Beyond resistance: geographies of divergent more-than-human conduct in robotic milking

Christopher Bear[1] and Lewis Holloway[2]

[1]Corresponding author

School of Geography and Planning, Cardiff University, King Edward VII Avenue, Cardiff, CF10 3WA, UK

Email: bearck@cardiff.ac.uk

Phone: +44(0)29 2087 6181

[2] Geography, Geology and Environment, University of Hull, Cottingham Road, Hull, HU6 7RX, UK

Email: l.holloway@hull.ac.uk

Phone: +44 (0) 1482 466759

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Abstract

This paper begins to develop a terminology for discussing less-than-convivial more-than-human relations, providing a tool for exploring such relationships in the context of problematic human-nonhuman entanglements. The paper reviews existing work on such relations, showing how they tend to have been conceptualised in terms of animal transgression and resistance. It then develops critiques of these terms, focusing on their problematic representations of animals' actions and subjectivities, and engaging with arguments that non-living nonhumans also need to be considered in conceptualisations of problematic more-than-human situations. Drawing on empirical material from research into automated (or robotic) milking systems (AMS), and the associated relations between machines, humans and cows in specific places, the paper proposes and outlines the concept of divergent conduct as a way of exploring how heterogeneous entities co-produce activity which is likely to differ from accounts of trouble-free introductions of technologies and practices. The concept draws together an emphasis on the 'lively' nature of machines with a focus on the agency of nonhuman animals and the topological relationships involved in attempts to establish AMS in UK dairy farming. to suggest that the characteristics and capacities of heterogeneous entities make multiple and relational differences to situations. As such, the concept emphasises the constitution of AMS in relation to multiple human and nonhuman requirements, and their related conducts, which may pull in different directions. The paper argues that divergent conduct provides a way of exploring problematic and politicised entanglements in which inequalities of power can be many-layered and intersectional.

Key words

Resistance; Transgression; Divergent conduct; More-than-human; Topologies; Robotic milking

Highlights

- Human-cow-robot relations around Automated Milking Systems can be dissonant
- These relations can be analysed through the concept of divergent conduct
- Divergent conduct highlights that actors' conduct can follow multiple trajectories
- These trajectories co-constitute topological and topographical spatialities

1. Introduction

Animals, along with other nonhumans, have increasingly become a focus of geographical research. Following calls in the 1990s to 'bring the animals back in' (Wolch and Emel, 1995), geographers have conceptualised space as co-constituted by heterogeneous actors and forces (Philo and Wilbert, 2000; Buller, 2014). One strand of recent work in this area has been characterised by an interest in 'entanglements' (Ogden, 2011; Slater, 2002; Ingold, 2008; Nading, 2014; Tsing, 2015), a concept that highlights the intertwining of heterogeneous entities. As entities converge in this way, any notion of authority becomes ambiguous ('directionally surprising' in Haraway's (2008: 225) words) – humans cannot be assumed to be in control. The ambiguity of authority has been a consistent theme since the advent of the 'new' animal geography, with Philo and Wilbert (2000: 14) arguing that if geographers are to take animals seriously, they need to 'look at animals themselves as embodied, meaty beings who evade human attempts to place them in space, physically or conceptually [and who]…inject their own agency into the scene, thereby transgressing, perhaps even resisting, the human placements of them' . Alongside a focus on convergence, therefore, it is not surprising to observe a recent turn to studying 'awkward' (Ginn et al., 2014), 'dissonant' (Brown and Dilley, 2012) or even violent (Griffin, 2012) human-animal relations, where *divergence* might be a more appropriate expression[1].

In this paper, we expand on these strands of work by critically examining geographers' treatment of what we come to refer to as divergent conduct in more-than-human (Whatmore, 2006) relations. We develop this concept, first, in response to the tendency of research in animal geography to analyse dissonant more-than-human relations through the foundational concepts of transgression and resistance and, second, through an interest in teasing out the awkward and sometimes dissonant relations that characterise entanglements between heterogeneous actors and forces. Despite their widespread application, concepts of non-human transgression and resistance have rarely been subjected to extended scrutiny (though see Philo and Wilbert, 2000; Wilbert, 2000; Holloway and Morris, 2012; Wadiwel, 2018; Coppin, 2003). While both concepts bring the often uneven power relationships between humans and nonhumans to the fore, we argue that they tend to focus on: 1) violent acts; 2) living, and especially sentient, beings, rather than non-living entities; and 3) animal actions that restrict the achievement of human desires and intentions. In these ways, we argue, more-than-human relations come to be over-simplified, particularly through the reinforcement of an anthropocentric (even anthropomorphic) sensibility. In contrast, the concept of entanglement is often used to refer to 'the ongoing coconstitution of people and (living and nonliving) things' (Nading, 2014: 202), emphasising the complexity of more-than-human relations through a more explicitly symmetrical approach. While Nading (p. 11) notes that entanglements involve not just 'attachments and affinities' but also 'antagonisms and animosities', this literature often focuses on – even celebrates – the convergence of entities and forces over the ways they might push apart. Our development of the term 'divergent conduct' therefore moves away from the anthropocentric focus of much work on nonhuman 'resistance', while bringing to the fore the less-than-convivial relations that can characterise entanglement.

We take these ideas forward through studying tensions around the introduction of Automated Milking Systems (AMS – commonly referred to as 'robotic milking') on UK dairy farms (see also Holloway et

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[1] We are grateful to an anonymous referee for highlighting the contrasting foci on convergence and divergence.

al., 2014a, 2014b; Bear and Holloway, 2015; Bear et al., 2017; Holloway and Bear, 2017). AMS is often marketed on the dual premises of giving cows greater freedom (allowing them to choose when to be milked), and of providing further means of control and management for farmers (particularly through collecting data on cows' health and productivity). However, existing research has demonstrated the disjuncture between cow and farmer priorities.; Cows kick the robots, fail to present themselves for milking (Jacobs and Siegford, 2012) or have bodies that are difficult for the robots to engage with. Everyday uses of milking robots may also be at odds with their manufacturers' intentions. AMS are thus not installed on any farm as a finalised technological assemblage but are co-produced by their users, human or otherwise (Holloway et al., 2014a; see also Oudshoorn and Pinch, 2003; Porcher and Schmitt, 2012), and co-production of the AMS assemblage emerges as much through tension and dissonance as more convivial relations. Our fieldwork, therefore, was frequently guided by the idea that the agency of cows, robots and farmers might become apparent through practices of resistance or transgression (see Despret, 2013). However, such concepts frequently proved to be unhelpful, as the vocabulary around more-than-human relations of resistance, transgression and suchlike is often poorly-defined.

After briefly introducing AMS and our methodology in the next section, we subsequently discuss three existing approaches to what we later call divergent conduct in more-than-human relations. Work drawing on the first two, transgression and resistance, often build on Philo and Wilbert's discussion of these terms, tending to emphasise either disruptive animal movements or animal violence. The third, which we define as 'relational resistance', places greater emphasis on more-than-human negotiation and disrupts assumptions of the unidirectionality of resistance, while also introducing non-living actors such as technologies. We suggest that non-living actors often continue to appear inert in these studies; they are often the tools by which humans attempt to exert influence, rather than things which can themselves 'object' (Latour, 2000: 116). In the paper's penultimate section, therefore, we develop the concept of divergent conduct. As we argue, it implies that the characteristics and capacities of heterogeneous entities make multiple and relational differences to situations, meaning that the conduct and outcomes of those situations might diverge in more than one way. We build on Haraway's (1997) concept of technobiopower to engage with the 'lively' nature of machines (Haraway, 1991) and propose a topological framework that more fully accounts for distributed and heterogeneous forms of divergent conduct, moving away from the focus of previous work on, variously, living organisms, direct encounters and intentionality. In the conclusion, we outline an agenda for future analyses of divergent more-than-human conduct.

2. Freedom and control in Automated Milking Systems

First used commercially in 1992, AMS have become increasingly common. By 2015, AMS constituted around 30% of new milking systems purchased in the UK (Heyden, 2015). Unlike conventional milking, where cows are herded through a milking parlour two or three times per day, AMS enables cows to 'milk when they like' (Delaval, 2011: 9), 'in a natural way' and 'manag[ing] their own time' (Lely, Date unknown). . They enter a milking robot, which identifies each cow, automatically cleans the udder, attaches milking cups and milks the cow. The robot provides a predetermined amount of feed, records information about the cow's milk yield and quality, and can collect information regarding her health.

Manufacturers[2] argue that AMS 'can result in improved udder health' (Fullwood, 2014: 7) and that the greater 'freedom' (Fullwood, 2014: 7) can result in 'happier' (Lely, 2013: 9) cows. Decisions, it is argued, are 'transferred from the farmer to the cow' (Lely, 2012: 21), which in turn is claimed to give farmers a 'more flexible' schedule (Lely, 2017) and more time to carry out other activities.

In spite of this apparent bovine utopia, where resistance might seem redundant, others have argued that 'work performed in a profit-maximising animal agriculture system will inevitably cause alienation, exhaustion, and suffering' (Stuart et al., 2013: 217) for animals involved. Indeed, Porcher and Schmitt (2012: 42) view dairy cows (including those in AMS) as 'an ultraflexible underproletariat, exploitable and destructible at will', as many choices with which they are presented are managed by humans on and beyond the farm; the capture of increasingly detailed data on cows provides farmers with new management tools through which to 'control' (DeLaval, 2014: 2) their cows. For Holloway et al. (2014a: 140), the freedom that is promoted as beneficial for AMS farmers and cows 'becomes a responsibility to take care/be taken care of and to foster productive life'; AMS is neither altruistic nor benign but rather co-produces new farmer-cow relations.

In forming our argument, we draw on interviews with farmers in the UK, as well as with robot manufacturers and dairy farming advisers. In total, 59 interviews were conducted[3] between December 2010 and September 2012. Additionally, extended periods were spent observing interactions between cows, robots and people on three case study farms (an established AMS farm, one which has a robotically milked herd alongside a conventionally milked herd, and one which converted from conventional to AMS during the course of the research; see Bear et al. (2017) for more information on the observational methods employed). Interviews were recorded and transcribed, prior to analysis with QSR NVivo software. We have reported extensively on our empirical findings elsewhere (Butler et al., 2012; Holloway and Bear, 2017; Holloway et al., 2014b, 2014a; Bear and Holloway, 2018) but here draw selectively on our fieldwork to further the conceptualisation of divergent more-than-human conduct.

3. Transgression and resistance: Dissonant relations between humans and nonhuman animals

Figure 1 shows a cow standing in a milking robot, which was in its first week of use. The robot detected that the cow had been milked recently, so the gate opened, allowing her to leave. Despite delivering a small electric shock from a wire above, she stayed in the robot, leading the farmer to nudge her out. This is one of many similar examples witnessed during our research, where cows attempted to stay in robots longer than the robot and its programmers saw fit, or conversely where cows needed to be coerced by farmers (who in turn often referred to them with adjectives such as 'lazy'; see also Holloway et al. (2014a); Driessen and Heutinck (2015)). In this section, we examine how such incidents

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[2] At the time of writing, there are seven AMS manufacturers globally: Lely, DeLaval, Fullwood, GEA, SAC, BoumaticRobots, and AMS Galaxy.

[3] Interviews were conducted with: 22 UK farmers, including 10 who were using 'conventional' milking techniques; three manufacturers of AMS used in the UK; eight UK organisational representatives, covering cow health/welfare, the dairy sector and technology development; three agricultural colleges that included dairy farming on college farms; 16 representatives of institutions and companies in the Netherlands and Scandinavia with interests in developing and marketing AMS in the UK; and with seven dairy farmers in the USA to explore AMS in a very different geographical context. Three focus groups were conducted, one drawing on an existing dairy farmer discussion group and two with students at agricultural colleges.

have been described or conceptualised in the animal studies literature, first (and briefly) in relation to animals' spatial transgressions, and second through the lens of resistance. In reviewing work on resistance, we differentiate between two broad approaches. The first takes what we refer to as a 'descriptive' approach, tending to focus on animals' ostensibly disruptive actions. The second adopts a more explicitly relational approach, emphasising the complexity, emergence and multi-directionality of resistance. This review provides a backdrop for our subsequent arguments for a more holistic treatment of divergence in more-than-human relations, which deals more explicitly with non-living actors.

Figure 1 – Farmer nudges cow to leave robot (Authors' photograph)

3.1 Spatial transgression

The aforementioned cow's refusal to leave the robot illustrates the spatial transgression frequently referred to by animal geographers (e.g. Philo and Wilbert, 2000). Her failure to leave prevented the robot from milking other cows, reducing the farm's productivity, and subverting the automated nature of the system through necessitating the farmer's intervention. The cow was, in other words, 'out of place', or transgressive. Other examples of spatially transgressive animals from existing literature include cougars appearing in suburban California (Gullo et al., 1998), pigeons coming to be labelled as out of place in urban areas , 'wild' animals breaking into domestic homes (Yeo and Neo, 2010), captive animals breaking free from their enclosures (Bear, 2011; Hribal, 2011) and animals showing little respect for physical (Lulka, 2004) or regulatory-cartographic (Bear, 2013; Bear, 2014) boundaries placed around them. In the examples listed here, animal transgressions are far from politically inert and, as such, focusing on transgressions continues to offer a useful route into emphasising animals' agency and understanding how space emerges through multispecies relations.

However, we argue that the potential of 'transgression' as an analytical device is limited, or at least underdeveloped. First, the concept is often employed simply to refer to the movement of animals from one place to another; in the example of the cow, above, we have extended this to a *failure* to move. Such acts may be construed as deliberate or accidental ('unwitting' in Philo's (1995: 677) terms), but intentionality is less significant in analyses than 'the *results* – …the "being noticed" of a particular action. …Transgression is judged by those who react to it' (Cresswell, 1992: 53-54; cited by Philo, 1995: 656; see also Yeo and Neo, 2010). Transgression, therefore, makes animals very visible but the focus of the literature is more often on human responses rather than on animal lives *per se* (cf Philo and Wilbert, 2000).

Second, the examples of transgressive acts cited here generally refer to boundaries placed (ostensibly) by humans. The studies cited earlier in this section show that human desires for the spatial organization of animals can emerge from concerns around issues ranging from zoonotic disease through to fears around being attacked by animals and to efforts to protect and conserve certain animals that, for instance, hold economic value. In contrast, during our fieldwork it was often unclear who or what placed boundaries. For instance, the arrival of cows at a milking robot is not an orderly process, frequently involving jostling as cows stake a claim for their place in the robot (see Figure 2). One farmer (Conversion Farmer 1[4]) referred to certain cows 'hanging around going through all day and they wouldn't let the other cows come near'. Another (Robot User 1) found that 'some cows like the robots so much that if I'm trying to get one in the bully will be patrolling its area'. Spatial order and organisation, therefore, are not established by the farmer alone; the farmer, too, must navigate boundaries that emerge in relation to bovine hierarchies (see Gygax et al., 2010), and farm management takes place *with* animals (see also O'Doherty, 2016; Sage et al., 2016; Latour, 2013). Conceptualisations of transgression often stop short of engaging with such intra-species organisation, over-simplifying the nature of non-human actions and focusing more on the disruption of human intentions and desires.

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[4] Pseudonyms used here – to protect participants' identities – are consistent with those used in other publications from this project. We distinguish farmers according to the system(s) of technology they employ (i.e. robot or 'conventional'). This farmer was in the process of converting from a non-robotic parlour to AMS.

Figure 2 – cows jostling near a milking robot (Authors' photograph)

3.2 Resistance: Disruptive and violent encounters

Alongside the examples in the previous section, we frequently witnessed or were told about explicitly aggressive behaviour: cows kicked robots, headbutted feed dispensers, tried to 'wreck' the robots, and attempted to kick farm workers. Our initial engagement with such behaviour was guided by the common association of violence with 'resistance' in animal studies. In analysing the uneven power relations between humans and animals – and especially those animals that are held in captivity – violence has been a frequent focus. While this has sometimes involved actions of humans against animals (Gröling, 2014), some authors have examined animals' agency in resisting their captivity. For instance, Morin (2015: 77) speaks of caged animals 'using their own bodies as weapons,' kicking or attacking 'their human caregivers,' while Srinivasan (2013: 114) refers to a captive orca killing its trainer as a display of 'animal resistance.' However, violence is not a necessary characteristic of animal resistance. In Gillespie's (2016: 117) study of dairy farming, 'refusing to eat or work' were as much characteristics of resistance as 'escaping, kicking [and] biting', and Peterson (2007:38) similarly wrote of animals used in theatrical performances as resisting by 'not kicking out' – by a 'refusal to be "wild".' Indeed, numerous examples of non-violent animal behaviour characterised as resistant can be found in the literature, ranging from captive dolphins taking trays of fish bought by visitors to feed them by hand (Warkentin, 2009: 36), to pigs 'eating through the wood that made up their pens' (Coppin, 2003: 612), ducks refusing to 'enter the slaughterhouse in an orderly fashion' (Youatt, 2012: 351), and horses bringing a 'risk of instability' to displays of horsemanship (Schuurman and Franklin, 2015: 29).

For many authors cited here, the examples of cow behaviour at the start of the section could be construed as bovine resistance – cows obstructing human desires, sometimes through violent response. Such examples may have practical significance – for the farmer, the ease of 'training' cows, the longevity of robots and suchlike; for the cows, their ability to communicate frustration and discomfort and the extent to which this is acted on. The interpretations of 'resistance' presented thus far go beyond merely highlighting the 'dissonance' (Brown and Dilley, 2012) and 'discomforting encounters' (Garlick, 2015) in many more-than-human relationships to provide 'evidence that a being has agency' (Carter and Charles, 2013: 328). However, through focusing on specific disruptive actions, they might be viewed as 'descriptive' interpretations.

Although such instances were relatively easy to find and observe, our observational fieldwork (see Bear et al. (2017) for a full discussion of this methodology) left us questioning what *else* could be construed as resistant or whether that label should be applied at all. As Pearson (2015a: 719) observes, biting and kicking of humans by horses has been referred to as resistant (Baratay, 2012) but could be interpreted as actions of 'fear and stress'. Similarly, Gillespie (2016: 129) warns that some animals 'resist a little but give up when they learn that their resistance does not improve their conditions, and some never resist'; a lack of physical resistance does not necessarily equate to contented animals. Further, in the first example from our fieldwork, the focus of any resistance that might be identified is unclear; the cow fails to respond to the robot as its manufacturer had intended, requiring human intervention. Any resistance here is necessarily hybrid and distributed, rather than simply the disruptive actions of an animal against a human.

The dilemmas from our own fieldwork speak to wider debates in relation first to intentionality and resistance, and second to the focus or direction of resistance. With regard to the first, Philo (1995: 656) quotes Cresswell (1992: 53-54) to argue that, in contrast to transgression, 'resistance rests on the intentions of the actor(s)'. Some writers build on this to consider the relationship between intent and consciousness, with Wilbert (2000) arguing that resistance can emerge through practice rather than conscious intent and that it is not necessary 'to go so far as to impute conscious intentionality to animals in order to speak of purposive action'. Neo and Ngiam (2014: 238-239) take this further, arguing that an animal 'can "dissent" against its representation', and that 'even if one were to dismiss such dissent as an "agency without intentionality", that the animals behave in ways contrary to their representations, impl[ying] that animal representations cannot be completely in human hands, but in part with the animals'. In contrast, others have argued that the connotations of intention ostensibly inherent to resistance are unhelpful. Pearson (2017: 251), for instance, argues for the use of 'less politically loaded terms…such as "thwarting" or "blocking"' (see also Birke, 2012). In other words, it should not be assumed that such creatures are deliberately antagonistic; rather their actions work to remind us that even in controlled settings, they retain animality, express subjectivity and have agency. For Gillespie (2016: 123), it is less the act itself, or the intention behind it, than the situated nature of actions within a political-economic system that should be analysed. She navigates the issue of intentionality by arguing that animal resistance studies should focus on 'the way other species act in response to conditions created by the uneven hierarchies of power between humans and animals'. There, the act is a route into examining power relations, rather than the endpoint of those power relations.

Secondly, there is not a consistent sense in the literature of *what* or *who* is being resisted. The wider geographies of resistance literature has tended to conceptualise power either as held by individuals and exercised against oppressed groups, who in turn direct their resistance against those in power, or as distributed and 'entangled' (Sharp et al., 2000). Some authors argue that such conceptualisations might be relevant to nonhuman animals. Best (2014: 126, emphasis added), therefore, contends that animals 'rebel against abusers and fight for freedom *just as humans do*', with Hribal (2007) suggesting that, in Pearson's words, 'animal labourers in capitalist systems…can take their place alongside human working-class radicals and revolutionaries'. More commonly, it is accepted that animals' resistance cannot be equated to that of humans as they 'cannot organize collectively to resist the relations of power and domination within which they are enmeshed' (Carter and Charles, 2013: 334; see also Palmer, 2003; Scholz, 2013), and 'cannot even begin to share the same systems of (political) meaning' (Philo, 1995: 656; see also Pearson, 2015b; Pearson, 2017; Hobson, 2007). Palmer (2001: 354) takes such arguments further, drawing on Foucault to contend that animals in systems of domination are *incapable* of resistance, as when they are 'placed by humans in situations or environments where no reaction or response from them is possible, they are being treated *as things* – even though they…*could have* been treated as beings who react.' Such animals, according to Palmer, become objects 'to which things are done – however much one might want to maintain that, in other contexts, the being is not just a "thing".'

Conceptualisations of animals as resistant actors, therefore, have been useful in emphasising their agency, their frequent disregard for human desires, and that human-animal relations can frequently be 'discomforting'. Considerable positives to be drawn from this work include highlighting the dissonance found in many human-animal relations, and through offering a way to begin exploring uneven multispecies power relations. However, we share Pearson's (2017: 251) concern that a continuing focus on disruptive actions, such as animals' violence towards humans, projects 'human motivations onto animals', saying 'more about humans' desires for animal liberation and developments in critical inquiry' than about the animals themselves. Second, we are cautious about Palmer's (2001: 354) characterisation of animals as 'things' in systems of domination, 'when no reaction or response from them is possible'; even in industrial farming, a livestock animal can simultaneously be portrayed or encountered as a 'machine' and 'friend' (Convery et al., 2005: 105; see also Wilkie, 2005; Ellis, 2014) and through the ambiguous relationships associated with 'stockmanship' (see Butler and Holloway, 2016; Burton et al., 2012). Such fluid identities render propositions of total domination problematic. Third, we suggest that much of this work not only privileges 'nonhumans' resistance to human activities at the expense of other cross-species interactions' (Pearson, 2015b: 713) but also tends to side-line other nonhumans, whether living or otherwise.

3.3 Relational resistance

In contrast to the focus on specific and identifiable *actions* in, and on relations between humans and non-human animals, in work outlined thus far, others have retained a vocabulary of resistance but have emphasised its ambiguous directionality and emergent nature, while beginning to introduce non-living actors such as technologies more explicitly into conceptualisations of resistance. Wadiwel's (2016) study of fishing technologies, for instance, showed how purse seine nets developed around fishes' potential to resist, and that such resistance renders fish as co-creators (p. 221) of fishing

practices and technologies. It is not fishes' consciousness or intentionality that are central to any conceptualisation of resistance but rather that 'animal insubordination drives the development of new…technologies to counter that resistance' (Wadiwel, 2018: 533).

Others, however, have moved away from this sort of focus on resistance as emerging through embodied encounters. For example, following Foucault (2007), Holloway and Morris (2012: 67) interpret resistance as 'something which is always already alongside power and which is part of capillary processes of counter-conduct which pose alternate truths, authorities, knowledges, and moralities to those being established by "power"'. Their interpretation does not pit animals against humans *per se*, nor view resistance as simply located in the agency or intentionality of individual actors or subjects (Wolfe, 2012). Rather, they write of 'heterogeneous resistances', where resistance is distributed and emergent in 'heterogeneous biosocial collectivities' (Holloway and Morris, 2012).

Holloway and Morris's conceptualisation of heterogeneous resistances builds upon a reading of Foucault's notion of biopower, which holds that individuals internalise 'truth discourses, influencing their behaviours and social practices, and taking responsibility for the "care" of their selves in line with particular discursive framings of how the good self and good body should be fostered' (Holloway et al., 2014a: 133). Although Foucault developed his conceptualisation of biopower in relation to human populations, a growing number of authors (e.g. Asdal et al., 2017; Haraway, 2008; Holloway, 2007; Holloway et al., 2009; Twine, 2010; Wolfe, 2012; Youatt, 2008; Hinchliffe et al., 2017) have demonstrated that the ideas can be extended to nonhuman animals and their relations with humans. This extension is useful in conceptualising nonhuman resistance because of the way Foucault positions 'life' at the centre of relations of biopower. As Deleuze writes of biopower, it is 'life that emerges as the new object of power' (1988: 76). As such, 'when power in this way takes life as its aim or object, the resistance to power already puts itself on the side of life, and turns life against power' (*ibid*). This perspective is suggestive of organisms' potential to resist 'power' in different ways due to capacities and demands associated with their 'livingness'.

Nonetheless, the association of resistance with individual entities – such as in the earlier examples of 'descriptive resistance' – is problematic. Holloway and Morris's (2012: 64) interpretation specifically elaborates on Rabinow and Rose's (2006) discussion of biosocial collectivities, exploring how 'assemblages of humans and nonhuman animals [take] shape around different and changing knowledges concerning the fostering of life in agricultural and food systems'. Studying genetic knowledges in livestock breeding, they showed how collectivities that form around geneticised truth discourses are heterogeneous, not formed solely of human actors (Holloway et al., 2009; Holloway and Morris, 2012; see alsoRabinow, 1999). In these, 'the lives, bodies, subjectivities and behaviours of humans *and nonhumans* are powerfully influenced by particular regimes of truth' (Holloway et al., 2014a: 134, emphasis added). Resistance might therefore be associated with collectives, not (simply) their constituent entities. Wolfe (2012: 34) similarly argues against resistance being 'coterminous' with agency, suggesting instead that it is constituted in forces and bodies 'that only partially coincide with what we used to call the subject'. Indeed, from this perspective, subjectification proceeds (at least in part) from 'resistance' to power.

According to Holloway and Morris (2012), resistance can take multiple forms. Drawing on fieldwork with farmers using new 'genetic' techniques in livestock breeding, they acknowledged that certain

breeders' 'scepticism' (p. 74) about, and reluctance to engage with, genetic knowledges and techniques could be construed as resistant to a powerful idea of genetic 'progress'. More significantly, their paper argued that heterogeneous biosocial collectivities are not necessarily characterised by shared will or endeavour and can involve practices of 'resistance to or contestation of…knowledges and interventions' (p.65). Livestock breeding, by its nature, 'intertwines the lives and life of humans and non-human animals' (p.74); while certain breeders may be enthusiastic about the use of genetic techniques, animal bodies' materiality can render the collective problematic as they fail to conform to supposed genetic 'truths' breeders are told about their animals. They therefore refer to 'diffuse, capillary modes of resistance to the biopower of geneticisation' (*ibid*), wherein resistance does not simply equate to the non-acceptance of new genetic techniques but emerges in relations between bodies, practices and discourse.

Building on these ideas, we have argued elsewhere that truth regimes extend beyond the genetic and are seen more widely in dairy farming, producing 'specific interventions in the co-constituted lives of dairy cows and dairy farmers' (Holloway et al., 2014a). Dairy farming, therefore, 'is comprehendible in terms of relations of biopower' (ibid). Regimes of truth around AMS emerge through farming practices and discourses such as those around the marketing of AMS, which imply appropriate ways of being bovine (e.g. physically in relation to udder conformation, or temperamentally in terms of being motivated to go to a milking robot) or being a farmer (e.g. being 'progressive' and willing to engage with large quantities of data in herd management). We have therefore argued that the heterogeneous actors on dairy farms comprise a biosocial collectivity that depends on the 'simultaneous subjectification of the cows *and* the humans in accordance with the establishment of a particular regime of care' (p. 137, original emphasis) and in relation to the demands of particular technologies. We did not, however, explicitly examine how the conceptualisation of resistance as heterogeneous might be applied or developed in this context.

Returning to the examples from our fieldwork, we might reinterpret them in light of these arguments about resistance as relational, and about its constitution within collectivities in which actors' identities and subjectivities are similarly being co-constituted. For instance, a cow is not simply 'lazy', resisting the AMS by not attending, but her subjectivity as a 'lazy cow' is produced from relations in which she is enmeshed: conditions such as lameness related to barn flooring may disincentivise attending the robot; she may experience bullying from other cows while trying to attend; 'lazy' behaviour might be linked to her diet (Driessen and Heutinck, 2015); or, as we were informed by veterinary scientists, the demands placed on her by her metabolism and by a systemic requirement to maximise yields of milk from bovine bodies have created a cow biologically stressed and thus unwilling to play her expected role in the AMS. The very 'life' (her health, her metabolism) of the cow here is crucial in understanding this as resistance within relations of biopower which seek to discipline and exploit that life (her capacities to produce milk, and to visit the robot to have it extracted). Similarly, cows' violence against robots in AMS need not be an act of intentional resistance but could be regarded as an example of how 'life' resists confinement, restriction and direction in conditions of industrial agriculture, with that violence emergent from a necessary relationship between cow, human and machine.

A key attraction of this interpretation is that it encourages exploration of resistance as distributed rather than directed by one actor against another, or against an amorphous 'system'. Further, it allows for resistance to emerge not only between individuals (though does not preclude this) but also

between different groups, which may themselves be emergent and heterogeneous, and as a co-production with attempts to control or to direct conduct. Nevertheless, this work's focus has been on '*inter-species* relationships' , with technologies viewed as 'apparatuses that intervene almost constantly in the lives of' livestock (*ibid*). Indeed, in the few other instances where Foucault's ideas around biopower have been extended beyond humans, the emphasis has been on collectivities composed of living beings (Holloway and Morris, 2012; Collard, 2012; Youatt, 2008) . Actors such as technologies often appear somewhat inert in such analyses, or are characterised as tools through which biopower is enacted. In the following section, we examine implications of developing a more holistic conceptualisation of more-than-human divergent conduct, which accounts for non-living nonhumans.

4. Technobiopower and topologies of more-than-human divergent conduct

In this final substantive section, we develop further conceptual tools which aid analysis of the more-than-human relationships involved in AMS. We suggest that, moving beyond some of the problems discussed around ideas of transgression and resistance, the terminology of divergent conduct helps to work through some aspects of existing perspectives which discuss actor-networks (e.g. Latour, 2005), meshwork (Ingold, 2008) and entanglement and assemblage (e.g. Ingold, 2008; Ogden, 2011; Nading, 2014; Tsing, 2015). These approaches emphasise convergences of heterogeneous elements, exploring how their co-constitution emerges within networks that exhibit various degrees of (in)stability.

Importantly, such entanglements can include relationships ranging from the convivial to the antagonistic (Nading, 2014: 11). As such, we build on Murdoch's (2006: 79) comment that while some networks have a degree of stability and an alignment between entities involved, in others 'the links between actors and intermediaries are provisional and divergent, where norms are hard to establish and standards are frequently compromised'. Here, Murdoch draws on Latour's discussion of actor-network theory (ANT), where an intermediary is something that 'transports meaning or force without deformation' (Latour, 2005: 39). We return to this below in arguing that in divergent conduct such entities (e.g. a technology) can become active mediators, which develop into more complex and less predictable components of the systems they are part of because they 'transform, translate, distort, and modify the meaning or the elements they are supposed to carry' (ibid: 39). In such circumstances the element that has become a mediator can 'lead in multiple directions' (ibid: 39); divergence is an outcome of a shift on the part of an entity from intermediation to mediation.

Asdal et al. (2017) have begun to explore how Latour's arguments might extend the conceptualisations of biopower introduced previously. For them, interventions of – and, by implication, resistance to – biopower are understood in relation not just to a bounded or fixed version of 'life' but to 'lively entities' and 'things' (p. 18). These 'things' are not limited to entities that are organic or sentient, and liveliness is not constituted as 'life' *per se* but rather as a sense of agency 'within the practices and events' being studied (p. 16). While Asdal *et al* do not consider resistance explicitly, the idea that nonhuman things might 'object' is central to ANT. As Latour (2000: 116, original emphasis) argues, 'Natural objects are naturally *recalcitrant*…they always resist and make a shambles of our pretentions

to control' (see also Leap (2014) on 'troublesome nonhumans'). It is in part this recalcitrance that makes nonhumans' agency visible (though as Despret (2013: 42) notes, it is important not to *only* acknowledge nonhuman agency in this way).

Haraway (1997) has also critiqued the constitution of 'life' at the heart of Foucault's biopower, arguing against his inherent 'species chauvinism' (2008: 60). In response, she refers to a 'technobiopower:' a 'political regime constituted by the implosive imbrication of informatics, biologics, and economics, which controls citizens via the redistribution of technobiocapital'. She views technologies not as ontologically separate from modes of life but rather as bound up in 'the world-building alliances of humans and nonhumans' (1997: 51). Similarly, in attempting to disrupt assumed boundaries between humans and technologies in favour of an ontology of hybrids or cyborgs, she claims that 'machines are disturbingly lively, and we ourselves frighteningly inert' (1991: 152). She further dissects the 'we' of that assertion, conceptualising the subject as decentred, emerging through 'co-constitutive relationships in which none of the partners pre-exist the relating, and the relating is never done once and for all'. More recently, Haraway has written of wanting to 'affirm on-the-ground collectives capable of inventing new practices of imagination, resistance, revolt, repair and mourning, and of living and dying well' (2016: 51). Resistance must be seen as co-produced with power and control, which in turn, are exerted 'over a technoliving and connected whole' .

In this sense, technologies are considerably more than tools through which (techno)biopower emerges and affects humans and animals; they are active within heterogeneous, hybrid (technobiosocial) collectivities. It is thus too simplistic to say that any cow merely resists human intentions and desires; these intentions and desires, and divergent conduct, are themselves co-produced in unsettled and problematic more-than-human relations between farmers, their milking robots and the wider technological system (involving barn architecture, manufacturers' instructions, data collected by the robots about each cow and so forth). From the perspective of human actors at least, technologies are unreliable accomplices in regimes of biopower. That their interventions will accord with human intentions cannot be assumed.

A wider body of scholarship from science and technology studies has pointed to 'fluidity' in technological artefacts (e.g. Law and Singleton, 2005; De Laet and Mol, 2000). This notion of fluidity helps us to see technologies as mutable instead of stable and directs us to the work that is done to make them less mutable so that they perform particular roles. Work in this vein has demonstrated that technological artefacts are co-constituted by and alongside their users, whether in how they are talked about and constructed (Pini, 2005), how they are used to reinforce particular identities and subjectivities (Saugeres, 2002) or are re-worked by their heterogeneous users in being used differently from the ways intended by manufacturers (Holloway et al., 2014a). Users, therefore, are not simply the passive recipients of completed equipment (Oudshoorn and Pinch, 2003), whilst technologies do not emerge alongside stable and predictable users. Indeed, as Singleton (2010, see also Law et al, 2014; Law and Singleton, 2005) has suggested, a process of 'tinkering' – suggestive of experimentation, or trial and error (Law et al, 2014) – is common in relation to fluid technological entities, in order to make something provisionally and temporarily 'work'. Drawing on these concepts, we argue that a terminology of divergent conduct allows us to articulate more effectively some of the complexities of relationships between humans and living and non-living nonhumans such as those in AMS.

The idea that technologies and their users are fluid relates to the notion that space itself is fluid. As Ingold (2008, drawing on Mol and Law, 1994) argues, in fluid spaces 'there are no well-defined objects or entities. There are, rather, substances which flow, mix and mutate…sometimes congealing into more or less ephemeral forms that can nevertheless dissolve or reform' (1806). The terminology of topology furthers this conceptualisation of space as fluid. Topological thinking (following Law, 1999; see also Murdoch, 2006; Hinchliffe et al., 2017) challenges topographical views of spaces as containers for action by arguing that spatial formations are constituted through relationships between heterogeneous actors. Metaphors of space as folded or pleated suggest that a topology is 'an undulating landscape in which the linkages established in networks draw some locations together, while at the same time pushing others further apart' (Murdoch, 2006: 86). Topologies draw our attention to both transformations and durabilities in the ways that they map out the co-production of change and stability (Hinchliffe et al., 2017) and can allow us to suggest how resistance, rearticulated as divergent conduct, relates to multiple geographies that describe the extension of relationships between human, animal and non-living entities.

It is, however, simplistic to argue that topological thinking should simply replace topographical perspectives; topographies and topologies overlapping and inter-relate (Allen, 2011), such that materialities and specificities of particular places and landscapes, for example, entangle with topological drawings-together and pushings-apart, emphasising that in many empirical instances topography still matters (see Jönsson, 2016). Following Murdoch (2006), the relationships between both the topographical sites we have focused on in this paper (i.e. dairy farms) and the topological, networked spaces of which they are part are crucial to understanding the interplay between attempts to extend power and the inevitability of divergent conduct. At the same time, Murdoch follows in arguing that topological spacing is multiple and fluid, produced by and producing multiple identities, ontologies and relationships (see also Mol and Law, 2002). For Mol and Law (2002), topological thought is necessitated by a sense of ontological multiplicity, where different kinds of ordering and order coexist and are co-produced with overlapping and interconnected spatialities. Such a view of spaces, as co-produced, complex, part of 'agonistic' relations between heterogeneous entities, and as multiple and fluid, leads us to rethink ideas of resistance in terms of divergent conduct associated with different yet connected topologies. These nevertheless centre around the ongoing and relatively, if temporarily, stable convergence of heterogeneous entities situated on particular topographical sites – e.g. UK dairy farms. Divergent conduct here is not simply diametrically 'counter' to a dominating force but is potentially multiple in the way that different entities might simultaneously be re-ordering things in several ways.

To illustrate this, we outline two further examples of the topologies associated with instances of AMS 'accidents, breakdowns and strikes … where all of a sudden completely silent intermediaries become full blown mediators'. The first articulates problems associated with new topological formations linked to attempts to make robotic milking spaces; the second to an emergent 'disease situation', or 'the suite of issues that make disease more or less likely' (following Hinchliffe et al., 2017), enacted in part by introducing robots into milking practices. Both encounters emphasise robots' active nature as mediators, especially when things go wrong, and mark the production of new kinds of topology associated with divergent conduct within AMS assemblages of cows, robots and people.

First then, we look at how robot manufacturers have tried to create spaces for AMS. The example begins with the admission of a mistake. Here, an AMS manufacturer described how they moved towards the establishment of dedicated regional marketing and servicing centres:

> It's important to acknowledge that we as a company made mistakes, we sold robots to people, anybody who was interested, and we sold them geographically where we couldn't support them … we didn't have engineers nearby. So in the early days we made mistakes … So we only then … we targeted areas, and our centre would only sell in that particular area. So today the … robots in the UK, a lot of these centres have only come up in the last twelve or eighteen months and now we're not selling in a wider geographical area, we're just selling in little pockets of areas where we had engineers. (AMS Manufacturer 1)

The company thus recognised that, in effect, it needed to produce new geographies for its robotic technologies because the human-cow-machine relationships before this reconfiguring of AMS space were subject to failure: technical issues and routine maintenance could not be dealt with adequately. Prior to the production of this new AMS geography, there was a topological folding of robotic technologies and expertises from overseas countries (where the technology was developed and marketed) into the barns and practices of British farms, but also a simultaneous topological distancing or pushing-apart of the engineers and advisers (who would normally advise on AMS installation and barn configuration, repair the robots and ensure that feeding etc. was done effectively), from the farms (and their robots, cows and people). The knowledge and expertise they required was now elsewhere, and malfunctioning robots were revealed as mediators, making a difference to the situation, not simply inert machines. Farmers themselves spoke of the outcome of the earlier problematic topology. In the first case below, the farmer refers to the problems of over-expansion that the manufacturer above discussed, while in the second case the robot's mediating role becomes clear when it breaks and topological distancing between the farm and the necessary expertise emerges:

> …we put [the robot] where the [company] chap said. And…a couple of years later we've really regretted it and decided we'd made the wrong decision… at that time [the company] were reorganising the business and expanding fast and we probably didn't get the advice that we should have done. Having had that initial layout…we had a few issues that we should have resolved, and we finished up as farmers resolving them as opposed to getting their expertise in to resolve them. (Robot User 9)

> on the robots there's that much technology …talking to the fitters, even they're saying well if they break we don't know how to fix the damn things, there's not enough in the country, you know, to actually practice learning on, because that's all it is. You know, if something new comes out you have to learn how to do it. You can't go on a course for two days and be an expert despite what they tell you. (Conventional User 1)

These quotes illustrate the possibility for non-living nonhumans to (co)produce divergent conduct. The robots, by breaking and necessitating repair or by requiring particular expertise to be available to facilitate their effective use, are not 'resisting'. However, their particular characteristics, capacities and requirements make a difference in the situations they are folded into. As such, the functioning of the networks they, along with humans and cows, are part of can diverge from an expected mode of conduct (the efficient harvesting of milk) and become something that simply doesn't 'work' as expected and required by actors, whether they be the farmers, robots or cows.

A second example illustrates this with reference to the way that robots' capacities, their making a difference to a situation, come to be associated less with technological breakdown, and more with a

breakdown in the health and welfare of the bovine components of AMS assemblages. In the extract below, a farmer discusses the emergence of health problems (the udder infection mastitis, here linked to the bacteria *Streptococcus uberis* and *Staphylococcus aureus*) in an AMS, and their efforts to circumvent the robot's contribution to what we define as a divergent mode of conduct. The robot is meant to spray disinfectant on the udder during the milking process to combat mastitis. However:

> One of the biggest problems we had with the robot from the mastitis point of view was the spraying was absolutely pathetic. …what we did was get a very small minute drill and bored out the nozzle of all things and it gave a better spray and …gee-whiz what numpties, why have we never picked up on that? …we measured the volume of…stuff that they were using on each robot and it varied unbelievably per cow from 12 mls to 20 odd mls …it was just unbelievable so we…we've altered that, we've done the pre-spraying, we change our liners more than what [the manufacturer] were recommending. We also…for strep uberis we put on a Dosatron pump with peracetic acid to back flush with the acid to stop this spread…and then this flushing system on the [manufacturer name] system was fine but it was totally ineffective if you've got staph aureus or strep uberis. So we put on this peracetic acid pump just to stop cross contamination. So as these cows then leave this robot and go to the cubicles, they're not bringing the bugs with them to then cross-contaminate on the other cubicle robots. (Robot user 10)

The farmer thus describes, first, a situation where spraying was inadequate and problematically variable, and second, tinkering actions including modifying the robot themselves, exceeding the manufacturers' recommendations on changing liners, and adding a new disinfectant pump system, with other chemicals, to try to remedy the situation.

In this case, multiple living (humans, cows and microbes) and non-living actors (robotic milkers, Dosatron pumps, cluster liners and acids), which have been folded together within the micro-topologies of the farm and in the larger-scale topologies which connect this farm to international exchanges of technologies and AMS expertise and engineering, become part of modes of conduct diverging from an idealised model of AMS practice evident in the promotional and scientific discourses associated with this technology. Tiny elements – in this case ineffective spray heads and proliferating bacteria – can lead to divergency in carefully assembled and intricate systems (see Akrich, 1989, cited in De Laet and Mol, 2000). In combination, the robot's technical characteristics (ineffective and variable disinfectant spraying), bovine agency (spreading infection between cubicles), microbial agency (infecting udders and surviving ineffective spraying), and human subversion of manufacturers' instructions (re-engineering the robot with a drill and supplementing its capacities with additional pumps and chemicals) effect divergent modes of conduct, , although these are nevertheless oriented towards aligning the AMS as a whole with a normalised mode of conduct (that is, efficient milk production). While robots may 'work', in the sense of extracting milk from cows without direct human intervention, an important aspect of divergent conduct is that the notion of what counts as 'working' can be differentiated. As Laet and Mol's (2000) argued in relation to a Zimbabwean water pump, fluid technologies can be said to work, and simultaneously to be not working, on different levels. For example, the pump may draw water (it works), but the water may be dirty, and the pump might not contribute to community-building in ways which were expected. 'Working' and 'not working' are thus not binary. Similarly, an AMS which obtains milk but which does not prevent mastitis, is working only in part.

In interviewing AMS manufacturers, it was evident that a model of disseminating an ideal of robotic milking, which could be contested or resisted by farmers or cows doing things differently, was too simplistic. In practice, companies negotiated with and learned from farmers, cows and other entities.

Divergent conduct, therefore, is not just deviation from practices dictated by (in this case) AMS companies, although it might contravene the idealised robotic milking micro-geographical ordering and practices they promote. Divergence seeps in through the tacit acceptance that in practice, behind the ideal, are differences in the views, aims and capacities of the various actants involved in robotic milking situations (company representatives, farmers, technicians, cows etc), alongside differences in specific farm microgeographies and topological relationships.

In this section, we have moved towards a topologically-inflected understanding of more-than-human divergent conduct. We have shown how within this divergent conduct (conduct divergent in potentially more than one way from those outcomes required or desired by particular actors), non-living nonhumans have agency, a capacity to make a difference to the possibly multiple conducts that emerge from a situation, alongside the humans and nonhuman animals they are associated with. We argue that this opens up a new vocabulary in conceptualising some of the tensions and divergent forces inherent in attempts to try to manage 'the conduct of conduct' in 'technobiopowerful' situations. In the concluding section we summarise our key arguments and outline some implications of this perspective on transgression, resistance and more-than-human counter conduct.

5. Conclusions

Where Foucault's (2007) concept of counter conduct remains anthropocentric and suggests a diametric opposition to the efforts of 'power' to govern conduct, divergent conduct is intended to suggest the potential for several tangential divergences to be taking effect simultaneously within more heterogeneous collectivities. We argue that emphasising divergent conduct complements existing approaches to entanglement and provides a useful conceptual tool for navigating some of the problems and tensions encountered within understandings of resistance found in many descriptions of situations where humans and nonhumans are associated in less-than-convivial ways. Alongside metaphors of network, assemblage and entanglement, the concept of divergent conduct aims to both avoid an anthropocentric focus on humans and their intentionalities and a simplistic dualism of nature and culture, by acknowledging the agency of heterogeneous human and other-than-human entities, any of which can become a mediator (Latour, 2005), and all of which are less-than-stable and relationally-constituted. The concept directs us to focus on non-living nonhumans in the same ways as we approach human and living nonhuman actors, regardless of the ways in which some of these actors might be attributed with intentionality or otherwise.

Divergent conduct relates to the multi-dimensional, topological *and* situated relationships between humans and living and non-living nonhuman entities, each with potential to make various differences to situations through the multiple material and affective capacities produced by and effecting the inter-relationships which they do not pre-exist and within which they are not fixed. For instance, where farms were both drawn into close and dependent relationships with overseas AMS companies and distanced from the advice and technical support they needed, divergent conduct was evident where the contradictory topologies of AMS meant that a 'broken' robot could begin to mediate a set of relationships in which what happened would diverge from what was expected. Similarly, the agency of microbes and malfunctioning robots became evident in mastitis disease situations, resulting in

divergent conduct from (amongst others) tinkering humans who effected illicit repairs and improvements to the robots in attempting to realign conduct with what was needed (efficient and profitable production of milk). But the idea of divergence does not mean that things have (simply) gone wrong, or that in an empirical situation there has been a departure from a 'right path;' determinations of 'right' and 'wrong', of what works and what doesn't, are seldom clear (Laet and Mol, 2000). Instead, we suggest that AMS is constituted around a number of different human and nonhuman requirements, and their related conducts, sometimes diverging in multiple trajectories, through topological and topographical spatialities. In examining this further we might examine, for instance, ideals of AMS, bovine and human behaviours, and how machines and microbes 'should' behave in relation to the topologically destabilised and multiple relationships between on the one hand human and bovine bodies, technologies and international exchanges of machines and expertise, and on the other, the topographical spaces of barns, farms, farmed landscapes and situated human-animal-technology knowledge-practices. However, what might be seen or experienced as divergent conduct in other empirical examples involving very different assemblages of humans and living and non-living nonhumans, may vary considerably. We conclude, therefore, by setting out a three-fold agenda for the further conceptualisation of divergent conduct as an alternative to a language of resistance.

First, as suggested above, following Mol and Law (2002), there is a need to pay attention to the multiple nature of divergent conduct and to avoid a sense that it can be uni-directional (Wadiwel, 2018). If divergent conduct can pull in multiple directions within a situation, resulting from and producing different orderings and orders, how can this be traced and described, and how can its differential effects be understood? Divergent conduct provides one way of beginning to define the paths (Mol and Law, 2002) needed to navigate the multiple orders and spaces associated with tensions and differences evident within entanglements of actors and relationships, and resonates with the idea of an ontological politics (Hinchliffe, 2007) which encourages a confrontation with the problematic nature of many human-nonhuman relationships (see below). The idea that divergent conduct is multiple suggests that there are further questions concerning the agency and mediation of nonhuman actors within such conduct. In particular, how can entities' different capacities and abilities to affect situations be mapped against the series of divergences they might be associated with? How can such a multi-dimensional agency be described in relation to a flourishing of divergent conduct in other biological-technological entanglements?

Second, the interconnected topologies and topographies of divergent conduct in different situations will be of interest. We have suggested how divergent conduct can be related to the ways in which (in the case of our empirical examples) technologies, companies, cows and suchlike are topologically connected or disconnected. In considering further examples, multiple divergent topologies might be described and mapped out, and articulated with other understandings, for example, of the social construction of spaces and scales co-produced with these specific examples (Marston, 2000), and of the situated or emplaced convergences of human and nonhuman entities (e.g. on specific farms and in particular farmed landscapes). .

Finally, in proposing this agenda, we suggest that exploring moments, topologies and topographies of divergent conduct provides a perspective on less-than-convivial, only patchily-working, networks or entanglements of humans, nonhuman animals and technologies. Our move away from a vocabulary

of nonhuman resistance should not be taken to imply a depoliticisation of more-than-human geography, nor a shying away from the intrinsically awkward (and, indeed, sometimes violent) relations inherent to contemporary livestock farming. Rather, following Srinivasan (2016), we suggest that focusing on more-than-human divergent conduct enables a continuing emphasis on 'direct encounters,' while concurrently attending to 'systematic' factors, without recourse to theories of hegemonic power. In addressing ontological questions about the nature of resistance, and proposing an alternative terminology of divergent conduct to analyse some of the relationships and processes evident in the kinds of human-animal-technological entanglements found in this paper, we seek not to sidestep the urgent politics of these relationships. Instead we argue that our approach, with its emphasis on the multiple nature of possible divergence, concerns the ontological politics discussed by, for example Mol (1999, cited in Hinchliffe (2007)); see also Law (2004). These authors argue that simply acknowledging different perspectives on a thing or a messy and complex situation is insufficient; instead, taking a perspective has effects, creating or enacting things and situations. Multiple perspectives (and multiple ways of producing perspective) enact things and situations differently, so that what is being 'viewed' is multiply produced. The idea of divergent conduct adds to this, providing a way of exploring problematic and politicised entanglements in which inequalities of power can be many layered and intersectional. The multiple effects of different perspectives and their enactments could thus be explored in terms of how divergence is produced, with a focus on the politics and power structures constituting the relationships between different entities. The concept of divergent conduct thus provides a perspective on the disruption of smooth flows of conduct in situations involving heterogeneous living and non-living entities, in turn producing and being produced by complex and shifting topological and technobiopowerful relationships.

Acknowledgements

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