through the gallery, we darted from artwork to artwork, ignoring the pieces that weren't interesting or wouldn't photograph so well. In that sense, the breaching experiment forced us to consider the socially accepted ways of navigating public cultural spaces.

I never published any of the photographs online as my friend didn't want to the images to appear online. In that sense, the selfie stick practice and publication process had been cut short. Hypothetically, even if I had published an image or two it would have posed a question of how I would have framed that image. How would the material practice of the selfie stick been enacted in a digital space such as Instagram? What attributes would I have given the selfie stick, knowing the situation, and the public I was publishing to? It likely would have been posted with a humorous comment about having to do the breaching experiment and how it hadn't gone to plan.

ETHNOGRAPHY, OBJECTS AND REFLEXIVITY

The problem with this fence-sitting approach to conducting an ethnography of an object is that as a researcher, a lot of time and energy is taken up in debating - both internally and outwardly - both ontologies, as though one must outweigh the other or have precedence over another. This, of course, is not true. Ontologies are largely dependent on situated action, and they will change, shift and morph in accordance with the actors involved in the situated action. The problem with the ontologies of the selfie stick is not the object itself - it is the humans and their varying understandings of it. And this leads me to a place of realisation: it is acceptable for the researcher to be reflexive in order to come to that understanding. For myself, that realisation came shockingly late in the research. Specifically referring to the selfie stick, it is interesting to note that many ontologies of the object exist, and yet they rarely intersect and enter into discourse with one another. Hence the angst of researching this object: the researcher can go around in circles *looking for discourse* of differing understandings where they may simply not exist.

But what of the object? After all of this ethnography in both material and digital settings, and after all of the reflexivity and recursivity, what can be said about the selfie stick? Is it inherently narcissistic? No.

Selfie practices would still exist without the selfie stick and those unsupportive would still discuss the selfie as a narcissistic activity. Is the selfie stick disruptive? Yes, in some settings, but never without help from other actors. A selfie stick will never damage a precious museum object on its own, it needs a human actor to accomplish that. Similarly, a selfie stick will never delay someone on its own, there must be a human actor using the selfie stick to cause the delay. And what of my discomfort in using the selfie stick for a breaching experiment? That could speak to my own lack of expertise with the object, or a dislike for being the active participant in a breaching experiment.

FIELDSITES: DIGITAL ETHNOGRAPHIES, MATERIAL ETHNOGRAPHIES AND, INTERSECTIONS.

The primary challenge of this autoethnographic, ethnomethodological cocktail of an approach across digital and material fieldsites was the difficulty in finding and describing the intersections and the settings where the digital and material merge. With the benefit of hindsight and with the aid of resources published after this research was conducted, it may have been beneficial to delineate exactly what was being studied when researching the selfie stick.

Pink et al. (2015) set out five principles for digital ethnography that would have been helpful to keep in mind at the time. While reflexivity features as one of the principles, the principle of 'non-digital-centric-ness' is also listed. It is an idea whereby the digital needn't necessarily be studied using digital methods. In this sense, does the inclusion of Twitter and Instagram data help the enquiry? Similarly, Pink et al. describe the multivalence of digital ethnography; we may research things, relationships, practices and spaces, all under the banner of 'digital ethnography'. With this hindsight it is clear that within that digital ethnography, I was trying to research too much. I was trying to research the selfie stick as a thing, as a practice and, within digital and material spaces. A benefit of this was that I was able to examine all of this and roughly determine that indeed selfie stick existed as an object to be practiced in digital and material spaces, but the downfall came in the analysis where it was near impossible to write something coherent without bouncing between referring to an object and a practice within spaces. This was especially apparent when it came to describing the differences between digital and material spaces.

WHAT ABOUT FUTURE OBJECT ETHNOGRAPHIES?

In some respects this case study of conducting an ethnography of selfie stick is something I would not repeat, it was disjointed across the material and the digital without enough to connect the two. There were noticeable absences which raised important questions: Why was there such strong critique online and yet there was no direct critique of the selfie stick when the situated practice was occurring? It was a curious separation of practice and critique. And yet these ontologies of the selfie stick co-exist; people still use the selfie stick to create images to be published online. And those critical of the selfie stick carry on in this way to a lesser extent now that selfie stick use has stabilized somewhat.

At some point in time I approached the selfie stick ethnography as a search for a controversy (Venturini, 2010) or an issue (Marres, 2007, 2015). What the ethnography showed was something more akin to a co-existence of ontologies that do not converge towards discourse. I am hopeful that in future ethnographies of objects there can be close attention paid to the potential for differing yet not intersecting discourses. These 'differing-yet-not-intersecting' discourses may in fact be akin to the broader concept of filter bubbles. Might we be able to take this co-existence of ontologies forward into future ethnographies of faddish objects that capture both the enthusiasm and critique of publics?

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FRANZISKA WEIDLE

A RESPONSE TO JESSAMY PERRIAM'S

ETHNOGRAPHY, OBJECTS AND REFLEXIVITY: A CASE STUDY OF THE SELFIE STICK

Jessamy Perriam's contribution discusses the selfie stick as a challenging object of ethnographic research. At first glance, the selfie stick appears to be no less complicated, variable and entangled within its sociotechnical assemblage(s) than any other object commonly examined in Science and Technology Studies. Similarly, its fluidity becomes visible when we follow and compare the object's multiple appropriations – or "ontologies" as the author calls it. What is interesting about the selfie stick, then, are the ways it polarizes and disrupts as we observe its co-existence in various spaces. While public places are a common stage for posing with the selfie stick, galleries and other cultural institutions have banned its use on their property and, although the photographs produced with it prove popular on online platforms such as Instagram, the broader media environment responds with criticism. The question is how can we analyze and interpret its distinct properties when faced with these shifting meanings and controversial practices?

Perriam sets out to conduct (auto-)ethnographic research of the selfie stick but struggles to shake off her own discomfort with it in the process. In addition to her annoyance with selfiestick- users in London and hesitation towards conducting a breaching experiment in the National Gallery, she also questions the researcher's role as an involuntary supporter of her object under investigation. Beyond a mere interference, this self-reflexive approach draws attention to the notion of disconcertment as a suitable framework for the analysis of controversies surrounding objects. But what is the specific quality that disconcerts the author and her research participants with the selfie stick? Physically speaking, it is just an extendable pole with a clamp. As part of an ensemble of contemporary visual practices, media ecologies (Horst et. al., 2010) and the messy experience of everyday life, however, contextualized meanings and values are continuously ascribed and re-ascribed to its affordances.

While examining the varying engagements and negotiations of this technology, Perriam uncovers a "curious separation" between practice and discourse: "Conflicting ontologies" of the selfie stick, she argues, co-exist in different locations, yet they do not directly intersect with one another. Although this gap is not a unique characteristic of the selfie stick and its sociotechnical assemblages per se, it can become an interesting lens through which to view the object and its different ontologies as emerging in relations. Let us consider Perriam's breaching experiment, again. Despite being banned from the Gallery, the use of the selfie stick did not cause any of the anticipated difficulties except for "a few funny stares". On one level, this observation implies a mismatch between the negative attributes ascribed to

the selfie stick by non-users online or removed from the actual scene and the experience of using it in public. On another level, the funny stares, nevertheless, affected the researcher in an interesting manner worth analyzing in greater detail.

Performing with the selfie stick in the Gallery has produced discomfort and intervened in the standard practice of a museum visit. Reflecting on that experience has revealed the stick's disruptive potential as it co-constitutes itself in an unfolding tempo-spatial subject-object constellation. As frequently demonstrated in anthropological scholarship on the senses, it can be fruitful to investigate one's own experience in order to better understand to what extent the experiences of others shape the multiple ways object properties are negotiated. Moreover, focusing on a disconcerting experience as a category for object-oriented ethnographic research might offer insights into how the usage of a certain object relates to configurations of other things and processes. As a result of Perriam's autoethnographic approach, the selfie stick's experiential qualities and atmospheres, which are often difficult to express or observe directly, became more tangible for the researcher. At the same time, usage in situ can serve to enhance immersion in the field and understanding of the sensory experience of selfie-stickusers in contrast to non-users' strong emotional responses.

Perhaps, it is in the habitual, tacit and sensory dimension of *doing*, then, that we gain access to some of the specificities that render the selfie stick controversial. To strengthen this approach, follow-up questions could include: What does it feel like to perform with the selfie stick? Which object components are relevant for this feeling and which other practices, things and atmospheric aspects come to matter in this situation? Are there any embodied practical skills required for a successful performance with the stick and how does a sense of achievement or competence affect the experience of using it in public? To what extent is it necessary for the ethnographer to become proficient (enough) with the technology as well as related practices such as sharing the generated image within a social network and what does this experience imply for the relationship between her and the object? Starting from this personal perspective and in conjunction with other methods such as participant observation, interviews, diaries or video reenactments (Pink & Leder Mackley, 2014), it would be possible to detect patterns amongst different situations the object participates in and further understand how these patterns contribute to making sense of what it does. Against the backdrop of studying local knowledge, the practical and symbolic properties of the selfie stick remain relational and fluid. Yet, within its wider sociotechnical context, the discrepancies between users and commentators become more graspable in the light of their varying experience and levels of literacy as the object is being inserted in roles and narratives constitutive for and disruptive of underpinning standards, values and ideologies.

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GÖDE BOTH

ACCOMPLISHING AUTONOMOUS DRIVING: AN UNFINISHED DESCRIPTION

When I embarked on my study, the questions – What is autonomous driving (or fully automated driving)? What is an autonomous car (or a self-driving car or a driverless car)? – seemed easy to answer. In fact, these questions seemed too simple to be asked. This changed when I started to engage in more detailed ethnographic descriptions. Instead of having one answer to each question above, I had multiple answers. The multiple labels for this type of object beg the question whether this is indeed one object. As for the questions above, there are multiple answers to these questions. For example, you might think of autonomous driving as a vision: One day cars will not require drivers to safely navigate them through traffic. In this sense, autonomous cars exist as a promise. Nevertheless, there are computer scientists and engineers claiming that they have already achieved autonomous driving. For them, autonomous driving may be performed by an autonomous car.

My case study is on a technological project devoted to autonomous driving. This particular collective of computer scientists and their modified cars claims that they and others as well have delivered a proof of concept. In press releases and publications they claim they have demonstrated the technical feasibility of autonomous driving. However, during my field work some project members believed it is still an open question whether self-driving cars can be turned into a reliable and mature product. Can autonomous cars be developed further to operate safely outside of carefully mapped environments and without human drivers as backup?

The following description is grounded in ethnographic field work which I conducted between June 2012 and November 2015. This collective is based at a large German university. In this unfinished description, I am trying to give a preliminary answer to the questions above by locating the autonomous car within the situated practices which generate an opportunity for autonomous driving in everyday traffic. This complicates the notion of autonomous technologies as bounded and self-sufficient with an inherent capacity for autonomous driving. Instead, I argue that autonomous driving is the result of a joint accomplishment of heterogeneous elements – i.e., human and nonhuman.

My analytical commentary is inspired by Jarzabkowski's and Pinch's criticism (2013) of what they label as script and affordance approaches. Within ongoing conversations on sociomateriality, they argue against a "current preoccupation with intentions encoded in objects or materials themselves" (p. 579). They criticize the affordance approach for placing too much emphasis on the intentions of humans mediated by nonhumans. The script approach tends to lead to analyses that "'black box' the social

interactions within which activities are accomplished to focus on the materials themselves" (p. 585). Instead, Jarzabkowski and Pinch propose the accomplishing approach – investigating practices as they are accomplished with materials. Following their suggestion, I will analyze the object "autonomous car" by describing the practice of autonomous driving in situ. This text is an unfinished description of the practice of autonomous driving including its site, machines and people that make up the assemblage of an autonomous car. I will introduce some of the key characters (car, laptop, safety driver, co-pilot), but I will not fully engage with them. My aim is to give you, the reader, a sense of why it is so difficult to write about an object that cannot be clearly delineated.

DISTRIBUTED TECHNOLOGY

First answer: Whatever this is that I am writing about, it is not just in one place. It is distributed.

Let me take you back to my field site and start from there: I am sitting in the office next to Michael. We are in a university building that belongs to the computer science department. The project spreads among several offices, a seminar room which is used for project meetings, a shared kitchen, the department secretary's office, but also the soccer robotics lab. In the office building project members work on the software and hold their team meetings and presentations (e.g. defenses of master thesis). They share the building with other working groups from the computer science department.

Michael is preparing the car's laptop for the up-coming test-drive. Michael is working on the car while he's sitting in the office. Does this mean that the car is in his office? In a sense, yes, the laptop is an important element of the car because it operates the car but it is also a mobile element. Where is the rest of the car? From the office building where I am sitting with Michael, it is a brief walk to its "garage". You walk through a quiet street with old trees alongside and enter the physics department, a large concrete building from the 1970s. The 'garage' is actually a huge physics laboratory. Michael enjoys entering the physics laboratory from the top entrance where a metal staircase leads to the ground. He loves this view of the laboratory. The ceiling of laboratory is two stories high. From the top of the stair case you can see over a vast collection of experimental apparatuses from the physics department. Some of them seem actively used; others seem just being stored here. Michael often jokes that the project members started to call these apparatuses "Doomsday devices" because they do not know what they are for but they look as if they belonged to mad scientists.

Physically separated from the physicists' experimental apparatuses by office cabinets and in the corner near the big door, two cars are parked inside the laboratory. Both these cars are computationally enhanced by additional sensors and ICTs (Information and Communication Technologies). My description focuses only on the station wagon Volkswagen Passat due to its special license for autonomous test-drives on public roads. This particular car is claimed to be an autonomous car. As

such, the 'new' comes in a very familiar shape of popular car model in Germany. To account for this familiarity with the object, I use the label "the car". During my field work, project members colloquially referred to the project's computationally enhanced Volkswagen Passat as "the car" ("das Auto") rather than "autonomous car", "experimental vehicle", "test-rig", or "self-driving car'" like they do in written accounts. Since I maintain the car cannot be separated from the situated practices it participates in, its boundaries differ depending on the situation.

The technological project and the technological object are distributed. While the human members, their offices and computers reside in the computer science building, the car shares its space with experimental apparatuses from the physics department. The human members, the computers and the car are separated. In order to go about their daily work the human project members do not depend on the physical co-presence of the car. What is important, however, is the laptop. They can do without the car but not without the laptop. Why is the laptop so important? To find out, let's go back to the laptop in Michael's office.

SYNCING THE LAPTOP WITH THE WORLD

Second Answer: Working properly means to be in sync with the world.

The car's laptop sits on Michael's desk hooked up to a large screen. Michael starts the "control center" – a software that is used both for simulating and operating the vehicle. He loads an old log file from a previous test-drive into the control center. On screen I see the map of the road infrastructure and the actual tracks travelled by the car during a particular "drive". The recorded tracks depart from the roads of the map at some points. Michael activates a second layer visualizing data from a specific laser scanner. He begins to correct the map. I ask him how he can tell the actual road from all the different measurements. Michael explains that he can see, for example, where the bike lane is simply by looking at the visualizations of the sensor data. After a while he says "we definitely have to test-drive this" and continues with a second log file. Michael loads a second log file from another drive into the control center. He comments "a nice drive (...) it definitely matches the map". The second log file seems to be more in sync with the map. Puzzled by all the deviations, I ask him what those deviations are caused by. He suspects that the first one was logged without correcting the GPS positions. I observe how he follows the map and the tracks on screen and I ask him what he is doing. He says, he wants to know whether the tracks are overlaying.

Autonomous test-drives do not start from scratch. The car does not venture in unmarked territory. Before the car can go anywhere, it requires a map, a very precise one (the error cannot be greater than a few centimeters). However, as we have seen in this vignette, maps are often incorrect. In this vignette

the map and the tracks travelled by the car do not overlap all the time. The map and the recorded positions are not in sync. This is one of the main problems of this kind of technology: Getting the representation of the world in sync with the measurements during test-drives. This problem will re-appear during my description of when we hit the real road.

ASSEMBLING AND RE-ANIMATING

Third answer: Whatever it is, it has to be assembled and re-animated each time.

After Michael has finished preparing the laptop, we pick up Timo from his office and walk to the garage. Once we are inside, we unplug the car from its battery charger and push the car out of the garage to avoid polluting the air inside. On the forecourt the engine is started and the members pop the trunk, booting up the different systems in a pre-determined order. Timo connects the laptop to the ICT systems of the car and launches the control center. The laptop responds with a feminine voice saying “System’s ready”. From now on, the laptop is the center of interest for the crew. It is many things at once. First, the control center operates the car by sending commands to the car’s steering, accelerator, brakes and signals. Second, it draws all the sensor data together to produce a singular representation of its environment. The project members call this process “sensor fusion”. Third, the human members use the laptop to monitor the car. Fourth, the human members use it as user interface to manipulate the car. Operation, monitoring and manipulation are all integrated in one piece of hardware. Hence, the laptop plays a key role in re-animating the car.

IT OSCILLATES

Fourth answer: Autonomous driving is a volatile technology. Control oscillates between the driver and the laptop.

I take a seat in the back of the car. This is where I usually sit, film or simply observe the action and ask questions. From this position you may notice the cameras hanging at the windshield with cables hanging freely. You might also notice the red emergency switches. These switches can disconnect the additional ICT systems (this includes the laptop) from the rest of the car. They are part of the safety requirements. I have never seen them used, but they seem to have a symbolic value. Once, I observed how a science journalist asked a project member to pose with an emergency switch for a picture. These emergency switches highlight the reciprocal relationship between the desire for automation and the need for human control. A test-drive usually begins with us driving off the court to the test-track manually. Manual driving is a member’s term to distinguish it from autonomous driving. Manual driving is whenever the car is controlled by the safety driver. In autonomous mode the car is controlled by the laptop.

The research vehicle may be driven just like a regular car. In fact, despite of all the modifications, it is still a regular car. The safety authorities would not allow it any other way. The modifications, such as the actor for the steering wheel, can be turned off and on. In fact, the safety driver often switches into autonomous mode in mid-drive or resumes control in mid-drive.

We manually drive to test track in order to drive autonomously. A test-track often used during my field work is close to the garage just in front of the university's main building. This test-track is a section of a public two-lane street. The test-track goes up and down the road separated by a grass strip with trees. In each direction it has a driving lane, a lane for parking and in between a bike lane. On each end of the track the car makes a U-turn to resume in the opposite direction. When we arrive at the test-track, Michael says that a sensor does not work and gets out of the car, opens the trunk and reboots a particular sensor system. He gets back into the car and resumes driving. Michael counts down: "3-2-1". He flicks a switch at the steering wheel and the laptop responds with a feminine voice: „Engaged". Michael takes his hands off the steering wheel and rests them on his lap. Shortly after, Michael takes hold of the steering wheel and resumes control of the car because it does not drive in the lane like it is supposed to. He explains by pointing towards the laptop screen: "You can see the arrow". He continues by stating that due to a problem with the correction data the deviation of the GPS receiver is too big. For this reason, the car assumes it was driving on the other side of the grass strip. The laptop is out of sync with the world. Michael stops the car once again. Michael and Timo fix the problem quickly and we continue to drive autonomously.

As we have seen in this vignette, test-drives oscillate between manual and autonomous driving between the car being operated by the laptop and by the driver. Repair is an essential part of accomplishing autonomous driving. One moment you are in autonomous drive, and in the next moment the car is back in manual drive. Autonomous driving is a volatile technology. It is enacted as part of a mundane practice – manual driving – incorporating a stable technology – the automobile.

IT DEPENDS ON HUMANS TO BECOME SAFE

Fifth, coordination is crucial for operating the car safely.

To safely operate the car in everyday traffic a number of precautions are taken. Most importantly, the car is always crewed in operation, even when driving on enclosed grounds. Now let's take a closer look at what the crew is for. There are two roles: the safety driver and the co-pilot (formally labeled "system observer"). The safety driver sits in the driver's seat. From his seat he can resume full control of the car immediately by overriding the laptop's commands. Next to him in the passenger seat, we have the co-pilot. He is in charge of the laptop. This combines monitoring the perception and planning of the car with

manipulating the laptop's software, such as selecting maps and missions and turning sensors on and off. When the pilot decides it is safe to hand over control, e.g. no closely pursuing vehicles, he checks with the co-pilot. It is the co-pilot's responsibility to monitor the laptop's perception of its environment and its planned maneuvers. In a sense, the co-pilot can tell about the near future. It is his responsibility to inform the safety driver about any pending maneuvers on behalf of the laptop (e.g. switching lanes, taking a turn etc.) so that he will not be surprised. Thus, it takes two experts to safely drive a driverless car. Or is it more accurate to say, it takes two men to safely drive a driverless car? This research field is heavily male-dominated and so is this particular project. During my fieldwork only – what I designate as – men were acting as crew members. This can be seen as an extreme case of the gendered division of labor.

Coordination is crucial for operating the car safely. By checking with his co-pilot, the safety driver ensures that the laptop is not planning to drive, for example, 0 km/h. In that case the car would come to a full stop, which in the worst case will lead to a rear-end collision by a pursuing vehicle. If everything checks out fine, the safety driver hands over control by flicking a switch at the steering wheel. As a result, the laptop takes over the vehicle's brake, accelerator, steering wheel and signals.

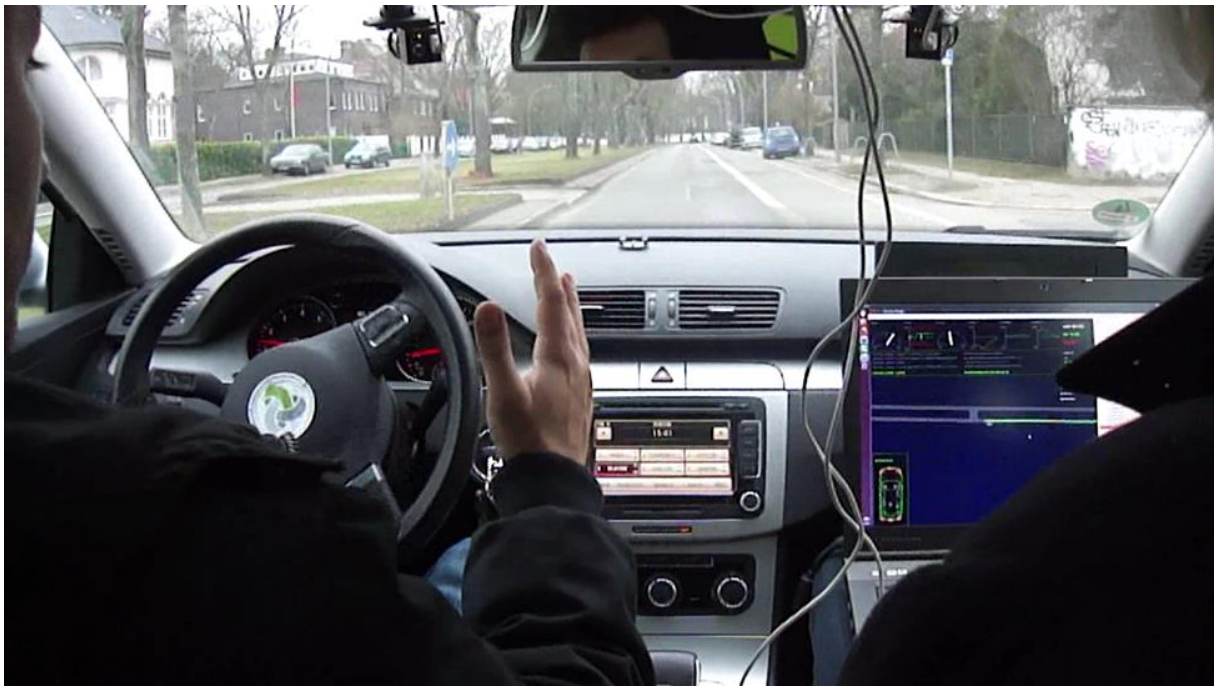

Figure 1: Driving in "autonomous" mode (still from a video by GB). The safety driver is sitting on the left while the co-pilot is on the right with the laptop on his knees.

Having their hands close to the steering wheel with no direct contact (figure 1) reminds me of trying to prevent a child from falling while making her/his first steps. This analogy captures the tension in the safety driver's task. Similar to monitoring a child learning to walk, the key challenge of monitoring the car in autonomous drive is to assess whether it is necessary to re-take control of the vehicle without being overcautious.

AUTONOMOUS DRIVING IS A JOINT ACCOMPLISHMENT

We have learnt that the car as a technology is distributed. It demands syncing, assembling, and re-animating. Even when the many elements are in place and working properly, this technology is volatile and depends on coordinated efforts of experts to create a safe opportunity for autonomous driving. Experienced computer scientists accomplish autonomous driving with a number of ICTs and a modified car. The technological project with the car at its core can be grasped as an assemblage of heterogeneous elements. The assemblage oscillates between two versions of technology, a good old-fashioned automobile and an experimental autonomous car, which is the coupling of a laptop with a vehicle, its sensor, and a highly skilled and focused crew.

To talk about an "autonomous car" is misleading if you think of it as a stable and permanent identity. When the "autonomous car" exists, it exists only for limited time as a situated accomplishment. It oscillates between manual and autonomous driving. It is also misleading to think of it as autonomous in sense of self-sufficiency. The car has to be pushed out of the garage, driven to the test-track and constantly cared for. The car is a precarious assemblage that has to be re-animated each time project members take it to the streets. Thus, the capacity to drive autonomously is not an inherent property of the object. Rather, it is accomplished by a collective of computer scientists, ICTs and a modified car.

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NATHAN WITTOCK

A RESPONSE TO GÖDE BOTH'S

ACCOMPLISHING AUTONOMOUS DRIVING: AN UNFINISHED DESCRIPTION

Moving in and between worlds is never easy, as doing so always entails the risk of letting down one side of the debate or the other. As a skilled equilibrist, Göde Both walks between the skyscrapers of the Computer Sciences and the Social Sciences, seeking "to combine sensitivities from both worlds to understand what is going on when computational enhanced cars are moved from the laboratory to real-life traffic." Such is the challenge for most scholars working in the field of Science and Technology Studies (STS). Both's "unfinished description" thus provides an entertaining and inspirational tale to be told.

In a sense, Göde Both's *confession* – so to speak – that his description is "unfinished" is a realization common to ethnographers working in STS. When studying objects that are characterized by an entanglement between multiple epistemological fields, who are we to decide where the boundaries lie? Who are we to say where a description ends, or should end? It nevertheless strikes me as a sign of honest doubt in Both's contribution to this volume. Instead of withdrawing at the sight of this difficulty, however, Both formulates five answers to his research questions: *"What is autonomous driving (or fully automated driving)? What is an autonomous car (or a self-driving car or a driverless car)?"* Whereas the tales told by Both appear fragmented at first, it is exactly the fragmented nature of the object, which oscillates between "a good old-fashioned automobile and an experimental driverless car," that he wishes to convey – and he succeeds in the endeavor.

In his first response, Both argues, "Whatever this is that I am writing about, it is not just in one place. It is distributed." To show that it is indeed distributed, he takes us along on a walk through the project's physical locations. Starting from "the office," he zooms out from the location where he "is sitting" to include a mental blueprint of "the computer science department" of the university. He also invites us to go with him to see the "Doomsday Devices" in the physics department of the same university. I found this notion very insightful. The term refers to "apparatuses" in the physics lab where the "autonomous car" is located. The members of the project in which Both does his field work "do not know what they are for, but [feel] they look as if they belonged to mad scientists." Both's respondents, however, do not belong to the latter group. Their autonomous car, and thus Both's object, routinely becomes normalized. The autonomous car, which is standing in the same laboratory with *the other* "Doomsday Devices," is referred to as *das Auto*: "the car." The model of the car is one of the more popular ones in Germany, we are told, and thus the self-driving car is *not* a "Doomsday Device," but a car. The tendency toward

normalization does not stop at the car's appearance. It extends to the inside as well. As Both argues in his observation of a test drive, the car contains "red emergency switches," which "can disconnect the additional ICT systems (this includes the laptop) from the rest of the car. I have never seen them used, but they seem to have a symbolic value," which he delineates as "the desire for automation and the need for human control."

As I observe Both walking the cable between the skyscrapers of the computer sciences and the social sciences, I am overtaken by an uneasy feeling. In his fourth response, Both notes, "Autonomous driving is volatile technology. Control oscillates between the driver and the laptop." In this, he once again discusses the oscillation between the desire for automation and the need for human control: "The research vehicle may be driven just like a regular car. In fact, despite of all the modifications, it is still a regular car. (…) The modifications (…) can be turned off and on. In fact, the safety driver often switches into autonomous mode in mid-drive or resumes control in mid-drive." I wonder, however, whether "it is still a regular car." Even though it is possible to drive the car without it being synced to the computer, it is *also possible* for it to be driven by the assemblage of human engineers, sensors, GPS, track, and computer. When Both arrives at his conclusion, however, I find myself fooled once more, for it seems that the provocation toward unease was precisely his intention. As he argues:

> To talk about an "autonomous car" is misleading if you think of it as a stable and permanent identity. When the "autonomous car" exists, it exists only for limited time in situated practice. It oscillates between manual and autonomous driving. It is also misleading to think of it as autonomous in the sense of self-sufficiency. The car has to be pushed out of the garage, driven to the test-track and constantly cared for. The car is a precarious assemblage that has to be re-animated each time the project members take it to the streets.

It is therefore not "a regular car," although it is part of the "precarious assemblage" that he portrays in this piece.

To conclude this commentary, I would like to pose several questions. Is it not the trademark of an equilibrist to incite in the crowd watching from below a blend of awe and unease – a sense of making them wonder whether they can do the same, while simultaneously leaving the audience feeling worried for the person balancing on the cable above? Is this not part of the fascination that one has for the balancing individual? Studying objects that are characterized by a state of constant "trans" is characteristic to work in STS, and part of the difficulty involves breaking down the normalization of these objects from all aspects of the spheres that they transgress, allowing readers to grasp the complex nature of the object under study. In this "unfinished description," I believe that Göde Both has found a way to do so.

MALVE JACOBSEN

TEMPORALITIES OF ASSEMBLING TRANSPORT SYSTEMS: PRESENCES AND ABSENCES IN A PLANNING PROCESS

DOING RESEARCH ON A PROCESS

If you want to investigate a process, it is not far-fetched to seek to employ a perspective of temporality. But how exactly is this done? "You never complete an infrastructure in the way you complete a novel; it is always and ever in the making. […] It is difficult to study things that do not have a singular identity at any one moment, that do not have clear life cycles" (Bowker, 2015). Therefore, Bowker suggests developing new historiographical skills, which fit into the complex nature(s) of infrastructures. Especially when we do research on processes, or more generally on the temporal dimension of infrastructures, we need to be careful not to fall into the trap of wanting to understand its temporality in a linear or chronological way. Therefore, I will utilise the term 'temporalities' in order to emphasize the multiple dimensions of temporality.

The following essay will focus on a number of objects[1] belonging to a bus: beeping sounds, number plates, closing doors, and the numbers *76* and *140*. Those, and many other objects, are part of the assemblage of the public bus system *Dar es Salaam Rapid Transit* (DART).[2] The DART system exists in a constant (re-)making by its (non-)human actors. Since the early 2000s, diverse actors are planning, designing, implementing and operating the bus system. I will demonstrate what objects might tell about the socio-political dimensions of this planning process.

SCRIPTS

Building upon STS scholarship and Akrich's work on 'de-scribing' technical objects (ibid., 1992), objects have roles that are inscribed in their material composition. Roles might change over time – from initial design to actual employment – and be de-scribed in practice by encountering a user. In line with Akrich, objects participate in building heterogeneous networks that bring together actants. By employing the

[1] As it will be elaborated in the following, objects are not necessarily material; they can have different shapes.

[2] DART is Dar es Salaam's Bus Rapid Transit (BRT) system. BRT is a model of public bus service that operates on dedicated lanes of the existing road network. BRTs contain ITS (Intelligent Transport Systems) technology, e.g. bus scheduling is carried out by a control centre, and an electronic ticketing system includes off-board fare collection and an integrated fare structure. Therefore, BRTs combine two relevant factors of transport systems: high passenger capacity at low costs. During the last two decades, BRT systems have been promoted and implemented mainly in the Global South.

concept of 'assemblage' rather than 'networks', I will work with the objects of DART as 'scripts' of an assemblage.

For example, the role of DART's buses differs in various scripts. They appear as models in policy papers of international consulting firms, technical descriptions for the manufacturer, materialised prototypes arriving in Dar es Salaam, a controversial number of *140*, a modern means of public transport carrying passengers, a chassis with traces of usage, fast and huge vehicles involved in accidents, the types 'articulated' and 'rigid', flexible buses for different corridors, etc. But their overall role is to transport passengers and facilitate the operations of DART. Certain values are inscribed in these different roles, which are not just about transporting people, but more specifically about *how* to transport people and *how* to shape the public transport system. Those values will be better understood by looking at certain objects of the bus assemblage. In them, this *how* is inscribed in detail. For example, DART shall "provide a better, more modern and more efficient public transport service" (DART, 2014b). According to a dominant script regarding the materialisation of these policies, the *Bus Output Specifications*, the bus design "[…] shall be energy efficient, environmentally friendly, and safe and secure for transportation of passengers". Furthermore, since passenger comfort is a major concern, "particular attention must be taken to minimise noise, vibration and harshness transmitted to passengers" (DART, 2014a).

But actants do not necessarily comply with the initially defined scripts, and objects do not strictly execute their roles as inscribed. Akrich mainly refers to (human) users employing objects in a different manner than planned by the designers. Looking at assemblages, de-scriptions occur much broader within the assemblage between various actants. Taking for example the case of DART's passenger comfort, the planners' script of the buses has not been realised in several regards. In Dar es Salaam, the climate conditions (very hot and humid, temperatures almost all over the year above 30 degrees Celsius) do not comply with the climate control script of the buses. Due to money constraints, buses do not supply air conditioning, but only low air ventilation while the bus is moving, through the use of small windows that can be manually opened (DART, 2014a). On so-called feeder routes[3], buses cannot drive continuously rapid as inscribed in operational plans due to two main reasons. First, transport planners have underestimated the high volume of traffic on this mixed-traffic road, which is slowing down any movements. Moreover, since the buses are quite low, they would be of better use on newly constructed plane corridors. The actual condition outside of dedicated lanes though is characterised by numerous

[3] On feeder routes, buses serve outside the dedicated lane on a mixed-traffic road, between BRT terminals and feeder stations.

bumps and potholes, which make fast driving impossible since speeding would damage the buses' bottom chassis (DART, 2015b).

Consequently, objects are being de-scribed in their roles and scripts change over time, getting adapted to the actual situation. Scripts are present and absent at different points of time within the planning process, or rather: various scripts can co-exist; they can be present in one shape and absent in another. Coming back to the *Bus Output Specifications*, this script had not disappeared by the time the materialised version of the buses appeared. Both scripts were present, either physically or in discourse.

PRESENCE AND ABSENCE

In addition to considering co-existing scripts, I will go deeper into the concept of presence and absence. Not only can different scripts of an object or assemblage co-exist; one script can also be present and absent – at the same point in time or at different points in time. In order to work with this perspective, we need to acknowledge and internalise the fact that presence and absence are not opposed to one another. Therefore, objects can be present in their (physical) absence. The questions are: which forms does this absent-presence have and how do these forms develop within the process, with the perspective of temporality?

Following Callon and Law, "times and spaces are in the making" (ibid., 2004, p. 3). Hetherington, who examines disposal as an integral part of consumption, writes: "Social relations are performed not only around what is there but sometimes also around the presence of what is not" (ibid., 2004, p. 159). We can go even further and argue that this co-existence of presence and absence is a necessary condition for the existence of every single thing. Without absence, there is no presence and vice versa. Though, many scholars[4] only think about absence in terms of 'there had been a presence before'. According to them, present absence is disposal and death. But isn't it vital to consider absences of objects which had never been physically present? For example, a lack of knowledge or information can be very present in a conversation. Or, if crucial elements for the materialisations of the buses had not been addressed in the *Bus Output Specifications*, this might have fundamental consequences for bus operations. The agency of the absent object further plays a role in research on (in)formality[5] and infrastructure research. Star wrote in her famous paper on the ethnography of infrastructure that, for many users, infrastructures become visible upon breakdown. This can be interpreted as by the time the infrastructure does not follow its (temporal) script, the infrastructure becomes absent in terms of not being present (e.g. no

[4] Scholars have been working on concepts of presence and absence not only in fields of STS, but also in fields of philosophy and cultural sciences (e.g. Homi Bhaba wrote on 'absence' referring to Jaques Derrida's concept of *Différance)*.

[5] A widespread, one-sided argument is that the void of formality leads to informality.

water coming out of the tap, no buses running on the streets, no electricity coming out of the socket). At the same time, the infrastructure might become more present for its users, like in the case of Star's research: "This breakdown became the basis for a much more detailed understanding of the relational nature of infrastructure" (ibid., 1999, p. 382). I would add that infrastructures are also present in their 'all times absence'; If you never have running water from the tap, bus services or electricity (but you are aware that those infrastructures generally exist), they can also be very present – in their role of not being physically, materially, or effectively present. The same argument can be applied to the planning and implementation of new infrastructures. As the following section will demonstrate, the DART system has been present (for different actants of the assemblage) in many different, temporally changing forms. By the time that the construction of the physical infrastructure (corridors, stations, terminals and depot) had been finalised and a service provider had been found, the buses were actively missing in order to put the DART script into being and to start operations. However, the buses had never been there before in a material shape (and were not yet even manufactured), but only in their expected role of transporting people.

THE IMPACT OF BIG NUMBERS

In the following, I will illustrate how roles have been changing within the script of DART. They all have a numerical dimension in common, in terms of influencing the change of the whole script.

HIGHER AMOUNT OF BUSES

The local service provider, UDA-RT, and the governmental entity responsible for DART, the DART Agency, signed the Interim Service Provider (ISP) Agreement in April 2015. This document obliges the interim service provider to supply BRT services for two years until a 'full' service provider for the long term is selected. ISP should purchase 76 buses in total in accordance with the Bus Output Specifications. Two of the buses should be provided before the launch of ISP services in order to train drivers (DART, 2015a). But UDA-RT flouted this contract and ordered a total of 140 buses. This step had strategic reasons: UDA-RT counted on a stronger and more permanent position within the DART project through the increased amount of buses. Ironically, the Tanzanian government officially became aware of this almost doubled amount of buses only by the time the buses arrived from China at Dar es Salaam's port in September 2015 (Interviews October 2015 & May 2016). Consequently, the DART Agency had to amend the Interim Service Provider Agreement, along with the operational plans to this physical appearance. These amendments had further consequences on the whole operational design and the power structure of Dar es Salaam's BRT scheme. UDA-RT successfully enforced their long-term participation through this massive investment of 140 buses.

HIGH TAXES

After the arrival of the buses, national media expected DART to commence operations soon (Lugongo, 2015). But for a long period of time, only the two prototypes were running along the BRT corridor (Interviews May 2016, Observations September/October 2015). In order to avoid paying high storage costs at the port, the Tanzanian government allowed UDA-RT to move the newly arrived bunch of buses from the port to two bus terminals. Apart from that movement, vehicles were not allowed to use public roads and become operational before clearance and registration.[6] It would have been much easier to park all buses at the depot, which has larger facilities. But by that time, the depot had not yet been part of the ISP Agreement. The script of ISP operations was changed a couple of weeks later in order to adapt to the new situation. Part of this ISP Addendum was to acknowledge all 140 buses and hand the depot over to UDA-RT. It became obvious that the interim service will be much more extensive than previously agreed.

In the meantime, UDA-RT tried to register itself as a public limited company instead of having the status of a private company (Interviews September 2015). The company asked Tanzania Revenue Authority (TRA; in charge of collecting import duties and other taxes) to obtain a tax exemption for the imported buses since the buses will serve 'for the public'. TRA refused their request after months of negotiations and standstill. Imported goods, especially motor vehicles, have been a highly political issue in Tanzania. On the one hand, Tanzania has a rather protectionist and rigid import policy. On the other hand, a lot of tax exemption had been conducted due to corruption and in order to attract foreign companies and ease international trade. Then, during the negotiation process between TRA and UDA-RT, Tanzania elected a new president. The president's topmost priority was to evict corruption and redistribute wealth from the big (foreign) companies to the people. It seemed like this case became the precedent for the new Tanzanian government, in order to prove that there was no longer extortion and corruption. Moreover, TRA only accepted full payment of the high amount, [7] which led to further delays since UDA-RT had to take out another loan (Msikula, 2015). Only after the full clearance in April 2016 were buses allowed to leave the terminals, and operations started a month later, after all buses had been checked regarding safety concerns (Observations May 2016).[8]

[6] The exact amount of import duties is not public and no involved actor responded to that. Estimated amounts range from USD 3.6 million to 1.4 billion (personal interviews; Lugongo, 2015).

[7] UDA-RT asked for payment in pieces. UDA, one major shareholder of the UDA-RT, once made the same request to TRA. TRA agreed and UDA did not pay due taxes in instalments. Therefore, TRA became even more careful with the company's request (Msikula, 2015).

[8] Also the clearance of the two prototype buses took much more time than expected and delayed the trainings for more than a month. UDA-RT tried to release the buses from the port without clearance.

Obviously, the only material difference between the two mobile buses and those 138 immobile ones was the physical presence/absence of number plates. Each bus has two place holders for the number plates: one in the rear and one in the front. The physical absence of number plates is also visually penetrating once this apparent gap is not filled (Observations September/October 2015). A bus which does not possess this item is immobile. It might be a global phenomenon that vehicles need to have number plates in order to use public spaces like roads. This is due to the fact that possessing a number plate means owning a registration. Indeed, a number plate is the materialisation of a formal registration and tax payment. Number plates restrict where vehicles can be physically present – and where not. They have the role in the DART assemblage as proving the legal status of the bus – as having been imported legally, meaning that import duties were paid. Only with that legal status can buses move and operate on public ground and fulfil their duty and take their role as transporting people within the DART service.

It is remarkable that the number plates appear neither in the *Bus Output Specifications*, nor in the *ISP Agreement*. Whereby, both documents describe the materiality and agency of the buses and inscribe roles to them. Generally, the documents ignore the necessity of licensing as a precondition for operations. Regarding the absence of number plates in the *Bus Output Specifications*, it is necessary to admit that a number plate is technically not necessary for moving the bus. In theory, an unregistered bus can comply with the script of a safe and comfortable bus service. This point strengthens the outstanding role of the number plates since it might be the only material component which is only legally, but not technically, necessary – e.g. in contrast to the steering wheel, doors, gearbox, axles, etc. By and large, this absence might be due to the fact that a valid license is so deeply inscribed into DART that it is indispensable. The producers of the documents probably assumed that this precondition is so clear that it is not necessary to be mentioned. Since the role of the number plate is deeply inscribed into the script, it is not flexible. A Tanzanian number plate cannot be replaced by a Chinese one without legal steps. But all other material components could be replaced, as long as they comply with the *Bus Output Specifications*. The salient point is: the material inscription of laws and state power is crucial for the functioning of the DART script. The state is materialised in the number plate and, therefore, the number plate directly connects the vehicle with the state.

The following two examples will illustrate the case of flexible, changing roles that embody another kind of de-scription of the technology in which operations can happen even if the object is not installed or used as inscribed. By the time that drivers and passengers become active parts of the DART assemblage, it necessarily changes and adapts to the present practice. Those actors do not comply in all means with their roles that planners and politicians had inscribed previously.

OVERCROWDING AND SPEEDING

For safety concerns, the role of the doors was supposed to comply with two essential features. First, doors should not be able to close (even if the driver pushes a respective button) when passengers are standing in the door area, marked as 'No Standing Area' in every bus. Second, "[t]he doors on each Bus must […] have a mechanism with safeguard to avoid opening of the doors while the vehicle is in motion or that the vehicles moves with open doors." In practice, both features are no longer present (Observations May 2016). Doors close even though people stand in the 'No Standing Area' and even when they stand right between the two wings of the doors, with one leg in the bus and the other one still on the platform. Beyond that, buses set off with open doors, the doors just closing once the bus accelerates. Both changes bring the new script of DART operations closer to common practices of minibus operations. Dar es Salaam's minibuses are highly overcrowded so that people squeeze and doors are many times opened during movements – in order to save time when passengers (dis)embark. Therefore, in trainings, drivers were instructed not to do so due to the BRT ideals regarding customer care, such as comfort and safety. Therefore, drivers were supposed to not change the DART script. In the initial beginning of operations, drivers still tried to follow this policy and many drivers even announced this safety note. But this behaviour has gradually ceased, and passengers followed the changing script and returned to stand in the 'No Standing Area' during peak hours (Observations May & September 2016).

Obviously, the service provider has changed the script. Due to high passenger demand and overcrowding, (dis)embarking takes much longer than scheduled and drivers try to take as many passengers as possible on board. Interestingly, different versions of the initial script were circulated: A manufacturer employee says that doors cannot close when passengers block them. By contrast, service provider staff claims that there has never been a technology to prevent these two kinds of doors from closing (Interviews May & November 2016).

A similar change in the script occurred regarding a technology that should prevent drivers from speeding. BRT buses are supposed to not exceed 50 km/h. If they do so, a high beeping sound rings out in order to remind the driver of that limit. In practice, it has turned out that many drivers speed in some sections of the corridor and simply ignore the annoying sound and do not change their driving according to the script (Interviews May & November 2016, Observations May & September 2016). An employee of the DART Agency put it in a funny way and meant that drivers perceive this sound rather as music than as a warning signal. Consequently, the beeping is no longer a guarantee for maximum speed. It is intriguing that the sound was only passively, in an absent-present way, inscribed. It should never ring out in practice, since the driver's role was to never exceed the speed limit of 50 km/h.

ETHNOGRAPHIC COMMENT AND CONCLUDING THOUGHTS

How did I become aware of these social-political dimensions of assembling? In how far did the focus on objects help me to understand controversies and changing scripts? I made various forms of participatory observations and conducted numerous interviews at four different points of time within two years.[9] This methodological interplay helped me to come so close to the different scripts and made me understand how DART changes over time. For example, I saw the 138 buses without number plates parking at the terminals before anyone told me about clearance issues. I was wondering why they were not based in the depot, which has much better facilities. Over the next days, local actors told me, and newspapers reported, about on-going negotiations between UDA-RT and TRA regarding due import duties. Through my previous observations of the missing number plates and the dislocation of the buses, I was sensitized to this topic. Through the focus on the physical constitution and materiality of the buses, I was able to develop questions directed at this conflict between service provider and state.

Moreover, finding the balance between following the process chronologically, which is of big use for understanding, and the assumption of multiple, twisted temporalities of planning and implementation processes, is necessary. Wood criticized the allegedly linear and straightforward process of BRT projects when explaining that "[…] BRT circulation is a more convoluted and long-lasting process than ordinarily considered" (ibid., 2015, p. 11). Just coming back to the example of scripts existing in parallel regarding operations of UDA-RT based upon the role of the amount of buses shows that DART is not a stringent, linear process, but rather a process that continuously goes back and forth, and turns around. I noticed several times that various actors have very different levels of knowledge and already decided issues were repeatedly put back on the table. Also, different speeds need to be considered as the ISP Agreement first accelerated the process and then, negotiations between UDA-RT and TRA on the ISP Addendum slowed the process down yet again.

To conclude, not only presences, but also absences – both in material and discursive shapes – provide insights into the social and political dimensions of infrastructures and their planning processes. Regarding DART, a lot of controversies evolved around the actual implementation and the impact of local operators within bus operations. This actual implementation materialised in various ways and roles thus changed. The missing number plates can be interpreted not only as a symbol of missing tax payments and legal registration, but further as absent support by the Tanzanian government in regards

[9] It is necessary to consider that my impressions though are very limited, basically due to the fact that I am not aware of where the gaps in my research are, and what I left out. It would never be possible to seamlessly describe a process. In my own research, the absent might be even more absent than the absent-presence in the DART script itself. On the other hand, my own research process reflects the shape of the DART process: rather multiple and unstable than (chrono)logical.

to the local operator's attempt to strengthen their position. Even the changing amount of buses and their physical absence on the BRT corridor for more than half a year indicates this conflict. The cases of speeding and overcrowding show in detail how scripts change when new actors enter the assemblage. Since DART's script is flexible (to a certain extent), bus operations do work under the modified script, e.g. when buses exceed their maximum passenger capacity so that passengers stand in areas which were not designed as standing areas.

Therefore, this closer look at several material components with a perspective on temporalities has proved that presence and absence can exist at the same time and that the scripts of an assemblage change over time. DART's objects temporarily have different shapes which are expressed through the presences and absences of material components and appearances, behaviours and discourses. Different forms of present-absence were determined, such as a divergence between the assemblage in discourse and its actual material shape, or perceivable consequences through that absence, which led to changes in the script and consequently of the object's agency itself.

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PHOTOS

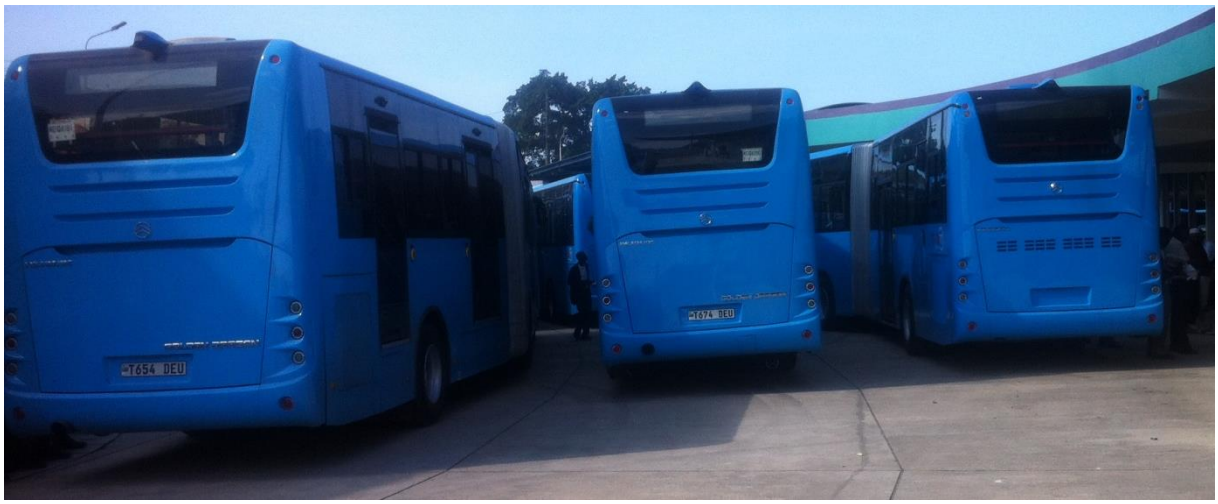

Photo 1, September 2015: Buses with and without number plates at the bus terminal (Image source: own photo).

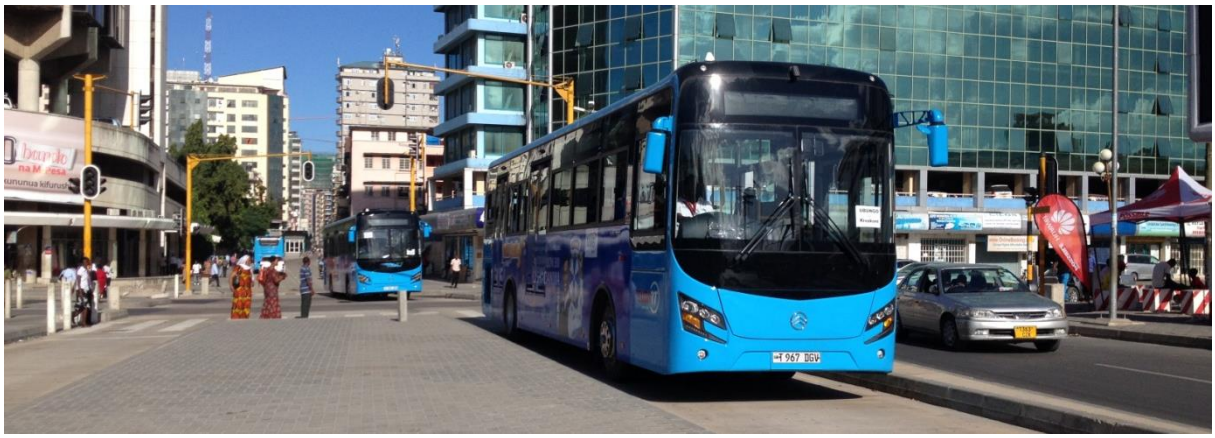

Photo 2, May 2016: Buses riding on the BRT corridor after clearance (Image source: own photo).

Photo 3, May 2016: Buses parking at the depot after clearance (Image source: own photo).

GÖDE BOTH

A RESPONSE TO MALVE JACOBSEN'S

TEMPORALITIES OF ASSEMBLING TRANSPORT SYSTEMS: PRESENCES AND ABSENCES IN A PLANNING PROCESS

Malve Jacobsen reports on her ethnographic fieldwork on what is to become supposed to emerge as a public bus service operating on dedicated lanes in Dar es Salaam, Tanzania. She takes the reader into messy realities of implementing Dar es Salaam Rapid Transit (DART) with compelling and rich descriptions. Jacobsen's essay takes the form of a detective story. She describes different objects and asks what their presences/absences tell about the "socio-political dimensions of this planning process." Although the title of the essay signals an essay about planning processes, my impression is the essay is really a story on implementation processes. The essay features ethnographic stories on how DART changes between how it was originally conceived by planners and a struggle to stabilize as a public bus service in the streets of Dar es Salaam. For example, her observation that the enforcement of a speed limit fails highlights a crisis in the form of a gap between the initial prescription of the driver and the actual subscription by the driver. Through the de-scription of her objects the reader also learns about – what I would refer to as – "trials of strength" (Callon, 1986; Latour, 1987) between two Machiavellian actors engaged in the implementation process. We do not learn whether DART will eventually become an object, i.e. to achieve a degree of reality and durability independent of the opinion of an observer. However, Jacobsen's essay invites the reader to cheer on a public bus service struggling to come into being. The case also invites for a comparison with failed attempts to introduce a new transportation service, such as ARAMIS (Latour, 1996).

Jacobsen conceptualizes DART as an assemblage of different scripts which could make the essay an interesting contribution to debates within actor-network theory. Her appropriation of the concept script departs from Madeleine Akrich's classic book chapter (1992) in three ways. Jacobsen rejects the network metaphor by mobilizing the assemblage metaphor. It would be interesting to hear why the network metaphor does not do the trick in her study. Why is assemblage a more adequate concept, how does it shift the way it conceptualizes DART? The latter questions could also be discussed with other similar conceptualizations that appear in the essay. For example, the term "system" – is "system" a member's category or an analyst's category? If so, how does it relate to "assemblage"? My understanding is that system and assemblage come with different imaginaries. In addition, I was confused by use of the category "infrastructure". How does this relate to the other categories above? In my reading infrastructure is mobilized with two different meanings. On the one hand, it refers to the

physical infrastructure for the buses and on the other hand, DART itself is figured as an infrastructure in the form of the imagined outcome of the planning and implementation processes.

Departing from Akrich's classic book chapter, Jacobsen's de-scription of the assemblage follows a number of different scripts by shifting between frames of references, for example, "script of ISP operations" or "climate control script". I understand Akrich in the way that "script" is the result of a de-scription by the analyst. Jacobsen appears to mobilize "scripts" with different meanings which sometimes makes it hard to follow the analysis. For example, in the enumeration following "the role of DART's buses differs in various scripts", she lists a number of examples where the buses appear. However, I do not understand what "scripts" and "roles" refers to in each one of these instances. In my mind, appropriating the distinctions between prescription, inscription, subscription, de-inscription, and de-scription could be a way to clarify the analysis. It is a terminology suggested by Madeleine Akrich and Bruno Latour (1992). Jacobsen's claim, that DART is figured in different inscriptions defining different roles for the buses, begs the question how they are coordinated or how they compete for hegemony. There appears to be some kind of hierarchy of roles topped by a 'super-role' when she talks about DART "overall role to transport passengers". This is an interesting addition to Akrich's actor-network theory which allows for a higher degree of complexity.

Another methodological contribution is Jacobsen's focus on "temporalities". The plural signals that the process described in the essay enfolds within multiple temporalities. Her interest in attending to temporalities in plural is motivated by literature that critiques assuming a linear chronological order in planning and implementation processes. While her argument for multiple temporalities is convincing and backed up by empirical evidence, I failed to see the evidence for "DART is not a stringent, linear process, but rather a process that continuously goes back and forth, up and down, and turns around." Since this point is central to essay, I would like to read more and how she reaches this conclusion.

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MALVE JACOBSEN

TEMPORALITIES OF ASSEMBLING TRANSPORT SYSTEMS: PRESENCES AND ABSENCES IN AN INTERMITTENT PROCESS

Today is 25th January 2017. Right now, it is 10 a.m. in Tanzania and John P. Magufuli, Tanzania's president, is officially inaugurating *Dar es Salaam Rapid Transit* (DART).[1] The day before, stakeholders of DART were discussing the preparatory work for this inauguration in a group called BRT EDUCATION CAMPAIGN of the messenger service WhatsApp. One major concern was a sign with an inscription in Swahili and English (see as well figure 1 and 2 on the next page):

> Phase 1 of the Dar es Salaam Bus Rapid Transit (BRT) infrastructure and bus operations have been officially inaugurated by his Excellency Dr. John Pombe Joseph Magufuli, President of the United Republic of Tanzania on 25th January 2017 in the presence of Mr. Makhtar Diop, World Bank Vice President, Africa Region.

After one person had posted a photo of this memorial plaque, several group members reacted on that: 'I think, it's not wise to spread this plaque before the day of inauguration.' – 'It's not a good idea. People should not be able to see what is written on it until they will have revealed the curtain. This is an open group, just imagine if the Honourable gets this picture. He will ask what he is supposed to inaugurate if DART has been inaugurated already.'[2]

[1] DART is Dar es Salaam's Bus Rapid Transit (BRT) system. BRT is a model of public bus service that operates on dedicated lanes of the existing road network. Usually, BRTs contain intelligent transport system (ITS) technology including a control centre that carries out bus scheduling, and an electronic ticketing system with off-board fare collection. Therefore, BRTs combine two relevant factors of transport systems: high passenger capacity at low costs. During the last two decades, BRT systems have been promoted and implemented mainly in the Global South.

[2] Own translation, original in Swahili.

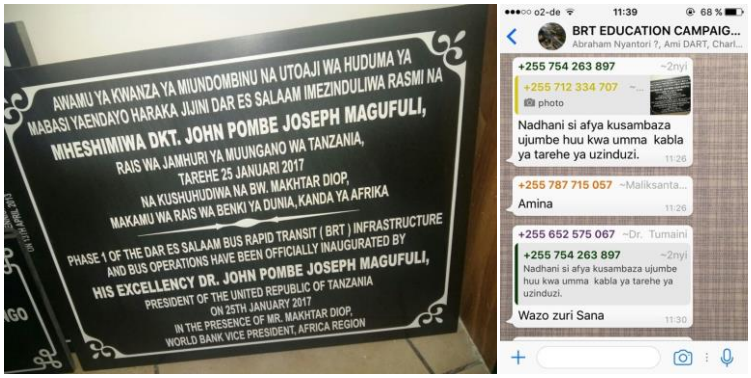

Figure 1 and 2: Sign for memorising the inauguration of Dar es Salaam's Bus Rapid Transit system and discussion in a messenger forum about the appearance of the sign before the inauguration, January 2017 (Image source: WhatsApp group *BRT EDUCATION CAMPAIGN*).

DART has been operating since 10th May 2016. Why does this ceremonial event take place more than eight months delayed? What is this inauguration about? In how far does this deferred inauguration defy the idea of 'inauguration'? I will not answer these questions here but today's event shows that the process of planning and implementing this transport system is not following any chronological order but is rather characterised by multiple temporalities. Incidents happen now which were supposed to happen in the future (the sign stating that the inauguration had already taken place) and incidents happen now which were supposed to happen in the past (the inauguration after a number of months of operations).

DOING RESEARCH ON A PROCESS

If you want to investigate a process, it is not far-fetched to seek to employ a perspective of temporality. But how exactly is this done? 'You never complete an infrastructure in the way you complete a novel; it is always and ever in the making. […] It is difficult to study things that do not have a singular identity at any one moment, that do not have clear life cycles' (Bowker, 2015). Therefore, Bowker suggests developing new historiographical skills, which fit into the complex nature(s) of infrastructures. Especially when we do research on processes, or more generally on the temporal dimension of infrastructures, we need to be careful not to fall into the trap of wanting to understand its temporality in a linear or chronological way. The introductory sequence demonstrates that the planning, implementation and stabilisation process of DART is not following a unidimensional, linear principle. The process temporarily slows up and down, unexpected actors and practices occur, and changes seem to be the only continuum. Consequently, I will utilise the term 'temporalities' in plural in order to emphasize the multiple dimensions of temporality. The following essay will focus on a number of objects belonging to a bus, appearing in different shapes: beeping sounds, number plates, closing doors, and the numbers 76 and 140. Those, and many other objects, are part of DART. Since the early 2000s, diverse actors are planning, designing, implementing and operating, stabilising and adapting this bus system. I will

demonstrate what objects might tell about the socio-political dimensions of this multifaceted and intermittent process.

SCRIPTS

Building upon STS scholarship and Akrich's work on de-scribing technical objects (ibid., 1992), objects have roles that are inscribed in their material composition. Roles might change over time – from initial design to actual employment – and might be de-scribed in practice by encountering a user. In line with Akrich, objects participate in building heterogeneous networks that bring together actants. Though, I will employ the concept of assemblage rather than networks. Even if these two approaches have a lot in common by referring to the (provisional) co-constitution of (non-)humans in heterogeneous forms (Law, 2009; Müller, 2015), the aspect of temporality emerges stronger in assemblages than in networks: 'assemblage is a process of bundling, of assembling' (Law, 2004, p. 42) and 'assemblage is a mode of ordering heterogeneous entities so that they work together for a certain time' (Müller, 2015, p. 28). This emphasis on process and temporality, also materialised in the verb *(to) assemble*, and the widespread critique that networks might comprise (pre-determined) hierarchies makes assemblages more appropriate for understanding intermittent processes.

'Times and spaces are in the making' (Callon & Law, 2004, p. 3) so that DART exists in a constant (re-)making by its (non-)human actors. Therefore, I will work with the objects of DART as scripts of an assemblage. For example, DART's buses are taking shape in various scripts, differing in time and space. They appear as models in policy papers of international consulting firms, technical instructions for the bus manufacturer, materialised prototypes arriving in Dar es Salaam, a bus fleet being expressed in the controversial number 140, a modern means of public transport carrying passengers, sky blue chassis with traces of usage and accidents, fast and huge vehicles impressing passengers and making minibuses look slow and small, the types *articulated bus* and *rigid bus*, flexible buses with doors at both sides for driving on different road types, etc. Their overall role inscribed by planners and manufacturers is to transport passengers and facilitate the operations of DART. Certain values are inscribed in these different roles, which are not just about transporting people but more specifically about how to transport people and how to shape the public transport system. Those values will be better understood by looking at certain objects of the bus assemblage. In them, this *how* is inscribed in detail. For example, DART shall 'provide a better, more modern and more efficient public transport service' (DART, 2014b). According to a dominant script regarding the materialisation of these policies called Bus Output Specifications, the bus design 'shall be energy efficient, environmentally friendly, and safe and secure for transportation of passengers'. Furthermore, since passenger comfort is a major concern, 'particular

attention must be taken to minimise noise, vibration and harshness transmitted to passengers' (DART, 2014a).

But actants do not necessarily comply with the initially defined scripts, and objects do not strictly execute their roles as inscribed. Akrich mainly refers to (human) users employing objects in a different manner than planned by the designers: 'To be sure, it may be that no actors will come forward to play the roles envisaged by the designer. Or users may define quite different roles of their own' (ibid., 1992, p. 208). However, de-scriptions occur much broader within the assemblage between various actors. Not only the agency of passengers, drivers and political decision makers but also the agency of speed restrictions, climate conditions and the road surface do have a role and consequently an impact on the complex and prolonged process. Taking the case of DART's passenger comfort, the planners' script of the buses has not been realised in several regards. For example, the hot and humid weather in Dar es Salaam, characterised by temperatures almost all over the year above 30 degrees Celsius do not comply with the initial climate control script of the buses. Due to financial constraints, the interim service provider ordered buses without air conditioning. Now, only little air ventilation is provided while the bus is moving and small windows are open (DART, 2014a; Observations 09-10/2015, 05/2016, 09/2016). On so-called feeder routes[3], buses cannot drive continuously rapid as inscribed in operational plans, which further decreases the air ventilation. Due to two main reasons, the speed of buses leaving the dedicated lane and entering the mixed-use traffic is reduced. First, transport planners have underestimated the high volume of traffic on this mixed-traffic road, which is slowing down any movement. Moreover, since the buses are quite low, they would be of better use on newly constructed plane corridors. The actual condition outside of dedicated lanes though is characterised by numerous bumps and potholes that make fast driving impossible since speeding would damage the buses' bottom chassis (DART, 2015b).

Hence, objects have inscribed roles, which are de-scribed in and translated to new contexts. Scripts are present and absent at different points of time within the planning process, or rather: various scripts can co-exist; they can be present in one shape and absent in another. Coming back to the Bus Output Specifications, this script had not disappeared by the time the materialised version of the buses appeared. Both scripts were present, either physically or in discourse.

[3] On feeder routes, i.e. routes between BRT terminals and feeder stations, buses serve outside the dedicated lane on a mixed-traffic road.

PRESENT ABSENCES AND ABSENT PRESENCES

In addition to considering co-existing scripts, I will go deeper into the notion of presence and absence. Not only can different scripts of an object or assemblage co-exist; one script can also be present and absent – at the same point in time or at different points in time. We could also talk of *pre-ab-sences* and *ab-pre-sences*, implicating the interdependency and mutual being of presence and absence: The presence of the absent and the absence of the present. In order to work with this perspective, we consequently need to acknowledge and internalise the fact that presence and absence are not opposed to one another. Therefore, scripts of an object can be present in (physical) absence of the object or in presence of another object, and scripts of an object can be absent in the presence of an object. The questions are: which forms do absent presences and present absences have and how do these forms develop within a process, characterised by multiple temporalities?

Hetherington, who examines disposal as an integral part of consumption, writes: 'Social relations are performed not only around what is there but sometimes also around the presence of what is not' (ibid., 2004, p. 159). We can go even further and argue that this co-existence of presence and absence is a necessary condition for the existence of every single thing. Without absence, there is no presence and vice versa. Though, many scholars[4] only think about absence in terms of *there had been a presence before*. According to them, present absence is disposal and death. But isn't it vital to consider absences of objects which had never been physically present? For example, a lack of knowledge or information can be very present in a conversation. Or, if crucial elements for the materialisations of the buses had not been addressed in the Bus Output Specifications, this might have fundamental consequences for bus operations.

The agency of the absent object further plays a role in research on (in)formality[5] and infrastructure research. Star wrote in her famous paper on the ethnography of infrastructure that, for many users, infrastructures become visible upon breakdown. This can be interpreted as by the time the infrastructure does not follow its (temporal) script, the infrastructure becomes absent in terms of not being present (e.g. no water coming out of the tap, no buses running on the streets, no electricity coming out of the socket). At the same time, the infrastructure might become more present for its users, like in the case of Star's research: 'This breakdown became the basis for a much more detailed understanding of the relational nature of infrastructure' (ibid., 1999, p. 382). I would add that infrastructures are also present in their *absence at all times*: if you never have running water from the tap, bus services or electricity (but

[4] Scholars have been working on concepts of presence and absence not only in fields of STS, but also in fields of philosophy and cultural sciences (e.g. Homi Bhaba wrote on absence referring to Jaques Derrida's concept of *Différance)*.

[5] A widespread, one-sided argument is that the void of formality leads to informality.

you are aware that those infrastructures generally exist), they can also be very present – in their role of not being physically, materially, or effectively present. The same argument can be applied to the planning and implementation of new infrastructures. As the following section will demonstrate, the DART system has been present (for different actors of the assemblage) in many different, temporally changing forms. By the time that the construction of the physical infrastructure (i.e. corridors, stations, terminals and depot) had been finalised and an interim service provider had been found, the buses were actively missing in order to put the DART script into being and to start operations. However, the buses had never been there before in a material shape (and were not yet even manufactured), but only in their expected role of transporting people.

THE IMPACT OF BIG NUMBERS

All roles addressed in this section have a numerical dimension in terms of influencing the change of the whole script. How have the roles been changing within the script of DART?

HIGHER AMOUNT OF BUSES

The local service provider, UDA-RT, and the governmental entity responsible for DART, the DART Agency, signed the Interim Service Provider (ISP) Agreement in April 2015. This document obliges the interim service provider to supply BRT services for two years until a 'full' service provider for the long term is selected. UDA-RT should purchase 76 buses in total in accordance with the Bus Output Specifications. Two of the buses should be provided before the launch of ISP services in order to train drivers (DART, 2015a). But UDA-RT flouted this contract and ordered a total of 140 buses. This step had strategic reasons: UDA-RT counted on a stronger and more permanent position within the DART project through the increased amount of buses. Ironically, the Tanzanian government officially became aware of this almost doubled amount only by the time the buses arrived from China at Dar es Salaam's port in September 2015 (Interviews 10/2015, 05/2016). Consequently, the DART Agency had to amend the ISP Agreement, along with the operational plans to this physical appearance. These amendments had further consequences on the whole operational design and the power structure of Dar es Salaam's BRT scheme. UDA-RT successfully enforced their long-term participation through this massive investment of 140 buses.

HIGH TAXES

After the arrival of the buses, national media expected DART to commence operations soon (Lugongo, 2015). But for a long period of time, only the two prototypes were driving along the BRT corridor (Interviews 05/2016; Observations 09-10/2015). In order to avoid paying high storage costs at the port,

the Tanzanian government allowed UDA-RT to move the newly arrived bunch of buses from the port to two bus terminals (see figure 3 below). Apart from that movement, vehicles were not allowed to use public roads and become operational before clearance and registration.[6] It would have been much easier to park all buses at the depot, which has larger facilities. But by that time, the depot had not been part of the ISP Agreement.

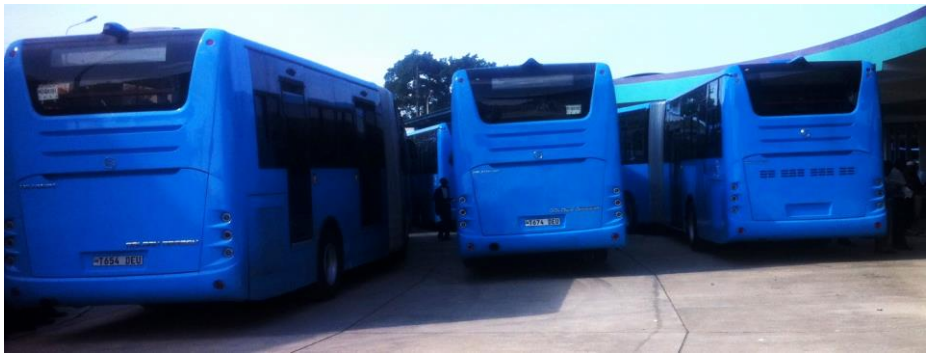

Figure 3: Buses with and without number plates at a bus terminal, September 2015 (Image source: own photo).

The script of ISP operations was changed a couple of weeks later in order to adapt to the new situation. Part of this ISP Addendum was to acknowledge all 140 buses and hand the depot over to UDA-RT. It became obvious that the interim service will be much more extensive than previously agreed. This means that also the script for the long-term service provision changed according to the de-scription of the interim service. So far, the script for long-term service had existed in political and medial discourse but not in binding contracts. In the meantime, UDA-RT tried to register itself as a public limited company instead of having the status of a private company (Interviews 09/2015). The company asked Tanzania Revenue Authority (TRA, in charge of collecting import duties and other taxes) to obtain a tax exemption for the imported buses since the buses will serve the public. TRA refused this request after months of negotiations and standstill. Imported goods, especially motor vehicles, have been a highly political issue in Tanzania. On the one hand, Tanzania has a rather protectionist and rigid import policy. On the other hand, a lot of tax exemption had been granted due to corruption and in order to attract foreign companies and to ease international trade. Then, during the negotiation process between TRA and UDA-RT, Tanzania elected a new president. The president's topmost priority was to evict corruption and redistribute wealth from the big (foreign) companies to the Tanzanian people. It seemed this case became the precedent for the new Tanzanian government, in order to prove that there was no longer

[6] The exact amount of import duties is not public and no involved actor responded to that. Estimated amounts range from USD 3.6 million to 1.4 billion (Interviews 10/2015, 11/2016; Lugongo, 2015).

extortion and corruption. Moreover, TRA only accepted full payment of the high amount,[7] which led to further delays since UDA-RT had to take out another loan (Msikula, 2015). Only after the full clearance in April 2016 were buses allowed to leave the terminals, and operations started a month later, after all buses had been checked regarding safety concerns (see as well figure 4 and 5 below) (Observations 05/2016).[8]

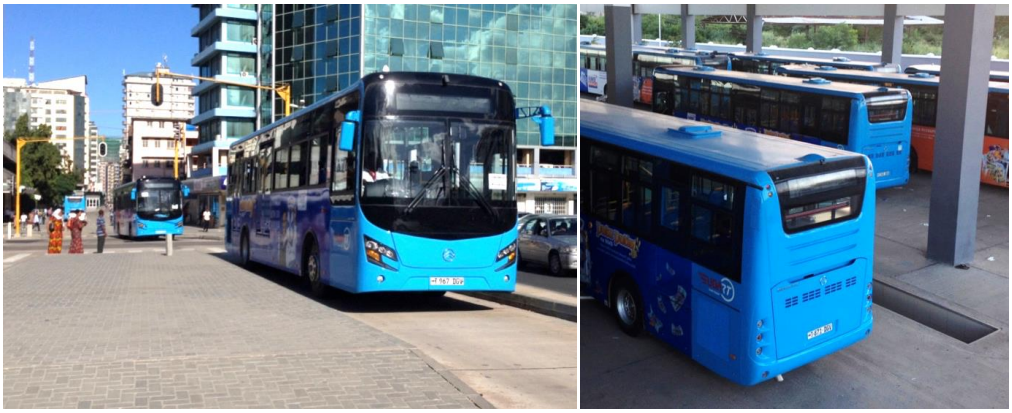

Figure 4 and 5: Buses riding on the BRT corridor and parking at the depot after clearance, May 2016 (Image source: own photo).

Apart from some signs of usage like scratches and unpacked driver seats, the only material difference between the two mobile buses and those 138 immobile ones was the physical presence/absence of number plates. Each bus has two placeholders for the number plates: one in the rear and one in the front. The physical absence of number plates is also visually penetrating once this apparent gap at the chassis is not filled (Observations 09-10/2015). A bus that does not possess this item is immobile. It might be a global phenomenon that vehicles need to have number plates in order to use public spaces like roads. This is due to the fact that possessing a number plate means owning a registration. Indeed, a number plate is the materialisation of a formal registration and tax payment. Number plates restrict where vehicles can be physically present – and where not. They have the role in the DART assemblage as proving the legal status of the bus, as having been imported legally, meaning that import duties were paid. Only with that legal status can buses move and operate on public ground and fulfil their duty and take their role as transporting people within the DART service.

It is remarkable that the number plates appear neither in the Bus Output Specifications, nor in the ISP Agreement. Whereby, both documents describe the materiality and agency of the buses and inscribe

[7] UDA-RT asked for payment in pieces. UDA, one major shareholder of the UDA-RT, once made the same request to TRA. TRA agreed and UDA did not pay due taxes in instalments. Therefore, TRA became even more careful with the company's request (Msikula, 2015).

[8] Also the clearance of the two prototype buses took much more time than expected and delayed the trainings for more than a month. UDA-RT tried to release the buses from the port without clearance.

roles to them. Generally, the documents ignore the necessity of licensing as a precondition for operations. Regarding the absence of number plates in the Bus Output Specifications, it is necessary to admit that a number plate is technically not necessary for moving the bus. In theory, an unregistered bus can comply with the script of a safe and comfortable bus service. This point strengthens the outstanding role of the number plates since it might be the only material component which is only legally, but not technically, necessary – e.g. in contrast to the steering wheel, doors, gearbox, axles, etc. By and large, this absence might be due to the fact that a valid license is so deeply inscribed into DART that it is indispensable. The actors who assembled these documents probably assumed that this precondition is so clear that it is not necessary to be mentioned. Since the role of the number plate is deeply inscribed into the script of (legally) moving a bus, it is not flexible. A Tanzanian number plate cannot be replaced by a Chinese one without legal steps. But all other material components could be replaced with spare parts from elsewhere, as long as they comply with the Bus Output Specifications. The salient point is: the material inscription of laws and state power is crucial for the functioning of the DART script. The state is materialised in the number plate and, therefore, the number plate directly connects the vehicle with the state.

The following two examples will illustrate the case of flexible, changing roles that embody another kind of de-scription of the technology in which operations can happen even if the object is not installed or used as inscribed. By the time that new actors become active parts of the DART assemblage, it necessarily changes and adapts to the present practice. Those actors do not comply in all means with their roles that planners and politicians had inscribed previously.

OVERCROWDING AND SPEEDING

For safety concerns, the role of the doors was supposed to comply with two essential features. First, doors should not be able to close (even if the driver pushes a respective button) when passengers are standing in the door area, marked yellow with red letters stating *No Standing Area*. Second, '[t]he doors on each bus must […] have a mechanism with safeguard to avoid opening of the doors while the vehicle is in motion or that the vehicles moves with open doors' (DART Agency, 2014a). In practice, both features are no longer present (Observations 05/2016). Doors close even though people stand in the *No Standing Area* and even when they stand right between the two wings of the doors, with one leg in the bus and the other one on the platform. Beyond that, buses set off with open doors, the doors just closing once the bus accelerates. Interestingly, different versions of the initial script circulated: A manufacturer employee told me that doors cannot close when passengers block them. By contrast, service provider staff claims that there has never been a technology to prevent doors from closing (Interviews 05/2016, 09/2016).

Both changes bring the new script of DART operations closer to common practices of minibus operations. Dar es Salaam's minibuses are highly overcrowded in peak hours so that people squeeze and doors are frequently opened during movements – in order to save time when passengers (dis)embark. Therefore, in trainings, future drivers of these rapid buses were instructed not to do so due to the BRT ideals regarding customer care, such as safety and comfort. Moreover, also the passengers should be prevented from standing in this yellow area so that no one gets injured and operations do not delay. In these trainings, bus drivers learned to announce a welcome and safety note on how to behave in the bus, and particularly in this yellow area (Observations 09-10/2015):

> Habarini za mchana abiria wangu. Kwa jina, naitwa Jason. Mimi ni dereva wenu. Angalizo: Abiria wote waliosimama, naomba msisimame kwenye milango na alama ya manjano kwani mlango wetu unafungua kwa sensor ya umeme. Pia, abiria usitupe takataka nje ovyo. Weka takataka kwenye chombo maalum ndani ya basi, yaani dustbin. Asanteni sana. Karibuni.[9]

In the initial beginning of operations, drivers still tried to follow this policy in order to not change that script. They did not close the doors when people still stood in the door area and they did not accelerate the vehicle with doors opened. Many drivers announced the note before disembarking at the terminals, some even adding their final destination and major stops since displays (indicating which buses are serving which line) were still missing at the buses, stations and terminals. But this behaviour has gradually ceased. Passengers followed the changing script and returned to stand in the *No Standing Area* during peak hours (Observations 05/2016, 09/2016). Not only drivers and passengers but also other actors like the unexpected high capacity of the buses when passengers squeeze, the openness and acceptance of Dar es Salaam's residents towards a new bus system and the experiences of minibus practices changed the script. Due to high passenger demand and overcrowding, (dis)embarking takes much longer than scheduled and drivers try to take as many passengers as possible on board. At the end of the day, higher passenger loads imply higher revenues for UDA-RT as the interim service provider.

A similar change in the script occurred regarding a technology that should prevent drivers from speeding. BRT buses are supposed to not exceed 50 km/h. If they do so, a high beeping sound rings out in order to remind the driver of that limit. In practice, it has turned out that many drivers speed in some sections of the corridor, simply ignore the noisy sound and do not adapt their driving to the initial

[9] Translation: 'Good afternoon, dear passengers. My name is Jason. I am your driver. Announcement: Those passengers who are standing, I beg you not to stand in the yellow marked door area since our doors open with electric sensors. I also ask you not to throw your waste on the floor. Put the waste into the dustbin. Thank you very much. Have a nice trip.'

script (Interviews 05/2016, 11/2016; Observations 05/2016, 09/2016). An employee of the DART Agency put it in a funny way and meant that speeding drivers perceive this sound rather as music than as a warning signal. Consequently, the beeping is no longer a guarantee for maximum speed – as it used to be in the previous script of the bus in motion. It is intriguing that the sound was only passively inscribed: in an absent-present way. It should never ring out in practice, since the driver's role was to never exceed the speed limit of 50 km/h.

METHODOLOGICAL COMMENT

How did I become aware of these socio-political dimensions of assembling? In how far did the focus on objects and their scripts help me to understand multiple temporalities and the co-existence of presence and absence in the process of DART? I made various forms of participatory observations and conducted numerous in-depth interviews at four different points of time of DART's planning, implementation and stabilisation process.[10] This methodological interplay helped me to come so close to the different scripts and made me understand DART in its different temporal shapes. For example, I saw the 138 buses without number plates parking at the terminals before anyone told me about clearance issues. I was wondering why the buses were not based in the depot, which has much better facilities. Over the next days, local actors told me, and newspapers reported, about on-going negotiations between the interim service provider (UDA-RT) and Tanzania Revenue Authority (TRA) regarding due import duties. Through my previous observations of the missing number plates and the dislocation of the buses, I was sensitised to this topic. Through the focus on the physical constitution and materiality of the buses, I was able to develop questions directed at this conflict between service provider and state.

Moreover, finding the balance between following the process chronologically, which is of big use for understanding the bigger picture, and the assumption of multiple, twisted temporalities of planning and implementation processes, is necessary. Wood criticised the allegedly linear and straightforward process of BRT projects when explaining that 'BRT circulation is a more convoluted and long-lasting process than ordinarily considered' (ibid., 2015, p. 11). Just coming back to the example of the amount of buses shows that scripts exist in parallel and that DART is not a stringent, linear process, but rather a process that is continuously slowing up and down, moving into new directions. I noticed several times that various actors have very different levels of knowledge and already decided issues were repeatedly

[10] It is necessary to consider that my impressions though are very limited, basically due to the fact that I am not aware of where the gaps in my research are, and what I left out. It would never be possible to seamlessly describe a process. In my own research, the absent might be even more absent than the absent presence in the DART script itself. On the other hand, my own research process reflects the shape of the DART process: rather intermittent and multiple than (chrono)logical.

put back on the table. Also, different speeds need to be considered as the ISP Agreement first accelerated the process and then, negotiations between UDA-RT and TRA on the ISP Addendum slowed the process down yet again.

CONCLUDING THOUGHTS

Present absences and absent presences, both in material and discursive shapes, provide insights into the social and political dimensions of infrastructures and their processes of planning, implementing and stabilising. Regarding DART's intermittent process, a lot of controversies evolved around the actual implementation and the impact of local operators within bus operations. This implementation materialised in various ways and roles thus changed. The missing number plates can be interpreted not only as a symbol of missing tax payments and legal registration, but further as absent support by the Tanzanian government in regards to the local operator's attempt to strengthen their position. Even the changing amount of buses and their physical absence on the BRT corridor for more than half a year indicates this conflict. The cases of speeding and overcrowding show in detail how scripts change when new actors – like the hot climate, former minibus passengers or the passenger demand challenging the bus scheduling – enter the assemblage. Since DART's scripts are flexible (to a certain extent), bus operations do work under the modified scripts, e.g. when buses exceed their maximum passenger capacity so that passengers stand in areas that were originally not thought as standing areas.

Therefore, this closer look at several material components with a perspective on temporalities has proved that presence and absence can exist at the same time and that the scripts of an assemblage change over time. DART's objects temporarily have different shapes that are expressed through the presences and absences of material components and appearances, behaviours and discourses. Different forms of present absence and absent presence were determined, such as a divergence between the DART assemblage in discourse and its actual material shape, or perceivable consequences through these absences, which led to changes in the scripts and consequently of the respective object's agency itself.

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NATHAN WITTOCK, MICHIEL DE KROM & LESLEY HUSTINX

MAKING SENSE OF A MESSY OBJECT: HOW TO USE SOCIAL TOPOLOGY AS AN ANALYTIC TOOL FOR ETHNOGRAPHY OF OBJECTS

ABSTRACT

This theoretical-methodological essay seeks to answer the question, "*How can one make sense of a messy object?*" The denomination "messy" refers to a situation in which the object of ethnographic research is interpretatively complex to such a degree that the ethnographer may become trapped in the attempt to capture all of the various facets of the object at once (Law & Singleton, 2005). We focus on blood as a messy object and study it in the context of a Belgian Blood Establishment, the organization charged with the provision of safe and sufficient amounts of blood for a region. Existing research has dealt with the messiness of blood through epistemological response, casting it in four "blood stories" – the gift relationship, the blood economy, biological citizenship, and blood safety. While these stories have enhanced our understanding of blood, we argue that they are examples of *perspectivalism* (Mol, 2002). Although they do frame blood from various angles, they fail to grasp the entanglement of technological, biomedical, political, and socio-technical aspects of this "bio-object" (Vermeulen et al., 2012). This essay takes a different turn and attempts to mediate the difficulties by formulating an ontological response through careful consideration of the social topology framework (Law & Mol, 2001; Mol & Law, 1994). For every space (Euclidian, network, fluid, and fire), we provide a comprehensive summary of the theory, after which we delineate specific elements from this theory to induce conceptual sensitivity and propose research questions that follow from these elements. In this endeavor, we attempt to highlight the unique value of this framework for the ethnography of objects, as compared to the frameworks that initially gave rise to the theory.

INTRODUCTION

Blood is a "messy object" (Law & Singleton, 2005, p. 333). The denomination "messy" refers to a situation in which the object of ethnographic research is interpretatively complex to such a degree that the ethnographer may become trapped in the attempt to capture all of the various facets of the object at once (Law & Singleton, 2005). We focus on blood as a messy object and study it in the context of a Belgian Blood Establishment, the organization charged with the provision of safe and sufficient amounts of blood for a region. As a "bio-object," blood is characterized by the entanglement of technological, biomedical, political, and socio-technical aspects (Vermeulen, Tamminen, & Webster, 2012). In order to summarize and structure the messiness, social scientists have formulated an *epistemological response* (Law & Singleton, 2005). By casting blood as the subject of *four blood stories*, they highlight the "trans" character of blood – how it simultaneously fits multiple "interpretive repertoires" (Holmberg & Ideland, 2012).

In the most frequently cited story, blood was the object of a gift relationship (Titmuss, 1998, p. 155), in which one person donates blood to the benefit of an undefined other, without demanding direct return. Most Western blood establishments have adopted this idea as one of their core professional beliefs (Folléa, G. et al., 2013; Farrell, 2012), and the blood donor has gradually become the archetypical "altruistic personality" (Goodwin, 2013). The gift relationship still sparks researchers to search for what typically motivates blood donors (Bednall & Bove, 2011; Shehu, Langmaack, Felchle & Clement, 2015) and how blood collection should be organized (Healy, 2000, 2006). In the second story, blood is part of a market (Hagen, 1982; Sheikh, Deleuran & Hoeyer, 2016; Slonim, Wang & Garbarino, 2014). It is the object of a *blood economy*, with a supply side (i.e., donor group) and a receiving end (i.e., patients-recipients), along with intermediary means of production in blood banks, processing facilities, and similar entities known as *blood establishments* (Epstein R.A. in Goodwin, 2013, pp. 49-50). In a third story, blood establishments mediate the relationship between donors and recipients, with blood being a matter of safety and risk governance (Anderson et al., 2009; Davison, Brant, Presanis & Soldan, 2011; Germain, Remis & Delage, 2003; Hoeyer, 2015). Through the mechanism of donor-selection practices pertaining to such safety and risk governance, a *fourth story* comes to light, in which blood is intermeshed with biology and citizenship or, more generally, group membership (Rose, 2001; Rose & Novas, 2004; Valentine, 2005). Given that donors are the archetypical altruistic personality and given that blood makes up part of a person's *bio-identity* (Waldby, Rosengarten, Treloar & Fraser, 2004, p.

1462),[1] the link between group membership and blood incites discussion on the existence of *the right to donate blood* (Franklin, 2007; Martucci, 2010; Valentine, 2005).

This epistemological response to the encounter with messy objects (Law & Singleton, 2005, p. 332) has nevertheless been criticized as leading to perspectivalist accounts (Mol, 2002). Although this response implies recognition and exploration of the numerous possible "perspectives" on the object studied, it never "touches the object." In other words, it does not take the object as the starting point for studying the entanglement of different "interpretive repertoires" (Holmberg & Ideland, 2012, p. 21; Mol, 2002, p. 12). The alternative is thus to formulate a response in *ontological* fashion (Law & Singleton, 2005, p. 334). This implies a necessity "to rethink method in quite radical ways." To this end, Law and Singleton (2005) propose developing models for imagining objects by using the *social topology framework*. Such an approach has also been adopted in other articles written by Law (Law, 2002, 2009), along with Mol (Law & Mol, 1995, 2001; Mol & Law, 1994), who has also written on the topic alone and with others (De Laet & Mol, 2000; Mol, 1999, 2002).

Our essay follows Law and Singleton (2005) in formulating an ontological response to the methodological challenge of using the framework of social topology (Law & Mol, 2001) to grasp the nature of a messy object. The text is built upon a careful consideration of the framework, demonstrating how the various space imaginations may serve to guide an ethnographic study of *messy* objects. For every space (Euclidian, network, fluid, and fire), we provide a comprehensive summary of the theory, after which we delineate specific elements from the theory to induce conceptual sensitivity and propose potential research questions that follow from these elements. We aim to make explicit the analytic implications for other research objects, thereby demonstrating how social topology can be used as an analytic tool that can help researchers know what to observe and which questions to pose.

SOCIAL TOPOLOGY

Following the ontological response to the methodological difficulties encountered when studying messy objects can mean two things (Law & Singleton, 2005, pp. 334-345; Mol, 2002). First, it can mean studying the object through a focus on enactment, as in Annemarie Mol's work *The Body Multiple* (2002). This method presupposes the thorough observation of the actions in which the object is involved, thus making it possible to observe coincidences and/or contradictions between narrative and action, protocol and reality, principle and practice (Mol & Berg, 1994), which help explain the object's

[1] According to Waldby and colleagues (2004), however, the link between blood and bio-identity is less performative than is the case with organs.

ontologies as enacted in practice (Mol, 2002). In our context, following the methodological focus on enactment means following blood from its donation onwards, as well as studying its enactment throughout the processes in which it is involved in a blood establishment. We pursue this line of work elsewhere. In this essay, however, we do not proceed from observation, but from a theoretical exercise, "to work on different models for imagining objects" (Law & Singleton, 2005, p. 334). Using the framework of social topology to this end, we proceed from rethinking *space as given* to consider *space as performance*.

The framework can be related to the spatial turn in social theory or,

> (...) the insight that all spaces (architectural spaces, urban spaces, regions, nation-states, bedrooms, recreation parks, river landscapes, etc.) are always also results of social production: not only in the sense that there are professions that plan and design these spaces, but also in terms of the challenging insight that spaces only become spaces for people inasmuch as they are – again and again and again – produced socially. In other words: the constitution of space is a performative act (Löw, 2016, p. vii).[2]

If space is a performance, a researcher can adopt a space performance to examine a given object in multiple ways and to study its ontologies through an approach highlighting the elements that shape it and that are in turn shaped by the properties of the object. This relates to a subject discussed during the *Ethnography of Objects* sessions.[3] While ethnographers commonly discuss scenes in terms of zooming in or out, there are other ways to think of space. It has more to do with going along than with seeing from above. For example, in contrast to urban planners, who conceive of a city as a plan, people walk around and see houses and public buildings from the street or from the inside of the building; they interact with their environment, lean against the facades, use the back door if the level of acquaintance with the person living in the house allows, or look with curiosity through curtains where their interest is sparked. This multiplicity of potential focuses has informed our endeavor to delineate thinking of spatiality as a special way of ordering our observation of the social. Given that space and the social world are co-constitutive, we can use a specific space-imagination to produce a conceptualization of observations.

In order to break loose from a black-boxed materiality, Mol and Law (2001, 1994) suggest that we extend our views to include a topological sense of space. If we think of space in topology, a wide array of possible spaces emerges from which we may choose. Spaces are made by and shape the conditions

[2] In response to an important comment by Alev Coban, we should explicitly state that the social constructionist background developed by Martina Löw is highly divergent from the epistemological assumptions of Law and Mol.

[3] Credit is due to professors Estrid Sørensen and Jeanette Pols for bringing these ideas to our attention. Nevertheless, the understanding of and attention to the notions of space, place, and time have also benefitted from discussions with Dara Ivanova.

for the objects we study (Law, 2002). Social topology is built on mathematical topology: "a branch of mathematics which explores the character of objects in space." It is based on thinking about spatiality "by asking questions about the continuity of shapes."

> In topology (…) a shape is said to hold its form while it is being squeezed, bent, or stretched out – but only so long as it is not also broken or torn. If it is broken or torn then it changes, it is no longer homeomorphic (Law, 2002, p. 94).

Homeomorphism is thus a form of simultaneous continuity and deformation (either potential or actual). An object moving in a space is homeomorphic as long as it does not break; as long as there is no rupture. In different topologies, however, rupture can have different meanings. Mol and Law (1994) discern regions (i.e., Euclidian space), networks, fluids, and fire space. Importantly, the different spaces should not be seen as either in conflict or separate from one another. Neither should they be conceptualized in any hierarchical interrelationship, even if their presentation in a text does suggest such a hierarchy. These spaces are available simultaneously and, in some cases, it is their interplay that forms our understanding of the social. For this reason, the framework can be used as an analytic frame, with multiple space imaginations informing multiple types of observations and analyses. In the following section, we discuss the theoretical assumptions for each of the spaces and exemplify how each space could guide observations through the formulation of research questions related to our own messy object: blood in a Belgian blood establishment.

EUCLIDIAN SPACE

In modernist Euro-American[4] thinking, we typically refer to only one type of space: regional or Euclidian space. This practice emerges from the idea that "space comes before us (…) it is a neutral container within which our bodies (…) happen to exist" (Law, 2002, p. 96). In this space imagination, objects are homeomorphic only if the boundaries of the object occupy a fixed relative position in three-dimensional space (Law, 2002). Euclidian space guides our thought toward sets of regional differences to discuss (Mol & Law, 1994). The central axis of our analysis shifted to socio-geographical regions (e.g., states, continents, nations, boroughs) – sometimes scaled down to "settings," "social groups," "classes," or other entities. One consequence of this shift, however, is that it forces us to level out intra-regional differences (Mol & Law, 1994).

[4] The phrasing "modernist Euro-American" is used in line with the expositional ends explained by Strathern (1996), who draws a distinction between "twentieth-century Euro-Americans," "late twentieth-century Euro-Americans," and "modern, Euro-Americans" and sometimes does not use an adjective at all. In the interest of consistency, however, we continually use the term *modernist*.

There are three important ways in which the analytical frame of a Euclidian space can be applied to blood. First, scholars have discussed differences between the various national organizations that perform the blood supply, usually through large-scale comparative research (Boenigk, Mews & de Kort, 2015; Healy, 2000, 2006). A second option is to focus on collection sites and study the spatial organization of elements contained within them. For example, Simon Cohn (2016) has recently described the organization and atmosphere in blood collection centers in the United Kingdom's NHSBT,[5] and Zainab Sheikh et al. (2016) have described Danish blood-collection centers. A third focus takes the middle ground. Taking inspiration from urban sociology, a researcher departing from Euclidian space imaginations can ask such questions as:

- *How does the establishment organize itself geographically?*
- *Where does it locate its collection sites to maximize their effectiveness?*
- *How does it ensure the apt distribution of blood products through the location of its storage facilities?*

In our attempt to answer such research questions, we take positivist, measurable, and delineated socio-geographical divisions into account and ask how these divisions influence the provision of blood in a region. This space imagination nevertheless says nothing about the ontology of blood. In this context, blood is (or becomes) something that moves from one region to another, from a body to something or someone else. In some cases, however, it is precisely the connection between the origin of blood and its destination that can help elucidate *what* blood *is*. For example, blood bags can move in a given department of the service and suddenly change from "pure" to "impure." This can happen *if* anything goes wrong with the processing method, although this need not be the case. A bag can become "impure" as it moves along the production chain – thus even if everything goes according to plan – given that it is then embedded within a different network, in which the "safe status" of the bag has yet to be confirmed by another department that tests for pathogens in the donor's test sample. In such cases, we can think about another space imagination, which allows for the incorporation of multiple Euclidian spaces into a single observation or analysis: the space imagination of networks.

NETWORK SPACE

Thinking about the social world in terms of material-semiotic networks was introduced by actor network theory (see Law, 2009, for a discussion on the origins and evolution of ANT). First-generation ANT considers the world in (1) *semiotic relationality*, meaning that objects and actors co-exist and co-create each other within a network formation. These networks are (2) *heterogeneous*, given that actors can be

[5] This refers to the NHS Blood and Transplant Special Health Authority, which is responsible for blood collection on behalf of the UK National Health Service.

of a material, human, natural, ideological, or other nature. Focusing on heterogeneity, ANT draws attention to the world's (3) *materiality*, which is embedded in the social, and to (4) *process and precariousness*, given that all elements must *continuously* fulfill their function in order to keep the network in place. Furthermore, (5) *power* is regarded as an effect of the network configuration. Finally, attention has been paid to (6) *space and scale* or, in other words, "how it is that networks extend themselves and translate distant actors" (Law, 2009, p. 146). Actor network theory studies *how* something happens, "how differences [are] generated in a semiotic relational logic" (Law, 2009, p. 146). A *network object* can thus be understood as a set of objects and actors that are linked through defined relationships. For this reason,

> Proximity has (…) to do with the identity of the semiotic pattern. It is a question of the network elements and the way they hang together. Places with a similar set of elements and similar relations between them are close to one another, and those with different elements or relations are far apart (Mol & Law, 1994, p. 649).

Network objects should be understood as "an effect of stable arrays or networks of relations [that] hold together so long as those relations also hold together and do not change their shape" (Law, 2002, p. 91). There is thus continuity in the specific assemblage of actants in the network. These networks are not fixed in a Euclidian sense, however, as they can move. The combination of shape continuity and regional-space mobility inspired the classic concept of the "immutable mobile" (Latour, 1990).

Before we can formulate research questions, we must consider yet another question, that of where to "cut the network" (Strathern, 1996). In essence, networks are self-expanding. The analysis could thus conceivably go on to incorporate everything. Strathern (1996) suggests two ways of conceptualizing a network: discussing (1) *the perceivable network* and delineating (2) *the analytic hybrid*. Whereas the former is built up from the accounts of respondents in the field – an *emic* conceptualization – the latter is built up from the researcher's perspective – the *etic* conceptualization. It is important to note that referring to a network as analytic does not imply that it is inconceivable to the respondents in the field. It simply refers to a situation in which the researcher sees connections that have not been brought to the researcher's attention by the respondents. Both types of network imaginations may shape the research questions posed.

The perceivable network of a blood establishment is made up of the various different departments that divide the tasks of collection, processing, testing, distribution, and research that are involved in providing sufficient and safe amounts of blood to a region. In encountering such networks, researchers can formulate such questions as:

- *How is the blood establishment organized to succeed in what it delineates as its mission?*
- *How should blood be considered as a product of the network?*
- *How do the processes to which blood is subjected within the establishment's multiple departments influence the ontologies of blood?*
- *How can the network of the establishment's departments produce multiple versions of blood through different types of product, even though the network is the same for each?*

Furthermore, if we adopt the notion of the immutable mobile, we may ask questions including:

- *How do the network configurations of different blood establishments in Europe keep the ontology of blood stable?*
- *When and how do they fail to do so?*
- *How much change to the network configuration is acceptable?*
- *When does it produce a different entity?*

Moreover, the perceivable network can guide our observation to highlight differences between the functional units of the network. This helps to delineate the occasion on which a given "story" is told, given that the meaning of an object – as well as the form in which it is reproduced –changes with the network within which it is thought to be embedded (Latour & Woolgar, 1986). It is therefore necessary to consider the analytic hybrid (Strathern, 1996), in order to avoid *the dangers of going native* (Latour & Woolgar, 1986, pp. 38-39). This means that the adoption of a strictly emic approach to the conceptualization of a field can cause the analysis to neglect concepts that are used as "social phenomena" in themselves. The notion of the analytic hybrid means that it is informed by the researcher's analytic gaze instead of by the emic gaze of the insiders.

To exemplify the search for an analytic hybrid, we refer to a study by Sheikh et al. (2016, p. 107), in which the authors delineate a hybrid in an attempt to

> (…) explain the co-existence of the moral ideal of gifting and legally mandated trade, and to unfold how the tension between the two produces 'silencing' as well as economically ineffective modes of organization.

They propose including legally mandated trade structures alongside the "altruist network" in which blood donors and blood establishments are intuitively cast. In drawing on a network imagination of the analytic hybrid, we may thus ask such questions as:

- *How is blood embedded within a network that moves beyond that delineated by spokespersons in the field of observation?*
- *Which existing actors are left out of the narrative (whether deliberately or non-deliberately)?*
- *Does blood change if we include such actors?*

The aspect that differentiates the analytic hybrid from the perceivable network is that the analytic hybrid moves away from what the researcher is told by the respondents to think of other actors and new networks.

Network objects inform the research questions in important ways. The rigidity and sometimes functionalist assumptions of the network metaphor have nevertheless caused theorists to move beyond it (De Laet & Mol, 2000; Law, 2002, 2009; Mol & Law, 1994). For example, what should one think of instances in which the object stops being immutable? What happens when the object disintegrates? What happens when its elements change? What happens when the nature of their functional connections changes? What happens if some of the most vital elements of the network change? What happens if blood establishments are capable of producing blood products *in vitro* and donors are no longer necessary to achieve or maintain the sufficiency of the blood supply? What happens if new drugs are developed that eliminate the therapeutic use value of blood products? Does this change the nature of blood as a product of the network, or does it remain the product of the network although in a new form? Networks can "break down" when one or more elements ceases to perform their functional tasks or when these tasks are dropped from the network. In these cases, should we discontinue our assessment of the object, given that it is now characterized as a "failed" network? Alternatively, should we shift our understanding of the object by re-imagining it in a new space, in which "failure" makes sense as "adaptation"? Mol and Law (1994) suggest that we should

> make the move as that made by actor-network theory when it analyzed the way in which networks generate and supplant regions. (…) [A]sk whether there are other spaces around, spaces that have topological properties which aren't like those of regions or networks (1994, p. 653).

For this reason, the authors introduced a third topological space to guide our understanding of the social world. This guide was later elaborated upon in Mol's work with De Laet (2000) on the fluid technology of the Zimbabwe Bush Pump.

FLUID SPACE

Although fluid space bears a partial resemblance to the idea of network space, it does not require every element in the network to be and remain stable (Law & Mol, 2001). The object itself may be built up from various elements, and various typifications of the social relationships revolving around it can exist at the same time. Law and Mol (2001, p. 613) conceptualize such an object as a *mutable mobile*.

Fluid objects move in a *fluid spatiality*:

> Although the connections which make a shape invariant in fluid space change shape, they do so gradually and incrementally. (…) [L]inks slowly change their character. From time to time bits, so to speak, fall off. New bits are patched on. (…) There is a sameness, a shape constancy, which does not depend on any particular defining feature or relationship, but rather on the existence of many instances which overlap with one another partially (Law & Mol, 2001, p. 614).

Summarizing the characteristics of fluid spatiality from the literature (De Laet & Mol, 2000; Law, 2002; Law & Mol, 2001; Law & Singleton, 2005; Mol, 2002; Mol & Law, 1994), we delineate six conceptual tools that are helpful in guiding observation and analysis: (1) the mutable mobile, (2) the fluidity of effects, (3) the fluidity of the evaluation of effects, (4) the absence of clear boundaries, (5) a world of mixtures, and (6) the absence of the actor behind the object.

In fluid space, there is no fixed structure for the elements making up the object. Moreover, change is necessary for the object to sustain itself (Law, 2002). The fluid object is variable, in terms of the elements that are incorporated within its constellation, as well as in terms of the elements that are needed (De Laet & Mol, 2000). Some elements may change their function, adopt a function previously performed by another element, or even drop a function. These variations do not cause the object to break down or dissolve. The fluid object constitutes (1) a *mutable mobile* (Law & Mol, 2001).

Fluid objects are also (2) variable in the effects they produce. For the classic example of the Zimbabwe Bush Pump (De Laet & Mol, 2000), variable effect production does not stop at the various degrees of success in the production of water. It can do "(…) something even better: it becomes a source of pure, fresh, *clean* water. And so the Bush Pump turns out to be a technology that provides not just water but also health" (De Laet & Mol, 2000, p. 231; emphasis in original). Moreover, in being supported by the state, it seems to build a connection to the nation, while *also* appearing to depend on and concomitantly build the local community (De Laet & Mol, 2000, p. 237). Given its manifold effects in terms of success, the ways in which the Zimbabwe Bush Pump may fail are obviously manifold as well (De Laet & Mol, 2000).

Effect fluidity presupposes yet another fluidity: (3) the fluidity of effect evaluation. This applies to the quality standards used, as well as to the nature of the relationship between indicator and measured effect (Mol & Law, 1994). Continuing the example of the Bush Pump, the fluidity of quality standards is most prominent when discussing its health-promoting effects (De Laet & Mol, 2000, pp. 242-243). First, an absolute measurement of health standards says little within a context in which such standards are practically unattainable or in which international norms produce negative side effects at the local level. A second consideration is the nature of the relationship between the indicator – in their case, *E.coli* counts

– and the measured standard – in their case, "health." "It is not a direct or a rigid relation; it is fluid. And it depends not only on the *number* of *E.coli*, but also on who(se) they are" (De Laet & Mol, 2000, p. 243; brackets and emphasis in original).

The fluidity of elements (and their function), effects, and the assessment of effects is accompanied by a general (4) lack of clear boundaries in fluid space (Law, 2002). In modernist Euro-American notions of space and objects, dichotomization is a key feature, and the construction of typologies that are both exhaustive and exclusive appears to be the holy grail of the social sciences (Haraway, 1987, 1988). Creating opposition through the definition of boundaries allows the objects separated by the boundaries to "both make sense," thereby blocking "the exit to a world made up of entirely different entities", and thus ignoring the possibility that, "what is opposed may also collaborate" (Mol, 2002, pp. 144-145). Thinking along the lines of fluid space, however, allows us to study objects that do not come with a stable identity and lack "clear-cut boundaries" (De Laet & Mol, 2000, p. 227). In general, this means that fluid objects can be conceived of as being embedded in multiple network-like constellations without one necessarily prevailing over the other in or causing changes to, the ontology of the object (De Laet & Mol, 2000, pp. 228-231).

> The fluidity of the Bush Pump's boundaries does not imply that it is vague or random; that it is everywhere or anything. (…) [T]he Bush Pump's various boundaries define a limited set of configurations. They each, one might say, enact a different Bush Pump. But these different Bush Pumps have in common that they are indeed a pump (De Laet & Mol, 2000, pp. 237-238).

Given the absence of clear boundaries in a fluid topology, it constitutes (5) "a world of mixtures" (Mol & Law, 1994, p. 660). Along with notion of the mutable mobile, this feature is what differentiates fluidity most clearly from the network-space imagination. The objects we discover in fluid space may represent different versions (i.e., multiples) of one object (i.e., a singularity). Nevertheless, these different versions allow the identification of changed elements, without the changes radically altering the fluid object. Change is necessary in a fluid space, but a change can occur only in a piecemeal fashion (Law, 2002).

All of this variability – the multiple singularity of the fluid object – thus (6) obscures which actor is central to its existence. In other words, fluidity exists with regard to who or what is to be considered "the actor behind" the object (e.g., the inventor, the go-to engineer, the expert, the funding agency). Moreover, the fluidity of this actor is regarded as part of the fluid object's success (De Laet & Mol, 2000). The absence of the actor behind the fluid object seems to lend it the advantage of drawing support from everyone.

These six analytically separate characteristics of fluid space can guide a researcher's focus in approaching a messy object, including with regard to the following questions:

- *How is it that some objects are different versions of an original without changing the overarching denomination?*
- *How is it possible for the elements that make up a certain processing method in the production of blood products to vary without the different products resulting from these varying methods being something entirely different?*
- *Why may we cast blood in the European blood supply in a national, regional, and European network at the same time without the network constellation making it entirely different?*
- *How could a fluid method for quality assessment be used in an organization as rigid as a blood establishment?*
- *How could such fluid measurement actually be part of its success?*
- *Is the anonymity of the donor – as the actor behind the blood product – part of the success of the blood establishment?*

Returning to the four blood stories of gift, economy, safety, and group membership, fluidity can help us to interpret, not how and why they become separated, but exactly how they be mixed without causing problems. Fluidity helps us to understand how, in some cases, the interrelationship between all of these versions – blood is something you give; it is something that is paid for by the recipient (or the recipient's insurance); it is something sacred and safe, in addition to having a dangerous and life-threatening potential; it is something that one shares with one's fellow citizens, family – is part of both its success and its failures, without radically changing our basic conception of blood in the blood supply.

To summarize our consideration of fluidity and to construct a bridge to our final space imagination, we have mediated several of the properties of ANT that have been identified as problematic. More specifically, ANT scholarship has been criticized for "effacing invisible work and (…) committing itself to an inappropriately rigid and centered version of relations" (Law & Singleton, 2005, p. 341). Nevertheless, several concerns remain. When should we consider a fluid object of blood as changing from the mixture of its components into something different? When should we regard plasma as something different from the whole blood that was donated at collection? What if *making* it different actually helps to keep the object the same? There must be some "tipping point" at which the elements of the object, the boundaries within which it exists, or the pace at which it changes and adapts lead us to say that the object has *changed* – that a rupture has occurred in the homeomorphism of the fluid object (Law, 2002). Law and Mol (2001) propose using the notion of "rupture" to start formulating a fourth spatiality: *fire space.* The questions posed in *fire space* include:

- *What if rupture causes continuity instead of discontinuity?*
- *What if sudden change and variability are necessary for the object to hold its form?*

FIRE SPACE

Just as fluid objects are similar to yet different from networks, fire objects are related to fluids. In this case, however, instead of gradual change, the problem of difference becomes a question of juxtaposing

multiple ontologically different, enacted versions of an object (Law & Singleton, 2005, p. 342; Mol, 2002). A second way in which fire space moves away from fluidity is through its attempt to mediate the reproach that post-ANT persisted in colonizing "the other" and omitting elements from the picture. As argued by Law and Singleton (2005, pp. 342-343), "An object is a presence. (…) But, whatever the form of its presence, this also implies a set of absences," therefore, "an object is a pattern of presences and absences." A *fire object* is:

> (…) an object that jumps, creatively, destructively and more or less unpredictably, from location to location. It is an object in the form of a dancing and dangerous pattern of discontinuous displacements between locations that are other to (but linked with) each other. Perhaps it flows too, perhaps it is a fluid object. (…) But it is also, or so we believe, much more dynamic, more sporadic, less predictable, and, yes, more discontinuous than is suggested by the metaphor of flow. (…) it lives in and through the juxtaposition of uncontrollable and generative othernesses (Law & Singleton, 2005, p. 347).

Law and Mol (2001, pp. 615-616) propose three suggestions concerning fire space and the objects that reside within it. First, as its basic premise, the continuity of a shape can be considered an effect of the discontinuity in fire space. Second, in fire space, an object is constantly both present and absent, in line with the metaphor of "flickering," or "oscillation." Third, fire space contains a present center, which is related to multiple absent remotes or others. In summary, continuity is derived from (1) discontinuity, (2) the presence and absence of otherness, and (3) a star-like pattern in simultaneous absence and presence (Law & Mol, 2001, p. 616). To clarify this space, Law and Mol refer to the example of a mathematical equation for determining the gust response (commonly experienced as turbulence) of an aircraft wing. In their view, this expression could be regarded as a network that "connects and defines the relations between a set of terms" (Law & Mol, 2001, p. 616). Stating that this object is a network, however, ignores the fact that the enactment of this object is "a complex association between that which is present in the expression and that which is not (…) it loses sight of the irreducible discontinuity between what appears on the paper and what does not" (Law & Mol, 2001, p. 617). The existence of the product of the equation, which is the determination of acceptable gust responses, therefore depends on the absence of the non-acceptable gust response. There is thus

> an oscillation or a flickering between present-presence and absent-presence (…) which is the key to what is distinctive about the enactment of this object, the key to giving it a relatively stable and determinate shape" (Law & Mol, 2001, pp. 617-618).

Few examples of the use of fire space in empirical research exist. In one of the few examples, Anders Blok (2011) uses the space imagination as part of his study on controversies involved in the regulation of the whaling industry. Blok discusses how multiple enactments are used by both the pro-whaling and

anti-whaling camps and how these "ontologically different versions of whales [are] mutually reinforcing their heterogeneous realities" (Blok, 2011, p. 69). In the context of whaling, therefore, the fire object of whales retains its current form of messy controversy-without-change, given the continuous juxtaposition of the whale enactments in the *ethno-epistemic assemblages* of pro-whaling and anti-whaling actors. In blood-supply management, a similar controversy is repeatedly presented as a *nontroversy*. In the organization of blood-donor selection, one party's arguments – evidence-based policy – supersede those of the other party – claims for inclusion – in importance and validity. In such a case of nontroversy, the debate has been won before it takes place. We can nevertheless study such cases using the conceptual and analytic sensitivity to be gained from fire space.

Drawing upon the notion that (1) in fire space, the problem of difference becomes a matter of juxtaposing multiple ontologically different, enacted versions of the object; and that (2) fire space can help us move away from bracketing out the "other," toward conducting an inclusive study of controversy; the framework of fire space allows us to study matters that never seem to change radically, despite constant challenges. More general research questions include:

- *How does discontinuity between multiple versions of the object in fire space produce the continuity of the object in other spaces?*
- *In what way is the object both present and absent, in line with the metaphor of oscillation? In what way is there a version of the object acting as a present center, which is related to multiple absent remotes or others?* In other words:
- *How do the other versions of the fire object build the central object through multiple juxtapositions?*

If we transpose these theoretical questions to the empirical example of safety through donor selection, these questions can be reformulated as follows:

- *How does the discontinuity in what is deemed a safe donor produce the continuity of blood as safe?*
- *In what way is blood both safe and under continuous suspicion of being unsafe?*
- *In what way is the safe donor built up from the juxtaposition of all these versions of a donor who is unsafe?*
- *Why are unsafe donors rigorously classified according to the reasoning behind the deferral, with the group of safe donors making up a seemingly unitary entity?*

CONCLUSION

In this theoretical-methodological essay, we have attempted to follow Law and Singleton in their proposition of the social topology framework as a tool for studying messy objects (2005). We have focused on blood as a messy object and studied it in a Belgian Blood Establishment. Previous studies have dealt with the messiness of blood through an epistemological response, casting it into four "blood stories": the gift relationship, the blood economy, biological citizenship, and blood safety. We have

attempted to transcend these dominant narratives, all of which are examples of what Mol (2002) has termed *perspectivalism*. We argue that grasping the entanglement of technological, biomedical, political, and socio-technical aspects of this "bio-object" (Vermeulen et al., 2012) warrants an ontological response. We use the social topology framework to this end (Law & Mol, 2001; Mol & Law, 1994). For each space (Euclidian, Network, Fluid and Fire), we provide a comprehensive summary of the theory, delineate specific elements from the theory in order to induce conceptual sensitivity and propose research questions that follow from these elements.

In Euclidian space, blood is (or becomes) a black-boxed object that moves from a region to another, from a body to something or someone else. In this space, the entanglement of blood is silenced. Overcoming the black-boxed nature of blood, the space imagination of networks informs a discussion of blood as the product of a network made up of stable relationships between heterogeneous elements. The research questions that follow from such a space imagination contribute to efforts to highlight differences between the functional units of the network and to identify the occasion on which a given "blood story" is told. Network space thus allows us to investigate how the entanglement of technological, biomedical, political, and socio-technical aspects of blood is organized by allocating different elements to different parts of the network. By separating the ontologies of blood, conflict is avoided. The third space imagination, that of fluids, allows us to interpret, not how and why the ontologies of blood as being inspired by the "blood stories" become separated, but exactly *how they can be mixed without causing problems*; how the interrelationship between all of these versions can sometimes be part of both its success and its failures, without radically changing our conception of blood in the blood supply. Fluidity thus allows us to understand situations that have previously been conceptualized as network "breakdowns" or "failures" as "adaptations." Finally, through our consideration of fire space, and its focus on continuity-discontinuity and presence-absence, we demonstrate its utility as a tool for studying controversial issues that are presented as *nontroversies.* In these cases, there is a conflict between the ontologies of blood, although some representations of the object supersede others without explicit discussion. Fire space thus allows us to study entanglement where the contradictions and discussions that such entanglement evokes are effaced.

In presenting a theoretical answer to a methodological issue, we have also presented many questions. These theoretically informed research questions can help to uncover the multiple ontologies of an object through ethnographic research. Our essay builds upon insights from Annemarie Mol, John Law, and Vicky Singleton, with the goal of providing a comprehensive summary of the analytic benefits to be gained from their thought and theory (Law & Mol, 2001; Law & Singleton, 2005). This summary

highlights how inspiration can be taken from their work by transposing their theory for adaptation to other fields of inquiry. Their framework can be used to study objects and empirical contexts other than those that initially gave rise to the conceptualization of the various spaces. It is important to note that the various space imaginations should not be seen as either exclusive or hierarchical. They co-exist. It could even be that a combination is exactly what is needed to help researchers in their endeavor to uncover the ontology of objects. In this regard, the exercise in social topology exemplified in this essay could both help and challenge ethnographers to question their most basic assumptions when observing objects: those concerning the spaces in which these objects can and do reside.

This essay represents a small step in the endeavor to demonstrate how social topology can be used as a tool to guide a researcher's focus and research questions in the ethnographic study of objects. It also demonstrates that not all of the four spaces are suited to studying the *entanglement* of multiple ontologies. When formulating research questions from the Euclidian space imagination, we risk studying blood as a *black-boxed object,* thereby *silencing* the entanglement. Network space moves beyond black-boxing to demonstrate clearly how the multiple ontologies of blood become separated into the functional elements of the network. It nevertheless becomes more difficult to demonstrate how they are mixed and combined, or how they can contradict or supplement one another. In contrast, the post-ANT space imaginations of fluid space and fire space both allow for contradiction and richness in studying objects. In our opinion, this is exactly what we need when attempting to grasp the entanglement of the technological, biomedical, political, and socio-technical aspects of our *bloody* "bio-object" (Vermeulen et al., 2012).

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ALEV COBAN

A RESPONSE TO NATHAN WITTOCK, MICHIEL DE KROM & LESLEY HUSTINX'

MAKING SENSE OF A MESSY OBJECT: HOW TO USE SOCIAL TOPOLOGY AS AN ANALYTIC TOOL FOR ETHNOGRAPHY OF OBJECTS

The essay by Nathan Wittock, Michiel de Krom and Lesley Hustinx is a very comprehensible summary of various works of John Law, Annemarie Mol and Vicky Singleton focusing on their epistemological and methodological lenses of Social Topology. Wittock et al. seek to apply the Social Topology approach to their empirical field of blood in the context of a European blood establishment. Thus, they use the four different spaces of regions, networks, fluids and fire as defined by Law and Mol (2001) in order to position their object *blood* in each of the four spaces. Due to that appliance Wittock et al. succeed in posing research questions to interrogate blood as a messy object being in different spatial relations at the same time. In doing so, the authors make the reader wanting to read more about their bloody object(s).

This desire to learn more about blood in European establishments leads me to the first comment on the discussed essay, namely the craving for empirical content. Although it is Wittock et al.'s explicit aim to write a "theoretical-methodological essay", more empirical contextualization would help to understand the formulated research questions better. The posed questions referring to the four spaces show the immense knowledge of the authors about their object of investigation. Nevertheless, it feels just like a glimpse into the negotiations around blood. The authors seem to know why those research questions are important and interesting to ask but due to the lack of context it is not transparent to the reader. Furthermore, the focus on the theoretical accounts following Law and Mol, makes it unclear what Wittock et al. exactly contribute to the topic of Social Topology. Their analytical work, e.g. gathering the characteristics of fluid space, should be made more explicit as their own work.

Following the first comment on the empirical part of the essay, I would like to make two conceptual comments: Firstly, I am not quite convinced of the understanding of topology. On page four of the essay, Wittock et al. describe the four spaces - regions (i.e. Euclidian space), networks, fluids, and fire – as "topological spaces": whether this is an ascription done by Law and Mol or by Wittock et al. is not clear. Despite of that, the essay leaves out why the Euclidian space should be called a 'topological space'. In Human Geography the Euclidian space as topographical understanding of space was *the* reason to use topology in order to demarcate from the belief in a Euclidian space. My second comment tackles the incoherence in epistemological thoughts. In my opinion, the reference to Martina Löw is not very suitable to the following statements of the essay. Introducing the spatial turn with her social-

constructivist understanding of space, marginalizes the importance of materiality and its agency as acknowledged by Law, Mol, de Laet, etc. It seems important for me to illustrate the epistemological difference between Löw's understanding of space and Law and Mol's view on spaces.

Having laid out my three comments on the essay of Nathan Wittock, Michiel de Krom and Lesley Hustinx, I would like to thank them for appreciating the work of John Law, Annemarie Mol, etc. and for depicting their approaches to topology in a very comprehensible way. I am very excited to learn more about Wittock et al.'s contradictory, messy, disruptive and bloody stories about their research object *blood*.

JESSAMY PERRIAM

A RESPONSE TO NATHAN WITTOCK, MICHIEL DE KROM & LESLEY HUSTINX'

MAKING SENSE OF A MESSY OBJECT: HOW TO USE SOCIAL TOPOLOGY AS AN ANALYTIC TOOL FOR ETHNOGRAPHY OF OBJECTS

Wittock et al.'s paper explores how we might develop a highly theoretically informed approach to conducting an ethnography of an inherently messy object, in their case - blood. In particular, their use of the social topology framework (Law & Singleton, 2005; Law & Mol, 2001; Law & Mol, 1994) indicates the challenges faced by researchers to examine their object when it exists in multiple ways, in multiple settings. It is a challenge that every ethnographer of objects is sympathetic with - how to examine an inanimate informant that struggles to make its voice heard over the noise of humans who wish to speak for it?

THE CHALLENGE: ETHNOGRAPHERS DON'T THEORISE ENOUGH

In this theoretical-methodological paper, Wittock et al. take aim at qualitative, ethnographic researchers who 'shy away from heavy theorizing as a starting point for observation and analysis because it is believed that it limits the researcher's openness and inductive capacities.' As a qualitative, ethnographic researcher myself, I saw this as a helpful challenge and a starting point for this commentary. Within this commentary, I want to ask three questions - they may be rhetorical questions - but I do hope they start a discussion that is fruitful for the community of object ethnographers. The first question poses a Goldilocks-style question: How much theorising is enough theorising? If we do too little we end up being radically inductive. Too much, and it becomes radically deductive. How do we strike an abductive middle ground? In this question I want to explore the placement of theory in the object ethnography process.

My second question touches on practical matters: How to mobilise an approach such as a social topology framework? With this question I wish to explore what happens after heavy theorising and the possible fieldwork and analysis implications.

My third question is more of a serious one: How do frameworks such as the one Wittock et al. introduce us to serve to domesticate a messy object? With this question I wish to provoke the methodology and ask how the methodology itself impacts the object of study.

THE FIRST QUESTION: HOW TO STRIKE AN INDUCTIVE/DEDUCTIVE BALANCE?

Wittock et al.'s provocation about qualitative researchers and their leaning towards conducting inductive research describes heavy theorising as a way of countering openness. Without enough theoretical or methodological preparation, how can one pointedly interrogate an object? How does the researcher know what to ask of the object? We as researchers may have been guilty of leaping into our respective fields earlier than we would have liked; only realising this error in hindsight.

However, this provocation seems to play down the benefits of inductive research, or seek to render them inferior. It asserts that one cannot both theorise and maintain an inductive approach to research. It is important to challenge this notion because it's not necessarily accurate. A researcher can theorise to their heart's content (or their timeframe's content, or budgetary constraints) before embarking on the research, but what help does theory bring to an object if it results in a list of attributes to be proven or disproven? What help does a deductive approach bring to an ethnography?

But perhaps a middle ground must be found and struck with a more pragmatic, abductive approach (Brinkmann, 2014). As researchers going through the theorising and methodology stages of research, it is important to engage well with theories to develop well thought out research questions, hypotheses and research plans. But we must also engage fully and pointedly with theory and methodology and yet hold onto it loosely and prepare to listen to our object and be surprised when it behaves in ways we did not expect it to (Latour, 2000). We must prepare to have our theories and frameworks fail us from time to time and have the humility to let the object resist being shoehorned into quadrants.

THE SECOND QUESTION: HOW TO MOBILISE THE LABOR OF A SOCIAL TOPOLOGY FRAMEWORK?

With this question, I wish to ask an honest question about the transition from the mind work of theory and methodology to the handiwork of method and fieldwork, back to the mind work of analysing what you have just witnessed and recorded. How does the social topology framework relate to these points of transition? How is it mobilised within method, fieldwork, and analysis? The social topology framework seems to demand a lot of the researcher and the analyst after doing theoretical/methodological heavy-lifting (please don't misunderstand, I'm not advocating intellectual laziness here). But the researcher must do four times the fieldwork or analysis work under the social topology framework in order to take advantage of the four angles it provides.

It is a lot of work but perhaps that is precisely where the heavy theorising pays off. After that investment, the researcher-analyst is living and breathing the theory and methodology and able to identify and form these correlations between theory and the object observed. I am curious and excited to see how this labor is divided in Wittock et al.'s ensuing fieldwork with blood donation. Will they conduct research four

times, tailoring the methods to best suit each angle of blood donation? Or will the empirical data be analysed four times, each focusing on an individual angle. In any case, the social topology framework neatly divides the research and analytic work to be done, but it gives the researcher little room to move if for some reason it is not the best tool for the job. This drives forward the point that a social topology approach is helpful, but perhaps more so in the analysis phase rather than the research design phase. How can a researcher see more insightful angles to an object if her research framework is standing in the way?

When writing findings, how does a social topology framework provide a formula for the how the study is to be presented? Could there be a scenario where the findings of each angle interacts, acknowledging and reflecting the messy situations that the blood goes through within the donation process, or is each angle within the topology to be kept discrete from others?

THE THIRD QUESTION: HOW TO AVOID DOMESTICATING A MESSY OBJECT?

The social topology framework seems to encourage a form of purification of the object. Indeed, the framework becomes a laboratory of sorts through which to study the object. My fear of using a social topology framework is that it could lead to domesticating the object in an attempt to examine it and translate it to others. The cost of using frameworks to examine messy objects could be radical domestication whereby the object is simplified beyond recognition of the messy situation it came from.

On this point I have no comments that differ from those outlined above, other than the need to be reflexive of the research decisions that could cause the object to be domesticated and prepare to explicate and acknowledge those decisions and their impacts on analysis.

CONCLUSION

Wittock et al. provide a comprehensive and persuasive call to (re)introduce a focus on heavy theorisation when preparing and planning for an ethnography of an object, in their case, blood. This commentary sought to encourage them in this process and thank them for providing an outlook that stresses the importance of doing the necessary theoretical work to situate the object ethnography within a broader discussion. In this commentary I hope to have used some questions around balancing inductive and deductive approaches, mobilising the social topology framework and, domesticating a messy object in order that it can also be considered by ethnographers as they embark researching objects. I wish them the very best as they carry out their empirical work through a social topology framework.

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