

ARTICLE

Thinking with Forests as Sentient Societies: Towards a Pedagogy and Ethic of Immanent Care

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Abstract

While Indigenous knowledges have long recognised forests as sentient and caring societies, western sciences have only acknowledged that trees communicate, learn and care for one another in recent years. These different ways of coming to know and engage with trees as sentient agents are further complicated by the introduction of digital technologies and automated decision-making into forest ecosystems. This article considers this confluence of forest sentience and digital technologies through a *pedagogy and ethic of immanent care* as a relational framework for analysis and praxis in environmental education. The authors apply this framework to three key examples along Birrarung Marr, an ancient gathering place and urban parklands in the city of Naarm (Melbourne). These include an immersive theatre-making project exploring forest communication networks with young children; the Melbourne Urban Forest data set, which hosts digital profiles for over 70,000 trees; and the Greenline masterplan which aims to revitalise the north bank of the Birrarung over the next five years. Exploring the ethical and pedagogical contours of these examples leads to propositions for rethinking the role of environmental education in navigating the current confluence of animal, vegetal, fungal and digital life.

Keywords: environmental education; forest sentience; Indigenous knowledges; ethics of care; critical forest studies; digital technologies

Introduction

Aboriginal and Torres Strait Islander peoples have long recognised trees as animate creatures (Arnold et al, 2021) and forests as sentient societies that learn from experience, adapt to changing conditions and pass down knowledge through time (Bawaka Country, 2022). These knowledges of forests and trees are highly situated through living practices of mutual attunement, reciprocity and regenerative care within the traditional homelands, or Country, of Aboriginal and Torres Strait Islander peoples (Poelina et al, 2022). Living practices of caring for and *as* Country interweave pedagogy and ethics with metaphysical and corporeal knowledges of forests and trees (Suchet-Pearson et al, 2013), where teaching, learning and research are inseparable from the environment through which it becomes possible to think and know (Hughes & Barlo, 2021; Martin, 2017). Deep understandings of trees and how they communicate are learned through relations of care that spiral through time (Kelly & Rigney, 2022; Saunders, 2021), generating reciprocal knowledges of self, culture and place through messages and teachings of Country (Arnold et al., 2021; 2023).

In contrast, western scientific understandings of how trees communicate, protect and care for one another have only been established in recent years (Simard, 2021). There is now wide

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scientific consensus that trees recognise their own kin and can accumulate and transmit experiential knowledge over time through both subterranean (mycorrhizal) and airborne (aerosol) chemical signals (Beiler et al, 2010; Hooper, 2021). Such insights are expanding public perceptions of forests as sentient societies in ways that sometimes find resonance with Indigenous knowledges cultivated and passed down over millennia (Kohn, 2013; Lawrence, 2022; Marder, 2013; Sheldrake, 2021). However, unlike Indigenous knowledges, western sciences fail to provide an ethical and pedagogical framework for interspecies relations of care between humans and trees now that their sentient capacities are more widely accepted and understood (Whyte & Cuomo, 2016).¹

The need for an ethic and pedagogy of mutual care between humans and trees has been intensified with the onset of climate change and the catastrophic loss of biodiversity resulting from colonial resource extraction over the past century (Ambreen & Pahl, 2023; Rousell, 2023). Trees are precariously positioned within these urgencies as both commodity and solution, a situation further complexified by the introduction of drones, sensors, robots and artificial intelligence into forests as sites of remote sensing, predictive analytics and automated intervention (Gabrys, 2020; Prebble, McLean, & Houston, 2021). As trees and forests become enfolded into a generalised ecology of technics at planetary scale (Horl, 2017), new questions are emerging in environmental education regarding the confluence of animal, vegetal, fungal and digital life (Jukes, Stewart, & Morse, 2023; Rousell et al, 2023).

This article considers the emerging intersections of forest sentience and digital technologies through an ethics and pedagogy of immanent care, which we develop and apply as a relational framework for analysis and praxis within a place-based, anti-colonial approach to critical forest studies. The article draws on an ongoing research residency and participatory arts practice located along the banks of the Birrarung, a river in Naarm (Melbourne) on the unceded lands of the Kulin Nation. In developing an ethic and pedagogy of immanent care, and its implications for environmental education, we discuss three empirical examples located along this stretch of the river. The first is an immersive theatre production titled “Wood Wide Web”, which used a combination of analogue and digital technologies to simulate subterranean networks of rhizomycelial forest communications with young children. Our second example is the Melbourne Urban Forest data set (City of Melbourne, 2020), a digital platform designed to enable urban citizens to map and interact with over 70,000 individual trees across the city. And our third example is the City of Melbourne’s Greenline Implementation master plan, which looks to revitalise cultural and vegetal life along the northern bank of the river over the next five years.

Our analysis of these examples puts immanent philosophies of care into conversation with Indigenous knowledges of more-than-human relation and multispecies kinship, building on a series of publications focusing on related environmental education projects along the Birrarung (Rousell, 2023; Rousell & Penaloza-Caicedo, 2022). We argue that the current wave of public excitement about the scientific “discovery” of forest communication risks projecting settler colonial images of learning, communication, familial structure and futurity onto nonhuman societies. Resisting the common reduction of forest communication to either cybernetic or romanticised abstractions, we further question the methods by which different publics have come to revalue forests as sentient and caring communities (Ambreen, Badwan & Pahl, 2023). What are the pedagogical consequences of coming to understand forest communities through positivist science and technology, rather than through the immanent, relational and pluralist ontologies of Indigenous philosophies and sciences as living practices? Exploring the contours of this question leads to a series of propositions for rethinking environmental education through an ethic and

¹Isabelle Stengers (2005; 2010; 2018) and other feminist philosophers of science offer compelling accounts of how western science positions itself at an artificial distance from the world in its search for universals. This can be understood as an attempt to purify the findings of science from the complexity of living practices (including myth, story, art, politics) which could offer a route into an ethics of care (Watts, 2013).

pedagogy of immanent care that engages respectfully with Indigenous knowledges, as they have been generously shared with the wider public.

As co-authors, we each bring a different angle of positionality to our shared work on the unceded lands of the Eastern Kulin Nation, as animated by ongoing practices of listening and responding to First Nations people's calls for Indigenous-led land practices. David (Author 1) identifies as a migrant settler of mixed European descent who electively migrated from the United States as a young adult and has since lived and worked on unceded Peramangk, Kaurna and Bundjalung Countries in Australia, and the lands of Ngāti Hau in Aotearoa New Zealand. Today he lives on unceded Wurundjeri-Woi Wurrung Country close to the Merri Merri (or "very rocky") creek. Jess (Author 2) was born in Magandjin (Brisbane) (Charlton, 2023), another city defined by its river, and has lived, worked and learned on the unceded Country of the Wurundjeri and Boon Wurrung peoples for over a decade. Her relations with place and land are informed through her connection to both white rural settler and Vietnamese refugee settler experience, while being a lifelong suburban/urban dweller.

Together we have developed a shared praxis of engaging carefully and respectfully with Indigenous knowledges through a series of protocols developed in conversation with Indigenous mentors and colleagues. We believe such work is particularly important in densely populated urban areas where Indigenous knowledge holders are in great demand. These protocols include acknowledging Country whenever we gather to work and exchange ideas; seeking and turning up in places where Indigenous knowledge is being freely shared; reading and citing published works by Indigenous scholars and elders carefully and with attention to geographically and culturally specific knowledges; acknowledging the plurality of Indigenous knowledges and their deep connections with specific places; and, wherever appropriate, stating who we are, where we come from and how we come to this place and to this work. These protocols form a significant aspect of the ethic and pedagogy of immanent care that we develop and share through this article, because they guide how we seek to engage responsibly with Indigenous knowledge wherever it is shared on Country with non-Indigenous people like us.

The more we sense and listen, the more we become aware of Indigenous knowledge that is often being shared with the wider public in plain sight. For instance, along the banks of the Birrarung in Naarm (Melbourne) there are guided walks, audio tours, installation artworks and signposted engagements with Indigenous histories of specific places that can be readily accessed. Welcome to Country ceremonies, smoking ceremonies, community gatherings and knowledge sharing talks with Indigenous elders are frequent events that offer direct modes of engagement with contemporary Indigenous people and knowledges. There are numerous educational resources — that are also art, stories, songs, dance — shared by Indigenous knowledge holders online, many of which arise from specific places such as Birrarung Marr. Seeking, recognising, showing up, listening and engaging carefully does not mean taking this knowledge and using it for our own ends (Poelina et al., 2022). Rather, it means allowing ourselves to be transformed by the practice of attending carefully to knowledges which are not our own, but are nonetheless embedded in the places where we work and carry out our lives (Simpson, 2017). For us this means respecting how Indigenous knowledges matter in terms of where we are, how we think and what we do, a practice which informs our immanent orientation towards an ethics of care and also what it means to teach and learn on unceded Kulin lands and waterways.

Gathering at Birrarung Marr

The work developed in this article emerges from an ongoing research residency at ArtPlay, the City of Melbourne's multi-arts creative studio for children situated in the urban riverside park now known as Birrarung Marr. This place not only begins our inquiry, but we can come to understand with Mary Graham that this place *precedes* inquiry as "a living thing" that is

“geographically located [as] an event in time” (Graham, 2007, p. 6). To call forth even just the name Birrarung Marr connects this article to ongoing histories of relationality gathered up across space and time. While Birrarung Marr has been a gathering place for the five language groups of the Eastern Kulin Nation for thousands of years, the parkland we encounter today was created by the urban renewal project of Federation Square in 2002. Named in the Woiwurrung language of the Wurundjeri people and translated as “beside the river of mist and shadow” (Epstein, 2020), this river is itself a shadow of the waters and wetlands that their ancestors would meet beside, to do *Tanderrum*, or ceremony, alongside the Boon Wurrung, Taungurung, Wadawurrung and Dja Dja Wurrung language groups. The colonisation that established Melbourne began a long programme of technological intervention in the Birrarung — the blasting of a natural basalt rock barrier between the freshwater river and saltwater bay, straightening of meanders, dredging and widening the banks into bluestone-lined channels. Tea tree and mangrove forests were quickly replaced by willows (City of Melbourne, 2021), and later, a grove of she-oak (casuarina) trees that stretches behind the Victorian era tram station now housing ArtPlay. As Naarm (Melbourne) grew, the river and wetlands shrank, straightened-out and hardened into the urban parklands we encounter today.

This inherited relation of coloniality between the built environment and the river is not merely historical, but produces meaning for this inquiry in the present (Graham, 2009). The Birrarung and its namesake park is an example of a place, irrevocably changed by colonisation and western technologies, that in recent years has been a site of reconnection and revitalisation for the Wurundjeri and Boon Wurrung peoples, a different kind of course correction that embraces Indigenous futurities with and for the river. In 2006, a public installation titled Birrarung Wilam (or “Common Ground”) was installed by Keerray Woorroong Gunditjmarra artist Vicki Couzens, Yorta Yorta, Mutti Mutti and Trawlwoolway artist Lee Darroch, and Yorta Yorta artist Treahna Hamm. The installation includes several intricately carved “ancestor stones” leading to a mound campsite, or “puulwuurn,” along with an “eel walk” snaking between the rocks. A series of traditional shields, water vessels and an audio installation shares Indigenous knowledges, creation stories and histories of the Birrarung with the wider public (City of Melbourne, 2023).

Between 2013 and 2016 the *Tanderrum* ceremony was also returned by peoples of the Kulin Nation to the banks of the Birrarung. For the first time since colonisation, this ceremony of welcome and safety was sung, danced and spoken to those gathered, including one of the authors of this article. The practice and performance of this ceremony was also a passing of knowledge from elders to children in their community, a pedagogical event: from 1835 (when John Pascoe Fawcner and John Batman established the unauthorised settlement of Melbourne) to 2013, *Tanderrum* had been hidden (Ilbijerri Theatre Company, 2014). This then, is not an ancient ceremony picked up and placed in the present, but as Taungurung elder Uncle Larry Walsh (2015) explains, a revitalised ceremony, responding to the present, instantiating regenerative Indigenous futurities. This care for Indigenous futurities, reimagined and reenacted by the Kulin Nation on grounds cleared and reconfigured, replanted by the settler colonial state, finds alternative expression in the recent government policy *Wilip-gin Birrarung murrin “Keep Birrarung Alive” Water Act 2017* (Vic), the first piece of Australian legislation to be co-titled in a First Nations language.

Thinking with an ethic and pedagogy of immanent care

As a living, gathering place, Birrarung Marr emerges now as a particular and specific site in which to discuss a multiplicity of confluences between different knowledges and practices of care. These confluences take place through and are often created by the publicness of the site, its history of settler colonial and Indigenous worldmaking practices, and its centrality to urban life and its imaginaries of care in terms of both civics and management. Our work here builds on multiple genealogies of scholarship on care as a relational praxis and ethic of encounter. In the western

tradition, much current work on care continues to draw on the foundational contributions of feminist theory and practice (Noddings, 1988; Hooks, 2000), with the relational ethic of care introduced by second wave feminist theory finding renewed contexts of application within the education, health, development, technology and social service sectors (Pettersson & Tillmar, 2022). These approaches to care are often concerned with the dynamics of relationships between human beings (Desai & Smith, 2018), with care positioned as an interpersonal quality to be pedagogically cultivated, sustained and espoused through social systems, institutions and technologies (Monchinski, 2010).

Since the 1980s and 1990s, third wave feminists such as Donna Haraway (2016), Isabelle Stengers (2010), Rosi Braidotti (2020), Vincienne Despret (2004) and Maria Puig de la Bellacasa (2012) have re-oriented theories of care through philosophies of immanence that disrupt the reduction of relationality to discrete human interactions. This work has often been catalysed by feminist readings, syntheses and expansions of the immanent tradition of thought in western philosophy which includes the works of Spinoza, Bergson, Whitehead, Nietzsche and Deleuze (Grosz, 2017). First Nations philosophies of immanence have also been formative in the development of eco-feminism (Rose, 2002, 2011; Plumwood, 2002) and feminist science and technology studies (Kimmerer, 2013; Tallbear, 2014) as associated fields of research and practice that have taken a more-than-human approach to relations of care. These have in turn shaped the emergence and growth of environmental education (Gough & Whitehouse, 2018; Harvester & Blenkinsop, 2010), and more specifically, the radical ecologisation of thinking and practice emerging through the field's turn to relational ontologies and post-foundational methodological approaches (Clarke & McPhie, 2020; Hart & White, 2022; Poelina et al, 2023; Somerville, 2020).

This article follows the implications of relational ontologies within environmental education in proposing a more-than-human ethic and pedagogy of care under current conditions of environmental upheaval, technological capture and socio-political unrest. It recognises an immanent ethic of care as an ethics located *inside* events of encounter and exchange that exceed human capacities to know and understand (Rousell, 2020, p. 1392). This makes an immanent ethic of care inherently pedagogical because it is bound up with events of encounter that are never fully intelligible, but nonetheless teach us how to think and live in a world of irreducible differences (Rousell, 2021). While the concept of immanence resists standard definitions and is experienced and articulated in a myriad of ways, it is precisely this sensitivity to the pluriversal production of difference that lies at the heart of an immanentist philosophy (Savransky, 2021). One of the reasons why immanence is so difficult to define is because it is presupposed by the very act of trying to define it (Whitehead, 1978). No matter what definition we might come up with, immanence will have already formed the ground on which it becomes possible to think and live. This is because immanence includes all possible actualisations and potentials without any predetermined categories or criteria for thought, which means that ethics must rethought and renegotiated in every event and every encounter with the world. To think an immanent ethics of care is to engage with multiple ongoing practices as they emerge, in relation, and through a co-creation of value: “in caring, an ethos creates its ethics, rather than the other way round” (Puig de la Bellacasa, 2017, p. 154). Ethics becomes what is composed and re-composed through acts of care that cannot be determined in advance, as a praxis of sensing, attuning and responding to obligations and demands of care within events as they unfold.

Forests as sentient and caring societies

The current resurgence of interest in an ethic and pedagogy of care has coincided with increasingly popularised understandings of forests and trees as sentient agents (Marder, 2013; Myers, 2020;

Slater, 2021).² Western science has only recently admitted into evidence what forest ecologist Suzanne Simard first proposed in the 1990s and described in 2010 as the “wood wide web”: that forest communities communicate through vast mycorrhizal networks, and trees care for one another through subterranean and airborne chemical signals (cf Beiler et al., 2010). This “new” knowledge, that trees recognise their offspring, make friends and allies, nurture and care for their families and communities, register emotions such as fear, and even learn and pass down knowledge gained from previous experiences (Hooper, 2021, p. 40), has since been popularised through award-winning novels (Powers, 2018), news articles (Macfarlane, 2016) and children’s books (Wild et al, 2020). These in turn have expanded public awareness and understandings of forests as intelligent entities and social creatures. However, the modes and practices of care that such knowledge might apprehend in the social imaginary, and the pedagogies through which they are enabled, are less straightforward than they might appear.

While these emerging scientific insights are often celebrated for expanding public perceptions of forests as sentient and caring societies, they potentially occlude longstanding Indigenous knowledges which include plants as animate and signifying agents within more-than-human kinship relations (Arnold et al., 2021, 2023). The Bawaka Country collective from Northeast Arnhem Land, for instance, describe how “the stringy bark in flower sends messages to Country, including to humans, if they attend.” (Bawaka Country, 2016, p. 273). Here it is not just a question of how trees communicate with one another, but how they also communicate with humans *and all other creatures* through Country as immanent ground and force of life.

The current wave of public excitement about the scientific “discovery” of forest sentience risks projecting Euro-western figurations of intelligence, learning, communication and familial structure onto trees (Rousell, 2023). As Myers (2017) argues, “even as plant scientists reach into the vegetal sensorium for evidence of plant sentience, we do not yet know what a plant wants or what a plant knows” (p. 300). Sheldrake (2020) also cautions against “network” and “system” metaphors and the plant-centric bias embedded in current public imaginaries of forest sentience, noting the tendency to background the complex role of fungal and bacterial life while imposing anthropocentric ideals of altruism and beneficence onto plants. Sheldrake raises the danger of reducing complex understandings of forest intelligence and communication either to informatic systems or romanticised anthropomorphic narratives, to name two of the most common default explanatory models of western knowledge systems. These tendencies also increase the risk that only those forms of Indigenous knowledges of forests that are assimilable to western scientific and anthropomorphic imaginaries become authorised and allowed to speak, while incommensurable knowledges, such as the spiritual connection of trees to human family lines (Harrison & McConchie, 2009), or the possibility of exchange and consent between human and nonhuman nations (Simpson, 2017), are historicised and erased. The question of the methods by which different publics have come to value knowledge of forest sentience, its subsequent narrativisation within popular culture, and the real-world enactments it engenders is of vital importance. This is a life and death matter playing out, right now, for the Djab Wurrung people and the poisoning of

²Definitions of sentience vary across disciplines and cultures (Myers, 2015; Shaviro, 2015). Sentience is now widely used within western cognitive and neurobiological sciences to describe a diverse range of mental capacities across human and non-human species. Myers (2015) cites recent work in evolutionary biology that “identifies cells as forms of ‘selves’ with minimal forms of ‘sentience’” and proposes that “any organism, single cell or otherwise, that can change itself in response to its environment, could be considered sentient” (p. 47). She applies this to the study of signal transduction in plants in an attempt to “open up a model of plant sentience that is grounded in the very sensitivity of plant tissues” (p. 48), and which recognises that “vegetal sensoria . . . have unique sensibilities and transduce affects and sensations differently than animal or human bodies” (p. 49). For Shaviro (2015), sentience describes the felt sensations and affective capacitations of living organisms that both precede and exceed consciousness, intentionality and cognition. Sentience, in this respect, is far more pervasive, capacious, and widely distributed than consciousness. Plants are considered “demonstrably sentient” creatures which are “probably not conscious”, but the same applies to ourselves because “most of the information processing in our brains goes on unconsciously, and without the possibility of ever becoming conscious” (p. 221).



Figure 1. Photograph of Birrarung Marr showing the Victorian era tram station now housing ArtPlay (centre) and the grove of she-oak trees (right).

their sacred birthing trees to make way for a highway not far from our research site at Birrarung Marr (Kirkham, 2023).

The underground world

One of the questions this article looks to explore is whether and how environmental education can play a role in cultivating more pluralistic public knowledges and understandings of forests as sentient societies. This brings us to the example of *Wood Wide Web*, an immersive theatre-making project which invited young children (3–5 years old) to play as fungal messengers transmitting minerals and biochemical energy packets to trees in need. Taking place at ArtPlay along Birrarung Marr in 2020–2021, *Wood Wide Web* was one of four participatory arts projects funded by the City of Melbourne with the aim of engaging children with the challenges and complexities of climate change (Figure 1). Aligning with a participatory process now typical in ArtPlay’s New Ideas Lab, the project was developed through an initial “dreaming” phase where children collaborated with artists to develop ideas in a grove of she-oak trees behind the ArtPlay building (Figure 2); a “making” stage where immersive environments and participatory strategies were explored within the ArtPlay theatre space (Figure 3); and a “performance” phase where an immersive experience was shared with the public (Figure 4). A previous article focused on the “dreaming” phase of this project as a significant example of multispecies participatory arts practice which takes seriously children’s tendencies to recognise nonhuman animacy (Rousell, 2023). Our analytic engagements with the performance outcome of the project here are more critical, largely due to the project’s turn to an informatic modelling of forest communication networks which lacked engagement with Indigenous knowledges and practices freely shared in the surrounding environment.

As an immersive theatre experience, the final public outcome of *Wood Wide Web* was facilitated by a multiplicity of creative means: the experience was semi-automated, gamified in



Figure 2. Children engaging with she-oaks behind ArtPlay during the “dreaming” phase.



Figure 3. Experimental activity during the “making” phase of Wood Wide Web.

multiple ways and incorporated dramatic, visual and architectural strategies of various kinds. As children enter the immersive environment they take on the role of fungal messengers, and soon learn that the trees really do speak to them, ask their names and share energy balls packed with nutrients to redistribute to other trees in need. The “voice” of each tree emits from a cone shaped hollow, which unbeknownst to the young children, connects to a tube that runs up to a balcony where actors voice the characters of the trees in real time. This can be considered an example of

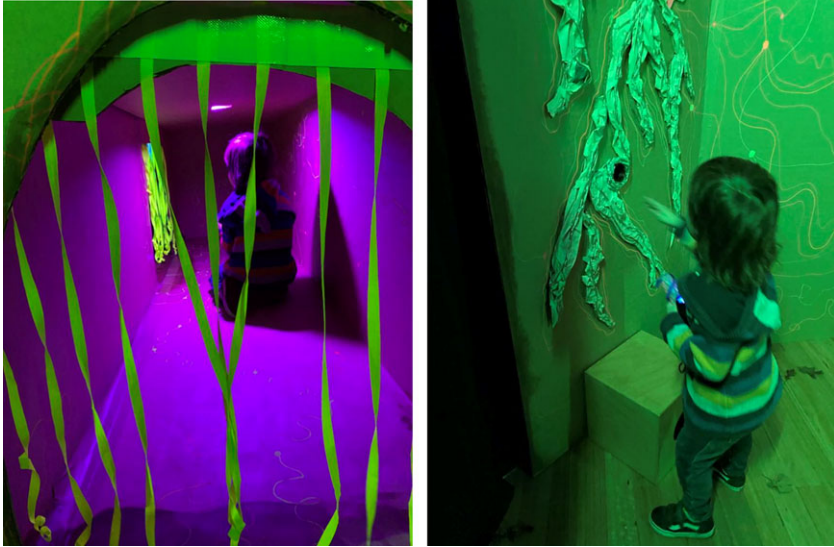


Figure 4. Children engaging with the final performance outcome of Wood Wide Web, including “tree voices” and “energy packets” delivered through a tube (right).

what Jane Bennett (2010) describes as “enchanted anthropomorphism,” which seeks to build phantasmatic *resemblances* between humans and trees with regards to matters of care, relationality, political agency, justice and wellbeing.

In a recent article on the “dreaming” stage of Wood Wide Web, Rousell (2023) connects the concept of an enchanted anthropomorphism with young children’s tendencies to attribute animate personhood and autonomous agency to nonhuman entities, elements and environmental forces. These animist understandings of nonhuman personhood and interspecies communication are not expressed by children as general concepts attached to universal models, but through highly specific characterisations involving complex personality traits, desires, dreams and modes of expression instantiated through particular relational contexts and practices (Merewether, 2020). This is also the premise of what Viveiros de Castro (1998, 2005) terms the “multi-naturalism” of both Amerindian and Aboriginal knowledge cultures, where nature is pluralised rather than monolithic, and nonhuman entities and forces are understood to be just as subjectively complicated, fallible, capricious and contextually situated as human lives.

In thinking through the “performance” phase of Wood Wide Web in more detail, we have engaged Alfred North Whitehead’s (1978, 1967) process philosophy in considering forests as sentient societies. As a mathematical physicist turned philosopher writing nearly a century ago, Whitehead’s body of work is widely recognised for introducing a non-anthropocentric system of thought into western philosophy which recognises all events as relational occasions of experience. In *Process and Philosophy* (1978) Whitehead uses the term “creature” to describe the primordial units of processual experience (“becomings”) through which any event becomes realised. The human body, in this terminology, is a living society composed of myriads of creatures (becomings of cells, neurons, molecules, atoms) which renew their own existence continuously. Similarly, a tree is a society composed of many creatures that cross the continuum of living and inorganic matter, and a forest comprises a larger society of trees and other creatures held together within a shared nexus of experience. The multiple natures of these societies are determined by the processual activity of the creatures that compose them, which in Whitehead’s terminology, are the

relational patterns of experience or “feelings” that sustain a body, a forest, or any other enduring phenomenon within its particular spatio-temporal region of the universe.³

Whitehead’s concepts of “creatures” and “societies” help us see how even a highly immersive and interactive installation such as *Wood Wide Web* can fall prey to two of the most prevalent tropes in Euro-western thought: first, the abstraction of a complex, highly specific living society into a systematised model of stimulus/response and cause/effect; and second, the projection of a romanticised anthropomorphic narrative as an explanatory mechanism for this informatic model. Both are what Whitehead (1978) termed “fallacies of misplaced concreteness” because they misrecognise an abstract model for the actual process of reality taking place. This misplaced concreteness becomes especially notable in the automated reward system built into the installation. As children collect energy balls and feed them to the needy tree, the tree remains dark, still and silent until enough energy lights it up and it suddenly clangs like a gambling machine. The sensational reward the children receive from this system is highly affective and indeed concrete, but it also obscures the possibility of more nuanced and relationally embedded understandings of interspecies care and sociality. In other words, the affective reward obscures how trees and mycorrhizal fungi engage in reciprocity, not by means of informatic exchange or response to stimulus, but through reciprocal circulations of felt qualities and value that generate a mutual sense of identity, care and relationship (Arnold et al., 2021).

While *Wood Wide Web*’s initial “dreaming” stage embraced the concreteness of children and trees as a multispecies society of creatures, as it progressed towards a final outcome it submitted to the lure of transcendence so common to western sciences that claim to “reveal” nature’s underlying causal functions. Rather than staying responsive to the concrete specificities of place the project became an abstract simulation of any place whatsoever. In doing so, it lost touch with the actual grove of she-oaks behind the ArtPlay building, and at the same time, lost an opportunity to engage with histories and knowledges shared through Birrarung Wilam, a permanent installation and sharing of knowledge by Indigenous artists Vicki Couzens, Lee Darroch and Treahna Hamm just outside the ArtPlay doors. Here the dream of scientific transparency according to a universal model of abstraction displaces the specificity of how particular places continuously generate new qualities of relation. This is precisely the dream that underpins the binary code comprising contemporary digital technologies, and more recently, the rise of so-called “artificial intelligence” as an abstract model that attempts to reduce thinking, learning and information to aggregate quantities (Goodman, 2021).⁴

The urban forest dataset

The discussion above raises critical questions about how western scientific explanations of tree sentience and communication can occlude Indigenous knowledges and histories, even when these are generously shared in plain sight. One of the arenas where these matters require urgent attention is within the current technologisation of forest ecosystems through what has been called the “smart forest” or “internet of trees” (Gabrys, 2022). While the concept of the “wood wide web” is now widely adopted to describe vegetal networks of communication, intelligence and sociality, the figures of the “smart forest” and “internet of trees” are increasingly used to describe human management and control of forest environments through remote sensing, predictive data modelling and automated intervention (Prebble et al., 2021). Environmental sociologist Jennifer

³This “production of novel togetherness” amongst creatures is also how Whitehead defines *creativity*, a concept which has found alliance with Indigenous philosophies that are similarly committed to immanence and infinite relationality as first principles (cf Bawaka Country, 2022).

⁴An ultimate dream of western science as transcendent universalism is the frictionless transfer of information from point (a) to point (b) (see Whitehead, 1967), which children physically model in *Wood Wide Web* through the transfer of chemical signals from one location to another. Within this transcendent model, both (a) and (b) are causally determined according to abstract universal “laws” of nature that obtain regardless of context or situation.

Gabrys (2020) argues that we need to develop critically nuanced understandings of smart forest technologies as “emerging planetary modes of governance that have yet to be adequately assessed for their social–political effects”. Her key example of such transformative technologies is the emergence of “precision forestry” that uses drones, sensors, computer models, data analytics and artificial intelligence to undertake reforestation initiatives, enabling forests to literally be replanted and regenerated by drones and AI. While Gabrys (2020, 2022) focuses primarily on the agency of emerging technology and its socio-political implications in transforming what forests can be and become, our interest is in how such technologies impede or enable experiences and understandings of forests as sentient, caring and creative communities. In other words, what is the relationship between the emergence of the smart forest and increased public awareness and understanding of trees as sentient agents with their own complex relations of learning, communication and care?

This brings us to our second example, the Melbourne Urban Forest Visual, an open dataset that digitally locates and classifies over 70,000 individual trees across the council area (City of Melbourne, 2021). Originally created as a tool for managing the health and maintenance of trees within the urban landscape, the dataset evolved in recent years into a participative technology which invites urban citizens to learn about issues facing urban forests, such as climate change, heat spots, ageing and species diversity. The Urban Forest dataset also seeks to facilitate a community network of “citizen urban foresters,” some of whom also meet in person to carry out various community events and citizen science projects. Users of the open data set can develop their own data mappings of Melbourne’s urban canopy, either through selecting variables within the platform or exporting the data to use with their own projects and analytic tools. We have, in our own research, used the dataset to visualise various dynamics of the treescape along the north bank of Birrarung Marr which has been our research site for the past three years. This has enabled us to learn about the distribution of tree species along this bank of the river, when they were planted, how old they are and what their vulnerabilities and adaptations to climate change might be.

As part of this initiative, each of the 70,000 trees has been assigned a unique email address and urban citizens have been encouraged to report utilitarian issues related to vandalism, storm damage, or dropped branches. In recent years, fuelled by social media, the Melbourne Urban Forest dataset has gathered public momentum with citizens around the world sending notes, questions and even love letters to specific trees. The response prompted news stories on the emails alongside photographs of the tree recipients (Burin, 2018). While the content of the emails demonstrates a diversity of motivations for writing and interest/disinterest in the trees themselves, we were drawn to several that ask for the tree’s perspective on different ways to understand and know the urban forest.

We are intrigued by how the Melbourne Urban Forest Visual simultaneously makes visible and obscures the ways in which trees are agentic members of complex societies and kinship networks. The abstraction of trees as individual data points, surveilled by a citizenry who engage them through individualised devices, potentially reinforces relationships of coloniality and mastery (Patel, 2015). Again, in this example, there is a misplaced concreteness as people fantasise about sending emails to trees, when they are actually sending emails to an automated data filing system. In contrast, we consider Yuin elder Uncle Max Dulumunmun Harrison’s description of very concrete practices of receiving information from Country: “I don’t use a computer but I receive emails from the land – they’re spiritual ones” (Harrison & McConchie, 2009, p. 77).

Harrison’s description of receiving spiritual information from the land offers a very different proposition than receiving binary coded information from a digital dataset. While the data set seeks to individualise, classify and locate trees on a geometric grid, the Yuin immanent ontology recognises that all things come to expression through Country as a living manifold of oneness (Harrison & McConchie, 2009). Individual identity (whether for a tree, a human, or any other creature) is an expression of the whole of Country of which it is a relational part (Arnold et al., 2021). Moreover, this whole or “oneness” of Country necessarily configures and articulates itself

differently depending on which Country one is inhabiting or travelling through (Arnold et al, 2023). Such distinctions gesture towards a multi-naturalist ontology, which posits an underlying reality of spiritual oneness and subjectivity which expresses itself in many different objective realities or “natures” (Viveiros de Castro, 2005). The causal laws of such natures are often considered mutable and differentiated according to specific configurations of place, language and identity, rather than universal laws which can be applied to any place or situation whatsoever.

In contrast, western environmental thinking and management practices tend to exclude the metaphysics of relationality from material concerns and resources for environmental management strategies designed to serve particular human agendas. For instance, while the Melbourne Urban Forest Dataset presents trees as distinct “individuals,” the concrete reality is that many of Melbourne’s urban trees are stranded, root bound, cut off from their communities and therefore unable to create families and find friends. The data set therefore obscures how the kinship relations that hold forest communities together are both metaphysical and deeply corporeal, as Koori writer Mykaela Saunders describes:

When trees are prevented from holding onto each other under the ground they get sick. Sick trees will recover and thrive if they are given a community to hold onto. When trees are ripped from soil and planted somewhere new, they won’t thrive unless they are connected as a community. Like entering new communities, there must be a grafting onto existing life ways, rooted in Country. (Saunders, 2021, p. 31)

Thinking with Saunders, we are encouraged that the she-oak trees planted together behind the ArtPlay building might be able to “hold onto each other” and thrive as a community. However, the Melbourne Urban Forest Dataset also shows many trees planted across the city on their own without any other community nearby. We also see how individual trees are often cut down and replaced at a young age because it is cheaper for the city to plant new trees than to maintain them over time. Within this grid of intelligibility, any one tree can be replaced by any other as determined by its capacity to serve particular human interests: to clean the air, create shade, protect us from climate change, help us build communities, and now, even become a sounding board for human desires, fears, proclivities and uncertainties. The metaphysical relations of sentience and sociality between trees are erased by this grid, just as the ethical and pedagogical complexities of urban forests are drowned out by relentless submission to a pragmatics of “usefulness” (Manning, 2023). The question of what a tree feels, thinks, desires, produces, and (maybe even) dreams for itself, and within its own communities, is almost entirely occluded by such practices. Part of the problem is that smart forest projects assume that technology serves universal human interests with respect to forests and trees, an assumption which in turn reinforces a hegemonic conception of the human predicated on abstract models of use-value, rather than on living practices and relations with place (McKittrick, 2020).

The question remains whether digital technologies, in their current binary manifestation and trajectory, can ever become capable of participating in ethical relations with place. Klumbyté et al (2022) propose a set of decolonising computing and software design practices aimed at challenging “white prototypicality . . . from the sourcing of minerals for technologies, to designing machine vision, to generating forms of representation that enact racializing assemblages” (p. 183). But can the extension of digital technologies into forest societies ever break completely with white logics of extraction and coloniality? A collective of Indigenous scholars take up this question in an article titled “Making Kin with the Machines” (Lewis et al, 2018), which explores the possible integration of artificial intelligences and other digital entities into the ecological kinship networks of the Kānaka maoli, nēhiyawak (Plains Cree) and Lakota nations. The article tentatively proposes “an extended ‘circle of relationships’ that includes the nonhuman kin — from network daemons to robot dogs to artificial intelligences weak and, eventually, strong — that increasingly populate our computational biosphere” (n.p.). This proposal comes with several strong caveats however,

including the need for a metaphysical concept of “balance” as an operating principle (see also Rousell & Penalosa-Caicedo, 2022), along with traditional practices of ritual and ceremony that formally induct digital entities into existing creation stories and relations of kin between animals, plants, fungi, lands, waters and skies.

Birrarung futurities

Ultimately what is at stake in the discussions above is the question of multiple and often incommensurable futurities (Pratt & Rosiek, 2023; Rowe & Tuck, 2017; Tuck & McKenzie, 2014). We take up the concept of futurity here, rather than futures, because it speaks to the concrete specificities of living practices rather than the abstraction of a “future” in general. Futurities are sites of active and contested relations within the present and historical consciousness of a place and time, and this puts an ethic of incommensurability into necessary proximity with an ethic and pedagogy of immanent care. As Poelina et al. (2023) emphasise, for Indigenous peoples futurity is a site of *survivance* up to and including the present moment. Futurities are not, in this sense, simply ways of envisioning the future from wherever we happen to stand. They are more so ways of carrying the whole contested and traumatic histories of a place into a movement of relative openness or closure (Green et al., 2018). Walking, thinking, writing and working with children along the banks of Birrarung Marr gives us time to linger with the incommensurable futurities that continue to gather here, including Indigenous futurities of survivance that stretch back many thousands of years; settler futurities which have maintained dominance for around two hundred years; and diasporic futurities which may have only arrived recently on these banks and are beginning to shape the many folds of historical experience that gather along this stretch of the river.

Drabinski (2019, p. 3) describes such incommensurable futurities as different “geographies of reason” that can nonetheless co-exist in the same place and time. Incommensurability, in this reading, is the inescapable outcome of empire as the claim to an abstract, universal reason which stands to master and contest all local variations. And yet, Drabinski notes that “a specific, non-universalisable geography of thinking” always remains possible through encounters with “*this* history, *this* place” where “certain things become readable, even in their illegibility” (p. 12). The question of what aspects of place become legible according to particular futurities and how illegibility still plays at the edges of empire and its claims to universal reason is central to the analysis of our third and final example, the City of Melbourne’s *Greenline Implementation plan*.

The *Greenline Implementation Plan* sets out an ambitious proposal to redevelop and revitalise the north bank of the Birrarung, the river that flows through Melbourne’s central business district, including the area of Birrarung Marr which holds deep historical and contemporary ceremonial significance for the Kulin nation. The plan identifies “Wurundjeri Woi Wurrung and broader Aboriginal significance” as part of a guiding “cultural” theme (City of Melbourne, 2021). Although there is a recommendation to “work with the Traditional Owners” in the development of new plantings and mention of river walk signage, the focus is on the acknowledgement of an Indigenous past. According to the futurities set in this governance plan, tree life is to be utilised for urban cooling and biodiversity goals, enacted through a programme of “removal and replacement” and subject to “management regimes that can be expected for that site”, and the very real threat of future droughts and ongoing climate change (City of Melbourne, 2021, p. 67). The plan therefore separates out the care of trees and vegetation, and the care of Wurundjeri Woi Wurrung histories, as two disconnected pieces of the futurities in the making, at odds with the immanent understanding of Country, culture and place shared by many First Nations peoples (Graham, 2009; Gay-wu Group of Women, 2019).

Propositions for an ethic and pedagogy of immanent care

The ongoing settler colonial project of clearing relations (Manning, 2023) and prioritising the utility value of plants for instrumental purposes continues to rupture and disappear the potential for more relational understandings of urban life, and a concomitant care for Indigenous knowledges and co-creation of futurities *with* plant communities as sentient kin (Arnold et al., 2021; Saunders, 2021). This registers as a collision between different geographies of reason: one which forcibly tries to separate tree and land management from culture and ethics; and another which holds all these together in relation, without even the need or desire to separate (Poelina et al., 2023). And yet there is a profound sense of futurity in, as we have relayed here, ongoing settler colonial attempts to straighten the curves of the Birrarung, clear out the relations that have thrived here for millennia and classify the remains as artefacts of coloniality (Rousell & Hussey-Smith, 2024). As Gay-Wu Group of Women (2019) teach us, Country's curve of relation goes to infinity and can never be straightened. The idea of a "straight line," the separability of ethics from knowledge, or the frictionless transfer of information from point (a) to point (b) are all abstractions. Fallacies of misplaced concreteness. These abstractions are weak and require constant policing to maintain. Perhaps this is why the abstractions of empire appear to repeat to the point of redundancy in our technologies, our cities, our workplaces and our schools. Separating ethics from science and landcare, straightening the meanders of the river, overlaying a grid of human use-value onto the sociality of the forest - these are all futile attempts to undo the curves of relation. And while these attempts to straighten and separate are never fully successful or complete, we must remain wary that "the entanglements of empire are as metaphysical as they are political; reality itself is transformed by empire not just the terms of economy and political representation" (Drabinski, 2018, p. 3).

How do we learn to stay with the curve? To care for things wildly by curving outside the grid? How do we sustain a wild sense of futurity, as a trust in what peoples who respect and care for Country have always known? We ask these questions from the place in which we live and work, along the Birrarung and its tributaries that flow down from the alpine regions, through the inner urban settlements and their revegetated creek beds, and into the tunnels under the metropolis where the eels navigate their way back to the Coral Sea. And it is in this spirit, writing with these histories and futurities, in this place, that we offer a concluding series of propositions for an ethic and pedagogy of immanent care which recognises forests as sentient societies.

1. *Seek and listen carefully to Indigenous knowledge wherever it is publicly shared.* As environmental educators we cannot rely only on elders and other cultural custodians to teach us directly about the sentience of trees and forests and how to care for local places, lands, and waterways. An ethic and pedagogy of immanent care calls on us to seek out and learn from Indigenous perspectives and knowledges wherever they are publicly shared, including through public talks, publications, radio shows, online audio and video resources, protest actions, encampments and installations in our streets and parklands.

2. *Spend time in particular places listening and thinking with forests and trees.* An ethic and pedagogy of immanent care is not so much about explicit "teaching." It is also about how we listen together and put our own senses and thoughts into conversation with those of forests and trees. Considering pedagogies that prioritise facilitation, relational connection and shared bodily awareness can help to orientate and situate knowledge and curriculum differently.

3. *Recognise the futurities that unfold from incommensurability.* We cannot dismiss the complexities of incommensurable futurities and their entanglements with traumatic histories and presents. An ethic and pedagogy of immanent care works to host safe spaces for incommensurability to be recognised and worked through, but doesn't shy away from calling out injustices that continue to breach and denude living practices of caring for Country. With this recognition and articulation of injustice, what is it now possible to do?

4. *Rewild the digital.* We are not sure to what extent this is possible, and whether the binary logic that underpins nearly all digital technologies needs to be abolished and re-invented to embrace an ethic and pedagogy of immanent care. But we are committed to ongoing attempts to bend the configurations of digital technologies back to the curve of living practices of caring for Country.

5. *Stay with the curve.* The idea of a straight line is a fallacy and the relational curve of all life-living can never be broken. This is where unlearning and relearning histories, thinking with situated place and wandering beyond usefulness, might open ways to do things differently, to consider what movements can work against the forces of linearity that constrain contemporary institutions. When the path ahead appears narrow and straight, just remember to stay with the curve.

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