Workplace Learning on Dairy Farms: Contemplating the Notion of a Multi-Actant Community of Practice

Leonie Cornips

NL-Lab (Humanities Cluster, KNAW), Amsterdam & Maastricht University, Maastricht, Netherlands
Email: leonie.cornips@maastrichtuniversity.nl
ORCID: https://orcid.org/0000-0003-2408-6083

Daan Hovens

Maastricht University, Maastricht, Netherlands
Email: d.hovens@maastrichtuniversity.nl
ORCID: https://orcid.org/0000-0001-5181-6219

═══

Abstract:

This paper discusses whether the framework of communities of practice can be used to describe and analyse processes of workplace learning and work routinisation in an environment where human beings are physically absent most of the time. The communities of practice framework is typically used to capture processes of workplace learning among human beings, with a joint enterprise, mutual engagement, and a shared repertoire as defining characteristics. Inspired by the insights from a linguistic-ethnographic study of human-machine interactions in a metal foundry, the paper contemplates the notion of a multi-actant community of practice in the context of two dairy farms, composed of farmers, cows, robots, and various other non-human actants. First, the paper finds evidence of mutual engagement between different actants (such as cows and robots), leading to routinised work practices. It also finds evidence of shared repertoires, which create shortcuts in these practices. Reminiscent of previous observations in the foundry, one salient artefact in the dairy farms can be interpreted as sound symbolism. The paper further finds that different actants on the farms function as 'experts' and 'newcomers.' Finally, regarding the identification of a joint enterprise, the paper finds that it is more difficult to speak of a genuine 'community', as different actants have different interests and reasons for their mutual engagement. At the same time, this conceptual puzzle opens an urgent academic and societal discussion on perspectivity in multi-actant work environments, of which a dairy farm is but one example.

Keywords: multi-actant community of practice, workplace learning, work routinisation, sound symbolism

1. Introduction

Extract 1. Learning routine activities in the Core Shooting Department, 12 July 2017

Unmarked = Associated with English

Italics = Associated with German

(xxx) = Unintelligible speech

(word) = Transcriber unsure

(.) = Short pause

01 JON:[1]	down (.) okay
02 DAA:	okay
03 JON:	(get it?) (.) yeah
04 DAA:	oh (.) (xxx) (.) okay
05 JON:	(here) down (.) up (.) down
06 DAA:	yeah yeah
07 JON:	(xxx) (.) slow down (.) slooooow down (xxx) and slow down (.) up (.) *jaaa* fast[2] slow down *aber*
08 DAA:	oh okay hahaha

Extract 1 shows an example of how the second author (DAA) was introduced to a routine work activity during his linguistic-ethnographic fieldwork in a metal foundry in the Dutch province of Limburg, in the Dutch-German borderland (see also Hovens 2021). JON was a temporary worker from Poland who lived in Germany at the time (L1: Polish), and who had more relevant work experience in the foundry than DAA, a participant-observer from the Netherlands (L1: Dutch and Limburgish). In the shared example, JON is teaching DAA how to use a hoist to lift a (heavy and fragile) sand core from a platform onto a wooden pallet. DAA is controlling the hoist, while JON is giving instructions.[3] As underlined by JON (in line 07), it is important that DAA does not raise or lower the hoist too quickly and suddenly, as this could cause the sand core to break. Therefore, DAA needs to develop a feeling

---

[1] "JON" is not his real name – we make use of pseudonyms to ensure anonymity.

[2] "Fast" could also be a German word meaning "almost", but JON's pronunciation sounds more like the English word "fast" (meaning "quick").

[3] As the transcript is based on an audio recording, the precise interactions with the hoist (e.g., pressing a button) could unfortunately not be transcribed.

for the 'right' amount of pressure when using the control buttons, and this can only be developed by practicing using the hoist. In this way, the hoist (as a *non-human expert*) is teaching DAA at least as much about how to use it as JON does, although JON is playing a key role in communicating norms about 'right' and 'wrong' working behaviour in this setting.

Observations and embodied experiences such as this problematise human-centric approaches to workplace learning (see also Hovens 2020). At first, the production workers of the metal foundry's Core Shooting Department may be considered a typical *community of practice* (Wenger 1998: 73). After all, more and less experienced people regularly engaged with each other in this department due to its joint enterprise (i.e., producing sand cores for metal moulding), and they built up a shared repertoire of routine activities in the process. However, as shown by extract 1, people did not only engage with each other, but also with various *non-human actants* (Latour 2005) such as tools and machines, and these non-human actants typically played a key role in workplace learning processes. Therefore, the notion of *multi-actant community of practice* might be more precise here.

When it comes to emerging language practice, the role of non-human actants should not be underestimated either. The metal foundry's production departments were not only linguistically diverse – they were also very loud due to the presence of machines, tools, and radios. In extract 1, JON and DAA speak English as a lingua franca with occasional elements that are typically associated with German (as in line 07). More importantly, however, the extract shows an example of *sound symbolism* (linguistic iconicity) as a tool for effective communication, especially in loud and linguistically diverse settings. Specifically, in line 07, JON underlined the meaning of "slow down" by literally slowing down the pronunciation of the first vowel. In this way, he overcame the arbitrary relation between the sounds and the meaning of the phrase "slow down" by strengthening the connection between the sounds and the meaning that he was trying to convey. Just like the hoist, the sound symbolism helps to make certain activities faster and more effective. Thus, as *reifications* (Wenger 1998: 61), *affordances* (Gibson 2015), or *artefacts* (Holland et al. 1998; Latour 1992), they enable shortcuts in the department's work and language practices.

Inspired by the insights from the metal foundry (see also Hovens 2021), this paper further contemplates the notion of a multi-actant community of practice. Specifically, we focus on linguistic-ethnographic field observations on two dairy farms, where human beings are physically absent most of the time. As a critical test case, these farms show how much the notion of community of practice can be 'stretched' when it is approached from a posthumanist point of view (Pennycook 2018), and what kinds of insights on workplace learning and work routinisation we might get from this. The next two sections of the paper proceed with a brief introduction to our theoretical and methodological approach, which is followed by an in-depth discussion and reflection on the farms as a case. Rather than a conclusion, we end with a section with final thoughts.

2. A Posthumanist Approach to Multi-actant Communities of Practice

Routinisation or *Taylorisation* is "the management practice of segmenting labour into standardised, repeatable tasks in order to maximise efficient production" (Urciuoli & LaDousa 2013: 177). The framework of communities of practice can be useful to describe processes of work routinisation in industrialised environments such as metal foundries and dairy farms. In the field of sociolinguistics,

the framework has been used primarily to describe how particular in-groups emerge as their members develop specific language practices (Eckert & McConnell-Ginet 1992; Holmes & Stubbe 2015). In industrialised workplace settings, for example, authors have focused on in-group swearing practices (Daly et al. 2004) and in-group humour (Holmes & Marra 2002). Sociolinguistic studies that approach language practices in industrialised workplaces as part of a broader negotiation of (transactional) work routines, and that consider the agentive role of non-humans such as robots, tools, sounds, and machines in this respect, are relatively rare (but see Hovens 2020; Kleifgen 2013). In this way, the current paper fits into a wave of *posthumanist* approaches in sociolinguistics (see also Canagarajah 2018; Cornips 2024; Pennycook 2018).

Posthumanism is a family of theoretical and methodological approaches, such as actor-network theory (Latour 2005) and new materialism (Bennett 2010), which all share a concern for decentring the human subject or agent (i.e., anthropocentrism) in the humanities and the social sciences (Pennycook 2018, 10). What makes posthumanist approaches typically stand apart is their understanding of *agency*, or "the capacity to act with effect" (Watson 2016, 170). Essentially, the claim is that not only humans, but also non-humans (such as cows and robots) have this capacity. After all, non-humans affect emerging practices in various ways, not just by initiating these practices (e.g., a cow starting to greet a farmer), but also by enabling or encouraging (i.e., *affording*; Gibson 2015) them (e.g., the architecture of a barn enabling or encouraging such a greeting). Thus, emerging practices often entail temporary associations between human and non-human actants, like a temporary chain or network (Latour 1986; Latour 2005, 71-72), or an *assemblage* (Bennett 2010; Deleuze & Guattari 1980; Pietikäinen 2024). In a similar vein, a posthumanist approach to language entails that human actants are no longer presumed to be, or treated as the sole contributors to processes of *semiosis* or meaning-making (Canagarajah 2018; Pennycook 2018). For example, cows and robots may initiate, enable, or encourage specific meaning-making practices (as this paper will show).

According to Wenger (1998, 73), communities of practice have three defining elements: (1) participants who regularly engage with each other, (2) a joint enterprise as an underlying reason for this engagement, and (3) a shared repertoire that participants build up or negotiate through their mutual engagement over time. From a posthumanist point of view, the category of "participants" does not (only) have to include human actants, but it can also include non-human actants. To begin with, this problematises the distinction between participants and the *reifications* or *artefacts* that constitute the shared repertoire of a community of practice, such as specific words and tools (see also Hovens 2020). Artefacts create *shortcuts* in a specific practice by reducing the amount of time and/or effort that is needed to complete specific actions (Wenger 1998: 58-61). In this way, as affordances, they also fundamentally affect the emerging practices, and, from a posthumanist point of view, they can be considered participants engaging in the negotiation of these practices. Finally, a posthumanist approach problematises what should be considered a community's joint enterprise as well, as the identification of such an enterprise depends on the perspective taken, as will become clear in the case of the dairy farms. In the empirical sections of the paper, we will therefore further discuss how these defining elements of the communities of practice framework can be recognised in the industrialised, multi-actant work environments of the farms.

3. Data and Methods

A dairy farm can be described as a *'total' institution* (Goffman 1961), as all the cows live (or work) under the same roof under the supervision of the same farmer(s). Each phase of the cows' daily routine is shared with fellow cows, who are treated similarly and participate in the same activities (e.g., being inseminated, pregnancy, giving birth to a calf, and repeating this cycle annually). Daily activities are tightly scheduled and dictated by humans, namely when, how, and what to eat, when and how to be milked, how to lie down, etc. All practices are exclusively designed to benefit dairy production within the barn. Cows must thus learn the daily routines of the barn where they spend their (short) lives, from birth until they are sent to slaughterhouses. How cows must participate in the organisational structure of dairy production shapes the power relations through cow-cow and cow-human practices. Almost all power resides within the dairy practices, which are interwoven with the daily "organisational logic of maximising productivity" (Kandel, Dlouhy & Schmitt 2023).

For this paper, observations of cows' activities in two different scenarios within an industrial dairy farming context were analysed. The cows were required to produce milk for human consumption in: (i) a barn housing approximately 200 Holstein Frisian cows, where calves were separated from their mothers immediately after birth (Farm 1), and (ii) a barn with around 60 primarily Groninger Blaarkop cows, where calves stayed with their mothers in the same barn for the first three months after birth and were allowed to nurse directly (Farm 2). The two dairy farms are very loud environments due to the workings of machines, robots, tractors, and tools (in these two farms, no radios were playing). Examining both routine interactions and (problematic) disruptions in the daily practices provides an increasingly deeper understanding of how resources are selected in unforeseen and surprising activities. Such unexpected activities can only be found when conducting ethnographic fieldwork (Abrell & Gruen 2020; Lestel, Bussolini & Chrulew 2014). The ethnographic method of observing cows received approval by the Ethic Review Committee of the Royal Netherlands Academy (2023; ID FAO/AKo/1675).

Data from the dairy farms were collected through ethnographic fieldwork. According to Hammersley and Atkinson (2007), participant observation is the core and defining method of classical ethnography. According to them, "ethnography usually involves the ethnographer participating, overtly or covertly, in people's daily lives for an extended period of time, watching what happens, listening to what is said, asking questions—in fact, collecting whatever data are available to throw light on the issues that are the emerging focus of inquiry" (Hammersley & Atkinson 2007: 3). Participant observation was combined with writing fieldnotes, making audio and video recordings of (communicative) interactions, and collecting relevant documents and other forms of data. Informal conversations with farmers were conducted at the dairy farms. Audio and video recordings were typically made using mobile phones alongside video cameras, allowing the participant-observer to follow calves or dairy cows throughout their environment while minimising interference (see Cornips 2022, 2024 for more detailed descriptions of the fieldwork). Data are considered to be co-produced by humans, dairy cows, and other actants.

4. Findings

4.1 Joint enterprises on the dairy farms

Within the type of 'total' institution that dairy farms consist of, identifying a joint enterprise from the perspective of cows is complex, particularly because Wenger (1998) assumes a certain degree of voluntariness among participants in a community of practice. In its simplest form, Wenger's concept entails individuals regularly engaging in "mutual engagement" around a "joint enterprise" (a shared activity, occupation, hobby, or interest), gradually developing a "shared repertoire". Thus, if we approach cows as subjects and seek to understand "joint enterprise" from their perspective, we must identify activities within the barn in which cows participate with some degree of agency, however limited. Clearly, mother milk production and/or metabolic work cannot be considered a joint enterprise from the cows' perspective, as these are imposed rather than co-constructed through voluntary participation.

Therefore, we propose, from the perspective of the cows, to explore *place-making* as a potential joint enterprise that involves the assignment of social meanings to physical space by cows (see an elaborate discussion of how cows do place-making Cornips & van den Hengel 2021:187). Through cow-human, cow-cow, and cow-robot interaction, as well as other forms of connectivity, the farm itself and/or different areas in the barn may be created into (a) social place(s) that is/are experienced as the basis of belonging. The joint enterprise by cows as social mammals is to depend on each other for interaction and emotional support, to form strongly bonded social groups (Marino & Allen 2017: 484), and to collectively 'work' on maintaining a peaceful atmosphere among themselves and with the farmer(s) (Porcher & Schmitt 2010: 243). Gygax et al. (2010) find that within the context of industrial farming, cows form a tightly connected network that includes the majority of individual cows, characterised by distinct social bonds and deliberate distancing patterns. Additionally, small dyadic networks were identified, which were dependent on "whether or not the two cows in question had grown up together and/or had spent the dry period before their latest calving together" (Gygax et al. 2010: 21). Thus, while previous sociolinguistic research has primarily conceptualised place-making in terms of human practices, we propose that other social animals, such as cows, also engage their wholy-body activities, senses, affect, memories in the material-semiotic production of the barn as a meaningful place. Or, as Cornips & van den Hengel (2021) phrase it: cows "engage in linguistic acts of place-making by transforming their shared living space into a site for negotiating, or renegotiating, the semantics of power, resistance, and belonging".

When comparing the metal foundry to the two dairy farms, machinery—understood as affordances (Gibson 2015)—played a central role in shaping and negotiating routine activities. They enabled the development of certain practices while constraining others, and they prompted both cows and humans, as production workers, to (co-)develop specific activities and practices. In this sense, machines at times functioned de facto as 'non-human experts' within the communities of practice of both the dairy farms and the foundry (see also below and Hovens 2020: 383).

4.2 Multi-actant communities of practice on a dairy farm: Learning work routines

Allogrooming among dairy cows constitutes a form of place-making, understood as the process through which space is imbued with social meaning through repeated, relational practices. By engaging in this spatially situated practice, dairy cows actively co-produce social and family bonds. Allogrooming appears to be a joint enterprise that adult cows engage in with some level of regularity and voluntariness (Phillips 2002). By conceptualising joint enterprise in this way, we can better understand the lived experiences of cows and how they navigate their constrained environments. It is, of course, possible that grooming is part of a more comprehensive joint enterprise inherent to sociality, which also encompasses additional practices such as feeding, drinking, sleeping together, navigating fences and barriers together, using the milking parlour together, and engaging in social interactions. Exploring this broader joint enterprise forces us to consider the farm from the perspective of the cows themselves, rather than as a space designed primarily for human-driven production processes.

Grooming, as an important component of place-making, emerges not just as an isolated activity but as part of a larger, complex network of social and environmental interactions within the farm. In more natural conditions, cows use trees and other objects to groom themselves, but they also dedicate considerable time to grooming each other (Phillips 2002: 27). Plausibly, the use of a machine, i.e., the automated grooming brush in the two barns mimics both self-grooming and allogrooming. As such, it serves as an artefact within the cows' community of practice, creating a shortcut in the dairy production process from a human perspective. The brush, as a shortcut, reduces the time cows spend grooming each other, as their rhythm is much slower than the tempo of the brush. When grazing outdoors, cows must find trees or other structures, which requires considerable time for self-grooming.

Adult cows can activate the rotation of the automated grooming brush in the barn with various parts of their body, such as their ears, head, neck, trunk, and rump (Mandel, Wenker, van Reenen, Keil, & Hillmann 2019). They are not only able to rotate the brush but also possess the knowledge of how to work together in using the brush, hence, engaging in a joint enterprise. The automated yellow brush in Farm 1 (see Figure 1) does not provide enough counterpressure to be used effectively on its own (Figure 1a). The cows help each other make the best use of the brush. By holding the brush between them, they achieve the right pressure to be properly groomed (Figure 1b, 1c). Figure 1b shows how a cow in front of the brush uses it to groom her side, while another cow is grooming her head behind the brush. Figure 1c shows how the cow in the foreground brushes her chin, while the cow behind the brush is grooming her back. This practice shows how dairy cows "engage[d] in a shared learning process" – "in which new subjectivities emerge, and the legitimacy of their claims and desires are explored in interaction, by tinkering with their shared material conditions" (Driessen 2014: 91).

<div align="center">1a   1b   1c</div>

Figure 1. Two Cows use the Automated Grooming Brush Together (Yellow) (Farm 1, October 2023)

Brushes are expensive artefacts and are exclusively available for milk-producing cows, not for heifers, pregnant cows or calves that are kept in separate, encaged areas within the barn or in a different barn. The physical separation between age cohorts makes intergenerational learning of (routines in) practices difficult. However, Farm 2 is a rare exception since the calves wander freely through the barn. They remain with their mothers for the first three months, allowing them to learn and engage in adult routines such as activating and using the automated grooming brush (see Figure 2). Figure 2 shows a calf attempting to engage with the automated grooming brush. The body size of the calf is too small to fully activate the brush as adults do, though she can barely reach it with her nose and chin (see Figure 2a, b, c, respectively).

2a	2b	2c

Figure 2. The Calf tries to use the Automated Grooming Brush (Yellow) (Farm 2, 18 November 2022)

The calf in Farm 2 learns to activate the automated brush, which clearly indicates a learning trajectory. Machinery thus plays an active role in this process, much like how automation in the foundry shapes skill acquisition. This raises the question of whether the calf–automated brush interaction may be considered an independent joint enterprise—namely, grooming—or whether it should be understood as part of a broader joint enterprise of sociality, encompassing practices of place-making.

4.3 Negotiating work routines with a manure-scraping robot and a milking robot

In Farm 2, a manure-scraping robot (Figure 3a) operates by pushing cow manure through the small gaps between the beams in the alleys. The robot is an artefact that 'replaces' the daily routine of cleaning the alleys by humans, hence, it saves the farmer time. Adult cows were observed to fully ignore the cleaning robot; they just step aside when the robot is running. In this farm, another calf is observed while the red manure scraper is running. Unlike the adult cows, the calf tries to interact with the robot by following it (Figure 3b/c), jumping, sniffing (Figure 3b/c/d), and touching it (Figure 3d).

3a

3b

3c

3d

Figure 3. A Calf Connects to the Passing Manure Scraper Robot (in Red) (Farm 2, 18 November 2022)

After a few seconds, the mother of the calf in Figure 3 arrives and nudges the calf with her head to encourage her to start drinking. As the calf begins to drink (Figure 4a), the robot approaches right where they are standing. The mother completely ignores the robot and moves away from it, leaving the calf behind (Figure 4b). The calf's drinking is momentarily interrupted, only to resume a short distance away as she follows her mother (Figure 4b/c/d). Meanwhile, the manure scraper robot continues along its programmed route (Figure 4). The mother cow thus actively teaches the calf to ignore the cleaning robot and to step aside when it crosses their path.

4a

4b

4c

4d

Figure 4. A Calf Connects to the Passing Manure Scraper Robot (in Red) (Farm 2, 18 November 2022)

What the calves reveal in relation to the automated grooming brush and manure scraper robot is their engagement with routine practices within their barn, where cows spend their entire (albeit short) lives. Although the calves are not yet fully versed in the automatic brush – failing to activate it so that it starts rotating and engage actively with the manure scraper robot instead of ignoring it –, they learn from the adult cows how to interact with these artefacts. In this manner, place (barn) and (routinised) practice mutually constitute one another, showing that artefacts constitute a 'resource' in the negotiation of meaning and practices (King 2014).

4.4 Unforeseen actants in the community of practice

In addition to the automated grooming brush, the manure scraper robot, also a milking robot is operating in Farm 1. As with humans (Rasenberg et al., 2023: 312), individual cows' activities around robots are "highly embodied, flexible, and contingent." A cow must move into the milking robot, and therefore the robot automatically provides some feed to motivate her visit and to make her stay in the robot more attractive (Driessen 2014: 94; Kramer & Bovenkerk 2024). Interestingly, although designed for cow use, starlings appear to make use of the milking robot as well (Figure 5). They have their 'perch' on the milking robot and fly into the robot while a cow is eating, apparently to snatch some food.

Figure 5. Cows and Starlings use the Milking Robot Together (Farm 2, 14 December 2024)

These starlings are clear subjects that voluntarily approach the milking robot in the barn. It is to be expected that the starlings return regularly for "mutual engagement" around this "joint enterprise," and therefore are part of an actual multi-actant community of practice. The starlings overwinter and/or return every year in the same season to raise their young, who very likely learn from their parents how to obtain food from the milking robot.

In relation to non-human animals, robots "change circumstances and relationships" (University of Hull, 2012). For example, the robot affects the cows' knowledge and practices, such as learning to use a defective automated grooming brush together or banging against the milking robot for food (see below). The robot thus affects routine practices on the farm, potentially fostering new ideas (Ohly, Sonnentag, and Pluntke 2006) and giving rise to unexpected connections—such as starlings perching on the milking robot to access cow food. Hence, it is not simply the case that non-human animals adapt to the robot; rather, their relationship with it changes their practices, i.e., mutual engagements emerge. Machines, robots, sounds, cows, and starlings co-constitute practices under the same roof in ways not originally envisaged by humans involved (Bear and Holloway 2018). A fine example is that different robots can also interact with each other. Figure 6 shows how in Farm 2 the manure scraper robot has somehow veered off its path—likely after being bumped by a cow—and positioned itself in front of the exit to the milking robot, blocking the gates from opening. The manure robot can no longer move forward or backward, the milking robot is unable to open its gates after the cow has been fully milked, and as a result, the cow remains trapped inside the milking robot, sticking her head outside the fences of the milking robot.

Figure 6. The Black Cow, the Manure Scraper Robot and the Milking Robot Interact Together in the Routinised Practices (Farm 2, 14 December 2024)

Thus, through routinised embodied practices between heterogeneous actants, dairy cows, calves, and starlings display knowledge in using artefacts designed by humans like bars, fences, milking and cleaning robots, automated grooming brush machines, milking robots, etc. (Caronia & Mortari 2015). There may be a note of existential tension in the concept of multi-actant community of practice, as the same activity can be considered part of different "joint enterprises" and thus different "communities of practice," depending on whose perspective one adopts—for example, that of the farmer (Vaarst & Christiansen 2023) or the cow or the starling, or the robot. This raises the question of whether we can truly speak of a multi-actant community of practice, given that their perspectives are so fundamentally different. According to Wenger (1998, 73), a community of practice is characterised by a shared enterprise which we argued is place-making by mutual engagement (in different areas) in the barn, which enables cows to interact regularly and establish meaningful relationships for example to use the brush together and/or to eat together with starlings in the milking robot. Importantly, it also involves the development of (acquiring) a shared repertoire consisting of routines, engaging in shortcuts. In sum, even from the cow perspective only, cows reveal different engagements and interactions with different robots and with each other and their calves, which create separate, parallel communities of practices.

4.5 Sound symbolism on a dairy farm

During fieldwork, the first author observed the black cow depicted in Figure 7 (see also Figure 6), which, while standing in the milking robot, was loudly banging her horns against its interior. This cow had consumed the feed provided by the robot and was attempting to prompt it to dispense more. Porcher and Schmitt (2010: 252) note that cows can behave according to the rules of the robot (they follow the rules set by the robot, allowing it to function normally) or they can act in a way that does not comply with these rules, leading to a disruption in the robot's operation. Non-compliance with the rules, according to Porcher and Schmitt (2010), demonstrates that the cows understand how the robot works. This becomes particularly evident through activities that do not conform to the rules such as banging head and/or horns inside the robot as the cow in Figure 7.

Figure 7. The Black Cow Banging her Horns Inside the Milking Robot (Farm 2, 14 December 2024)

Porcher and Schmitt also observe how sounds produced by the milking robot are interpreted as semiotic artefacts by the cows. They (2010: 255) note that "when a cow enters the robot, several distinctive sounds announce the start of the milking process: the feed dropping down, the feed trough sliding back, the pulsation beginning, and the arm grabbing the udder hose and bringing it under the udder." These sounds are confirmed by own fieldwork by the first author. However, when a cow does not need to be milked, these sounds are absent, and it seems that the cows know they will leave the robot without being milked. These different activities suggest that the cows recognise the sounds of the robot but, more importantly, that they understand their meaning. These sounds allow the cows to comprehend the progression of their passage through the robot and respond accordingly. The cows are aware of the significance of each sound the robot makes; they can place it within a specific moment of the process, and they can associate a particular sound with a specific event. Therefore, Porcher and Schmitt (2010, 255) conclude that the robot has a timing system that the cows recognise through, among others, auditory cues. Crucially, these cues point toward sound symbolism as an index for cows, i.e., how they perceive and react to the milking robot according to the sounds it makes, and its silence. Sound symbolism is not just about the physical properties of sound(s) but also about how repeated exposure to these sounds creates (specific) meaning for dairy cows.

The robot milking sounds as indexical sign remind us of the sound symbolism found in the metal foundry context, when JON produced a prolonged 'sloooow down' directed at DAA in line 07, as illustrated in extract 1. Here, "slow down" functions as an iconic sign, representing the movement of the hoist through formal resemblance. The use of sound symbolism in "sloooow down" arguably enhances the efficiency and immediacy of the interaction, serving as a communicative shortcut in negotiating workplace norms between JON and DAA. One might even consider whether a parallel recipient design is at play here. This interpretation is inspired by Szczepek Reed's (2023:90) analysis of horse riding instruction, in which the instructor's use of "STEADY" appears to be directed jointly

at the horse–rider pair, instructing the horse to decelerate and the rider to facilitate this speed reduction. As in 'sloooow down', STEADY functions as a lexical-prosodic bundle that is "delivered with a low overall pitch register, sustained on a single-level tone, and featuring a considerably lengthened final syllable" (0.6 seconds), which is lexically unstressed (Szczepek Reed's (2023:90)). Similarly, with "slooooow down" two recipients - a human and a machine - are jointly mobilised to perform a coordinated action, addressing both the hoist and DAA as a unified hoist–JON pair.

By comparing insights from the metal foundry and the dairy farm, we can discern that shortcuts in both workplaces involve sound symbolism, albeit of a different order. In the metal foundry, JON mimics the slowed-down operation of a machine by uttering the phrase "slow down," which functions as an iconic sign—the sound imitates the action. In contrast, the cow in the milking robot does not reproduce the sound of the machine itself, but the sounds emitted by the milking robot serve as indices of the various stages of being milked. One possibility worth considering is that the banging of the horns against the walls of the milking robot might also function as an iconic sign. In addition to an attempt to trigger feed release, the sound of the horns striking the frame could be mimicking the sound of the feed dropping inside the robot, from the cow's perspective. Whether and how such a reading can be empirically supported or falsified remains an open question. However, it is important to consider this possibility, particularly in light of Dingemanse's distinction between indexicality (e.g., interjections) and iconicity (e.g., ideophones), which he argues is linguistically significant "for our ability to understand (...) and to explain how and why they differ in terms of markedness, morphosyntax, and mode of signification" (2023:467-468).

5. Final Thoughts

This paper has contemplated the notion of multi-actant communities of practice, which in a posthumanist perspective involves expanding the communities of practice framework to include non-human actants, and it has demonstrated that work routines emerge through multi-actant relations and interactions. This led to discussions on agency (Meijer 2019, Meijer & Bovenkerk 2021), perspective, and a discussion on more-than-human joint enterprises involving machines, sounds, phrases, robots, tools, and non-human animals within work routines in a metal foundry and two industrial dairy farms. The paper aimed to foreground a multi-actant perspective that emphasises the active, agentive roles played by diverse human and non-human participants in the emergence and negotiation of routinised work practices.

Machines and robots are designed to alleviate the physical labour of human workers and to save time for both human and non-human participants. On farms, machinery similarly serves to reduce the farmer's workload, rendering human presence in the barn nearly redundant. However, machinery in dairy farms—primarily designed for interaction with non-human animals—also functions to accelerate the cows' metabolic processes, specifically the production and release of milk (Theunissen, 2012, Forbes 2025), and the transformation of bodily flesh into meat. The notion of shortcuts is crucial here. Metabolic work functions as a shortcut in the production of milk for human consumption. This underscores that shortcuts are not neutral or universal but emerge through evolving and continuing relations (Pietikäinen 2024) between humans, machines, animals, and spatial resources (Pennycook 2018) within industrial power dynamics (Hovens 2021). Cows acquire a shared repertoire of routines

and actively engage in shortcuts through processes of place-making in the barn. Machinery may reshape the practices of both humans and non-humans, as mutual engagements emerge through their interactions.

A key issue raised in this study is that of perspective. While the study primarily adopted the viewpoint of the human in the metal foundry and the cow in the dairy farm, future research could consider the perspectives of other actants, such as robots, starlings, or hoists, to examine how work routines and joint enterprises emerge through interactions among different networked entities. Furthermore, fieldwork demonstrates that artefacts actively reshape the nature of social interactions both in the metal foundry and the dairy farms (Kramer & Bovenkerk, 2024).

Crucially, our combined insights from the two workplaces show that both species engage in forms of sound symbolism (linguistic iconicity and indexicality) in loud and linguistically diverse environments. This phenomenon may easily be overlooked when examining either the metal foundry or the barns in isolation. Humans appear to create a shortcut by phrasing "slooooow down" to speed up the activity of moving sand cores more effectively with the help of a hoist. Dairy cows, on the other hand, understand the sound patterns of the milking robot as a shortcut to going through the process of being milked and receiving a food reward.

Future studies could further investigate how different species develop these abilities to engage in shortcuts and how this affects their engagement with artefacts and routines, while also opening an interdisciplinary dialogue with other fields, such as more-than-human workplace learning.

Declarations and Acknowledgement:

References

Abrell, E., & Gruen, L. (2020). Ethics and animal ethnography working paper. *Wesleyan Animal Studies*, 1-16.

Bear, C., & Holloway, L. (2018). Redistributing labour in automated milking systems and the more-than-human (co)production of dairy farming. In T. Marsden (Ed.), *The SAGE handbook of nature* (pp. 831-847). SAGE Publications Ltd.

Bennett, J. (2010). *Vibrant Matter: A Political Ecology of Things*. Durham/London: Duke University Press.

Canagarajah, S. (2018). Translingual practice as spatial repertoires: Expanding the paradigm beyond structuralist orientations. *Applied Linguistics*, 39(1), 31–54. https://doi.org/10.1093/applin/amx041

Cornips, L. (2024). The semiotic repertoire of the dairy cow(s). *Language in Society*, published online 2024, 1-25. doi:10.1017/S0047404524000460

Cornips, Leonie & Louis van den Hengel (2021). Place-making by cows in an intensive dairy farm: A sociolinguistic approach to nonhuman animal agency. In B. Bovenkerk & J. Keulartz (Eds.), *Animals in our midst: The challenges of co-existing with animals in the Anthropocene* (pp.177-201). Springer.

Daly, N., Holmes, J., Newton, J., & Stubbe, M. (2004). Expletives as solidarity signals in FTAs on the factory floor. *Journal of Pragmatics*, 36(5), 945–964. https://doi.org/10.1016/j.pragma.2003.12.004

Deleuze, G., and F. Guattari. 1980. *Mille plateaux*. Paris: Les Éditions de Minuit.

Dingemanse, M. (2023). Ideophones. In E. van Lier (Ed.), *The Oxford Handbook of Word Classes* (pp. 466–476). Oxford University Press.

Driessen, C. (2014). Animal deliberation. In M. Wissenburg & D. Schlosberg (Eds.), *Political animals and animal politics*(pp. 107-121). Palgrave Macmillan. https://doi.org/10.1007/978-1-349-68308-6_7

Eckert, P., & McConnell-Ginet, S. (1992). Think practically and look locally: Language and gender as community-based practice. *Annual Review of Anthropology*, 21, 461–488. https://doi.org/10.1146/annurev.an.21.100192.002333

Forbes, N. (2025, January 2). The birth of one cow could change the UK's dairy industry forever. *The Independent, UK Edition*. https://www.independent.co.uk/climate-change/news/ivf-cow-birth-dairy-dumfires-b2672717.html (accessed January 5, 2025).

Gibson, J. J. (2015). *The ecological approach to visual perception: Classic edition*. Psychology Press. (Original work published 1979)

Goffman, E. (1961). *Asylums: Essays on the social situation of mental patients and other inmates*. Anchor Books.

Gygax, L., Neisen, G., & Wechsler, B. (2010). Socio-spatial relationships in dairy cows. *Ethology: International Journal of Behaviour Biology*, 116(1), 10–23. https://doi.org/10.1111/j.1439-0310.2009.01708.x

Hammersley, M., & Atkinson, P. (2007). *Ethnography: Principles in Practice* (3rd ed.). London: Routledge.

Holland, D., Lachicotte, W. Jr., Skinner, D., & Cain, C. (1998). *Identity and agency in cultural worlds*. Harvard University Press.

Holmes, J., & Marra, M. (2002). Having a laugh at work: How humour contributes to workplace culture. *Journal of Pragmatics*, 34(12), 1683–1710. https://doi.org/10.1016/S0378-2166(02)00032-2

Holmes, J., & Stubbe, M. (2015). *Power and politeness in the workplace: A sociolinguistic analysis of talk at work*. Routledge. First published 2003.

Hovens, D. (2020). Workplace learning through human-machine interaction in a transient multilingual blue-collar work environment. *Journal of Linguistic Anthropology*, 30(3), 369–388. https://doi.org/10.1111/jola.12279

Hovens, D. (2021). Power dynamics at work: An ethnography of a multilingual metal foundry in the Dutch-German borderland. PhD thesis: Maastricht University.

Kandel, I. K., Dlouhy, K., & Schmitt, A. (2023). Animal roles in organizations: A framework for exploring organizational human–animal relations. *Organization*, 0(0), 1-19. https://doi.org/10.1177/13505084231217079

King, B. W. (2014). Tracing the emergence of a community of practice: Beyond presupposition in sociolinguistic research. *Language in Society*, 43, 61–81. https://doi.org/10.1017/S0047404513000870

Kleifgen, J. A. (2013). *Communicative practices at work: Multimodality and learning in a high-tech firm*. Multilingual Matters.

Kramer, K., & Bovenkerk, B. (2024). Dairy farming technologies and the agency of cows. *Animal*, 18(6), 101191.

Latour, B. (1986). "The Powers of Association." In *Power, Action, and Belief: A New Sociology of Knowledge?*, edited by J. Law, 264–280. Boston/London: Routledge & Kegan Paul.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. Bijker & J. Law (Eds.), *Shaping technology - building society: Studies in sociotechnical change* (pp. 225–258). MIT Press.

Latour, B. (2005). *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Lestel, D., Bussolini, J., & Chrulew, M. (2014). The phenomenology of animal life. *Environmental Humanities*, 5, 125-148.

Mandel, R., Wenker, M. L., van Reenen, K., Keil, N. M., & Hillmann, E. (2019). Can access to an automated grooming brush and/or a mirror reduce stress of dairy cows kept in social isolation? *Applied Animal Behaviour Science*, 211, 1-8. https://doi.org/10.1016/j.applanim.2018.12.007

Marino, L., & Allen, K. (2017). The psychology of cows. *Animal Behavior and Cognition*, 4(4), 474-498.

Meijer, E. (2019). *When animals speak: Toward an interspecies democracy*. New York University Press.

Meijer, E., & Bovenkerk, B. (2021). Taking animal perspectives into account in animal ethics. In B. Bovenkerk & J. Keulartz (Eds.), *Animals in our midst: The challenges of co-existing with animals in the Anthropocene* (Vol. 33, pp. 49–64). Springer.

Ohly, S., Göritz, A. S., & Schmitt, A. (2017). The power of routinized task behavior for energy at work. *Journal of Vocational Behavior*, 103, 132–142. https://doi.org/10.1016/j.jvb.2017.08.008

Ohly, S., Sonnentag, S., & Pluntke, F. (2006). Routinization, work characteristics, and their relationships with creative and proactive behaviors. *Journal of Organizational Behavior*, 27, 257–279. https://doi.org/10.1002/job.376

Pennycook, A. (2018). *Posthumanist applied linguistics*. Routledge.

Pietikäinen, S. (2024). *Cold rush: Critical assemblage analysis of a heating Arctic*. Palgrave Macmillan.

Phillips, C. (2002). *Cattle behaviour and welfare* (2nd ed.). Blackwell.

Porcher, J., & Schmitt, T. (2010). Les vaches collaborent-elles au travail? Une question de sociologie. *Revue de Mauss*, 35, 235-261.

Rasenberg, M., Amha, A., Coler, M., van Koppen, M., van Miltenburg, E., de Rijk, L., Stommel, W., & Dingemanse, M. (2023). Reimagining language: Towards a better understanding of language including our interactions with non-humans. *Linguistics in the Netherlands*, 40(1), 309–317.

Szczepek Reed B., (2023). Designing Talk for Humans and Horses: Prosody as a Resource for Parallel Recipient Design. *Research on Language and Social Interaction* 56 (2): 89–115.

Theunissen, L. T. G. (2012). Breeding for nobility or for production? Cultures of dairy cattle breeding in the Netherlands, 1945–1995. *Isis*, 103(2), 278-309. https://doi.org/10.1086/666356

University of Hull (UK). (2012). *Robotic and information technologies in UK dairy farming*. Department of Geography. Environment and Earth Sciences, 1-12.

Urciuoli, B., & LaDousa, C. (2013). Language management/labor. *Annual Review of Anthropology*, 42, 175–190. https://doi.org/10.1146/annurev-anthro-092412-155524

Vaarst, M., & Christiansen, I. A. (2023). Three years of situated social learning and development of diverse cow-calf contact systems in Danish organic dairy farms. *Journal of Dairy Science*, 106. https://doi.org/10.3168/jds.2022-22755

Watson, M. (2016). "Placing Power in Practice Theory." In *The Nexus of Practices: Connections, Constellations, Practitioners*, edited by A. Hui, T. Schatzki, and E. Shove, 169–182. London/New York: Routledge.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

About the Authors:

Leonie Cornips is a sociolinguist, affiliated with NL-Lab at the Royal Netherlands Academy of Arts and Sciences, and has held the chair of *Languageculture in Limburg* at Maastricht University since 2011. Her research focuses on multilingualism, dialects, and emerging language varieties in the Netherlands, as well as on local identity construction through language practices, including linguistic place-making and belonging. More recently, she has been exploring non-human animal languages, problematizing the a priori distinction between human (culture) and animal (nature). She conceptualizes language as a multimodal, embodied, and multisensorial phenomenon and is currently conducting ethnographic fieldwork on industrial dairy farms in the Netherlands in pursuit of this agenda.

Daan Hovens is an assistant professor at Maastricht University (Faculty of Arts and Social Sciences, Department of Literature and Art). He is interested in language diversity, border regions, and case studies that discuss a 'marginalised' or 'bottom-up' perspective on political issues such as European integration, labour migration, and workplace automation. Empirically, he often focuses on cases from the Dutch province of Limburg, but always within an international, European, and/or border-regional framework. Daan's PhD dissertation was an ethnography of a metal foundry in Limburg, where linguistic diversity among employees had changed significantly in a relatively short period of time. An innovative element was his posthumanist approach to human-machine interactions in the workplace.