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Title page

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Autonomous Technologies in Human Ecologies: Enlanguaged Cognition, Practices and Technology

Abstract: Advanced technologies such as drones, intelligent algorithms and androids have grave implications for human existence. With the purpose of exploring their basis for doing so, the paper proposes a framework for investigating the complex relationship between such devices and human practices and language-mediated cognition. Specifically, it centers on the importance of the typically neglected intermediate layer of culture which not only drives both technophobia and -philia but also, more fundamentally, connects pre-reflective experience and socio-material practices with advanced technologies in the loop. Theoretically, the paper draws on contributions from performativist Science and Technology Studies and Radically Embodied Cognitive Science and pushes new grounds by stressing their compatibility. Yet, it also emphasizes the importance of the enlanguaged side of cognition which is a requirement for human-style socio-material practices and, hence, the emergence of cultures that fetishes certain technologies.

Key words: Autonomy; Science and Technology Studies; Radically Embodied Cognitive Science; Performativity; Experience; Drone culture

1. Introduction

Drones, robots and perceived autonomy explores how seemingly intelligent devices affect human actors in their changing ecologies. In considering consequences for human living, we pursue how *perceptions* of autonomy influence individual experience in the course of socio-material practices. The paper stresses how advanced technology sets off immediate pre-reflective responses that have both practical and ethical consequences. On this view, the societal impact of AI arises in entanglement of human living, technology, design and culture. We show that:

- Studies of technical devices in assemblages connect the best of Radical Embodied Cognitive Science with the best of posthumanist performativism
- Using a distributed perspective on language enables us to integrate the pre-reflective, the explicit and the trans-situational
- Examining how 'autonomy' is attached to drones, robots and other advanced technologies as it brings new perspectives to both design issues and modes of various human-technology interplays.

In developing a unifying framework, we draw on the sister publications of the Special Issue. We begin by endorsing Benjamin's (2020) argument that, in the West, drones have become emblems of a new kind of cultural hegemony. Benjamin writes:

> "The drone acts as a cultural stand-in that obscures power relations and shifts perception onto the singular technological artefact and away from the various agents that define it. The drone is a medium for this technocultural mediation of contemporary power" (Benjamin 2020, p. 3).

In this drone culture, human ecologies – and individual lives – are increasingly dominated by distributed and anonymous decision-making.

The paper progresses as follows: In section 2, we set the scene by using the case of drones to stress bi-directional connections between their societal impact and culture. Then, in section 2.1, we use insights from the Special Issue to show how human-technology relations defy both strict technology determinism and pure domestication. In addressing 'what technology does to us' we

explore three ways in which humans are affected by socio-material practices that use such devices. Section 2.2 argues that such relations are not instantaneous and strictly situational but, rather, trans-situational: they contribute to technology-centered cultures that breach spatiotemporal constraints. Sections 3 and 4 combine insights from performativist approaches to Science and Technology Studies with Radical Embodied Cognitive Science. Although stressing compatibility, we find that both fields downplay the role of language. Section 5 fills the gap by offering an anti-representationalist account on enlanguaged cognition or, more specifically, its part in *languaging*. Finally, in section 6, we exemplify our case in relation to AUTONOMOUS DRONES – a verbal collocation central to the Special Issue.

2. Societal impact and the emergence of culture

The concept of 'societal impact' serves to channel research funding to certain concerns, nudge compromises between competing financial, political and intellectual interests, and even to simplify procedures of peer-review. It uses third person descriptions of 'well defined problems' – issues raised by established scientific findings and public discourse. Typically, the problems are to be solved by using extant (or soon to be available) data and technologies that draw on mainstream theories, standard methods and, of course, allow for rapid publication. We do not deny the value of problem-solving research that meets the concerns of funders. But as appears with drone culture (Benjamin 2020), societal impact arises in the interplay of the human, the technological and the experiential. To address such matters, not only is there little available data but observations are hard to come by and the interdisciplinary demands are daunting. The concerns raised are incompatible with mainstream theories or methods. Yet, as the Special Issue shows, perceptions of autonomy have massive implications for human actors, social organization, the environment and even how human killing – past and future – is managed by those who make, control, debate and use 'autonomous' devices.

Drone culture characterizes views that are spread across the media of the developed world. The label 'drone' can evoke business opportunities, military issues, boyish games, and fear that percolates from the spreading power of the anonymous. As ever more decision-making is managed by data driven, distributed sociotechnical systems, much of what we care most deeply about arises with the human 'out of the loop' – nation states and international bodies are increasingly powerless. There is a new blurring of human and nonhuman agency. Whilst some stress human responsibility for the future of evolution, others stress the fusion of the living and the artificial. Yet, in turning to drones, one wonders why these are often seen as alternatives. Are we not both living beings and, in some sense, posthuman? As Gahrn-Andersen (2020a) shows, the human-technology engagements that shape our practical entanglements are pre-reflective and, thus, evolutionary. As animals, we are readily perturbed: at this historical instant, indicative cases draw on perceptions of 'autonomy'. On this view, the functionality of a device is irreducible to its objective traits and features. By contrast, it depends on how the device is actually experience and, hence, the experiential categories employed by the perceiving subject.

2.1. What technology does to us

Like computers and robots, drones are increasingly influential. Even those unconcerned with their military function and cultural significance acknowledge that drones (and robots) are creating business opportunities and raising a range of public concerns. Unlike other flying and sailing machines, drones draw on what we have classified as motivational or operational autonomy (Cowley 2020) – they fall between automata and devices under continuous real-time control. The Special Issue shows that autonomy in drones and other advanced machines impacts in three main ways on the human condition:

- By using pasts (i.e. a history of writing, thinking about autonomy but also past encounters with seemingly autonomous entities)

- By evoking explicit frames (e.g. myths, explicit beliefs and ethical concerns)
- By using the immediate, and thus setting off visceral effects and achieving immediate functional outcomes through embodied engagements.

History speaks as the design of such devices draw on views of autonomy based in the work of Aristotle; this applies to all design that links hardware functions with algorithms used in short-term, data driven planning. Currently, its limits are quite unknown. Indeed, for McFarland et al (1993), similar kinds of functionality enable much (or all) animal behavior. Similar ideas appear in ascribing neural function to predictive processing (see, Hohwy 2013; Litwin and Miłkowski 2020) and using the autonomy of the cell as a model for machines and systems. As seen in Sprenger's (2020) work on autonomy in self-driving cars, the view drives technological change. Increasingly, devices link up history, computation and engineering as we increase our dependence on distributed agency. In this setting, concepts like 'drones' and 'androids' come to function as signifiers whose applications resonate with their sociocultural and practical applications. Devices themselves co-evolve as engineering concerns meet and create needs, actions and linguistic behavior that animate human actors (including ourselves).

How such devices are imagined draw on many traditions (see, Lindemann et al. 2016). In focusing on perceived autonomy, however, ethical frames come to the fore. In the first place, these bear on issues of policy, law and self-regulation. Second, the results both constrain how devices operate and, at once, set targets for evolving design. How ethics affect technology shapes debate about whether one should build autonomy into machines (see, Tonkens 2009; White 2020b) and, if one does, what kind of 'autonomy' is to be used (see, White 2020b; Lassiter 2020). While the outcomes of such discussion can only appear in the future, the imaginaries themselves drive much innovation. Even if (for technical reasons) there can never be an 'ethical' technology, few deny that the use of technology should be regulated by law. For Tonkens (2009), ethics speak against building autonomous machines and, as defended here, White (2020a; 2020b) takes the contrary view. Conversely, if drones and robots *can* undertake ethical decision-making, as shown by the White-Lassiter debate, the architecture matters: While a Kantian agent might enact individual, even religious, concerns an Aristotelian one would balance judgements of what is right with its responsibility as a citizen. One can readily imagine competition between autonomous devices with different decision-making systems or use by different organizations. Beyond this, another issue may be more urgent: some technologies (e.g. drones and intelligent algorithms) function within assemblages whose anonymous decision making has far reaching effects that are, to a large extent, beyond our understanding (perhaps even in principle).

In illustration of how use is made of 'autonomous' devices, we describe drones that monitor leakage from underground hot-water pipes, their military use and, indeed, a range of functions that are expanding at a great speed. Building on Gahrn-Andersen (2020a), we stress the power of immediate pre-reflective response to technology and how affect can trigger sensations such as perturbance, discomfort and eeriness. In this work, these are traced to the same visceral roots that set off uncanny-valley effects (Mori 2012). Indeed, it seems likely that similar pre-reflective experience underpins magic, myths, rituals and spiritual feelings for nonhuman agency. It is the power of perceived or seeming autonomy that makes appeal to culture emblematic. Next, therefore, we show that seeming autonomy in drones is amplified by the enactment of culture or, simply, a-culture-in-the-making.

2. 2. Enacted culture and the drone

Seeming autonomy enables culture to draw on pre-reflective experience that is triggered by responses to artificial agents. While phenomena pertaining to the uncanny valley are well known, Gahrn-Andersen (2020a) pinpoints how, in *2001: A Space* Odyssey, HAL seemingly takes on a new, perhaps malign, agency. He therefore argues that felt responding to perceived agency is ultimately grounded in pre-reflective experiential categories. Similar pre-reflective effects influence human-robot encounters (Förster and Althoefer 2020). In pushing the boundaries of the

immediately situated, we now ask how culture-making draws on the thematic link between pasts, the culturally explicit and the experientially immediate. Accordingly, we turn to how drone autonomy bidirectionally connects experience, situated technology-mediated encounters and, in slower scales, trans-situational practices.

The enactment of culture is an interplay of practices, technology, enlanguaged cognition and pre-reflective experience. Since these phenomena draw on different ontologies, we propose a model that offers a unified view of organized cognitive activity. As in engineering science, it serves, not to represent the world, but as the basis for epistemic practice (Boon and Knuttilla 2016). Elsewhere a related model pursued how perceived scientific value accrues from peer review (see, Cowley 2015; Secchi & Cowley 2018) that allows multi-scalar change (see, Secchi and Cowley, under review). Individuals and socio-material practices alike use trans-situational dynamics to connect domains (cf. Gahrn-Andersen 2019b; 2019c): as in Figure 1, this allows social life – say the use of drones in a company that heats homes (see, Gahrn-Andersen 2020b) – to interconnect historically derived practices, organized experience, and neurophysiology (or metabolism) and pre-reflective experience. The tripartite division reunites theory that is often split between the social and psychological; we use it to pursue how technical devices contribute to practices and lived experience. Below, the model is fully exemplified in relation to drones.

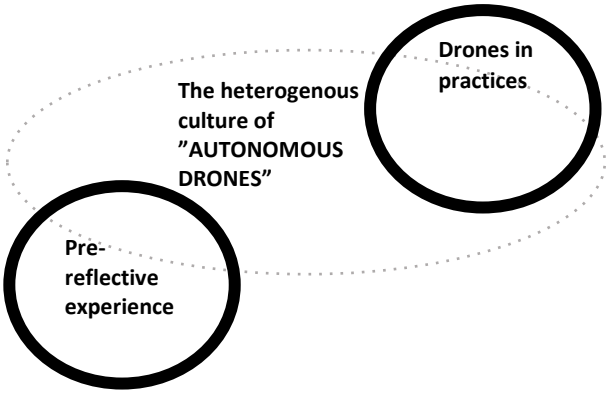

Figure 1: the interplay of drones, culture and lived experience

The temporal co-functioning of the three domains is central to any cultural nexus whose practices use a technical device.[2] In this context, we pursue the interplay by linking theories that derive from both social and cognitive approaches to complex practices. In so doing, we connect experiential aspects of Radical Embodied Cognitive Science with performativist views of practices from Science and Technology Studies (STS). Later, to connect the dimensions, we turn to how *enlanguaged cognition* enables experience to link the pre-reflective with cultural resources (e.g. practices, languages, genres, domains of action etc.) The results are thus public activity in a cultural domain: technologies sustain socio-material practices whose trans-situational arrangements enable people to accomplish practical tasks. People thus *actualize* practices in ways that have many consequences and, as noted, act in ways with ethical consequences that raise many social, legal and political issues.

[2] While lacking space discuss the model here, it uses a systemic view of cognition (see, Cowley and Vallée-Tourangeau 2017) inspired by empirical studies that pursue the role of living human beings in distributed cognitive systems (see, Hutchins 1995; 2014). Rather than oppose macro to micro (or social and psychological), attention falls on the meso domain of lived, social experience that arises as the others are managed by human action (see, Secchi & Cowley under review). The meso domain is one where practices are *actualized* by people acting together or alone.

3. Performativity and embodied cognition

Drones contribute to practices as diverse as play, taking photographs and warfare. These draw on what such devices accomplish, how they are experienced, and how they take on a second life through both scientific and popular depictions. Although drones play only a tiny part in society, they have become emblematic of our times. It is therefore illuminating to consider how their usage bears on many kinds of wider structures. To approach their functionality, we begin with what, in Science and Technology studies (STS) is called a *performativist* view (see, Pickering 1995).

Here, weight falls on the trans-situational aspect of practices afforded by technology. In pursuit of complex effects one can choose to focus on how people and devices are co-embedded in cognitive assemblages (Hayles 2016; Gahrn-Andersen 2019c; 2020b). For Pickering (1995), this arises as practices enable people to mesh interplays of agency with the actual manipulation of technology. As is usual in STS, he makes the case in relation to science:

> "Scientists, as human agents, maneuver in a field of material agency, constructing machines that, as I shall say, variously capture, seduce, download, recruit, enroll, or materialize that agency, taming and domesticating it, putting it at our service, often in the accomplishment of tasks that are simply beyond the capacities of naked human minds and bodies, individually or collectively" (Pickering 1995, p. 7).

In approaching how advanced technologies impact on agency, such work challenges the overwhelming importance granted to language (or discourse) in older work. Instead of ascribing knowledge to either mental or social 'representations' (Jensen 2004), epistemic production – the making of cultures – is traced to "enacted modes that bridge the gap between knowledge and material through performativity and action" (Lamontagne 2014, p. 158). The move effectively separates devices-in-practice from the concerns and activities of individuals or, indeed, from any one specific point of view. In its avoidance of individual-centrism, the field has come to see itself as dealing with the post-human and, thus, as allowing agency to devolve to objects and other non-living entities (Lamontagne 2014, p. 231). The Cartesian intellect is replaced by how human practices sustain bidirectional coupling within technical constellations and assemblages (Lamontagne 2014, p. 242). Later, we turn to how this also enables pre-reflective experience and, thus, language-making. In STS, however, the focus falls on scientific descriptions of a reality where assemblages are conceived of as things. In recognizing the existence and role of nonhuman agents, therefore, one begins to rethink the nature of the epistemic:

> "knowing (and thinking about knowing) are turned into particular styles and methods for connecting and cooperating with specific actors (human and otherwise)—thus shaping reality, or doing practical ontology" (Jensen 2004, p. 248).

Like knowledge, socio-material practices do not reduce to discourse (or the use of data and representations). To a large extent, they derive from specific ways in which devices are embedded in wider systems and, given actual experience (and presentations of experience), exert influence of individual knowledge and beliefs. Importantly, this allows everyday use of media to have a role in amplifying common experience: as persons and members of a culture, what people know is linked to media as pre-reflective response adjusts to fit the styles and methods of commentators, critics and users.[3] As a result, devices have an impact on how people engage with the technology as they draw on practices to enact a culture. In so doing, they also engage with both each other and other devices by means of discussion, pre-reflective response and, of course by acting. Socio-material practices play out across assemblages much wider than a single interface. For instance,

[3] As is typical of the living world, this is a bidirectional coupling. However, in focusing on practices, the top-down emphasis underplays how a person self-fabricates, responds or develops habits and expertise on the basis of experience with media or devices (cf. Gahrn-Andersen and Cowley 2017).

in reading and writing about *autonomous drones*, we invoke a performative idiom where practices are separated from individuals and language.

In order to connect pre-reflective experience with practices, we argue that, as parts of the world, devices like drones and robots come *with meanings attached* (as to the developmental aspects of such existential meanings, see Gahrn-Andersen 2019d). The case depends on linking the performative – the role of drones in practices – to neural and physiological prompting. In turning to the cognizer, we also emphasise that the practices are *enlanguaged*. Whether together or alone with drones, people can say what they are doing and use their knowledge to act, understand each other, and vary their performances. Each person can connect his or her pre-reflective experience of an actual device to what can befall other people: for this reason, language can be described as usage that is conventional. Yet, as part of practice, people must also act and, thus, draw on metabolism and the pre-reflective – and what is called *embodied cognition* (see, Wilson 2002; Chemero 2009; Wilson and Golonka 2013). In adopting, this overused term, we build on Shapiro's (2010) distinction between weak, medium and strong views of embodiment. In pursuing public activity – and enlanguaged practices – we can leave aside 'weak' views that focus on the mind's role in the conceptual (Lakoff 2008) or ascribe the pre-reflective to brain-based simulation (Barsalou 1999). Our concern is with medium or strong views of embodiment or how experience is materialized as artifacts invite controlled modes of perception and action. Such views allow practices to be actualized as people engage with material and institutional aspects of the world. The best-known medium view of embodiment is that of Clark and Chalmers's (1998) extended mind hypothesis. In pursuing cognition beyond the brain, they offer a thought experiment about Otto. As an Alzheimer's patient, he uses a notebook to remember the address of a museum or, more technically, establishes a doxastic link between mental states and an external artefact that allows fulfilment of a partial belief. The notebook shapes experience that, Clark and Chalmers argue, sustains function. While bringing experience of artifacts (and material symbols) to thinking about cognition, the belief still privileges neural representation. In leaving aside felt reactions, it is a medium strong view of embodiment. By contrast Malafouris' (2019) material engagement theory brings bodily engagement into play. It invokes *thinging*, a neologism built on Heidegger's (2001) phenomenological account of how what is said is inseparable from acting with things. For Malafouris, thinging "denotes the kind of thinking we do primarily with and through things" (p. 7). In criticising those who ignore the dynamical interplay between cognition and physical properties of the environment, he asserts:

> "thinking is not the cause of our thinging. Rather, the two are inseparable: thinking is thinging. There are no two separate processes, one realised on the 'inside' and the other on the 'outside', but a single process of cognitive becoming" (Malafouris 2019, p. 8).

For Malafouris, 'pure' cognitive processing is inadequate for dealing with things; nor are they unchanged when put to use. Rather, in engaging in an act of thinging, or using a thing, actual manipulation can change the thing (both in itself and as it is perceived). While Malafouris invokes dynamics in describing what happens, others trace pre-reflective experience to felt reactions (Cowley 2006) or the continuous judgements of felt response. Malafouris exemplifies the power of such experience in relation to pottery-making where, the properties of clay are, not just useful, but invite active manipulation. This permits interaction or, in other terms, a bidirectional connection between thinking and thinging. In time, a cognizer's agency is changed by material engagement –and, in slow historical scales, changes in agency transform how groups use techniques and technology. Further, Malafouris focuses on how an individual engages materially with a particular tool//artefact/machine or, as Kee (2020) notes, a word. Plainly, embodied encounters with technology enable a tool or technique to be integrated into social practices or, in terms of this paper, introduced to the assemblages of human socio-material practices (cf. Benjamin 2020; Gahrn-Andersen 2020b).

Malafouris assumes that cognition centres on the individual (and a brain) and, thus, emphasizes body-world dynamics (as opposed to the pre-reflective). In Shapiro's terms, his view of embodiment is medium strong. By contrast, many working with both enactivism and ecological psychology allow bodily dynamics (e.g., Dotov et al. 2010) be situated. They balance the world with the brain to take what Shapiro calls a 'strong' embodied view. However, just as with the notion of thinging, most emphasise the coupling of organism and environment. Even Chemero's (2009) radically embodied view focuses on what happens in the present, leaving out how agency self-fabricates by using historically derived materials and practices. Given a focus on models, it overplays 'dynamics' and, thus, leaves out a wider ecology of techniques, technology and assemblages. Seen thus, Gallagher's (2017) version of enactivism is a stronger view. It traces mental phenomena to, not just the body, but also the environment construed or, "rich dynamics of brain-body-environment" (p. 21). Citing Varela, Gallagher emphasises that cognition involves temporally extended events. An agent uses history and, with learning, draws on felt reactions to innovate. For Gallagher, such enactivism is a *philosophy of nature* that "takes seriously the results of science" by using its insights to build its own coherence. In parallel, Hutto and Myin (2017) stress, not tight body-world coupling, but the *extensive* nature of human minds. Unlike basic minds, these "also loop into society and culture and vice versa" (p. 253). They do not reduce to localized and situated embodied encounters. In reaching beyond mere body-environment dynamics, Hutto and Myin come closer to Hutchins' (2010) view of how humans use the practices and devices that make up a cognitive ecology. While Hutchins (1995) initially drew on the representationalism of mainstream cognitive science and an orthodox view of language (Hutchins 2010), both were tempered by the time he called for a new science of cognitive ecosystems (Hutchins 2014). As an anthropologist and ethnographer, he saw that practices are distributed in time and, for this reason, demand various kinds of agency –ways of meshing culture, institutions, devices and pre-reflective experience that links expertise with language. Given the binding role of language, human cognition is systemic (Cowley and Vallee-Tourangeau 2017) in that allows individuals to act within wide cognitive systems as they implement practices. Conversely, as people engage in practices, they actualize performances, develop habits and, over time, adopt beliefs and ways of talking: as they gain skills, they individuate as persons. They draw on practices to gain practical skills, ways of using language and beliefs and a social standing. Practices rely on people who are bidirectionally incarnated with both the pre-reflective and a world of common experience. People learn to draw on cultural phenomena that aid, challenge and frustrate what we do, feel and think: events in fast timescales (e.g. seeing a drone) trigger experience (e.g. assuming it is seeking leaks) that bear on slow-moving change (e.g. how drone use is regulated).

4. Performative cognition – a need for language

The posthumanist tradition allows for bidirectional coupling between technical constellations and assemblages. A focus on practical engagements both eschews individualism and grants agency to things as used by people with common experience of styles, methods and practices. On this performative view, drones, robots and other advanced devices can constrain how people engage with their immediate surroundings while enacting a socio-technical culture that changes human ecologies. While highlighting the role of culture, the tradition overlooks actual encounters and pre-reflective experience. For all the merits of focusing on practices that reach beyond individual cognizers, it leaves out crucial linguistic factors. It overlooks the effects of material engagement thanks to which, in Gahrn-Andersen's (2020) terms, objects like drones and robots come *with meanings attached*.

As we have seen, medium-strong versions of embodied cognition allow one to invoke abstract semiotic conceptions of meaning. In working clay, a bidirectional link between thinking and thinging enables a potter to use pre-reflective experience in material engagement. Over time, the results enable the potter to become skilled and develop talents. In a social setting, enskillment influences agency and leads to product types whose properties can sustain, change and overthrow (older) practices and techniques. In material engagement theory, a residual cognitivism

underplays how felt experience affects individual construals. In bringing Hegel to an enactivist philosophy of nature, Crisafi and Gallagher (2010) allow public events to draw on history. However, since language remains unaccounted for, no view is given of how action is able to draw on past happenings. The same explanatory gap appears in Hutto and Myin's (2017) extensive mind that gains its mental content from propositional structures. A focus on abstract linguistic forms separates construal from practices, changing cognitive ecologies and, crucially, how beliefs bear on individual cogniser's felt experience.

Performativists and proponents of strong embodiment concur on two major issues. First, both reject representationalism and, thus, deny that culture or cognition is founded on 'language'. Second, both appeal to bidirectional coupling. Yet, performativists ignore felt reactions to practical usage and, thus, individual construals: they leave out how experience draws on langauge. In contrast, those taking strong views of embodied cognition allow for bodily dynamics and construal but, lacking a trans-situational focus, omit how practices impact individual felt-experience and linguistic anchoring. Further, they fail to ask either what 'language' means or how its verbal nature constrains and conditions experience through the link between felt reactions and public construals. On the view presented here, by contrast, language – or better languaging (see, Cowley 2019) – gives coherence to changing cultures and human agents. Human activity connects the lived experience with practices in drawing on physical wordings – aspects of activity that contribute to experience of the world. Next, we show that, as inhabitants of a world where practices are inseparable from wordings, objects themselves have meaning attached.[4]

4.1 The limits of language

Social activity that informs the cultural domain draws on assemblages that unite people, artifacts, organisations and what are known as lifeforms or cognitive ecosystems. Thus, in unexpectedly encountering a drone flying up their street, people react in remarkably predictable ways. Groups have similar experiences and use similar ways of feeling talking, moving, explaining etc. People and culture exist in public domains where pre-reflective experiences trigger the use of verbal constraints, demonstrating how feeling and activity mesh with how cognition is transformed by language (Gahrn-Andersen 2019a). Thus, while languaging applies to activity in which wordings play a part (including, thinking, dreaming, watching television etc.) (see, Cowley 2019; 2014; Love 2017), in many settings, it is of value to contrast this with how practices draw on its repeatable verbal aspect. The latter is intrinsic to managing practices and is best known as *enlanguaged cognition*. Crucially, unlike discourse, it is situated – its use is shaped by action in a particular situation. In what follows, we use the concept to add more spice to strong views of embodied cognition. Where practices draw on what is routinely said –and often repeated –acts of construal can also be facilitated by history, routine and procedure. Given an anchoring in practices, actualizations of wordings become central to the explicit sense of events, perceptions and felt reactions. Before returning to the argument, we consider its bearing on views that have arisen in post-human thinking.

Performativist views of language, inscriptions and linguistic experience have the virtue of connecting activity, trans-situational technical engagements and language as constitutive of socio-material practices. However, to specify how individual powers connect with trans-situational socio-material practices, one needs a concept of languaging to connect up the socially shared, the publicly actualised and the felt reactions as well as ongoing perceiving by the participants. Thus, as Gahrn-Andersen (2019b) suggests,

[4] While developed independently, this metaphor is strikingly similar to how distributed language was first introduced (Blair and Cowley 2003) around Marquez (1972) story of Macondo, a fictional place of collective memory loss where all items come to be labelled (and, later, are given labels about the labels).

> "one of the things that makes human sociality special – or global in Latour's sense – is the fact that we can recognise things by means of attaching denotative meanings to them. Thus, we conceptually identify things across contexts" (p. 181).

The key word is *we*: meanings are attached, say, to drones as they bear on both individual experience *and* so-called drone culture. Given post-human focus on practice and performance, however, no account is given of pre-reflective experience or felt reactions. In presenting performance, post-humanists fall into two camps. Whereas *makers* treat language as central to socio-material relations, *materialisers* pursue the performative logic by abstracting away from languaging as a phenomenon to treat language as discursive practice.

For Jasanoff (2020), language has the power "to make and unmake the relations between nature and society" (p. 62). In principle, such a premise can be extended to both practical engagements with the natural world and also to relational bridging between different realms.[5] However, Jasanoff also regards the making function as extending practical engagements. A similar connection between scientific practices and language appears in Latour's observation that scientific work generates inscriptions. While surely true that language renders scientific practices possible (p. 60), his metaphor presents the process as quasi mathematical (or generative). By eliminating the individual, language is treated as inscription-like and separated from its bodily making (or construal). In lacking any concept of languaging, the theory blurs how verbal aspects of language contribute to situated practice (e.g. use of documents) while ensuring diachronic continuity across generations.[6] In building on ANT, Jasanoff's disregard for the making function – and languaging – like Latour's generative metaphor, reveals a residual representationalism. Indeed, for Jasanoff, language is a medium with an odd transparency: it is said to grant coherence to scientific practice only because language

> "permits the translation of what one pair of trained eyes has seen into a medium that allows many others to share in that intimate act of discovery" (p. 60).

Inscriptions are taken to function as storage medium for representations. And, just as with Radical Embodied Cognitive Science, the model gives no attention to acts of construal – let alone pre-reflective experience.

The second camp of performativists are more explicit in challenging any appeal to linguistic representationalism. In this respect the work of Karen Barad is emblematic:

> "As long as representation is the name of the game, the notion of mediation-whether through the lens of consciousness, language, culture, technology, or labor-holds nature at bay, beyond our grasp, generating and regenerating the philosophical problem of the possibility of human knowledge out of this metaphysical quarantining of the object world" (Barad 2007, p. 375).

Barad's (2003) performative approach to material-discursive practices builds on the negative claim that "language has been granted too much power" (p. 801). While language is not irrelevant, she stresses that representationalist approaches to cultural studies, social theory and STS tend to favor the verbal, the discursive and the cultural over materiality.[7] Consequently, she claims, language has been (mistakenly) rendered "more trustworthy than matter" (ibid.). The reason for

[5] For instance, as Barad (2007) puts it, "scientific practices are specific forms of engagement that make specific phenomena manifest" (p. 336). It thus follows that other kinds of practices makes manifests. However, Barad does not grant language a role in this. We return to Barad's account below.

[6] In our terms, she equivocates between situated use of enlanguaged cognition and patterns of discourse that can be described as languages, forms of usage, genre, rhetorical moves etc. or, for Love (2017) terms, *2nd order language*).

[7] The fact that this also holds for orthodox linguistics is shown by Gahrn-Andersen (2019b).

this, Barad thinks, is a tendency to view socio-material engagements through the lenses of linguistic constructs (e.g. signification, discourse, culture). Yet, in favoring "cultural representations and their content" (ibid.), representationalists can, at best, make indirect contact with what, in this tradition, is termed *materiality*.

Barad challenges the dominance of language by attributing primacy to materiality or matter. She thus overthrows the representationalist fallacy that everything (including materiality) reduces to conventional content. Barad rejects a semantic view: "meaning is not a property of individual words or groups of words but an ongoing performance of the world in its differential intelligibility" (p. 821). The move effectively renders content-vehicle distinctions redundant by making linguistic phenomena wholly performative. She thus endorses a shift in "focus from questions of correspondence between descriptions and reality (e.g., do they mirror nature or culture?) to matters of practices/ doings/actions" (p. 802).

Two major issues arise: First, although Barad dismisses classic notions of semantic content, she nonetheless retains some kind of content. Her argument is negative in that what is at issue "is not achieved through the thoughts or performances of individual agents" (p. 81). While recognizing that discursive activity is not driven by linguistic representations, Barad retains the view that discursive interaction results in representations. Her focus on the discursive thus centres on, not "what is said", but, in her terms, what "constrains and enables what can be said" (p. 819). Barad thus offers no performativist alternative to a representationalist view of meanings: while there is great merit in deflating the "what is said", her discursive take places strict limits on what enables language (i.e. discursive practices) and ignores what makes performance possible.

Second, given explicit posthumanism[8] it is unlikely Barad's approach can be used to develop a non-representationalist nature of conceptual meanings. Thus, on her view,

> "discursive practices are not anthropomorphic placeholders for the projected agency of individual subjects, culture, or language. Indeed, they are not human-based practices" (p. 821).

By emphasizing the nonhuman nature of material-discursive practices, Barad leaves aside the phenomena and felt-reactions that allow discourses to be read, inscribed and used in coordinating human-relative practices. In short, she chooses to ignore the phenomenality of language and the resonances of languaging.

Performativist views highlight the limits of language. They rightly show that language is not an agent that constructs or represents the world. However, in leaving language as an unanalyzed part of material-discursive practices, they grant no space to the pre-reflective or, indeed, the making and interpreting of construals. When there is no residual representationalism (as in treating inscriptions as a transparent result of practices), languaging becomes discursive practice that uses, not living bodies, but materiality. The focus on the limits of language is of value in clarifying how constraints on linguistic activity structure both interaction and the production of inscriptions. However, it prevents us from considering either human language in particular or, just as crucially, conceiving of languaging in general.

5. Languaging experience and enlanguaged life

Neither embodied cognitive science nor posthumanism offer anti-representationalist views of language or languaging. In sketching such a course, we overview the position and sketch a unificatory view of pre-reflective experience, the making and interpreting of construals and how culturally discursive practices mesh with performance. In so doing, we draw on a distributed perspective which, as applied to language, and languaging, defines both as 'activity in which

[8] Here we are not targeting post-humanism; rather, we challenge the specific variant endorsed and developed by Barad (2003; 2007).

(physical) wordings play a part' (see, Cowley 2014). In this context, the enactment of wordings is seen as a human-specific phenomenon arising within human-specific practices (Gahrn-Andersen 2019b; 2019d). This enables us to treat questions about wordings as central to languaging in general. In illustration, we later exemplify with the inscription "AUTONOMOUS DRONES." Specifically, we show it attaches meaning to an ill-defined class of machines that, at the historical juncture of writing, have massive cultural significance.

Arguments against representationalist views of language reduce language to 'propositions' and/or 'utterances' that allegedly represent form, meaning and/or to allow mappings between them. In terms of this paper, such views leave out pre-reflective experience, felt reaction, language-doing and, how we live in and through language as performers who rely on an interplay of discursive practices (and enlanguaged cognition). In the language sciences, such views can be traced to arguments such as the following:[9]

- Inappropriacy of the conduit metaphor and/or appeal to linguistic transparency
- Refutation of the view that, in some non-trivial sense, language is like a code
- Identification of written language bias in compositional models of how linguists inadvertently extend this a literacy-based vision to all languaging
- The importance of the material properties of utterance-activity, linguistic bodies and the many ways in which language is embedded in action with and without the help of artifacts and institutions.

In extending these arguments, we stress that 'language' – in all uses of the term – not only binds experience, culture and practice but exhibits multi-scalar functionality. If accepted, this observation in itself undermines reduction of language to abstract 'items' with discrete 'senses': thus, what is called a *word* is quite a different entity when viewed historically or as informing the lived experience of populations from what it becomes when treated as a something (a 'wording') that influences pre-reflective experience or, thus, serves in language making.

So, what of anti-representationalist views? Inspired by, above all, the work of Ryle (1949), Wittgenstein (1957), Heidegger (1982) and Maturana (1983), these have developed slowly in the linguistic context. As with the performative, they reject individualism and organism-centred views invoking either a brain-based system that animates a mind and/or invoke linguistic bodies that depend on interaction. Like life and cognition, languaging unites parts and scales and is, in this sense, 'distributed'. From a macro-perspective, we live in and through language; for each human child, it is already there, awaiting exploration. In Wittgenstein's phrase, one has to step into language and, having done so, find a way around a historically derived 'city'. For Ellis (2019), language is the quintessence of distributed cognition in that usage unites the practical (and performative) with the acting, feeling and thinking of individual bodies that are able to link nonliving materiality with their own metabolism derived powers.

Since languaging functions in many ways, distributed approaches offer a perspective that challenges linguistic tradition. Appeal to languaging as multi-scalar action is quite incompatible with views that seek 'explanations' in linguistic 'systems' or the 'use' of static units. In connecting the macro with the meso, practices use repeatable patterns that, at times, index marks that appear as inscriptions. In slow scales, these slowly changing items are, in English, known as *words*. They were seen as the central object in 19th century linguistics as is exemplified, above all, by the work of Whitney (1875). In 20th century tradition, words were ascribed to abstract counterparts – signs (Saussure 1959), forms (Bloomfield 1933), utterances that are described by sets of morphemes and phonemes (Harris 1951) a finite infinity of sentences (Chomsky 1965), or embodied concepts (Lakoff 2008). All such models use a history of repeating and analysis and, one a distributed view, conflate language with abstract constraints on human practices. The claim

[9] Among the major critical voices behind this summary are Reddy (1979), Harris (1981), Carling and Moore (1982), Linell (1982), Love (2004) and Kravchenko (2011).

is largely consonant with the performativist view. However, in literate societies, these constraints also appear as material inscriptions that draw on alphabets and other writing systems which are subject to complex sets of codified norms ('standardisation'). Given the formal simplicity – and precision – of inscriptions, it seems inevitable that these have transformed pre-literate ways of languaging. Although individuals inhabit a world of discursive practices that regulate discursive practices (sic), these constraints function, in the main, by placing limits on language, languages and languaging.

Materiality has a powerful influence on even second-order structures. In a metaphor, it changes how they are 'realised' as utterances or as texts (Halliday 1985). However, there are no grounds for identifying these: neither vocalizations nor written patterns reduce to forms with spatio-temporal continuity (Kravchenko 2009; Olson 2016). Second-order structures also arise as human bodies coordinate practices based on languaging (and enlanguaged cognition). As people perform activity much depends on (physical) *wordings*. These are actualised patterns that can be repeated and thus identified with words (or verbal signs): in situations they influence events –or readings – and are, at once open to description as second-order structures. They use, not whole-body coordination, but fine control over articulatory gestures that is honed by human skills in hearing many ways of articulating gestures as 'the same'. They arise in hearing and feeling what one says while also suppressing other aspects of action, vocalizing, gesture, postural moves and thinking. This activity is part of languaging as are, indeed, the felt experience of hearing, grasping or failing to grasp what is said. Indeed, as first suggested in 1582, languaging depends on using the tongue to induce one's own understanding (Mulcaster 1582; Cowley 2019). In literate societies, of course, we also language without speaking –we learn to read and write without rendering thoughts out loud. Thus, in the US population, almost half the population report that they 'think in words' (Fernyhough 2016).

First-order languaging is experienced and fully integrated in activity. It unites pre-reflective experience with language-doing and interpretation (including silent thinking and dreaming). While a focus on utterances makes it appear individual-centred, this is misleading. Anything said (or thought) is inseparable from enlanguaged life – how persons draw on a history of discursive practices that presuppose named languages and domains of action. At the core of all this activity-cum-practice, is an ability to make and attend to wordings. In the exemplary case of talk, the activity is public and depends on physical events that give voice to, at once, discursive practices and, indeed, pre-reflective experience. While only one aspect of how we make meanings, wordings have a crucial role. They are always different and, as Pete Becker (1988) first recognized, the core of language in particular.

6. The case of AUTONOMOUS DRONES

Let us illustrate around a single inscription. In what follows, we will treat each upper-case instance of AUTONOMOUS DRONES as having a single *meaning*. In taking this view we turn from a concern with wordings – or the making/interpreting of inscriptions – to how a piece of 'text' indexes a changing social continuant that, in the second decade of the 21st century, connects pre-reflective experience, events in a public sphere and how readers of AI & Society are likely to make use of discursive practices. Our first point is technical: AUTONOMOUS DRONES is seen as a formula. While it can, of course, be analysed as a composite of 'autonomous' plus 'drones' – just as the terms can be explored etymologically – such facts are marginal to its role as a social continuant. Not only have we often invoked the relevant wording in this paper (by placing cases of AUTONOMOUS DRONES an upper case) but similar inscriptions are ubiquitous (usually in lower case) and many people use related language-making in social settings. Thus, as revealed by Google's search engine, on 7th July, 2020, we find 198 000 uses of the collocation; by 20th July, there are 213 000.

Plainly, AUTONOMOUS DRONES functions as a 'representation' in a casual sense. Even if each recurrent version of the 'letters' is seen as identical (or traced to a line of machine code),

what we evoke or see are correctly described as instances of a type (defined by a writing system or the use of programs). Further, in *reading* AUTONOMOUS DRONES, context affects construal as does, at times, pre-reflective experience. We cannot not respond to AUTONOMOUS DRONES as a wording (unless we skip large passages) and, even in reading a single paper, one can fine-tune one's attitude through repeated exposure to the patterning. The view fits a performativist description. The formula of AUTONOMOUS DRONES bundles practices that, as shown in the Special Issue, attest to cultural forces that merge a heterogeneous class of devices. Like an inscription, drones are part of enlanguaged life and, oddly, even if one has never seen such a device, the objects shape understanding: they bear on how we evaluate governments, war, business and technology. As Benjamin (2020) argues, the true threat of drone culture seems to lie in the rising power of anonymity that secures the interests of certain actors. A formula like AUTONOMOUS DRONES is indicative of how the process uses languaging: it is symptomatic of what language does to us.

Yet AUTONOMOUS DRONES is also a thinking tool: the inscription serves enlanguaged cognition. Above all, it serves in *making* construals, design and interpreting or reinterpreting many kinds of experience. In using the formula, the inscription/drones are conflated to facilitate what, in various senses, is called abductive reasoning.[10] Indeed, this resonates in a Special Issue where editors and authors alike make explicit ideas that will mesh with the inscription in various settings. While responding differently, readers will tend to similar reactions, ways of thinking and discursive practices. Thinking tools make minimal use of what goes on 'in the head.' While individual experience, expertise, biases and reading styles matter, *thinking* depends – to a remarkable extent – on how other people have manipulated properties of public media. In a case like AUTONOMOUS DRONES, a more remarkable consequence follows. The construals that arise can be resemiotized by engineers and other users– they can be put to work. As we have seen, the inscription has implications for philosophy, law and design. It is a pattern that can be used to trigger new practices and the development of new technologies (or ways of constraining how they are to be used).

But the power of AUTONOMOUS DRONES derives from neither practices nor its pragmatic value as a thinking tool. Its roots lie in human pre-reflective experience: drones perturb and, for the uninformed, this evokes a vague, folk notion of autonomy. First-person experience has tap-roots that become sensitized to the inscription and, of course, for those concerned by military use of drones – and its sociopolitical implications – the effects are powerful. Yet, since this aspect of languaging – what we experience as we read or write AUTONOMOUS DRONES – is pre-reflexive, it cannot be shared. Hence the inscription-type illustrates our claims. As human actors, we inhabit an ecology where drones and robots are ever more prominent – and raise issues that deserve serious consideration. To do this, we need a non-representationalist approach to languaging. Only such a view can show how advanced technology comes with many payloads but, in all cases, they have meanings attached.

7. Conclusion

Drones and robots serve in battling with environmental degradation and fighting climate change; equally, they will make a few people a lot of money. While critique of drone culture is important, we have left that important topic to others. Here, we highlight the power of perceived autonomy. Drones and robots are merely autonomous in a limited motivated or operational way. Not only is this interesting but, we argue, it sheds light upon what humans are, has implications for technological design and engineering, and will continue to drive ethical and political action long

[10] While often ascribed to Peirce (1931-1935), the concept derives from Whewell (1847). Abductive outcomes are neither inductive or deductive: in this context, the most important sense may be how it is generalized by Bateson (1979) to how living things settle on the unexpected, adapt and open up what was previously not possible.

into the future. To inform such processes, we need models that connect up spheres of human living by linking embodied cognitive science with posthumanist performativism and a distributed view of language. In considering DRONE AUTONOMY we show how bidirectional coupling links the pre-reflective, the explicit and the trans-situational: although we tend to enact/construe the inscription in similar ways, our doings are prompted pre-reflectively. Thus, the paper's central claim is that devices usually come with meaning attached, and that ways of responding that are culturally bound.

There is a certain logic to seeing that, if one gets the seeming right, the rest can follow. While plain in computer games, the insight extends to other systems. Visceral response has always been recognized: it appears in Weizenbaum's (1976) view that reactions to his ELIZA program show the dangers of computing just as it fits the argument that androids can be used as experimental devices in studying humans (MacDorman and Ishiguro 2006) and that robots shed light on human 'language' (Cowley 2008). Yet, many engineers resist the view that their products are parts of wider assemblages – they like to present devices as 'objects' that manage tasks in a few situations. In fact, we argue, they are fully integrated in wide systems and have all kinds of effects upon how we live, think and feel. Indeed, enlanguaged life is increasingly dominated by technology. In order to develop such understanding, in this paper we have sketched a basic model that can help us understand the impact of devices on human ecologies.

The societal impact of drones is out of proportion with what they can accomplish. Much depends on a few hegemonic actors; more surprisingly, it also bears on pre-reflective experience. Often, devices exert their power, not because of fancy engineering or killing capacity, but because of felt responses within a culture that increasingly relies on anonymous decision-making. Drones have an emblematic role in public imagination – they come with meanings attached. Accordingly, our work has implications for all research with societal relevance. As is exemplified by drone culture, many dangers and opportunities pertain to pre-reflective experience and enlanguaged cognition. For this reason, problem solving is of limited value in approaching societal issues. Technology has 'societal impact' that is obscure to established views and public discourse. Many feelings, observations and design opportunities elude extant (or soon to be available) data based on mainstream theories, standard methods and disciplinary models. These are inadequate for clarifying how technology affects human ecologies. As we have shown, only a transdisciplinary approach that draws on the best from STS, Radical Embodied Cognitive Science and Distributed Language is likely to be successful in such an endeavor.

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