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# More-than-human urban food growing imaginaries: engaging with the senses

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## ABSTRACT

This paper catalyses the academic urgency to understand agri-food system transformation pathways. Such transformation requires new food growing imaginaries of rooted in a change of thinking and ways of engaging with more-than-human perspectives. Urban spaces are hubs of human and more-than-human interactions, and urban organic farming offers an excellent site for exploring such new food growing imaginaries. The research presented here innovates theoretical and methodological knowledge in more-than-human geography. It develops alternative food growing imaginaries through a sensory ethnography at an urban organic workers' cooperative Organiclea and visual arts methodologies. Through that, the paper brings to the fore the marginalized more-than-human perspectives by exploring more-than-human sensory Umwelts – taste and nutrition for the soil, sound for soil denizens, smell for honeybees, tactile perception for common weeds – and understanding human experience of food growing through sight. Attuning to a more-than-human sensorium broadens our knowledge of the life stories of other biotic and abiotic critters and recognizes that human and more-than-human world-making projects are interconnected. The paper concludes that sensory engagement is critical to the development of new imaginaries for a more sustainable food production.

## Imaginarios urbanos más que humanos de cultivo de alimentos: interacción con los sentidos

## RESUMEN

Este artículo cataliza la urgencia académica de comprender las vías de transformación del sistema agroalimentario. Dicha transformación requiere nuevos imaginarios de cultivo de alimentos arraigados en un cambio de pensamiento y formas de interactuar con perspectivas más que humanas. Los espacios urbanos son centros de interacciones humanas y más que humanas, y la agricultura orgánica urbana ofrece un excelente sitio para explorar esos nuevos imaginarios de cultivo de

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geografía más que humana; Umwelt; agricultura urbana; metodologías basadas en las artes; etnografía sensorial

## MOTS CLEFS

géographie plus qu'humaine; Umwelt; agriculture urbaine; méthodes fondées sur l'art; ethnographie sensorielle

alimentos. La investigación presentada aquí innova el conocimiento teórico y metodológico en la geografía más que humana. Desarrolla imaginarios alternativos de cultivo de alimentos a través de una etnografía sensorial en una cooperativa de trabajadores orgánicos urbanos *OrganicLea* y metodologías de artes visuales. A través de eso, el artículo ilustra las perspectivas más que humanas marginadas al explorar los *Umwelts* (medioambientes) sensoriales más que humanos -el gusto y la nutrición para el suelo, el sonido para los habitantes del suelo, el olfato para las abejas, la percepción táctil para las hierbas comunes- y la comprensión de la experiencia humana del cultivo de alimentos a través de la vista. La puesta en sintonía con un sensorio más que humano amplía nuestro conocimiento de las historias de vida de otras criaturas y seres abiotícos (Sachs Olsen, 2022) y reconoce que los proyectos de creación de mundos humanos y más que humanos están interconectados. El artículo concluye que la interacción sensorial es fundamental para el desarrollo de nuevos imaginarios para una producción alimentaria más sostenible.

## Des imaginaires plus qu'humains de l'agriculture alimentaire urbaine : un engagement avec les sens

### RÉSUMÉ

Cet article catalyse l'urgence de plus de recherche pour comprendre les filières de la transformation du système agro-alimentaire. Ceci nécessite de nouveaux imaginaires pour l'agriculture alimentaire, qui seraient ancrés dans un changement de mentalité, et des voies pour un engagement avec des perspectives plus qu'humaines. Les espaces urbains sont des pôles d'interactions humaines et plus qu'humaines, et l'agriculture bio urbaine offre une place idéale pour explorer ces nouveaux imaginaires. La présente étude innove les connaissances théoriques et méthodologiques dans la géographie plus qu'humaine. Elle présente des imaginaires d'agriculture alimentaire différents par le biais d'une ethnographie sensorielle dans une coopérative bio urbaine, *OrganicLea*, et des méthodes fondées sur l'art. Grâce à cela, elle amène à la surface les perspectives plus qu'humaines marginalisées en explorant les *Umwelt* sensoriels : le goût et l'alimentation pour la terre, le son pour les habitants du sol, l'odorat pour les abeilles, le toucher pour les mauvaises herbes courantes, et l'appréhension de l'expérience humaine concernant la production alimentaire à travers la vue. L'adaptation à un sensorium plus qu'humain élargit nos connaissances sur les récits de vie des autres créatures et êtres abiotiques (Sachs Olsen, 2022) et reconnaît que les projets de fabrication des mondes humain et plus qu'humain sont imbriqués. L'article conclut que l'engagement sensoriel est essentiel au développement de nouveaux imaginaires pour une production alimentaire plus durable.



This paper catalyses the academic urgency to understand agri-food system transformation pathways (Lamine et al., 2019; Seymour & Connolly, 2023) by contemplating new food growing imaginaries. Here, such an imaginary is rooted in a change of thinking and ways of engaging with the beings that humans share the planet with by attuning to their sensory lifeworlds. In attuning to the sensory lifeworlds in food growing, the paper offers novel ways of understanding and enacting food systems that challenge capitalism-driven approaches.

Capitalism-driven agri-food system poses a significant threat to human and planetary health and wellbeing. It is resource- and capital-intensive (Ritchie et al., 2022), contributing to different types of pollution (Woodhouse, 2010), biodiversity collapse (Bar-On et al., 2018) and climate change, emitting ~30% of the global total of greenhouse gas emissions (Clark et al., 2020). The relational, more-than-human paradigm in geography (Ginn, 2014a; Panelli, 2010; Whatmore, 2006) is increasingly seen as a possible way to imagine ‘a food system that cares for Others’ (Sovová et al., 2021, p. 1), as exemplified by Donati (2019) and Seymour and Connolly (2023). Despite food growing being an interspecies endeavour (Ginn, 2014a; Singleton, 2010), a more-than-human paradigm has received limited application to urban farming (Goburdhone & Dombroski, 2023; Mincyte et al., 2020), with the only UK-based studies by Pitt (2018) and Beacham (2018).

Urban farms are sites of human and more-than-human proximity and close interactions. Urban spaces provide ‘key testing grounds’ for pushing the boundaries and reconsidering ethical and political questions around the urban from more-than-human perspectives (Amin & Thrift, 2002, p. 156, cited in Oliver et al., 2021). Urban farms offer an excellent context for exploring new food growing imaginaries that can serve to ‘meaningfully integrate the affective and the ecological, the individual and the relational, moving beyond anthropocentrism, speciesism, symbolism and utilitarian thinking’ (Lien & Pálsson, 2021, p. 16).

This paper innovates theoretical and methodological knowledge in more-than-human geography: it develops alternative food growing imaginaries through a sensory ethnography at an urban organic workers’ cooperative Organiclea in East London and visual arts methodologies. The paper brings to the fore the marginalized more-than-human subjectivities by exploring more-than-human *Umwelts* (unique sensory worlds) – taste and nutrition for the soil, sound for soil denizens, smell for honeybees, tactile perception for common weeds – and understanding human experience of food growing through sight. An intersection between a more-than-human perspective, a sensory element and urban food growing allows for exploring the interdependencies between humans and other biotic and abiotic beings, while making the boundaries between them more porous. Secondly, if, as Haraway (2016) argues, we live at a time marked by discontinuities, the challenge for the arts is to create ways of acting and thinking that build forms of alternative cohabitation. The visual arts methodologies here are deployed to that goal – they engage with the human readers’ primary sense, encouraging a critical reflection on more-than-human agency and experience.

This paper uses the term ‘more-than-human’. As Price and Chao (2023) suggest, this term challenges the hierarchy of superior human worth and value; it acknowledges a diversity of beings, agencies and actions that participate in world-making projects.

The term offers an ethical and philosophical paradigm relevant to this paper. Similar to Price and Chao (2023), I am aware of the critiques of 'more-than-human' terminology proposed by critical race scholars (Büscher, 2022) and the use of the term here does not intend to replicate any problematic racializing assemblages.

The paper first draws on anthropocentrism in the existing food system and offers its critique by discussing a more-than-human perspective. It offers a grounding for exploring more-than-human sensory lifeworlds – Umwelt thinking – before describing the context and methodology. More-than-human sensory *Umwelts* and the human experience of food growing through sight are then presented. The paper concludes that alternative urban food growing imaginaries emerge from broadening our knowledge of more-than-human sensory lifeworlds and recognizing that human and more-than-human world-making projects are interconnected.

### A more-than-human perspective

The anthropocentric food system is underpinned by a capitalist ideology (Kneafsey et al., 2021), in which natural ecosystems with their inhabitants have been subsumed into the market economy and considered as a resource to exploit. The capitalist world order (closely linked with Euro-Western patriarchal and colonialist orders) reproduces the gender, labour, racial and species hierarchies, and rests on 'the logic of dualism' (Plumwood, 1993). This logic sees the world through hierarchical binaries (culture/nature; male/female; mind/body; master/slave; reason/emotion; human/non-human). Within them, certain human groups and other living beings are devalued and objectified. The dualistic and hierarchical conceptual frames stand in the way of relational thinking and understanding our connections with each other and other beings (C. Adams & Gruen, 2014, 2022; Cudworth, 2005; MacGregor, 2017).

A conceptual shift in Western humanities and social sciences towards 'more-than-human' seeks to challenge the above-mentioned human exceptionalism and transform ecologies and communities that have been damaged by the dominant extractive mode of production. In geography, this trajectory is most prominent in animal (Philo & Wilbert, 2000; Wolch et al., 1995) or more-than-human geography (Greenhough, 2014). It brings forward 'more-than-human neglected subjects' (Miele & Bear, 2022, p. 756) and also centres more-than-human agency in ordinary practices (Miele & Bear, 2022), as shown by, among others, Bear (2013), Poe et al. (2014), Head et al. (2014).

A more-than-human perspective considers webs of relations between different beings (van Dooren et al., 2016). We become human with 'Earth others' (Plumwood, 1993), and human lifeways and accountabilities are entangled with other species (Baynes-Rock, 2013; Kimmerer, 2013; Kohn, 2013; Mol, 2002; Tsing, 2015; van Dooren et al., 2016). This means opening to new ways of seeing the world that challenge the prevailing anthropocentric trends. As Kirksey (2018, p. 450) puts it, 'in blasted landscapes that have been transformed by multiple catastrophes, ethnographers and artists are illuminating modest sites of biocultural hope'. In the food growing context, we can imagine all the burgeoning life underground, even in soils that have been overworked and overfertilized. Such hopes can produce new articulations, which in turn produce conditions for possible mutual flourishing (Kirksey & Chao, 2022).

Adopting a more-than-human perspective means practicing the art of noticing. Haraway (2008, 2016) advocates for kinship as a non-anthropocentric form of relationality based on response-ability and becoming-with. It entails noticing the relational ways in which apparently separate entities 'co-shape' (Haraway, 2016) each other, thus pushing beyond the human-centred imaginations behind the ecological crises we face today. Haraway (2008) sees significant otherness as a productive relation that subverts binary thinking. Practicing the art of noticing follows Elder's (1998, p. 11) logic that 'love is where attentiveness to nature starts, and responsibility toward one's home landscape is where it leads'. Our awareness that different species are in a co-constitutive relation through mutual connections invite a degree of responsibility and care.

Importantly, 'more-than-human' conceptual shift has been criticized for erasing non-European ontologies: Sundberg (2013) asserts that a foundational ontological split between 'nature' and 'culture' is not universal and posthumanist theories tend to erase both location and Indigenous epistemologies. More-than-human scholars often draw inspiration from agentic thinking pioneered by Indigenous ontologies (de la Cadena, 2015). Agency in this case is intersectional, allowing to identify among entangled beings; human and more-than-human are associated and form 'a world of many worlds' (de la Cadena & Blaser, 2018). Country et al. (2015) suggest that agentic thinking needs to penetrate all aspects of research, as the need to practice methodologies that challenge human superiority is an ethical matter. They propose 'a methodology of attending' that calls for all beings to be respected for their part in creating, participating in and sustaining the world.

A more-than-human perspective critiques and provides an alternative to the exploitative, objectifying binary logic that underpins today's food production system. It also provides a suitable lens for exploring new food growing imaginaries in the context of urban farming, envisioning a relational web of being with others that disrupts productionist relations. Its thinking in assemblages and practicing the art of noticing allows contemplating alternative imaginaries for food growing. Such alternative imaginaries are underpinned by 'sympathetic imagining' practices where more-than-human species are dignity bearing subjects, active agents and constructive world makers (Kirksey & Chao, 2022). The next section offers a theoretical grounding for constructing such alternative food growing imaginaries by presenting Umwelt thinking.

### **More-than-human sensorium and umwelt thinking**

Latour (2004), drawing on Despret (2004), speaks about 'learning to be affected'. He describes that through one's embodied interaction with the diversity of the world (in his case, smells), that world becomes more highly differentiated, and one ultimately connects to it more closely, appreciating that diversity. Applying this thinking to a more-than-human realm (specifically to the soil), De La Bellacasa (2017) proposes that we need to be more specific about the relationship behind learning to be affected and how that relationship transforms both our understanding of ourselves and others we are affected by.

Both Latour and de la Bellacasa draw on the sensorial realm in relation to thinking and 'knowing' that is beyond the dominant Euro-Western form of

knowledge-making. As De La Bellacasa (2017), p. 19) puts it, the sensorial universe 'better explores the ambivalences of conceiving caring knowledge as an intensification of involvement and proximity'. Being attentive to and appreciating a more-than-human sensorium brings us closer to a non-anthropocentric form of relationality.

Abram (1997) invites us to connect with more-than-human sensuousness. This invitation resonates with Kohn's (2013) work on forests and his suggestion that all living beings actively engage with their environments and communicate through semiotics. This is exemplified by bees' waggle dance that transmits information about food sources (Judd, 1994), insect communication through pheromones (Vander Meer, 2019), trees' and plants' entanglements with fungal networks (van der Heijden & Horton, 2009). Deepening a more-than-human sensorial understanding, Tsing (2015, p. 263) considers fungal perspectives, thus reshaping the conventionally overlooked more-than-human 'participants' agency and acknowledging their role in 'social relations' with others. Similarly, Gabrys (2018) contemplates a garden from a lichen's point of view, being attentive to the communicative exchanges between different organisms, while Fijn and Kavesh (2021) focus on more-than-human agency and subjectivity through engaging with different senses.

The notion of Umwelt (von Uexküll, [1934] 2010) captures more-than-human sensory universes well, and its relational ethic offers a promising perspective for contemplating alternative food growing imaginaries. It allows bringing to the fore the marginalized more-than-human lifeworlds, as shown by P. Adams (2016), J. Lorimer (2007), H. Lorimer (2010), J. Lorimer (2010). The concept and associated research into the phenomenal worlds of biotic actors was developed by Jakob von Uexküll who is considered the pioneer of biosemiotics today. von Uexküll saw Umwelt as an 'island of the senses' (von Uexküll, 2001, p. 107), in which each being exists, which shapes its needs and desires and its way of being in the world. Umwelt is one's own universe and consists of three functional cycles – one's perception, interpretation and action in the world. Critics of von Uexküll (Buchanan, 2008) suggest that each living organism is a prisoner of its Umwelt. However, von Uexküll (2001) shows that one's Umwelt does not exist in isolation but is entangled with the Umwelts of others. All living organisms 'have their origin in a duet' which is underpinned by an invisible 'relation structure' (2001, p. 118). The subject of one's Umwelt is therefore the object of other Umwelts at the same time – something of the 'other' is embedded in every organism (von Uexküll, [1934] 2010), p. 158) gives an example of a spider's web and how in its construction the spider needs to be 'fly-like' before the web is encountered by the fly: considering the fly's vision to create the thread thin enough, considering the fly's weight and the power of its body to create the web strong enough, considering the fly's body shape to create a web able to catch it.

Yet, while organisms exist in an interconnected 'relation structure', their corresponding Umwelts may still be closed off from each other, which is proposed as one of the limitations of von Uexküll's thinking (Schroer, 2021). In addition to observing von Uexküll's difficulty in challenging human exceptionalism, Schroer critiques a predetermined biological nature of one's Umwelt development, which does not consider the evolving ways of life within and across different species.



Attuning to a more-than-human sensorium brings us closer to a non-anthropocentric form of relationality. Explorations of a more-than-human sensorium re-envision interiority as a ‘planetary space of encounter’ between human and other bodies, inanimate objects and events (Evans & Edwards, 2017) and allow for a better understanding of our interconnected world. They also challenge the anthropocentric logic by opening human interiorized environments to a multiplicity of more-than-human affects and materialities (Evans & Edwards, 2017). An exploration of more-than-human perceptual universes and their relational ethic through Umwelt, therefore, offers an appreciation of the complex and contested entanglements involved in food growing relevant for this paper.

### **Performative methodologies: sensory ethnography and visual arts**

To contemplate new food growing imaginaries by exploring more-than-human sensory Umwelts, this paper uses sensory ethnography and visual arts methodologies. Both methodologies are performative – enabling new possibilities, contemplating new realities (Law & Urry, 2004). They help producing a new reality where the research focus shifts towards more-than-human subjectivities (Miele & Bear, 2022) and those subjectivities are valued in their own right.

A sensory ethnography is research about the senses, through the senses and for the senses (Vannini, 2015). It emerges through the art of noticing, creating a greater appreciation for the entanglement and connectivity between human and other beings. It is inspired by the anthropological more-than-human sensory engagement (Fijn & Kavesh, 2021) and Ingold’s (2000, p. 10) ‘sentient ecology’ of engaging with the different perceptions of senses in writing. It challenges the dominant mode of human communication – verbal and written. At the same time, a sensory approach uses the hegemonic human sense – vision – productively by recognizing the embodied and multisensuous intra-actions between human and other beings, while valuing the agency of the latter (Markusela, 2024). By focusing on the entanglement of senses, humans have an opportunity to relate to more-than-human agents communicating beyond language and ‘engage in a more meaningful way toward interspecies knowledge-making’ (Fijn & Kavesh, 2021, p. 13, 2024). Interspecies sensory knowledge-making steps beyond ‘what is’ and instead explores ‘what could be’, engaging with imagination and encouraging action and change-making (Vannini & Vannini, 2024), which is pertinent for contemplating new food growing imaginaries.

The sensory ethnography in this research took place on an urban organic farm in London – Organiclea. Organiclea is a workers’ cooperative that started in 2001. Today it grows food in Hawkwood Nursery in the Lea Valley, based on the principles of socially and environmentally just food system. Organiclea uses ecologically sound and sustainable methods and in accordance with the organic standards: building soil life, fertility and structure as the basis for plant and human health; avoiding chemical fertilizers and pesticides; maintaining biodiversity; avoiding genetically modified organisms.

Data collection involved volunteering at Organiclea every Friday in June–August 2023 and conducting participant and non-participant observations and informal ‘show-and-

tell' interviews with staff and other volunteers. I asked: How can we foster new convivial relationships in the context of agriculture? What can we learn about food growing by speculating about a sensorial perspective of soil, a honeybee, a common weed and other species? What more-than-human needs and interests should be taken into consideration when thinking about the futures of food production? I adopted what J. Lorimer (2010) call a 'perspectival approach' that provides an insight into other species' experience of the world despite embodied and sensory differences between human and other beings. It included an embodied and empathic attuning to other beings' sensory perceptions of the world through actively engaging my own senses of taste, hearing, smell, tactile perception and sight. The combination of a 'perspectival approach' with the situated knowledges of Organiclea staff and volunteers led to contemplating taste and nutrition for the soil, sound for soil denizens, smell for honeybees, tactile perception for common weeds and understanding human experience of food growing through sight, the hegemonic sense for humans.

Here, it is important to be conscious of the idea of more-than-human 'representation': such work may contain a risk of ventriloquism (Kirksey & Chao, 2022) – an attempt to speak 'for' and speak 'of' 'the other'. Undoubtedly, there are limitations to my chosen methodological position – I cannot escape the 'bubble' of human Umwelt and cannot truly understand what it is to be a honeybee, a weed or soil. Yet, speculating about and recognizing the importance of more-than-human sensory lifeworlds is still a paradoxically important endeavour 'for the limits of our ethical responsibility do not end at the limit of our epistemological capacities or sensory experience. Rather < ... > this is precisely where they begin' (Brueggemeier, 2021, p. 40). In my case, speculative research expands, complicates and invents abstractions that modify the possibilities of what thought might become (Williams & Keating, 2022).

In the spirit of that, I have created digital collages to think creatively about more-than-human sensory Umwelts. More-than-human geographers often communicate their ideas in visual, audio and video formats (H. Lorimer, 2010; Hodgetts & Lorimer, 2015; Vannini & Vannini, 2020; Marr et al., 2022; Rubio Ramon & Srinivasan, 2023) as words are not enough when attempting to capture more-than-human lifeworlds. Each collage is positioned as an illustration on the themes of taste, sound, smell, feeling and sight in alternative food growing imaginaries. Being playful, provocative speculations, they resulted from my adoption of a 'perspectival approach' and provide an attempt to attune to and foreground more-than-human sensorial experiences, grounded in the active engagement of my own senses and 'the art of noticing'. All collages include photographs that I took during my time at Organiclea, manipulated in Photoshop and contain text relevant to each of the sections. As 'imaginary' is an anthropocentric notion, the collages are knowingly created for the human readers, and, through anthropomorphizing, draw human attention to more-than-human Umwelts. This visual arts method aims to awaken our imagination to go beyond the critique and find new ways of seeing the world and imagining a future in the age of disruption and uncertainty (Haraway, 2015). This research aims to plant a seed of hope in the form of alternative food system thinking by glimpsing into more-than-human sensoriums and human/more-than-human entanglements on urban farms.

## A meal for the soil



tasting menu for the soil

alfalfa  
bitter blue lupin  
buckwheat  
red clover  
mustard  
phacelia

There are a lot of things I am offered to taste at Organiclea. One day Clare, one of the Organiclea staff, gives me a fuchsia-coloured flower which I immediately recognize as red clover. It tastes sweet, with a subtle shade of vanilla to it. I take a photograph of the flower before eating it, thinking that I may use it in a collage later. Red clover is known for its medicinal and culinary properties for humans. But Clare tells me that it makes an even more delicious and nutritious meal for the soil. Having just had a wonderful vegan lunch myself, I take close-up photographs of the soil around different parts of the site, wondering whether its appetite has been satisfied.

Red clover is a familiar and ubiquitous plant that appears in diverse settings. 30–50 cm in height, it bears trifoliate leaves like most clovers and is adorned by rounded pinkish-red flowers. The leaves attract wood mice and the flowers provide delicious nectar for many bee species.

Clare informs me later that red clover is a type of 'green manure'. 'green manure' is an expression that I hear a lot at Organiclea. It refers to fast-growing plants that create that nourishing meal for the soil – they return valuable nutrients, improve its structure, ultimately boosting its fertility and quality. Green manures are normally planted in late summer or autumn and collect the nutrients, making sure they are not washed away by winter rain. In the spring, they are dug in back into the soil, releasing the nutrients they so far held onto back into the ground. Green manures also act against soil erosion – they cover bare patches of soil in the spaces between crops, protecting the soil surface from rain and creating shelter for some insects such as ground beetles (RHS, *n.d.*).

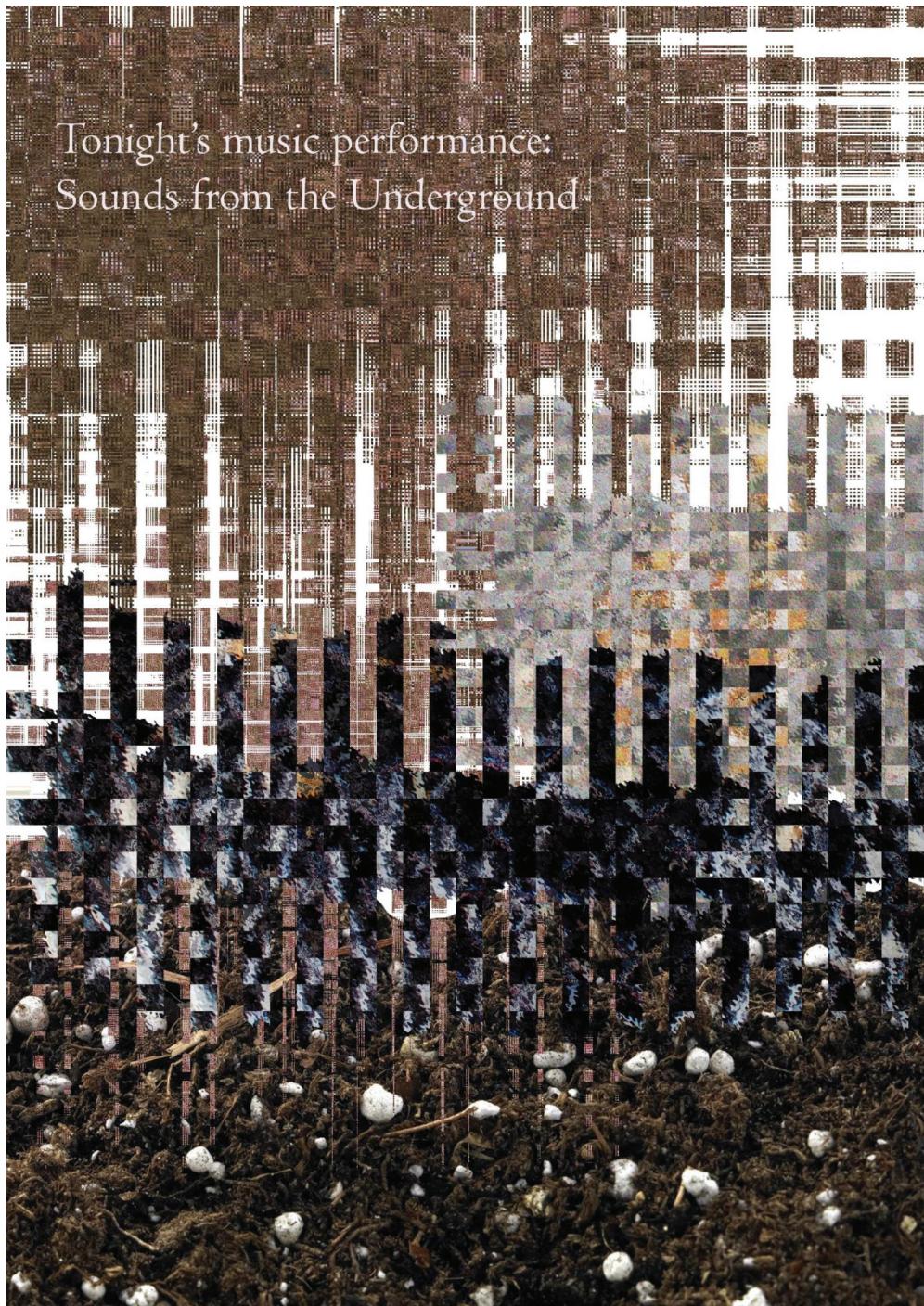
I am introduced to three different types of green manure. There are plants known as 'lifters' (chicory, lucerne) – their roots absorb unused nutrients left in the soil and store them in their leaves. There are also 'moppers' (phacelia) – with their spreading root systems they 'mop up' excess nutrients in the soil. Red clover is known as a 'fixer'. It is involved in nitrogen 'fixing' – drawing nitrogen from the air and storing it in its roots. The process of 'fixing' happens because of a symbiotic relationship between the clover and the Rhizobium soil bacterium. Rhizobium invades the root of clover forming a nodule; within the nodule the plant supplies the nutrients the bacteria require, and the bacteria convert nitrogen into ammonia, for use by the plant (Farming for Better Climate, 2018). Red clover can fix up to 250 kg/ha of nitrogen per year (Farming for Better Climate, 2018), nourishing the soil effortlessly.

The process of nourishing the appetite of the soil creates conditions for more entanglements. Changes in plant species can influence the biodiversity of the soil animals living under those plants (Crotty et al., 2015). There were more diverse populations of soil animals around red clover – earthworms, fungal-feeding nematodes, Poduromorpha springtails, predatory mites. Each of those contributes to the overall health of the ecosystem and rejuvenates the soil. Earthworms are known as 'ecosystem engineers' for their capacity to transform the whole soil habitat by mixing it and moving air and food within it. Nematodes' meal is fungi and bacteria, and this eating habit speeds up nutrient cycling in the soil. Springtails and mites help in decomposing dead plant material and recycle nutrients in the soil.

Taste and nutrition in alternative food growing imaginaries are beyond human. The soil's sensory Umwelt is perceptually distinct but also entangled with the perceptual 'bubbles' of other species. The soil's meal is attractive not only for the soil – soil animals also gather for the feast. The collage above mixes some of those human and more-than-human entanglements behind the soil's meal, imagining them both above and under the ground. In alternative food growing imaginaries, how can we respect the soil's desire for a delicious meal of nutrients?



## Sounds from the underground



It is always noisy at Organiclea, and a hum of human voices and a cluttering of farm equipment are only one part of it. Every day we are all submerged into a multitude of more-than-human noises – a buzz of the bees, wasps, flies, mosquitoes, a cacophony of birds, a gentle rustle created by muntjac deer in the nearby forest. I cannot help but think that there are so many more noises around us that we humans cannot perceive. As I start planting parsley, gently transferring the seedlings from a pot into the ground, I listen to the sounds around me intently and wonder what the soil into which I am putting the herb sounds like. Without the necessary equipment, I cannot hear the ‘polyphonic assemblage’ of multispecies relations (Tsing, 2015, p. 24) that constitute soil, so I ask Rob who works at Organiclea to tell me more about what goes on underground.

Soil is the foundation of most of life on Earth responsible for the transformation and storage of nutrients, carbon storage, biomass production. It stores, filters and transmits water, heat and gases. Soil is the main agent in decomposing and recycling waste. It also supports an intricate and diverse ecosystem. Soil is one of the most rich and diverse habitats on the planet, where multiple more-than-human interactions happen constantly. Nielsen et al. (2015) suggest that soil’s biodiversity exceeds biodiversity aboveground. Microscopic bacteria and fungi are at the basis of it, forming close relationships with plant roots or acting as decomposers. Nematodes, mites and springtails that consume bacteria balance microbial biomass and activity but also fall prey to predatory species of nematodes and mites. Isopods and earthworms act as litter transformers that help incorporate litter into soil. Larger animals such as moles, mice and rabbits also live at least some of their lives underground.

Biodiversity in the soil means that there is a constant exchange of information taking place below ground. Communications between plant roots, plants and bacteria and among bacteria have been described as an ‘information superhighway’ (Bais et al., 2004). That communication is chemical in nature. Communication through sound is much less explored (Rillig et al., 2019). Soil is often perceived as a dark, mysterious and soundless place: José Graziano Da Silva (2014), then FAO Director-General, stated that ‘Soil doesn’t have a voice, and few people speak out for them. They are our silent ally in food production’. Later, when reflecting on this, I imagine that the future collage will be about the soil sounds, or even a soil’s musical performance. I take more photographs of soil at Organiclea in preparation. Later, I research images of different types of sound waves, thinking how the two can be blended in an image.

Soil has a much stronger voice than humans presume. Soil soundscapes are the sounds of infiltrating, draining and moving water and of macropores forming by cracks or collapsing parts of the soil structure (Maeder et al., 2019). I also learn that soil speaks through its inhabitants, each of whom produces a different soundtrack. Soil denizens make noises when moving through the soil or eating. Larvae eating roots emit short clicks as they break the fibres of their meal. Worms rustle as they make their way through tunnels. Plant roots crackle as they push through soil. Some species also make use of the soil to communicate with each other acoustically (Maeder et al., 2019). Other species communicate by generating

vibrations: grass- and leafhoppers use plants and soil as a communication medium for mating purposes (Maeder et al., 2019).

The noisier the sound of soil, the more diverse its community is. Healthy soil appears to be more tuneful (Maedery et al., 2022; Robinson et al., 2023). Conventionally managed monoculture is quieter and produces fewer different noises than an organically managed meadow. Soil melodies reflect other types of human intervention: noises of building sites, traffic, airplanes, heavy agricultural machinery (Maeder et al., 2019). Rillig et al. (2019) pose a pertinent question: how do those noises affect the soil and its inhabitants? Can human-generated sounds disrupt communication in the soil or even mimic signals of danger?

von Uexküll (2001) speaks of the harmony of organisms and uses music as a metaphor to illustrate the interconnectedness of all Umwelts in a broader resonance of relations. Contemplating the sensory Umwelt of soil through sound shows that each sound from the underground has its own melody and is entangled with others – the orchestra of soil animals is joined by the orchestra of soil itself, while human-made noises perturb its rhythms. The collage above invites us to appreciate the soil's 'music of life' (von Uexküll, 2001) performance and consider its place in alternative food growing imaginaries.

### **The scents of honeybees**

I spot a honeybee landing on a bright yellow flower. On the side of its body, there is an orange pellet – pollen mixed with a little nectar or saliva. Later, the bee will unload the pellet into one of the honeycomb cells. I take a photograph of the bee and the flower, to use in a collage later. I watch the bee fly off with its precious cargo.

Danielle, another Organiclea staff, tells me that there is an apiary with five beehives on site, where bees are regarded purely as pollinators, not as honey producers. Honeybees are only one pollinator group, along with solitary bee species, bumblebees, wasps, ants, flies, butterflies, moths and some beetles. Today it is common knowledge that the cumulative effects of habitat destruction, capitalism-driven land management with widespread pesticide use, and the effects of climate change are behind the declining numbers of pollinators worldwide (Dicks et al., 2021). This poses an existential threat for humans – pollinator insects play an immense role in the production of many fruits, vegetables and field crops. The discourse around pollinators is tinted with anthropocentrism. But what lies beyond pollinators' one-dimensional value for humans?

Danielle takes me to the apiary and tells me that the honeybee world is a world of scents. As I learn later, honeybees possess a total of 170 odorant receptor genes responsible for smell (and, in contrast, only 10 gustatory receptors responsible for taste) (Robertson & Wanner, 2006). This translates into around 60,000 olfactory receptors located on their two antennae on the head (Brill et al., 2013). I tune in with my own sense of smell and realize that it is much less sensitive. I consider what I would like to learn from honeybees and get an idea for a collage. After that day, I research visualizations of smell.



Honeybees rely predominantly on the olfactory knowledge to navigate the world. In interspecies communication, they can perceive pheromones emanated by other bees, recognize kin signals and communicate within the hive. Bees also form interesting entanglements when foraging. Danielle informs me that a foraging honeybee will come



across a dizzying variety of flowers but is able to use its olfactory detection to choose and detect subtle differences between them. After only one visit to a flower, honeybees fix the scent in their memory and can find it again and share their knowledge with other bees (Robertson & Wanner, 2006).

The reason behind the bee-flower entanglements being formed around olfactory rather than gustatory knowledge reveals an interesting relational dynamic. Honeybees form a non-antagonistic connection with plants, and consequently plants do not have to defend themselves with toxins (Robertson & Wanner, 2006). The food that honeybees feed to bee larvae is also free of toxins, and the lack of need to detect toxins explains the low number of gustatory receptors. Honeybees and plants enjoy a non-toxic convivial relationship, which in turn shapes the knowledge that honeybees form to perceive the world.

The entanglement between honeybees and humans is often more toxic and appears to shift the patterns of the honeybee olfactory knowledge. Anthropogenic air pollution reacts with the compounds in plant scents, making plants much less recognizable to insects (Ryalls et al., 2022). Ryalls et al. (2022) found that polluted air reduced counts of insect pollinators by 62–70% and their flower visits by 83–90%. Atmospheric modifications and the anthropocene's 'multimodal' pollution profile (Halfwerk & Slabbekoorn, 2015) thus disrupt honeybees' *Umwelts*.

Exploring honeybees' *Umwelts* reveals their close entanglement with plants and humans, underpinned by the complex olfactory knowledges. Living creatures involved in the constitution of food systems create each other's lifeworlds and, as von Uexküll shows, are interconnected in ways not easily captured by the conventional biological units of enquiry. With smell as a guide towards scented environments not just for humans but for pollinators, I try making visible the invisible honeybee olfactory capacities in a collage and wonder how they can be appreciated in alternative food growing imaginaries.

## Weeds touch

'Weed' appears to be a dirty word in the food growing circles. I hear descriptions like 'pernicious', 'perennial', 'weed management' – weeds seem to be unwanted guests and it is assumed that other species do not want to socialize with them. One of my frequent encounters with weeds is through Horsetail. Hugo, an Organiclea member, describes it as an invasive weed, a nuisance, a smotherer. Like animal farming, agriculture also focuses on and prioritizes a small number of 'productive' species while excluding those who predate or parasitize them (J. Lorimer et al., 2019).

I pick young horsetail stems and arrange them neatly on a plastic tray – after drying it will be used for making tea. The stems are vibrant green, with a slightly uneven abrasive surface that varies in colour from green to light beige to dark brown. The leaves feel scaly, yet sturdy. They have a faint nutty smell. Most of my photos from Organiclea are those of 'weeds'. Later that day I blend them together in an image, making their vibrant colours subdued and reflect on the sensory powers of weeds while drinking horsetail tea. Their power can be documented in a manifesto.



From Hugo I learn that weeds (and other plants) explore their worlds by using mechanoreceptors found across their leaves and roots, which makes me realize that their Umwelts are closely entangled with so many others. Mechanoreceptors often take the form of fine hairs and when touched, they cause a shift in charged



compounds from one side of plant cells to the other, which is detected as a signal by the plant.

Weeds evolve rapidly and constantly adapt to habitat disturbance, which guarantees their resilience. They are incredibly skilled at transforming bare land into fertile soils – they appear first and lay the ground for the development of more intricate ecosystems. When they die, their decomposition increases soil's moisture while decreasing soil density – which is crucial at the early stages of soil development.

Weeds use their mechanoreceptors to detect chemical compounds in the soil and they become intermediaries carrying an important message about its condition. Acidic soil invites sorrel and ox-eye daisies. Chickweed indicates neutral pH. High levels of nitrogen can be hinted by ground elder, henbit, pigweed and chickweed. Plantain grows in compacted, sour soil with low fertility and often indicates heavy clay. Dandelions and knotweed are also signs of compacted soil, and creeping buttercup, horsetail and silverweed may indicate wet soil with poor drainage. More generally, Hugo tells me, if weeds grow fast, it means that the soil is very fertile.

Weeds are appreciated by wildlife, and it is through mechanoreceptors once again that their *Umwelts* are entangled. Dandelions attract bees and butterflies, and their leaves are food for several species of moth caterpillars (and humans!); chickweeds are for caterpillars and moths, and their seeds for finches and sparrows; nettles support more than 40 species of insects, including caterpillars, butterflies and some ground bugs. Weeds create and support more relational structures than ‘wildflower mixes’ that, counterintuitively, are recommended and even incentivized for promoting biodiversity. Weeds attract fourfold more flower-visitor species and fivefold more conservation-listed species than wildflower mixes (Balfour & Ratnieks, 2022).

Weeds exist in a complex entanglement between soil and its inhabitants, pollinators, birds, humans. Would the new food growing imaginaries be more considerate of weeds and their sensory worlds? Food growing is a transformational process, with human and more-than-human as ‘beings-with-an-associated world’ (Despret, 2016, p. 165). A sensory *Umwelt* of common weeds reveals a ‘world that has modified the list of what affects and constitutes them’ (Despret, 2016, p. 165), looking beyond a single species into a multitude of entanglements.

## **Art of noticing**

Sight is a hegemonic sense for humans; visual information tends to dominate the information coming from other senses (Stokes & Biggs, 2014). Yet in more-than-human imaginaries of food growing sight can become one’s primary tool when practicing the art of noticing. In my early days at Organiclea a fellow volunteer remarked that wildlife-friendly, holistic agriculture is all about noticing what is going on in the environment, ‘really having to pay attention’. Observation allows humans to attempt decoding a complex web of more-than-human signals and messages. The art of noticing becomes increasingly important when the natural equilibrium is disrupted, and some species start to dominate. In the dominant food growing paradigm, this occurrence has earned the title of ‘pest infestation’.



Like weed, 'pest' is a loaded term, which powerfully shapes ways of human/more-than-human relationality. 'Pests' are 'fixed abstractions "cleaved apart from the messy time-space context ... in which these animals actually live out their lives"' (McKiernan & Instone, 2016, p. 477). They are an inconvenience at best, and a target of a diverse



range of eradication strategies at worst. How can human relationship with 'Pests' become that of convivial cohabitation (Donati, 2019) instead of animosity and what role does human sight play in it?

While planting kale, I learn about food growers' friends and foes from other, more experienced volunteers. 'Pests' are grouped according to the parts of the plant they thrive on – sap suckers (aphids), root feeders (insect larvae), leaf feeders (butterfly, slugs and snails, leaf miners, birds and mammals), stem feeders (moth caterpillars), flower feeders (earwigs), fruit feeders (moth caterpillars, beetle grub, birds and wasps). I learn what some of them look like and practice my art of noticing when spotting them and capturing them on camera.

Later Clare tells me that the best food growing practice is 'walking the garden'. Walking the garden is not only about being present but most importantly about keeping one's eyes open, sharply observing what unfolds there. Have new visitors appeared? Or have the already existing species been thriving so much that it affects the ecosystem? A sharp eye would notice and recognize them. But observation does not need to translate into immediate action. I learn that 'pests' are part of the food growing process and make essential contributions to the overall health of the ecosystem. Aphids that are commonly labelled as 'pests' are a good example. A patch of nettles is attractive to nettle aphids and, consequently, to aphid predators, ladybirds. If one of the elements of the chain is removed, the rest of the chain will be thrown out of balance.

One's sense of sight also needs to be sharp to not confuse different species within one family. Larvae of certain insects, such as lacewing and hoverfly, get mistaken for 'pests', yet both insects are essential for maintaining a healthy ecosystem balance. Slugs also get an unfortunate label of 'pests', even though they provide a crucial food source for other wildlife. Clare tells me that slug species such as *Arion Ater* are key composters, helping to break down decomposing vegetation, while *Limax maximus* even predate on other slugs, helping to maintain a balance within slug communities.

Humans also need to use their sense of sight to read the message that an adjustment is needed. Is the soil rich enough in organic matter? If a dominance of one species has been observed and requires challenging, which relationships need building for that? Relationship building involves restoring the balance of the ecosystem. Dominance of insects such as aphids, mites and caterpillars is challenged by creating favourable conditions for ladybirds, lacewings and hoverflies. Creating favourable conditions inevitably includes eliciting help from plants. I learn that daisy, camomile and mints will attract predatory wasps, hover flies and robber flies. Plants also need to be of different heights – ground beetles need the cover of low-growing plants, while lacewings lay their eggs in shady, protected areas. Plants with simple, open flowers work best – many insects have short mouthparts and are unable to reach into deep or tubular-shaped flowers.

In alternative food growing imaginaries, human sight comes to play a key part in grappling with one of the main 'problems' of food growing – 'pest management'. I used my sight to capture some of the 'pests' at Organiclea and blended them into a collage. Can humans learn to practice the art of noticing in relation to the dynamics of the ecosystem and adjust to it accordingly? Can the art of noticing create opportunities for what Haraway (2008) calls cohabiting well without final peace?

## More-than-human urban food growing imaginaries

Moving beyond capitalist food production calls for alternative imaginaries. This paper is an invitation to start cultivating such an imaginary, rooted in explorations of more-than-human sensoriums. Urban organic farms present critical hubs of understanding and practices of living ‘with’ more-than-human lifeworlds; they provide a solid foundation for contemplating new, relational food growing imaginaries that broaden our knowledge of more-than-human life stories (Sachs Olsen, 2022).

I propose that one such imaginary can turn to more-than-human sensory lifeworlds and their associated relational webs: taste and nutrition for the soil, sound for soil denizens, smell for honeybees, tactile perception for common weeds, while exploring human experience of food growing through sight. Humans have been constrained by language, which makes us ‘blind to the numerous forms of embodied communication between other species, and it is now urgent that this complexity be widely understood’ (Tait, 2014, p. 3). An alternative food growing imaginary presented here recognizes that human and more-than-human world-making projects are interconnected.

By innovatively combining sensory ethnography with visual arts methodologies, this paper foregrounds the importance of the concept of *Umwelt* for exploring more-than-human and human sensoriums. It is through our senses that we can learn to notice and ‘be affected’ by other beings, while also becoming more attuned to their *Umwelt*. Practicing the human art of noticing of more-than-human senses of taste, sound, smell, touch brings us closer to a non-anthropocentric form of relationality. As I show here, at Organiclea human and more-than-human sensory *Umwelts* are closely intertwined, forming an intricate entanglement.

More-than-human *Umwelt* exploration is a transdisciplinary endeavour that radically remixes ‘the arts, humanities and the social and natural sciences’ (Edwards et al., 2023). Visual arts methodologies in this paper were an original means of attuning to and bringing forth the normally marginalized more-than-human sensorial experiences in the food growing context, contributing to the creation of alternative imaginaries for humans. They originated from the entangling and overlapping of my own *Umwelt* with those of others – human and non-human – at Organiclea.

The approach adopted in this paper – bringing more-than-human sensory explorations and visual methodologies together – offers novel pathways for rethinking and transforming food systems beyond capitalism. Starting at a small scale, it brings hidden forms of entangled relationalities to the surface, challenging conventional ways of relating to non-humans in food growing and building a world that is not yet fully formed, that is still in the making (Vannini & Vannini, 2024). This paper advocates for imaginative research approaches, rooted in prefiguration and creativity, that open possibilities for complex, unexpected interspecies world-makings and create more questions than they provide answers. An alternative future of food production is pluriversal; it brings nourishment to everyone, human and non-human alike.



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## References

- Abram, D. (1997). *Spell of the sensuous: Perceptual language in a more-than-human world*. Vintage.
- Adams, C., & Gruen, L. (2014). Groundwork. In C. J. Adams & L. Gruen (Eds.), *Ecofeminism-feminist intersections with other animals on earth* (pp. 7–36). Bloomsbury.
- Adams, C., & Gruen, L. (2022). Ecofeminist footings. In C. J. Adams, and L. Gruen (Eds.), *Ecofeminism – feminist intersections with other animals on earth* (2nd ed. pp. 1–43). Bloomsbury.
- Adams, P. (2016). Placing the Anthropocene: A day in the life of an enviro-organism. *Transactions of the Institute of British Geographers*, 41(1), 54–65. <https://doi.org/10.1111/tran.12103>
- Amin, A., & Thrift, N. (2002). *Cities: Reimagining the Urban*. Cambridge: Polity.
- Bais, H., Park, S.-W., Weir, T. L., Callaway, R. M., & Vivanco, J. M. (2004). How plants communicate using the underground information superhighway. *Trends in Plant Science*, 9(1), 26–32. <https://doi.org/10.1016/j.tplants.2003.11.008>
- Balfour, N., & Ratnieks, F. (2022). The disproportionate value of ‘weeds’ to pollinators and biodiversity. *The Journal of Applied Ecology*, 59(5), 1209–1218. <https://doi.org/10.1111/1365-2664.14132>
- Bar-On, Y., Phillips, R., & Milo, R. (2018). The biomass distribution on earth. *Proceedings of the National Academy of Sciences of the United States of America*, 115(25), 6506–6511. <https://doi.org/10.1073/pnas.1711842115>
- Baynes-Rock, M. (2013). Life and death in the multispecies commons. *Social Science Information*, 52 (2), 210–227. <https://doi.org/10.1177/0539018413477521>
- Beacham, J. (2018). Organising food differently: Towards a more-than-human ethics of care for the Anthropocene. *Organization*, 25(4), 533–549.
- Bear, C. (2013). Assembling the sea: Materiality, movement and regulatory practices in the Cardigan Bay scallop fishery. *Cultural Geographies*, 20(1), 21–41. <https://doi.org/10.1177/1474474012463665>
- Brill, M., Rosenbaum, T., Reus, I., Kleineidam, C. J., Nawrot, M. P., & Rössler, W. (2013). Parallel processing via a dual olfactory pathway in the honeybee. *Journal of Neuroscience*, 33(6), 2443–2456. <https://doi.org/10.1523/JNEUROSCI.4268-12.2013>
- Brueggemeier, J. (2021). Nature in the dark - public space for more-than-human encounters. *Animal Studies Journal*, 10(2), 19–45. <https://doi.org/10.14453/asj.v10i2.2>
- Buchanan, B. (2008). *Onto-ethologies: The animal environment of uexküll, Heidegger, Merleau-Ponty and Deleuze*. State University of New York Press.
- Büscher, B. (2022). The nonhuman turn: Critical reflections on alienation, entanglement and nature under capitalism. *Dialogues in Human Geography*, 12(1), 54–73. <https://doi.org/10.1177/20438206211026200>
- Clark, M., Domingo, N. G. G., Colgan, K., Thakrar, S. K., Tilman, D., Lynch, J., Azevedo, I. L., & Hill, J. D. (2020). Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets. *Science*, 370(6517), 705–708. <https://doi.org/10.1126/science.aba7357>
- Country, B., Wright, S., Suchet-Pearson, S., Lloyd, K., Burarrwanga, L., Ganambarr, R., Ganambarr-Stubbs, M., Ganambarr, B., & Maymuru, D. (2015). Working with and learning from country: Decentring human author-ity. *Cultural Geographies*, 22(2), 269–283. <https://doi.org/10.1177/1474474014539248>

- Crotty, F. V., Fychan, R., Scullion, J., Sanderson, R., & Marley, C. L. (2015). Assessing the impact of agricultural forage crops on soil biodiversity and abundance. *Soil Biology and Biochemistry*, 91, 119–126. <https://doi.org/10.1016/j.soilbio.2015.08.036>
- Cudworth, E. (2005). *Developing ecofeminist theory. The complexity of difference*. Palgrave Macmillan.
- Da Silva, H. (2014). *Soils are the foundations of family farming*. FAO. Retrieved July 21, 2023, from <http://www.fao.org/soils-2015/news/news-detail/en/c/271795/> :
- De La Bellacasa, M. (2017). *Matters of care: Speculative ethics in more than human worlds*. University of Minnesota Press.
- de la Cadena, M. (2015). *Earth beings: Ecologies of practice across Andean worlds*. Duke University Press.
- de la Cadena, M., & Blaser, M. (2018). *A world of many worlds*. Duke University Press.
- Despret, V. (2004). The body we care for: Figures of anthropo-zoo-genesis. *Body & Society*, 10(2–3), 111–134. <https://doi.org/10.1177/1357034X04042938>
- Despret, V. (2016). *What would animals say if we asked the right questions?* Minnesota Scholarship Online.
- Dicks, L., Breeze, T. D., Ngo, H. T., Senapathi, D., An, J., Aizen, M. A., Basu, P., Buchori, D., Galetto, L., Garibaldi, L. A., Gemmill-Herren, B., Howlett, B. G., Imperatriz-Fonseca, V. L., Johnson, S. D., Kovács-Hostyánszki, A., Kwon, Y. J., Latorff, H. M. G., Lungharwo, T. ... Vanbergen, A. J. (2021). A global-scale expert assessment of drivers and risks associated with pollinator decline. *Nature Ecology & Evolution*, 5(10), 1453–1461. <https://doi.org/10.1038/s41559-021-01534-9>
- Donati, K. (2019). 'Herding is his favourite thing in the world': Convivial world-making on a multispecies farm. *Journal of Rural Studies*, 66, 119–129. <https://doi.org/10.1016/j.jrurstud.2018.12.008>
- Edwards, F., Popartan, L., & Pettersen, I. (2023). , *Urban natures: Living the More-than-Human City*. Berghahn Books.
- Elder, J. (1998). *Stories in the land: A place-based environmental education anthology*. Orion Society.
- Evans, E., & Edwards, C. (2017). Speculations on a more-than-human sensorium: Spatial practice and becoming-with others. *Idea Journal*, 16(1), 130–147. <https://doi.org/10.37113/ideaj.vi0.10>
- Farming for Better Climate. (2018). *Nitrogen fixation*. Retrieved August 1, 2023.
- Fijn, N., & Kavesh, M. (2021). A sensory approach for multispecies anthropology. *Procedia - Social and Behavioral Sciences Elsevier BV*, 32(S1), 6–22. <https://doi.org/10.1111/taja.12379>
- Fijn, N., & Kavesh, M. (2024). Toward a multisensorial engagement with animals. In P. Vannini (Ed.), *The Routledge international handbook of sensory ethnography* ((1st Edition ed. pp. 237–247). Routledge.
- Gabrys, J. (2018). Sensing lichens: From ecological microcosms to environmental subjects. *Third Text*, 32(2–3), 350–367. <https://doi.org/10.1080/09528822.2018.1483884>
- Ginn, F. (2014a). Jakob von Uexküll Beyond Bubbles: On Umwelt and Biophilosophy. *Science as Culture*, 23(1), 129–134. <https://doi.org/10.1080/09505431.2013.871245>
- Goburdhone, S., & Dombroski, K. (2023). Thinking with soils: Can urban farms help us heal metabolic rifts in Aotearoa? *New Zealand Geographer*, 79(2), 127–131. <https://doi.org/10.1111/nzg.12363>
- Greenhough, B. (2014). More-than-human Geographies. In Lee, R., Castree, N., Kitchin, R., Lawson, V., Paasi, A., Philo, C., Radcliffe, S., Roberts, S., Withers, C. (Eds.), *The SAGE Handbook of Human Geography: Two Volume Set* (pp. 94–119). London, New York: SAGE Publications Ltd. <https://doi.org/10.4135/9781446247617>
- Halfwerk, W., & Slabbeekorn, H. (2015). Pollution going multimodal: The complex impact of the human-altered sensory environment on animal perception and performance. *Biology Letters*, 11 (4), 11. <https://doi.org/10.1098/rsbl.2014.1051>
- Haraway, D. (2008). *When species meet*. University of Minnesota Press.
- Haraway, D. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin. *Environmental Humanities*, 6(1), 159–165.
- Haraway, D. (2016). *Staying with the trouble: Making kin in the chthulucene*. Duke University Press.
- Head, L., Atchison, J., Phillips, C., & Buckingham, K. (2014). Vegetal politics: Belonging, practices and places. *Social and Cultural Geography*, 15(8), 861–870. <https://doi.org/10.1080/14649365.2014.973900>

- Hodgetts, T., & Lorimer, J. (2015). Methodologies for animals' geographies: Cultures, communication and genomics. *Cultural Geographies*, 22(2), 285–295. <https://doi.org/10.1177/1474474014525114>
- Ingold, T. (2000). *The perception of the environment: Essays on livelihood, dwelling and skill*. Routledge.
- Judd, T. (1994). The waggle dance of the honeybee: Which bees following a dancer successfully acquire the information? *Journal of Insect Behavior*, 8(3), 343–354. <https://doi.org/10.1007/BF01989363>
- Kimmerer, R. W. (2013). *Braiding sweetgrass: Indigenous wisdom, scientific knowledge, and the teachings of plants*. Minneapolis: Milkweed Editions.
- Kirksey, E. (2018). Multispecies. In R. Braidotti & M. Hlavajova (Eds.), *Posthuman glossary* (pp. 449–451). Bloomsbury.
- Kirksey, E., & Chao, S. (2022). Introduction. Who benefits from multispecies justice? In K. Bolender, E. Kirksey, & S. Chao (Eds.), *The promise of multispecies justice* (pp. 1–23). Duke University Press.
- Kneafsey, M., Maye, D., Holloway, L., Goodman, M. (2021). *Geographies of food: An introduction*. Bloomsbury.
- Kohn, E. (2013). *How forests think: Toward an anthropology beyond the human*. University of California Press.
- Lamine, C., Darnhofer, I., & Marsden, T. K. (2019). What enables just sustainability transitions in agri-food systems? An exploration of conceptual approaches using international comparative case studies. *Journal of Rural Studies*, 66, 144–146. <https://doi.org/10.1016/j.jrurstud.2019.03.010>
- Latour, B. (2004). How to talk about the body? The normative dimension of science studies. *Body & Society*, 10(2–3), 205–229. <https://doi.org/10.1177/1357034X04042943>
- Law, J., & Urry, J. (2004). Enacting the social. *Economy and Society*, 33(3), 390–410. <https://doi.org/10.1080/0308514042000225716>
- Lien, M., & Pálsson, G. (2021). Ethnography beyond the human: The 'other-than-human' in ethnographic work. *Ethnos*, 86(1), 1–20. <https://doi.org/10.1080/00141844.2019.1628796>
- Lorimer, H. (2010). Forces of nature, forms of life: Calibrating ethology and phenomenology. In B. Anderson & P. Harrison (Eds.), *Taking-Place: Non-representational theories and geography* (pp. 55–78). Ashgate.
- Lorimer, J. (2007). Nonhuman charisma. *Environment & Planning D, Society & Space*, 25(5), 911–932. <https://doi.org/10.1068/d71j>
- Lorimer, J. (2010). Moving image methodologies for more-than-human geographies. *Cultural Geographies*, 17(2), 237–258. <https://doi.org/10.1177/1474474010363853>
- Lorimer, J., Hodgetts, T., & Barua, M. (2019). Animals' atmospheres. *Progress in Human Geography*, 43 (1), 26–45. <https://doi.org/10.1177/0309132517731254>
- MacGregor, S. (2017). Gender and environment: An introduction. In S. MacGregor (Ed.), *Routledge handbook of gender and environment* (pp. 1–24). Routledge.
- Maeder, M., Gossner, M., Keller, A., Neukom, M. (2019). Sounding soil: An acoustic, ecological & artistic investigation of soil life. *Soundscape*, 18(1), 5–14.
- Maedery, M., Guo, X., Neff, F., Schneider Mathis, D., & Gossner, M. M. (2022). Temporal and spatial dynamics in soil acoustics and their relation to soil animal diversity. *PLoS One*, 17(3), e0263618. <https://doi.org/10.1371/journal.pone.0263618>
- Markuksela, V. (2024). Beyond the human: A sensory ethnographer's gaze on sportfishing practice. In P. Vannini (Ed.), *The Routledge international handbook of sensory ethnography* ((1 ed. pp. 263–273). Routledge.
- Marr, N., Lantto, M., Larsen, M., Judith, K., Brice, S., Phoenix, J., Oliver, C., Mason, O., & Thomas, S. (2022). Sharing the field: Reflections of more-than-human field/work encounters. *GeoHumanities*, 8(2), 555–585. <https://doi.org/10.1080/2373566X.2021.2016467>
- McKiernan, S., & Instone, L. (2016). From pest to partner: Rethinking the Australian White ibis in the more-than-human city. *Cultural Geographies*, 23(3), 475–494. <https://doi.org/10.1177/1474474015609159>
- Miele, M., & Bear, C. (2022). Geography and posthumanism. In S. Herbrechter. (Ed.), *Palgrave handbook of critical posthumanism* (pp. 1–23). Palgrave Macmillan.

- Mincyte, D., Bartkienė, A., & Bikauskaite, R. (2020). Diverging temporalities of care work on Urban farms: Negotiating history, responsibility, and productivity in Lithuania. *Geoforum*, 115, 44–53. <https://doi.org/10.1016/j.geoforum.2020.06.006>
- Mol, A. (2002). *The body multiple: Ontology in medical practice*. Duke University Press.
- Nielsen, U., Wall, D., & Six, J. (2015). Soil biodiversity and the environment. *Annual Review of Environment and Resources*, 40(1), 63–90. <https://doi.org/10.1146/annurev-environ-102014-021257>
- Oliver, C., Ragavan, S., Turnbull, J., Chowdhury, A., Borden, D., Fry, T., Gutgutia, S., & Srivastava, S. (2021). Introduction to the urban ecologies open collection: A call for contributions on methods, ethics, and design in geographical research with urban animals. *Geo: Geography and Environment*, 8(2), e00101. <https://doi.org/10.1002/geo2.101>
- Panelli, R. (2010). More-than-human social geographies: Posthuman and other possibilities. *Progress in Human Geography*, 34(1), 79–87. <https://doi.org/10.1177/0309132509105007>
- Philo, C., & Wilbert, C. (2000). *Animal spaces, beastly places: New geographies of human-animal relations*. Routledge.
- Pitt, H. (2018). Questioning care cultivated through connecting with more-than-human communities. *Social and Cultural Geography*, 19(2), 253–274. <https://doi.org/10.1080/14649365.2016.1275753>
- Plumwood, V. (1993). *Feminism and the mastery of Nature* (1st ed.). Routledge.
- Poe, M., LeCompte, J., McLain, R., & Hurley, P. (2014). Urban foraging and the relational ecologies of belonging. *Social and Cultural Geography*, 15(8), 901–919. <https://doi.org/10.1080/14649365.2014.908232>
- Price, C., & Chao, S. (2023). Multispecies, more-than-human, non-human, other-than-human: Reimagining idioms of animacy in an age of planetary unmaking. *Exchanges: The Interdisciplinary Research Journal*, 10(2), 177–193. <https://doi.org/10.31273/eirj.v10i2.1166>
- RHS. (n.d.). *Green manures*. Retrieved June 15, 2023, from <https://www.rhs.org.uk-soil-composts-mulches/green-manures>
- Rillig, M., Bonneval, K., & Lehmann, J. (2019). Sounds of soil: A new world of interactions under our feet? *Soil Systems*, 3(3), 45. <https://doi.org/10.3390/soilsystems3030045>
- Ritchie, H., Rosado, P., & Roser, M. (2022). *Environmental impacts of food production*. Retrieved May 10, 2023, from <https://ourworldindata.org/environmental-impacts-of-food>
- Robertson, H., & Wanner, K. (2006). The chemoreceptor superfamily in the honeybee, *Apis mellifera*: Expansion of the odorant, but not gustatory, receptor family. *Genome Research*, 16(11), 1395–1403. <https://doi.org/10.1101/gr.5057506>
- Robinson, J. M., Breed, M. F., & Abrahams, C. (2023). The sound of restored soil: Using ecoacoustics to measure soil biodiversity in a temperate forest restoration context. *Restoration Ecology*, 31(5), 1–13. <https://doi.org/10.1111/rec.13934>.
- Rubio Ramon, G., & Srinivasan, K. (2023). Animal geographies. In L. Lees & D. Demeritt (Eds.), *Concise encyclopedia of human geography* (pp. 17–21). Cheltenham: Edward Elgar Publishing.
- Ryalls, J., Langford, B., Mullinger, N. J., Bromfield, L. M., Nemitz, E., Pfraang, C., & Girling, R. D. (2022). Anthropogenic air pollutants reduce insect-mediated pollination services. *Environmental Pollution*, 297, 118847. <https://doi.org/10.1016/j.envpol.2022.118847>
- Sachs Olsen, C. (2022). Co-creation beyond humans: The arts of multispecies placemaking. *Urban Planning*, 7(3), 315–325. <https://doi.org/10.17645/up.v7i3.5288>
- Schroer, S. (2021). Jakob von Uexküll: The concept of *Umwelt* and its potentials for an anthropology beyond the human. *Ethnos*, 86(1), 132–152. <https://doi.org/10.1080/00141844.2019.1606841>
- Seymour, M., & Connelly, S. (2023). Regenerative agriculture and a more-than-human ethic of care: A relational approach to understanding transformation. *Agriculture and Human Values*, 40(1), 231–244. <https://doi.org/10.1007/s10460-022-10350-1>
- Singleton, V. (2010). Good farming. Control or care? In J. Pools, J. Mol, & A. Moser (Eds.), *Care in practice: On tinkering in clinics, homes and farms* (pp. 235–256). Transcript Verlag.
- Sovová, L., Jehlicka, P., & Danek, P. (2021). Growing the beautiful anthropocene: Ethics of care in East European food gardens. *Sustainability*, 13(9), 5193. <https://doi.org/10.3390/su13095193>

- Stokes, D., & Biggs, S. (2014). The dominance of the visual. In D. Stokes, M. Matthen, & S. Biggs (Eds.), *Perception and its modalities* (pp. 350–378). Oxford University Press.
- Sundberg, J. (2013). Decolonizing posthumanist geographies. *Cultural Geographies*, 21(1), 35. <https://doi.org/10.1177/1474474013486067>
- Tait, P. (2014). Review: The logos of the living world: Merleau-ponty, animals, and language by Louise Westling. *Animal Studies Journal*, 3(2), 1–3. <https://ro.uow.edu.au/asj/vol3/iss2/2>
- Tsing, A. (2015). *The mushroom at the end of the world: On the possibility of life in capitalist ruins*. Princeton University Press.
- van der Heijden, M., & Horton, T. (2009). Socialism in soil? The importance of mycorrhizal fungal networks for facilitation in natural ecosystems. *The Journal of Ecology*, 97(6), 1139–1150. <https://doi.org/10.1111/j.1365-2745.2009.01570.x>
- Vander Meer, R. (2019). *Pheromone communication in social insects: Ants, wasps, bees, and termites*. CRC Press.
- van Dooren, T., Kirksey, E., & Münster, U. (2016). Multispecies studies: Cultivating arts of attentiveness. *Environmental Humanities*, 8(1), 1–23. <https://doi.org/10.1215/22011919-3527695>
- Vannini, P. (2015). Non-representational ethnography: New ways of animating lifeworlds. *Cultural Geographies*, 22(2), 317–327. <https://doi.org/10.1177/1474474014555657>
- Vannini, P., & Vannini, A. (2020). What could wild life Be? Etho-ethnographic Fables on human-animal kinship. *GeoHumanities*, 6(1), 122–138. <https://doi.org/10.1080/2373566X.2020.1717979>
- Vannini, P., & Vannini, A. (2024). Non-representational sensory ethnography: Creation, attention, and correspondence. In P. Vannini (Ed.), *The Routledge international handbook of sensory ethnography* (pp. 358–372). Routledge.
- von Uexküll, J. ([1934] 2010). *A foray into the worlds of animals and humans with a theory of meaning*. University of Minnesota Press.
- von Uexküll, J. (2001). An introduction to umwelt. *Semiotica*, 2001(134), 107–110. <https://doi.org/10.1515/semi.2001.017>
- Whatmore, S. (2006). Materialist returns: Practising cultural geography in and for a more-than-human world. *Cultural Geographies*, 13(4), 600–609. <https://doi.org/10.1191/1474474006cgj377oa>
- Williams, N., & Keating, T. (2022). From abstract thinking to thinking abstractions: Introducing speculative geographies. In N. Williams & T. Keating (Eds.), *Speculative geographies: Ethics, technologies, aesthetics* (pp. 1–32). Palgrave Macmillan.
- Wolch, J., Emel, J., & Gaines, T. E. (1995). Theme issue on bringing the animals back in. *Environment & Planning D, Society & Space*, 13(6), 631–760. <https://doi.org/10.1068/d130735>
- Woodhouse, P. (2010). Beyond industrial agriculture? Some questions about farm size, productivity and sustainability. *Journal of Agrarian Change*, 10(3), 437–453. <https://doi.org/10.1111/j.1471-0366.2010.00278.x>