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BOOK REVIEW

Keeping Autonomous Driving Alive: An Ethnography of Visions, Masculinity and Fragility

Göde Both, 2020.

Reviewed by Bård Torvetjønn Haugland

In April 2019, Tesla CEO Elon Musk stated that "Next year, for sure, we will have over a million robotaxis on the road." As I write this review, the calendar reads January 2021 and robotaxis have yet to materialize. Tesla's intent to develop self-driving cars is well-documented, as is the associated challenge of delivering on their CEO's bold promises. This exemplifies how "the self-driving car is both a technology already with us and a work-in-progress, laden with promise for what it might become" (Stilgoe, 2018: 26). While Silicon Valley-based technology companies may be the most visible proponents of such vehicles, street trials have also been carried out by actors such as public transport companies (Haugland and Skjølsvold, 2020) and national governments (Marres, 2020). The (current and future) introduction of such a novel technology into more or less public spaces has also sparked a steadily increasing scholarly interest.

For obvious reasons, much of the existing literature on self-driving vehicles is technical in nature (Gandia et al., 2019). However, the social scientific literature on self-driving vehicles is growing. Many of these studies remain theoretical in nature (e.g., Bissell et al., 2018; Büscher et al., 2012; Laurier and Dant, 2012), perhaps reflecting the relative immaturity of the technology. For a long time, empirical studies were limited to survey-based studies focused on technology acceptance (e.g., Fraedrich and Lenz, 2016) and analyses of media and/or policy documents (e.g., Graf and Sonnberger, 2020; Hildebrand and Sheller, 2018; Hopkins and Schwanen, 2018). Recently, there has been an increase in studies which approach the field of self-driving vehicles through empirical studies of the involved actors, whether through engagement with transport professionals and authorities (e.g., Blyth, 2019; Legacy et al., 2019) or the variety of actors involved in pilot projects (e.g., Forlano, 2019; Haugland and Skjølsvold, 2020; Marres, 2020). With his book, *Keeping Autonomous Driving Alive,* Göde Both seeks to add to this empirically oriented literature.

Keeping Autonomous Driving Alive is centred on the AutoNOMOS project at Freie Universität Berlin. In this project, a team of roboticists and computer scientists have worked on developing a self-driving vehicle since the project's establishment in 2006. Between 2012 and 2015, Both conducted ethnographic fieldwork within the AutoNOMOS project. In this period, the AutoNOMOS team were carrying out tests with a research vehicle named MiG (short for Made in Germany), a Volkswagen Passat enhanced with information and computer technologies. This vehicle and its surrounding team are the protagonists of Both's book.

In terms of organization, the first chapter of the book lays out the theoretical and methodological framework underpinning the study. Then follows a thorough introduction of the AutoNOMOS project itself, including its history and organization. In this chapter, Both also introduces what he refers to as the central imaginary of the AutoNOMOS project – the idea that self-driving vehicles, in particular autonomous taxis, might make "motorized transportation more efficient and, as a result, cities more livable and sustainable" (p. 50). The rest of the book concerns the attempts at substantiating or realizing this future, whether through tracing how delicate assemblages are held stable during street trials (chapter 3), how old and new conceptions of masculinity are negotiated around autonomous driving (chapter 4), how the team's demonstration videos attempt to substantiate the envisioned future (chapter 5), and how various, partially contradictive narratives are mobilized to elicit support from groups with different concerns (chapter 6). The book concludes with a short summary of the preceding chapters.

Both has chosen actor-network theory (ANT) as the overarching framework for approaching the AutoNOMOS project. By choosing a framework which neither presupposes categories nor prioritises human actors over non-humans, Both seeks to chart how heterogenous elements, such as genders, technologies, and visions, are assembled into old and new networks. In addition to ANT, Both draws upon insights from gender studies and the sociology of expectations, focusing in particular on how gender and futures are performances that are continually reassembled or shaped anew, rather than stable or essential constructs. Through this set of perspectives, Both seeks to understand how the material and the immaterial, the human and the non-human is assembled around the emerging practice of autonomous driving.

ANT is particularly useful for charting all the details which have to be in place to make a car *appear* to drive by itself. This is particularly salient in the third chapter, in which the reader is given a thorough and detailed overview of the patchwork of technologies, test drivers, and system observers necessary to assemble in order to substantiate the feasibility of self-driving vehicles. To me, this chapter is the centrepiece of the book: here, MiG's ability to drive by itself becomes a prime example of distributed agency, with this

ability being a fragile assemblage that (by and large) is held together through the crew members' acts of care—that is, all the work needed for the technology to function, as well as for the technology to seem feasible. In later chapters, Both's commitment to ANT also allows him to provide a fascinating account of how masculinity is reiterated in both old and new ways around a new technological object and how partially contradictory narratives are assembled to alternately make autonomous driving appear plausible, optional, or inevitable. This is communicated through clear and oftentimes humorous prose, for example when Both relates the story of how one crew member "hid below the glow department with his finger on an emergency stop button" to make the car appear empty for a promotional video (p. 95, footnote 46).

While I generally found the book to be a fascinating and satisfying read, I found some of the discussions relating to gender and class to be a bit underdeveloped. For example, the book's fourth chapter traces the assembly of a particular conception of masculinity in and around MiG. Here, the AutoNOMOS crew members actively distinguish their own line of work from that of car mechanics and car modifiers; despite acting upon the same object, they are not the same. For example, the crew focuses on heroic displays of (technical) capability. In Both's interpretation, this represents an attempt at distinguishing themselves from a particular working-class masculinity (p. 76, p. 80). Through such heroic displays they assemble a distinctively middle-class masculinity, while simultaneously reiterating a pre-established linkage between technology and masculinity. This is argued convincingly. However, later in the book, when discussing the gendering of the MiG research vehicle, I am left a bit unsatisfied. While MiG figures in the project members' narratives as "a character – with a masculine pronoun" (p. 120), Both's field notes refer to MiG's "feminine voice" (p. 60, p. 61) and "feminine synthetic voice" (p. 70). The gendering of this particular feature is never brought into the discussion regarding the gendering of MiG. Considering the team members' use of a masculine pronoun, I find this curious. The lack of engagement with MiG's ostensibly ambiguous or fluid gender appears to be a missed opportunity. Such a discussion could, for example, have been informed by recent discussions regarding female voice assistants (e.g., Strengers and Kennedy, 2020).

Another missed opportunity is to discuss how autonomous driving relates to class more generally. While the (re)construction of masculinity around MiG is interesting, autonomous driving appears to harbour some prospect of destabilizing class. At one point, the project leader of AutoNOMOS embeds autonomous taxis in "a narrative of emancipation of the masses" (p. 110). Autonomous taxis might give everyone a personal driver, thus challenging the hegemony of automobility in its current form. They may offer the experience of a chauffeur to everyone, not only the rich, and might also challenge the norm of private car ownership. Here, there appears to be material enough for discussing the (potential) destabilization of the socioeconomic prestige associated with chauffeurs and certain brands of car. However, this topic remains unexplored.

Both remains cautious when discussing the relationship between the AutoNOMOS project and the outside world, a caution which might originate in his commitment to ANT tenets. The narrative remains close to the empirical material, focussing on the generation of (old and new) assemblages rather than teasing out the potential implications of these assemblages. Admittedly, the book does contain some discussions relating to how the prospect of autonomous driving might destabilize established conceptions of automobility and its relation(s) to masculinity. Still, even as MiG is test-driven on public roads, Both's focus generally turns to MiG's interaction with the surroundings, rather than on what happens at the interface between society and street trials of self-driving vehicles (Marres, 2020). While the outside world is sometimes brought into the assemblage, for example when attaining a permit to conduct street trials or when MiG has to interact with other road users, such interactions are generally interpreted in light of MiG and/or the AutoNOMOS project, rather than as a reciprocal interaction in which change occurs. By centring MiG and the AutoNOMOS crew in his analysis, Both veers close to the heroic or Machiavellian narratives ANT has sometimes been criticized for espousing (e.g., Amsterdamska, 1990). However, Both puts his own spin on this: rather than succeeding through feats of strength, the AutoNOMOS crew manages to sustain the often brittle assemblage surrounding MiG through acts of care, thus subverting the Machiavellian narrative.

In terms of style and complexity, the book is clearly written for a scholarly audience. While the prose is relatively plain and interspersed with field notes and photographs, the elaborate theoretical framework suggests that Both first and foremost seeks to add to scholarship on self-driving vehicles. Occasionally, this results in Both assuming the reader to be familiar with theory beyond what is presented in the book's theory chapter. For example, the exact content of the care perspective on technology may remain elusive to readers not well-versed in this literature. At one point, Both argues that a "focus on caring for technology directs attention away from the generation and expansion of sociotechnical assemblages" (p. 14). However, in my reading, this is exactly what the AutoNOMOS project appears to be: a generative assemblage centred on the emerging technology of self-driving vehicles. Occasionally, Both also veers from the theoretical framework established in the first chapter altogether. This happens in a manner which takes the reader's knowledge of more or less canonical STS works for granted, for example Callon (1998), on frames and overflows (see p. 113–115). While these instances are few and far between, they still demand some additional effort from the reader.

While the preceding points suggest that Both could have gotten even more out of his material, his book ultimately provides a compelling look under the hood of self-driving vehicles. By giving centre stage to self-driving vehicles and the people who drive them, Both has managed to write an engaging and useful actor-centred book on the complications surrounding autonomous driving. As for the book's contribution, I find it to be two-fold. First, the book is an interesting addition to STS literature on technology development.

The book makes it clear that technology development does not only entail acting upon the technology in question; it is also a process where the relationship between technology, technology developers and society might be (re)assembled or reconfigured. Second, the book adds to the growing number of studies approaching self-driving vehicles at the technology-society interface. Of particular interest is Both's intimate view of self-driving vehicle development, which highlights the work involved in making a particular technological future appear feasible. In a field fraught with hype (Stilgoe, 2018), the importance of such a study should not be understated.

Keeping Autonomous Driving Alive should appeal to anyone studying emerging technologies. On the surface, the book focuses on how involved actors attempt to keep self-driving technology stable in its nascent stage and how this technology might destabilize existing conceptions of automobility in the future. However, Both's insights clearly apply to processes of technology development more broadly. By showing how stage-management walks hand in hand with technology development, *Keeping Autonomous Driving Alive* provides a solid starting point for those studying emerging technologies, whether the increasingly advanced vehicles now taking to the road or something else altogether.

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